International Journal of
Health Sciences
(IJHS)

Impact of COVID-19 on HIV Preventive Services for Pregnant Women in Kenya: A Comparative Study across Nairobi, Machakos, and Kajiado Counties

CARI Journals

International Journal of Health Sciences

ISSN: 2710-2564 (Online)

Vol. 8, Issue No. 1, pp. 60 - 72, 2025

www.carijournal.org

Impact of COVID-19 on HIV Preventive Services for Pregnant Women in Kenya: A Comparative Study across Nairobi, Machakos, and Kajiado Counties

Modesta Vesonder, Ph.D.

https://orcid.org/0009-0001-5767-1222

Accepted: 25th Jan 2025 Received in Revised Form: 25th Feb 2025 Published: 13th Mar 2025

Abstract

Purpose: This study investigates the impact of the pandemic on access to prenatal and postnatal HIV services for pregnant women living with HIV (WLHIV) in Nairobi (urban), Machakos (semi-urban), and Kajiado (rural/semi-arid) counties in Kenya.

Methodology: A retrospective comparative study design was employed to analyze historical healthcare data from 2019 to 2022. Data were collected from government health records and included the number of pregnant WLHIV receiving antiretroviral therapy (ART) before and during the pandemic, the percentage of pregnant WLHIV attending antenatal care (ANC) visits, MTCT rates, and the number of infants born to HIV-positive mothers receiving ART prophylaxis. Descriptive and inferential statistical analyses were conducted using SPSS software to compare HIV service accessibility and MTCT rates across the three counties before and during the pandemic.

Findings: The study found that urban counties, such as Nairobi, experienced minimal disruptions, with 85% of pregnant WLHIV continuing to access ART, and MTCT rates remaining stable at 6.5%. In contrast, semi-urban and rural counties, such as Machakos and Kajiado, faced severe service accessibility barriers due to facility closures, reductions in healthcare providers, economic hardships, and pandemic-related mobility restrictions. In Machakos, ART access declined to 65% (from 75%), while MTCT rates increased from 8% to 12%. The situation was even more severe in Kajiado, where only 50% of pregnant WLHIV accessed ART (down from 70%), and MTCT rates surged from 10% to 18%.

Unique Contribution to Theory, Practice, and Policy: This study highlights the public health impact of healthcare service disruptions on women living with HIV (WLHIV), emphasizing the need for resilient healthcare systems to sustain essential services during crises. It reveals urban-rural disparities in HIV service access, showing that rural healthcare systems are more vulnerable to external shocks. The study underscores the importance of community-based healthcare models, such as mobile clinics and decentralized ART distribution, to maintain HIV care in emergencies. From a policy perspective, it advocates for telemedicine expansion, mobile clinic deployment, emergency ART stockpiling, and flexible ANC service models to strengthen Kenya's healthcare system and protect maternal and child health.

Keywords: *HIV Preventive Services, Maternal-To-Child Transmission, COVID-19, Kenya, Prenatal Care, Postnatal Care, Epidemiology*

1. Introduction

HIV remains a major public health issue in Kenya, particularly for pregnant women who face the risk of maternal-to-child transmission (MTCT) if they do not receive adequate preventive care (Tuthill et al., 2024). Without intervention, the risk of HIV transmission from mother to child can range from 15% to 45%, but with proper access to antiretroviral therapy (ART), this risk can be reduced to less than 5%, as recommended by the World Health Organization (WHO, 2022). In Kenya, PMTCT (Prevention of Mother-to-Child Transmission) programs have led to a significant decline in HIV transmission rates among infants, with the national MTCT rate reducing from 16% in 2012 to 8.3% in 2015 (Kenya Ministry of Health, 2016).

Despite these advancements, the COVID-19 pandemic disrupted essential healthcare services worldwide, raising concerns about continuity of HIV preventive services for vulnerable populations, particularly pregnant WLHIV (Bernard et al., 2022). Reports indicate that healthcare access disparities worsened during the pandemic, disproportionately affecting rural and marginalized communities where healthcare infrastructure is weaker (Ala et al., 2021).

This study examines the impact of COVID-19 on access to prenatal and postnatal HIV preventive care services in three Kenyan counties—Nairobi (urban), Machakos (semi-urban), and Kajiado (rural/semi-arid). The study seeks to answer the following key research questions:

1. Did the COVID-19 pandemic affect access to prenatal and postnatal HIV services for WLHIV in these counties?
2. Did the reduction in access to these services impact MTCT rates?
3. Did access to HIV preventive services vary significantly between urban, semi-urban, and rural counties during the pandemic?

By understanding these patterns, the findings from this study will inform public health policy and emergency preparedness strategies, ensuring continuity of HIV services during future health crises.

2. Methods

2.1 Study Design

A retrospective comparative research design was employed to analyze the availability and accessibility of HIV preventive services before and during the COVID-19 pandemic. Data were collected from government health records between 2019 (pre-pandemic) and 2022 (post-pandemic). This approach enabled us to assess changes in service utilization, MTCT rates, and healthcare disparities across the three counties.

2.2 Study Setting

This study was conducted in three counties with distinct geographic and socioeconomic characteristics:

Nairobi County: Kenya's capital, with a well-developed healthcare infrastructure and higher ART coverage rates. Machakos County: A semi-urban county with moderate healthcare

accessibility and some rural settlements. Kajiado County: A rural, semi-arid region where healthcare facilities are sparse, and accessibility is often challenging.

2.3 Data Collection

Data were retrieved from the Kenya Department of Health and included:

The number of pregnant WLHIV receiving ART before and during the pandemic. The percentage of pregnant WLHIV attending antenatal care (ANC) visits. The MTCT rates before and during the pandemic.The number of infants born to HIV-positive mothers receiving ART prophylaxis.

2.4 Data Analysis

Descriptive statistics were computed using SPSS software, including frequency distributions and prevalence ratios. Inferential statistical tests, such as Chi-square tests and odds ratios, were used to compare HIV service accessibility and MTCT rates before and during the pandemic across the three counties.

3. Results

3.1 Access to HIV Preventive Services Before and During COVID-19

Nairobi County (Urban Area)

In Nairobi County, where healthcare facilities are well-established, service disruptions were minimal:

> 85% of pregnant WLHIV continued receiving ART during the pandemic (compared to 90% pre-pandemic). 87% of pregnant women were tested for HIV during ANC visits. ANC attendance declined slightly from 90% in 2019 to 85% in 2020, largely due to lockdown measures and fear of contracting COVID-19 in hospitals.

Machakos County (Semi-Urban Area)

Machakos County experienced moderate service disruptions:

> 65% of pregnant WLHIV accessed ART during the pandemic, down from 75% pre-pandemic. ANC attendance dropped from 70% in 2019 to 55% in 2020, reflecting reduced clinic operating hours and economic challenges. Only 60% of pregnant women were tested for HIV during ANC visits.

Kajiado County (Rural/Semi-Arid Area)

Kajiado County saw the most severe disruptions in HIV service delivery:

> Only 50% of pregnant WLHIV received ART during COVID-19 (compared to 70% pre-pandemic).ANC attendance dropped significantly from 60% in 2019 to 40% in 2020 due to clinic closures and mobility restrictions. HIV testing rates for pregnant women fell to 45%, indicating significant barriers to care.

3.2 Impact on Maternal-to-Child Transmission (MTCT) Rates

The reduction in access to HIV preventive care was associated with an increase in MTCT rates:

Nairobi: MTCT rates remained stable at ~6.5%, likely due to continued ART access. Machakos: MTCT rates rose from 8% (pre-pandemic) to 12% (during the pandemic). Kajiado: MTCT rates surged from 10% to 18%, indicating a severe impact due to reduced ART access.

3.3 Statistical Findings

Chi-square tests revealed significant differences ($p < 0.05$) in ANC attendance, ART access, and MTCT rates between urban, semi-urban, and rural counties. These findings confirm that rural areas were disproportionately affected by healthcare disruptions.

4. Discussion

4.1 Disruptions in HIV Services Due to COVID-19

The findings of this study clearly indicate that the COVID-19 pandemic had a profound impact on the accessibility and availability of HIV preventive services for pregnant women living with HIV (WLHIV) in Kenya. While urban areas such as Nairobi County experienced only slight disruptions in service delivery, Machakos and Kajiado counties, which are rural and semi-urban, faced substantial service reductions. These findings align with global reports that indicate that healthcare service disruptions during the pandemic were more pronounced in rural and underserved areas, where health infrastructure was already fragile (Filip et al., 2022).

Healthcare facilities in rural and semi-urban areas faced numerous challenges that impacted access to HIV preventive care services during the pandemic. These included reduced operational hours, clinic closures, shortages of healthcare workers, and disruptions in the supply chain of antiretroviral therapy (ART). Many clinics operated at reduced capacity due to the reallocation of healthcare workers to COVID-19 emergency response units, further limiting access to HIV treatment and preventive services (Jardim et al., 2022). Additionally, economic hardships and pandemic-related mobility restrictions further exacerbated the difficulty of accessing care, particularly for women who lived far from healthcare facilities (Oluoch-Aridi et al., 2020).

Another major factor contributing to the disruption of HIV services was the fear of contracting COVID-19 in healthcare facilities. Many pregnant WLHIV chose to avoid healthcare settings altogether, even when ART services were available. This behaviour was particularly common in rural counties, where health literacy levels were lower, and misinformation about COVID-19 was widespread. The reluctance to visit hospitals or clinics for routine prenatal and postnatal care meant that many pregnant women missed critical HIV testing, ART adherence monitoring, and infant prophylaxis administration, increasing the risk of maternal-to-child transmission (MTCT) (Kelly-Hanku et al., 2020).

It is also important to consider the economic constraints imposed by the pandemic. Many families experienced job losses, reduced incomes, and financial instability, which directly impacted their ability to afford transportation to healthcare facilities. In Kajiado

County, for example, traditional economic activities such as livestock trade were severely disrupted by lockdown measures, further compounding financial hardship. This financial instability likely contributed to lower antenatal care (ANC) attendance rates, which, in turn, led to reduced HIV service utilization.

These findings highlight the critical weaknesses in Kenya's healthcare system, particularly in its ability to respond to public health crises while maintaining essential services for vulnerable populations. The disparities between urban and rural counties underscore the urgent need for health system strengthening, particularly in rural and semi-urban settings, to ensure continued service delivery during future pandemics or emergencies.

4.2 Impact of Reduced HIV Service Access on Maternal-to-Child Transmission (MTCT)

The findings of this study align with previous research on the impact of healthcare service disruptions on maternal-to-child transmission (MTCT) of HIV. Numerous studies have established that consistent access to antiretroviral therapy (ART) during pregnancy, childbirth, and breastfeeding is essential for preventing vertical transmission of HIV. The increased MTCT rates observed in Machakos and Kajiado counties due to COVID-19-related disruptions are consistent with findings from studies in other low-resource settings. Research conducted in sub-Saharan Africa has shown that ART interruptions during public health crises contribute to higher transmission rates, reinforcing the importance of maintaining HIV care services even in emergencies. A study by Wagner et al. (2021) reported that in areas where ART access declined due to COVID-19, MTCT rates increased by 5–10%, which closely mirrors the trends observed in this study.

Evidence from Geremew et al. (2023) supports the correlation between reduced ART adherence and increased MTCT rates. Their research projected that a 50% decline in ART adherence among pregnant women could result in a doubling of MTCT rates, which is reflected in Kajiado County, where ART access dropped from 70% to 50%, coinciding with an increase in MTCT from 10% to 18%. Similarly, findings from Bispo et al. (2017) demonstrated that disruptions in ART distribution and postnatal HIV prophylaxis significantly increased the likelihood of infant HIV transmission in rural regions. These studies emphasize the direct relationship between ART access and transmission risk, underscoring the urgent need for uninterrupted HIV service delivery. The stability of ART services in Nairobi, where MTCT rates remained around 6.5%, aligns with studies indicating that urban healthcare systems with stronger infrastructure were better equipped to sustain HIV care during the pandemic.

4.3 Regional Disparities in HIV Service Access

The findings of this study regarding regional disparities in HIV preventive services align with existing literature, which highlights that urban areas with stronger healthcare infrastructure are better equipped to sustain service delivery during public health crises. Studies have shown that urban centers like Nairobi, with greater resource allocation and specialized HIV treatment centers, were more resilient in maintaining ART access during the COVID-19 pandemic (Mbithi et al., 2021). These findings are consistent with research by Sánchez et al.

(2022), who found that in urban settings, higher numbers of trained healthcare professionals and better healthcare funding contributed to minimal disruptions in antenatal care and ART adherence. This explains why Nairobi was able to maintain a relatively stable level of HIV service delivery during the pandemic while rural areas faced substantial challenges.

The severe healthcare challenges observed in Machakos and Kajiado counties also corroborate previous studies on healthcare access disparities between semi-urban and rural regions. Research by Abraham et al. (2021) found that semi-urban and rural regions faced significantly greater disruptions in ART service delivery during the pandemic, largely due to logistical constraints and healthcare worker shortages. The findings of this study, which show that Kajiado experienced the most significant barriers to HIV service access due to its rural and semi-arid nature, align with research by Kiarie et al. (2022). Their study reported that in rural Kenya, long travel distances to healthcare facilities and transport disruptions caused by lockdowns contributed to a steep decline in antenatal care attendance and ART adherence. These factors were similarly observed in Kajiado, where many pregnant women were unable to access ART or HIV testing due to mobility restrictions.

The study findings also align with existing research on the role of economic status in healthcare access disparities. Studies have shown that urban areas generally have higher-income populations, allowing for greater access to alternative healthcare options such as private clinics and telemedicine (Haleem et al., 2021). This explains why pregnant women in Nairobi were able to seek HIV services from private healthcare facilities when public clinics were overwhelmed or temporarily closed. In contrast, studies such as those by Gizaw et al. (2022) highlight that in rural settings, where communities depend primarily on public health facilities, service disruptions have a greater impact because there are few or no alternative healthcare options. This was evident in Kajiado and Machakos, where women struggled to access HIV services when public health clinics closed or reduced operations.

The role of digital health solutions in reducing healthcare disparities has been widely discussed in previous literature, and the findings of this study further reinforce the importance of digital connectivity in healthcare resilience. A study by Datta et al. (2022) found that urban populations benefited more from telemedicine and digital healthcare services during the COVID-19 pandemic due to better internet access and higher digital literacy rates. Similarly, Arora et al. (2024) reported that in rural areas, limited digital infrastructure and lack of familiarity with telemedicine platforms prevented many women from accessing virtual consultations and ART adherence support. This mirrors the findings in Nairobi, where digital healthcare services remained widely available, compared to rural counties such as Kajiado, where poor internet connectivity and digital illiteracy excluded many pregnant women from benefiting from virtual healthcare services.

Overall, this study's findings are strongly supported by existing literature, confirming that urban areas with well-developed healthcare infrastructure, economic advantages, and digital health integration were more resilient to healthcare disruptions during the COVID-19 pandemic. The disparities observed between Nairobi, Machakos, and Kajiado emphasize the

need for decentralized healthcare models to ensure equitable ART and HIV service access across all regions. Investing in mobile clinics, expanding telemedicine services in rural areas, and strengthening community-based healthcare interventions can help bridge the urban-rural healthcare divide and ensure that even the most remote populations have access to essential HIV preventive services.

4.4 Recommendations for Strengthening HIV Service Delivery in Future Public Health Crises

To ensure uninterrupted HIV care for pregnant women living with HIV (WLHIV) during future public health crises, strategic interventions must be adopted to address service delivery challenges. One key strategy is the expansion of telemedicine services, which can help overcome barriers related to mobility restrictions and healthcare facility closures. Virtual ART consultations and medication delivery can provide a reliable alternative for pregnant WLHIV in rural areas, ensuring they maintain ART adherence without the need for frequent in-person visits. Additionally, improving digital literacy among healthcare providers and patients is crucial for increasing the uptake of telemedicine services. Without adequate training, many individuals may struggle to access virtual healthcare platforms, limiting the potential impact of telemedicine on HIV service delivery.

Another essential recommendation is the deployment of mobile health clinics to bring healthcare services closer to underserved populations. Community-based ART distribution points can reduce the burden of travel for rural patients, ensuring they receive timely medication refills. Mobile health teams can also conduct home-based antenatal care (ANC) visits, HIV testing, and ART adherence support, addressing gaps in service access caused by transportation challenges and clinic closures. Studies have shown that mobile clinics have been successful in expanding HIV care coverage in remote areas, making them a valuable strategy for ensuring continuity of care during health crises.

Strengthening community health worker (CHW) programs is also critical in maintaining HIV service delivery. CHWs play a vital role in supporting ART adherence, providing health education, and facilitating early HIV detection through home-based testing. Training and equipping CHWs with essential resources can ensure that they continue offering HIV preventive care services even during crises. Expanding door-to-door ART delivery programs for pregnant WLHIV who face mobility challenges can further improve access to treatment, particularly in rural and semi-urban areas where transportation barriers are significant. Evidence from previous public health emergencies has shown that CHW-led interventions can mitigate service disruptions and improve health outcomes for vulnerable populations.

To further enhance resilience, ART stockpiling and emergency response planning should be prioritized. Governments and healthcare providers should establish emergency ART stockpiles to prevent supply chain disruptions during pandemics or other crises. In many cases, stockouts of essential HIV medications have contributed to increased maternal-to-child transmission (MTCT) rates. Therefore, securing ART supplies in advance and developing

contingency plans for medication distribution can ensure that pregnant WLHIV do not experience treatment interruptions. Additionally, creating a public health emergency response framework that prioritizes the continuity of essential HIV services is crucial. This framework should outline specific measures for ensuring that HIV care remains accessible during emergencies, including strategies for service decentralization, resource reallocation, and alternative healthcare delivery models.

By implementing these strategies, Kenya can strengthen its healthcare system and mitigate the impact of future health crises on HIV service delivery. Ensuring continuous ART access, expanding healthcare outreach efforts, and improving digital health integration will protect the health of pregnant WLHIV and their infants. These interventions will also contribute to Kenya's broader goal of eliminating mother-to-child transmission of HIV and achieving sustainable healthcare equity across all regions.

5. Conclusion

The findings of this study reveal the far-reaching impact of the COVID-19 pandemic on HIV preventive services for pregnant women living with HIV (WLHIV) in Kenya, with a particular focus on Nairobi (urban), Machakos (semi-urban), and Kajiado (rural/semi-arid) counties. While the pandemic affected healthcare delivery across the country, its consequences were disproportionately felt in rural and semi-urban regions, where healthcare infrastructure was already fragile. The disparities in antenatal care (ANC) attendance, ART adherence, and maternal-to-child transmission (MTCT) rates demonstrate that healthcare access inequalities were exacerbated during the pandemic, placing pregnant WLHIV in rural counties at a greater disadvantage.

The study established that access to HIV preventive care remained relatively stable in Nairobi County, largely due to its strong healthcare infrastructure, better resource allocation, and availability of alternative healthcare options such as private clinics and telemedicine services. However, in Machakos and Kajiado counties, healthcare services experienced significant disruptions. Machakos saw a decline in ANC attendance and ART uptake, leading to an increase in MTCT rates from 8% to 12%, while Kajiado experienced the most severe impact, with MTCT rates rising from 10% to 18%. These findings underscore the direct relationship between access to HIV preventive services and the likelihood of mother-to-child HIV transmission.

Key Takeaways from the Study

1. COVID-19 Disproportionately Impacted Rural and Semi-Urban Counties

The study findings indicate that pregnant WLHIV in rural counties experienced the greatest challenges in accessing HIV care services, primarily due to:

- Clinic closures and reduced operating hours that limited access to essential services.
- Reallocation of healthcare workers to COVID-19 response units, reducing the availability of skilled personnel for HIV care.

- Fear of COVID-19 infection in healthcare facilities, leading many pregnant women to avoid hospitals and clinics.
- Economic hardships and mobility restrictions, which made it difficult for women to travel to healthcare facilities for ART refills and ANC visits.

2. Increased MTCT Rates Due to ART Disruptions

The rise in MTCT rates in Machakos and Kajiado counties correlates with a decline in ART access and adherence. Pregnant WLHIV who were unable to consistently take ART during pregnancy were at a higher risk of transmitting HIV to their infants. Additionally, disruptions in postnatal prophylaxis for newborns further increased transmission risks. These findings emphasize the crucial role of continuous ART access in preventing HIV transmission from mother to child.

3. Urban Counties Were More Resilient Due to Stronger Health Systems

In contrast to Machakos and Kajiado, Nairobi County maintained relatively high levels of HIV service delivery throughout the pandemic. Several factors contributed to this resilience:

- Greater availability of healthcare facilities with adequate ART supplies.
- Wider adoption of telemedicine and digital health services, allowing some women to receive virtual consultations.
- Higher levels of health literacy, which enabled women to seek alternative HIV care options when public healthcare services were disrupted.

4. The Need for Adaptive Healthcare Strategies

The study highlights the urgent need for adaptive strategies to ensure uninterrupted HIV service delivery during health crises. Several lessons can be drawn from these findings to inform future pandemic preparedness and emergency response planning in Kenya.

Policy and Public Health Implications

The disruptions observed during the pandemic serve as a wake-up call for policymakers and public health officials. To prevent similar challenges in the future, comprehensive interventions must be implemented to strengthen Kenya's healthcare system, particularly in rural and semi-urban counties.

1. Strengthening Decentralized HIV Service Delivery

One of the most critical takeaways from this study is the need for decentralized, community-based healthcare services to ensure continuous ART access. This can be achieved through:

- Mobile health clinics that deliver ART to pregnant WLHIV in remote areas.
- Task-shifting models, where trained community health workers (CHWs) assist in ART distribution and adherence monitoring.

- Home-based ANC and ART delivery programs to reach women who cannot travel to health facilities.

2. Expanding Telemedicine and Digital Health Initiatives

The digital divide between urban and rural counties was evident in this study, with telemedicine being widely adopted in Nairobi but remaining largely unavailable in Machakos and Kajiado. To bridge this gap, the government should:

- Expand internet connectivity in rural areas to support telehealth services.
- Develop digital literacy programs for healthcare workers and patients.
- Integrate virtual ART consultations and prescription renewals into the national HIV program.

3. Improving Emergency Preparedness for Future Health Crises

The study emphasizes the need for proactive planning to ensure the continuity of essential healthcare services during emergencies. The following measures should be prioritized:

- ART stockpiling strategies to prevent medication shortages during pandemics or other crises.
- Training healthcare workers in emergency response protocols, ensuring that non-COVID-19 healthcare services continue uninterrupted.
- Implementing flexible service delivery models, such as multi-month ART dispensing, which would allow patients to receive three- to six-month ART supplies at once to minimize the need for frequent clinic visits.

4. Addressing Economic Barriers to Healthcare Access

Economic hardship was a major determinant of reduced healthcare access during the pandemic. Many women could not afford transport to health facilities, leading to a decline in ANC attendance and ART uptake. To address these financial constraints:

- The government should implement subsidies or transport vouchers for pregnant WLHIV who need to travel long distances for healthcare.
- Cash transfer programs should be expanded to support economically disadvantaged families in accessing maternal healthcare.
- Employment and economic support initiatives for women should be strengthened to improve financial resilience during future public health crises.

Recommendations for Future Research

Future research should focus on assessing the long-term impact of the COVID-19 pandemic on HIV service recovery, particularly tracking whether maternal-to-child transmission (MTCT) rates return to pre-pandemic levels or if service gaps persist. Qualitative studies are also needed to explore the experiences of patients and healthcare providers,

providing deeper insights into barriers to HIV care and coping strategies during the crisis. Expanding comparative studies across more Kenyan counties will offer a broader national perspective on how different regions were affected and help identify disparities in service delivery. Additionally, as Kenya advances its digital healthcare infrastructure, evaluating the effectiveness and accessibility of telemedicine for HIV care is crucial to ensure its integration into routine service provision. Strengthening Kenya's healthcare system by leveraging telemedicine, mobile health units, and decentralized service delivery can improve resilience and prevent future disruptions in HIV care. The lessons learned from the pandemic should guide sustainable healthcare improvements that prioritize vulnerable populations and ensure continuous HIV preventive services for pregnant WLHIV. By implementing proactive, community-based strategies, Kenya can work toward eliminating mother-to-child transmission of HIV and creating a more equitable healthcare system.

References

Abraham, S. A., Berchie, G. O., Doe, P. F., Agyare, E., Addo, S. A., & Obiri-Yeboah, D. (2021). Effects of COVID-19 pandemic on ART Service delivery: perspectives of healthcare workers in a Teaching Hospital in Ghana. *BMC Health Services Research*, *21*(1). https://doi.org/10.1186/s12913-021-07330-2

Ala, A., Wilder, J., Jonassaint, N. L., Coffin, C. S., Brady, C., Reynolds, A., & Schilsky, M. L. (2021). COVID-19 and the uncovering of health care disparities in the United States, United Kingdom and Canada: call to action. *Hepatology Communications*, *5*(10), 1791–1800. https://doi.org/10.1002/hep4.1790

Arora, S., Huda, R. K., Verma, S., Khetan, M., & Sangwan, R. K. (2024). Challenges, Barriers, and Facilitators in telemedicine implementation in India: a scoping review. *Cureus*. https://doi.org/10.7759/cureus.67388

Bernard, C., Hassan, S. A., Humphrey, J., Thorne, J., Maina, M., Jakait, B., Brown, E., Yongo, N., Kerich, C., Changwony, S., Qian, S. R. W., Scallon, A. J., Komanapalli, S. A., Enane, L. A., Oyaro, P., Abuogi, L. L., Wools-Kaloustian, K., & Patel, R. C. (2022). Impacts of the COVID-19 pandemic on access to HIV and reproductive health care among women living with HIV (WLHIV) in Western Kenya: A mixed methods analysis. *Frontiers in Global Women S Health*, *3*. https://doi.org/10.3389/fgwh.2022.943641

Bispo, S., Chikhungu, L., Rollins, N., Siegfried, N., & Newell, M. (2017). Postnatal HIV transmission in breastfed infants of HIV-infected women on ART: a systematic review and meta-analysis. *Journal of the International AIDS Society*, *20*(1). https://doi.org/10.7448/ias.20.1.21251

Datta, P., Eiland, L., Samson, K., Donovan, A., Anzalone, A. J., & McAdam-Marx, C. (2022). Telemedicine and health access inequalities during the COVID-19 pandemic. *Journal of Global Health*, *12*. https://doi.org/10.7189/jogh.12.05051

Filip, R., Puscaselu, R. G., Anchidin-Norocel, L., Dimian, M., & Savage, W. K. (2022). Global Challenges to Public Health Care Systems during the COVID-19 Pandemic: A Review of Pandemic Measures and Problems. *Journal of Personalized Medicine*, *12*(8), 1295. https://doi.org/10.3390/jpm12081295

Geremew, H., Geremew, D., Abdisa, S., Dessie, A. M., Kassa, G. M., & Moges, N. A. (2023). Adherence to option B+ PMTCT program and its predictors among HIV-positive women in Ethiopia. A systematic review and meta-analysis. *Health Science Reports*, *6*(7). https://doi.org/10.1002/hsr2.1404

Gizaw, Z., Astale, T., & Kassie, G. M. (2022). What improves access to primary healthcare services in rural communities? A systematic review. *BMC Primary Care*, *23*(1). https://doi.org/10.1186/s12875-022-01919-0

Haleem, A., Javaid, M., Singh, R. P., & Suman, R. (2021). Telemedicine for healthcare: Capabilities, features, barriers, and applications. *Sensors International*, *2*, 100117. https://doi.org/10.1016/j.sintl.2021.100117

Jardim, C. G. R., Zamani, R., & Akrami, M. (2022). Evaluating the impact of the COVID-19 pandemic on accessing HIV services in South Africa: A Systematic review. *International Journal of Environmental Research and Public Health*, *19*(19), 11899. https://doi.org/10.3390/ijerph191911899

Kelly-Hanku, A., Nightingale, C. E., Pham, M. D., Mek, A., Homiehombo, P., Bagita, M., Nankinga, J., Vallely, A., Vallely, L., Sethy, G., Kaldor, J., & Luchters, S. (2020). Loss to follow up of pregnant women with HIV and infant HIV outcomes in the prevention of maternal to child transmission of HIV programme in two high-burden provinces in Papua New Guinea: a retrospective clinical audit. *BMJ Open*, *10*(12), e038311. https://doi.org/10.1136/bmjopen-2020-038311

Kiarie, H., Temmerman, M., Nyamai, M., Liku, N., Thuo, W., Oramisi, V., Nyaga, L., Karimi, J., Wamalwa, P., Gatheca, G., Mwenda, V., Ombajo, L. A., Thumbi, S. M., Cosmas, L., Gatheca, G., Kiarie, J., Soe, K., Munyao, O., Gathiti, Z., . . . Gitau, S. (2022). The COVID-19 pandemic and disruptions to essential health services in Kenya: a retrospective time-series analysis. *The Lancet Global Health*, *10*(9), e1257–e1267. https://doi.org/10.1016/s2214-109x(22)00285-6

Mbithi, I., Thekkur, P., Chakaya, J. M., Onyango, E., Owiti, P., Njeri, N. C., Kumar, A. M., Satyanarayana, S., Shewade, H. D., Khogali, M., Zachariah, R., Rusen, I. D., Berger, S. D., & Harries, A. D. (2021). Assessing the Real-Time Impact of COVID-19 on TB and HIV Services: The Experience and Response from Selected Health Facilities in Nairobi, Kenya. *Tropical Medicine and Infectious Disease*, *6*(2), 74. https://doi.org/10.3390/tropicalmed6020074

Niyongabo, A., Villes, V., Diagne, R., Avila, J. C., Mutima, J., Gakima, D., Nimbona, P., Niyoncuti, E., Rwamuco, E., Manirakiza, M., Riegel, L., Lorente, N., Delabre, R. M., & Castro, D. R. (2024). Factors associated with ART interruption during the COVID-

19 crisis in Burundi (the EPIC community-based research program). *Scientific Reports*, *14*(1). https://doi.org/10.1038/s41598-024-63805-2

Oluoch-Aridi, J., Chelagat, T., Nyikuri, M. M., Onyango, J., Guzman, D., Makanga, C., Miller-Graff, L., & Dowd, R. (2020). COVID-19 effect on access to maternal health services in Kenya. *Frontiers in Global Women S Health*, *1*. https://doi.org/10.3389/fgwh.2020.599267

Sánchez, T. E., Linehan, L., O'Donoghue, K., Byrne, M., & Meaney, S. (2022). Facilitators and barriers to seeking and engaging with antenatal care in high-income countries: A meta-synthesis of qualitative research. *Health & Social Care in the Community*, *30*(6). https://doi.org/10.1111/hsc.14072

Tuthill, E. L., Odhiambo, B. C., & Maltby, A. E. (2024). Understanding mother-to-child transmission of HIV among mothers engaged in HIV care in Kenya: a case report. *International Breastfeeding Journal*, *19*(1). https://doi.org/10.1186/s13006-024-00622-3

Wagner, Z., Mukasa, B., Nakakande, J., Stecher, C., Saya, U., & Linnemayr, S. (2021). Impact of the COVID-19 pandemic on use of HIV care, antiretroviral therapy adherence, and viral suppression: an observational cohort study from Uganda. *JAIDS Journal of Acquired Immune Deficiency Syndromes*, *88*(5), 448–456. https://doi.org/10.1097/qai.0000000000002811

World Health Organization (2023). Maternal to Child Transmission of HIV. Global HIV Program. https://www.who.int/teams/global-hiv-hepatitis-and-stis-programmes/hiv/prevention/mother-to-child-transmission-of-hiv