



Factors Associated With Success in Reducing HIV Mother-to-child Transmission in Sub-Saharan Africa: Interviews With Key Stakeholders

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ABSTRACT

Purpose: A key global health challenge is the persistence of new pediatric HIV infections due to mother-to-child transmission (MCTC), particularly in sub-Saharan Africa. The purpose of this study was to identify the key strategies that some sub-Saharan African countries have used to successfully reduce new pediatric HIV infections.

Methods: A qualitative study utilizing semistructured interviews with key stakeholders in 6 sub-Saharan African countries (Burundi, Malawi, Mozambique, South Africa, Swaziland, and Uganda) was conducted from September 2017 to September 2018. These stakeholders were situated in the National Department of Health or in international health-funding bodies relating to the provision of the HIV/AIDS implementation program in these countries. The countries were selected based on considerable success achieved with HIV treatment in pregnant women. Audio-recorded interviews were transcribed verbatim and thematic analysis was undertaken.

Findings: In all, 6 interviews were conducted, and the mean time of the interviews was 62 min. There were similar numbers of men and women, and most were in the 35- to 45-year age group. Five in six were either a medical doctor or held a doctorate degree. Four in six had >10 years of experience working in the prevention of HIV (PMTCT). Four key strategies that contributed to significant reductions in pediatric HIV infection in the respective countries were identified: (1) committed political leadership; (2) support structures within the community; (3) innovation in service delivery; and (4) robust monitoring and evaluation systems.

Stakeholders spoke about how their governments played a leading role in engagement with communities, and in the dissemination of services. Innovative service delivery comprising task-shifting initiatives and the integration of maternal, newborn, and child health and HIV PMCTC services played an important role in reducing the burdens experienced by women and health care workers, leading to improved health outcomes. Peer support also helped mothers to adhere to their treatment during and after pregnancy. The capacity of national programs to monitor and evaluate the PMTCT services and the importance of regular viral-load monitoring were highlighted by the stakeholders.

Implications: These strategies can be reviewed for possible implementation by other sub-Saharan African countries as possible means of reducing new pediatric HIV infections. (*Clin Ther.* 2019;41:2102–2110) © 2019 Elsevier Inc. All rights reserved.

Key words: elimination of mother-to-child transmission, HIV, pediatric, strategies, sub-Saharan Africa.

INTRODUCTION

A key global health challenge is the persistence of new pediatric HIV infections due to mother-to-child transmission (MTCT). The ongoing global efforts by the international health community toward eliminating MTCT have contributed to reducing the

Accepted for publication August 19, 2019

<https://doi.org/10.1016/j.clinthera.2019.08.012>

0149-2918/\$ - see front matter

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vertical transmission of HIV.¹ The adoption of a lifelong triple antiretroviral therapy (ART) regimen for the treatment of HIV in pregnant and breastfeeding women, and the implementation of the 2013 World Health Organization Consolidated Guidelines relating to Option B+, are expected to assist in eliminating MTCT. Option B+ is the current strategy recommended by World Health Organization for low- and middle-income countries for the prevention of vertical HIV MTCT (PMTCT) during pregnancy and the breastfeeding period, in which women are immediately offered ART for life, regardless of their CD4 count and World Health Organization clinical staging. This approach offers advantages, such as the protection of partner(s) and (unborn) children. In 2011, a Global Plan aimed at eliminating new pediatric HIV infections and keeping HIV-positive mothers alive was launched at the United Nations General Assembly High-Level Meeting on AIDS.² The Global plan prioritized the elimination of MTCT of HIV in 22 countries, accounting for 90% of pregnant women living with HIV. These 22 countries are known as Global Plan Priority countries. Of these 22 countries, 21 are sub-Saharan African countries. According to the Joint United Nations Programme on HIV/AIDS, in its final accountability report of the Global Plan released in 2016, 7 of the 21 Global Plan countries in sub-Saharan Africa have reduced new HIV infections among young children by >70% since 2009 (the baseline year of the Global Plan).² With their percentage reductions since 2009, these 7 sub-Saharan African countries are Uganda, 86%; South Africa, 84%; Burundi, 84%; Swaziland, 80%; Namibia, 79%; Mozambique, 75%; and Malawi, 71%. For example, Uganda decreased its MTCT rate from 28.7% in 2009 to 2.9% in 2015. As a result, Uganda was able to reduce the number of new pediatric infections from 25,000 cases in 2009–3500 cases in 2015. South Africa was able to reduce new pediatric infections from 32,000 cases in 2009–5000 cases in 2015, with the MTCT rate dropping from 11.6% to 2% within the same timeframe.² However, a number of Global Plan countries have made slower progress, including Angola and Nigeria, where the number of new pediatric HIV infections have been reduced only from 5600 cases in 2009–4300 cases in 2015, and from 52,000 cases in 2009 to 41,000 cases in 2015, respectively. The MTCT rates in

Angola and Nigeria remained as high as 21% and 23%, respectively, in 2015.² In this article, we argue that identifying strategies that have worked in countries associated with reductions in new HIV infections can be used by policymakers in other sub-Saharan African countries.

Numerous studies have identified challenges in implementing MTCT programs in sub-Saharan Africa.^{3–6} However, there is a scarcity of studies examining strategies that have made a positive difference in sub-Saharan Africa. The objective of the current study was to identify common strategies and factors associated with reductions in HIV MTCT in sub-Saharan Africa, with the goal of broader implementation across the continent.

MATERIALS AND METHODS

Study Design and Participants

This qualitative study was conducted from September 2017 to September 2018 and used semistructured interviews with key stakeholders in 6 sub-Saharan African countries (Burundi, Malawi, Mozambique, South Africa, Swaziland, and Uganda). These countries were selected based on considerable success achieved with HIV treatment in pregnant women.² Attempts to recruit a stakeholder from Namibia were made but were not successful. Approval of the protocol for the conduct of the study was obtained from the ethics committee of the administering university.

Sampling Approach and Recruitment of Stakeholders

A purposive sampling technique was used in selecting participants. Selection of participants was based on their knowledge and experience in understanding HIV treatment in pregnant women.^{7,8} Contact details of department personnel or key personnel of international health funding bodies and their implementing partners were accessed from websites, and e-mails inviting them to participate were sent. A consent form to stakeholders who agreed to participate was emailed at least 3–5 days before the intended interview. These stakeholders were situated in their National Department of Health or in international health funding bodies relating to the provision of the HIV/AIDS implementation program in their respective countries.

Data Collection

Semistructured interviews with each stakeholder were conducted via Skype or telephone. During the interviews, these stakeholders were asked open-ended questions about the challenges they encountered regarding managing MTCT of HIV under the Option B+ program. They were asked about strategies that were implemented to address challenges surrounding PMTCT services, including medication adherence to ART among HIV-positive pregnant women in their respective countries. A digital audio-recording device was used to record interviews. A demographic data tool was used to collect sociodemographic information.

Data Analysis

Interviews were transcribed verbatim in English, and thematic analysis was undertaken.⁹ Transcriptions were examined with audio-recorded sound files for accuracy. Transcribed data were then read several times and reviewed by all members of the research team to gain familiarity with, and understanding of, the data. Initial codes were generated using an open-coding approach, which involved developing and modifying the codes while working through transcriptions. The various codes were categorized into potential factors and subfactors. Identified factors and subfactors were thoroughly scrutinized and refined by the research team to ensure that data within the factors fitted together meaningfully. Each factor and subfactor was examined to ensure it represented a clear, identifiable, and distinctive entity.

RESULTS

In all, 6 interviews were conducted, and the mean time of the interviews was 62 min. There were similar numbers of men and women, and most were in the 35- to 45-year age group. Five of six were either a medical doctor or held a doctorate degree. Four of six had >10 years of experience working in PMTCT.

Data are presented according to major factors and subfactors that emerged, with illustrative quotes. Four factors that demonstrated the key strategies that contributed to significant reductions in pediatric HIV infections in the respective countries were identified: (1) committed political leadership; (2) support structures within the community; (3) innovation in

service delivery; and (4) robust monitoring and evaluation systems (Table I). Challenges that required the application of key strategies and a pragmatic multisector response in order to consolidate previous gains still persisted in these countries (Table II).

Committed Political Leadership

Political leadership was used to positively champion public health interventions. In reference to government readiness to adopt and change policies, most stakeholders attributed the successes they accomplished to the early adoption of policies such as Option B+, the test-and-treat approach, and fixed-dose ART combination: "Besides being a small country [country mentioned] has demonstrated a lot of political buy-in, as exemplified by early adoption of policies like Option B+, also test and start," (participant [PT]-1); "The government actually introduced the fixed-dose combination, and again that on its own reduces pill burden," (PT-2).

The change of policy in relation to allowing nurses to initiate ART in HIV-positive patients resulted in increased implementation of PMTCT services. Prior to this change of policy, only medical doctors who comprised limited numbers could initiate ART. As a result of the decentralization of PMTCT services beyond tertiary and secondary health facilities to primary health care centers, it became apparent that a policy change was needed to allow nurses to initiate ART: "The willingness of the ministry to amend their policy, we call it the *nurses' code*, which was not allowing them to initiate ART among people living with HIV—the ministry has been able to change that so that nurses are allowed to initiate ART, which have resulted in high access, high coverage, and easy decentralization of services," (PT-1).

Furthermore, key policy changes included a review of government policy, which led to reducing the number of weeks of enrollment in antenatal care. This action resulted in early initiation of ART in pregnant women: "That is why early booking is what we had to look into, and the antenatal care policy was changed. ... It was moved from 20 weeks to, I think, 12 weeks in terms of early booking even if it is not shorter than that. As soon as you are suspected to be pregnant, meaning you did not see your menstruation for that month you come forward, your pregnancy will be confirmed immediately and you are

Table I. Study findings relating to key strategies.

Major Factors	Subfactors	Frequency (N = 6)
Committed political leadership	Early adoption of novel treatment guidelines: Government led community engagement and program implementation: Government support for continuous mass media communication: Creation of specific government portfolios Government readiness to change policies: Government procurement of antiretroviral drugs	5
Support structures within the community	Peer support and mentorship for mothers: Active network of civic society organizations: Active engagement with community and religious leaders	6
Innovation in service delivery	Tasking shifting initiatives: Integration of maternal, newborn and child health and prevention of mother-to-child transmission of HIV services: Availability of trained and supportive health care workers: Community based services for women and their partners: Active implementation of voluntary assisted partner-notification services: Decentralization of prevention of mother-to-child transmission of HIV services: Integration of traditional and formal public health systems: Patient focused approach during program implementation	6
Robust monitoring and evaluation systems	Building capacities of national programs for monitoring: Effective mentoring and supervision visits: Viral load monitoring	5

Table II. Study findings relating to key challenges.

Major Factors	Subfactors	Frequency (N = 6)
Economic challenges	Lack of money for transportation Lack of money for food/food insecurity	5
Sociocultural issues	Male dominance in decision making: Lack of male involvement in antenatal care and prevention of mother to child transmission HIV services: Gender-based/domestic violence: Community level stigma and discrimination: Fear of disclosure of HIV infection status: Young girls getting more infected and missing prevention of mother to child transmission HIV services: Poor health/treatment literacy	5
Health facility level obstacles to antiretroviral therapy adherence and retention on treatment	Shook of HIV result and same day antiretroviral therapy initiation: Negative attitude of health care workers	6

tested for HIV and you will be initiated on treatment," (PT-2).

Most stakeholders reported that their governments played leading roles in engagement with communities and in the dissemination of services and strategies. This dissemination facilitated a smooth implementation of the PMTCT program: "On top of this, community engagement has also been crucial, so that even in villages, people know about PMTCT—you must protect your child because there was a lot of community engagement because this was coming from high level with political will, ... so that people were aware of the services, hence the uptake has been really good," (PT-3); "We do have a very committed government in [country] when it comes to PMTCT services—there is goodwill, there is political commitment right to the highest offices in the kingdom. That has made it very easy for our strategies, services, to actually be implemented without any difficulty," (PT-1).

Support Structures Within the Community

Support structures within the community played a crucial role that supported pregnant and breastfeeding women in reducing barriers to HIV care and treatment. Subfactors comprised peer support and mentorship for mothers and the presence of an active network of civic society organizations (CSOs). The central role of peer support helped mothers to adhere to their treatment, during and after pregnancy. This peer support was provided through mentorship by women who had accessed the PMTCT program and who had given birth to HIV-negative children: "I think that is what peer support has shown, how it has improved adherence, retention, and actual uptake of services such as early infant diagnosis and caring for the infants. So peer support is huge; I think it's a big intervention in PMTCT," (PT-3).

The use of an active network of CSOs involved identifying barriers to optimal uptake of PMTCT services at the community level. Through these organizations, women were visited by outreach workers who provided them with support: "Certainly, we've seen, and we have heard a lot about how, for example, women whose husband were not supportive of them taking antiretroviral therapy, like after been visited by these community CSO outreach members, and being sensitized of the

importance of pregnant women taking antiretroviral therapy, they actually become supportive of their partners taking [this therapy]," (PT-4).

Innovation in Service Delivery

With high levels of HIV-positive patients in many health facilities and increased workloads of health care workers, all stakeholders discussed the important role that innovative service delivery played in reducing the burden experienced by women and health care workers, leading to improved health outcomes. Subfactors comprised task-shifting initiatives and integration of maternal, newborn, and child health and PMTCT services, and integration of the traditional and formal public health system.

Stakeholders echoed the implementation of task-shifting initiatives as a part of the solution to rapidly increase access to services. Community health lay-workers were trained to deliver diverse services, including PMTCT, under supportive supervision, freeing up time for qualified providers to deliver specialized care, such as care for patients with infectious diseases or individuals needing emergency services: "Because of that, some of the work that traditionally were been done by the nurses and midwives alone are comfortably been done by a lay-workers like a peer mother or lay-counselor, and that has reduce a huge workload that traditionally health workers need to carry," (PT-5).

Stakeholders described how PMTCT services have become progressively integrated within antenatal and postpartum maternal health and family planning services: "In this strategy, the mother and baby are seen together in the maternal and child care environment for a period of about 18 months before they are let back into the ART clinic with other populations on HIV treatment. ... As soon as the mother gives birth to her baby, all the services that the mother and the baby need are provided in the mother-baby care point. ... There is a dedicated health care worker and mentor for the mother who provide services which range from the provision of antiretroviral treatment to contraceptives and condom provision and any other information as far as breastfeeding is concerned," (PT-5).

Integration of the traditional and formal public health system has assisted in improving attendance for health services. Acceptance of the traditional birth attendants as part of the public health system

improved the uptake of PMTCT services: "But in terms of dealing with the traditional birth attendants, it has really improved the attendance of PMTCT services. ... So most of these traditional birth attendants, because of their official recognition by government, they are attached to the local health facilities," (PT-6).

The stakeholders also alluded to the importance of the availability of trained and supportive health care workers. They described the essential role of knowledgeable, skilled, and supportive health care workers in delivering services, which has led to improved attendance and reduced loss to follow-up of pregnant and breastfeeding women: "We have seen that the nurses and health care workers are very vast in PMTCT and very supportive. So that is one key area where that activity has led to good adherence. ... It is hard to say adherence [is definitely improved] because we really can't measure that but would rather say [there is] retention in care, less loss to follow-up, among the pregnant women, breastfeeding women," (PT-4).

Robust Monitoring and Evaluation Systems

Subfactors relating to this factor comprised capacity of national programs to monitor and evaluate PMTCT services and the importance of regular viral-load monitoring. Stakeholders highlighted the value of monitoring and evaluating PMTCT services: "If you don't have a functional health-information system that is closely monitored, it would be difficult to realize any progress as far PMTCT is concerned. So we have been lucky to have a good national reporting system as far as PMTCT is concerned. We have a national operational center with a real-time dashboard. We are able to see from the national level the different results that are coming in from the various district as far as PMTCT is concerned," (PT-5); "We register them on what we call *MomConnect*, ... another [technologic] platform wherein they continue to remind the patient or the mother about the next visit where certain clinical measures will be taken, check the viral load if she is on treatment, and all the related antenatal care key messages that one needs to get, and it continues like that until the child is 1 year old," (PT-2).

Despite the potential of current first-line ART in eliminating MTCT, stakeholders upheld the crucial role that regular viral-load monitoring had in identifying challenges with ART adherence: "Many

HIV-positive pregnant women were closely monitored, so chances of not being adherent are picked up, and if there is a viral load that is not suppressed, it will be picked and there would be intervention—we call it *step-up adherence*. There will be an intervention there and now," (PT-2).

DISCUSSION

Stakeholders identified 4 key strategies that were implemented in 6 sub-Saharan African countries, which resulted in significant reductions in pediatric HIV infections occurring from MTCT. These key strategies were: (1) committed political leadership; (2) support structures within the community; (3) innovation in service delivery; and (4) robust monitoring and evaluation systems.

Political leadership has a major part to play within the health care system, especially with regard to HIV/AIDS.¹⁰ The findings from this study show that strong political commitment is essential in the implementation of a PMTCT program with significant outcomes. In order to lay a foundation for a successful PMTCT program, it is crucial that political leaders in sub-Saharan Africa show complete commitment to the development and implementation of strategic plans and frameworks for the elimination of MTCT in their countries. However, some have argued that Africa has no problem with policy development, planning, or formulation but rather faces challenges in policy implementation.^{11,12} As alluded to by the stakeholders, one of the major challenges of policy implementation is the inability to involve the target beneficiaries in the policy-formulation process.¹³ Thus, it is important that HIV-positive mothers who have had previous experience with MTCT services are involved in the planning, development, and implementation of strategies for the effective elimination of MTCT. Furthermore, political leaders must demonstrate commitment to providing financial protection for poor people living with HIV in accessing MTCT preventive care, through social protection schemes that can potentially help to remove social and economic barriers to accessing treatment, such as the provision of money for transportation and food. Current evidence shows that the inclusion of social protection schemes is a major strategy that can alleviate the negative impacts of the HIV epidemic among families.¹⁴ It is therefore important that

governments in sub-Saharan Africa demonstrate political leadership with increased domestic financial investment in PMTCT programs.¹⁵ Current evidence shows that the response to the HIV epidemic in sub-Saharan Africa is heavily dependent on international financing.^{16,17} In addition, there is also the necessity for governments in sub-Saharan Africa to put into place mechanisms that will engender accountability and efficient use of available resources allocated for PMTCT programs. Political leaders at all levels in sub-Saharan Africa need to match their commitment to eliminating MTCT of HIV with corresponding funding and leadership. Nonetheless, there should be continuous advocacy for increased funding of PMTCT programs in sub-Saharan Africa. Policymakers at the domestic and international levels need to be reminded that these programs are cost-effective and protect not just 1 but 2 lives.^{18–20}

Stakeholders identified that effective monitoring systems were crucial to address MTCT. Our results show that robust monitoring and evaluation systems are key strategies for improvement. However, as a result of inadequate health infrastructure and poor electronic health-information systems,^{21,22} there is widespread use of paper registers and reporting tools that persist across many sub-Saharan African countries.²³ Paper-based systems are often prone to errors and mistakes, which can lead to conflicting reporting and confusion, and these systems have the potential to undermine the correct use of MTCT program data for quality decision making and interventions. However, in sub-Saharan African countries, PMTCT programs should leverage on the mobile-telephony revolution^{24,25} to develop data-collection and -reporting systems for MTCT using short-message service technology that can facilitate real-time monitoring for programmatic interventions. For example, short-message service technology was harnessed successfully in Uganda to promote the monitoring and impact of PMTCT programs through real-time reporting of program data. The short-message service was used by about 1700 health facilities across Uganda to provide MTCT service reports on a weekly basis, with 9 key indicators, by texting data through mobile cellular phones.²³ Results are received in a central database and then analyzed and shared through an electronic dashboard.²³ This type of technology-based platform should be adopted to further drive the progress of

PMTCT programs in other countries in sub-Saharan Africa.

Our findings also show that viral-load monitoring in pregnant and breastfeeding mothers is essential for an objective assessment of adherence levels. However, current evidence suggests that adequate attention has not been given to viral load monitoring during the pregnancy and postpartum periods.²⁶ Therefore, to prolong and sustain the promise held by new ART regimens, such as dolutegravir for pregnant and breastfeeding women,²⁷ it is essential that sub-Saharan African countries ensure that viral-load monitoring is fully established within PMTCT programs for quick detection of suboptimal adherence and treatment failure. Some of the ways of achieving the aforementioned are: (1) to engage the support structures within the community, such as mentor mothers and community CSOs; (2) to sensitize and create awareness for viral-load monitoring tests; (3) to counsel women about the risks and consequences that nonadherence to ART carries; as well as (4) to provide medication-adherence support to women. In addition, in postpartum women, scheduled clinical visits for newborns, such as immunization visits and well-child visits, can be leveraged on as avenues of access to maternal viral-load testing during the breastfeeding period.

The stakeholders also indicated that innovation in service delivery was a key driving force for success that led to substantial reductions in new HIV infection among children. This form of innovative delivery has been shown to be effective in the uptake of services.^{28–31} Traditional birth attendants (TBAs) formed an important part of health-service delivery that could enhance the uptake of PMTCT services.^{32,33} However, their services are contentious in some parts of sub-Saharan Africa, for example in Zambia.³⁴ Our findings suggest that official recognition given by the Mozambique government to enable TBAs to be integrated into the public health system has improved women's attendance of services in that country. Evidence suggests that TBAs are increasingly involved in public health interventions, such as providing cost-effective malaria-prevention services to pregnant women in sub-Saharan Africa.³⁵ Hence, it may be useful for governments of other countries in sub-Saharan

Africa to embrace this important relationship with TBAs in order to improve the implementation and utilization of services.

CONCLUSIONS

Committed political leadership, support for women within the community, effective monitoring and evaluation systems, and innovative service-delivery models constitute the 4 key strategies that some sub-Saharan African countries have used in successfully reducing new pediatric HIV infections. Therefore, it may be useful for other sub-Saharan African countries that are not reducing new HIV infections among children in a substantial manner to review these strategies for possible implementation.

ACKNOWLEDGMENTS

This research was funded by an International PhD scholarship from the Center for Quality and Patient Safety Research, School of Nursing and Midwifery, Deakin University.

All of the authors conceptualized and designed the study and analyzed and interpreted the data. O. Omonaiye wrote the first and second drafts of the manuscript with input from S. Kusljic, P. Nicholson, and E. Manias. All of the authors read and approved the final manuscript.

DISCLOSURES

The authors have indicated that they have no conflicts of interest with regard to the content of this article.

REFERENCES

- Ishikawa N, Newman L, Taylor M, Essajee S, Pendse R, Ghidinelli M. Elimination of mother-to-child transmission of HIV and syphilis in Cuba and Thailand. *Bull World Health Organ*. 2016;94, 787A-787A.
- United Nations Joint Programme on HIV/AIDS. *On the Fast-Track to an AIDS-free Generation*. Geneva, Switzerland: UNAIDS; 2016. Available at: http://www.unaids.org/sites/default/files/media_asset/GlobalPlan2016_en.pdf. Accessed August 2, 2019.
- Helova A, Akama E, Bukusi EA, et al. Health facility challenges to the provision of Option B+ in western Kenya: a qualitative study. *Health Policy Plan*. 2016;32:283–291.
- Mitiku I, Arefayne M, Mesfin Y, Gizaw M. Factors associated with loss to follow-up among women in Option B+ PMTCT programme in northeast Ethiopia: a retrospective cohort study. *J Int AIDS Soc*. 2016;19:1–8.
- Marinda P, Chibwe N, Tambo E, Lulanga S, Khayeka-Wandabwa C. Challenges and opportunities of optimal breastfeeding in the context of HIV option B+ guidelines. *BMC Public Health*. 2017;17:2–13.
- Laar AS, Dalinjong PA, Ntim-Adu C, Anaman-Torgbor J. Understanding health facility challenges in the implementation of Option B+ guidelines in Ghana: the perspectives of health workers. *J Hosp Manag Health Pol*. 2018;2.
- Creswell JW, Clark PV. *Designing and Conducting Mixed Methods Research*. 2E. Los Angeles: Sage Publications; 2011.
- Bernard HR. *Research Methods in Anthropology: Qualitative and Quantitative Approaches*. 3rd ed. Walnut Creek, CA: Altamira Press; 2002.
- Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol*. 2006;3:77–101.
- Karan A, Hartford E, Coates TJ. The potential for political leadership in HIV/AIDS communication campaigns in Sub-Saharan Africa. *Glob Health Action*. 2017;10, 1270525-1270525.
- Uganda Management Institute. *Challenges of policy implementation*; 2018. Available at: https://www.umi.ac.ug/index.php?option=com_k2&view=item&id=866:challenges-of-policy-implementation&Itemid=171. Accessed August 3, 2019.
- Omoniyi V. The challenges of policy implementation in Africa and sustainable development goals. *Int J Soc Sci*. 2018;3:1497–1518.
- Dialoke I, Ukah F, Maduagwuna I. Policy Formulation and implementation in Nigeria: the bane of underdevelopment. *Int J Capacity Building Educ Manag*. 2017;3:22–27.
- Cluver LD, Hodes RJ, Sherr L, et al. Social protection: potential for improving HIV outcomes among adolescents. *J Int AIDS Soc*. 2015;18(Suppl 6), 20260-20260.
- Kabajulizia J, Ncube M. Financing HIV/AIDS responses in Africa: impact evidence from Uganda. *J Pol Model*. 2017;39: 843–860.
- Remme M, Siapka M, Sterck O, Ncube M, Watts C, Vassall A. Financing the HIV response in sub-Saharan Africa from domestic sources: moving beyond a normative approach. *Soc Sci Med*. 2016;169:66–76.
- Stephen R, Theresa R, Robert H. Funding AIDS programmes in the era of shared responsibility: an analysis of domestic spending in 12 low-income and middle-income countries. *Lancet Glob Health*. 2015;3:e52–e61.
- Johri M, Ako-Arrey D. The cost-effectiveness of preventing mother-to-child transmission of HIV in low- and middle-income countries: systematic review. *Cost Eff Resour Alloc*. 2011;9, 3-3.
- Kuznik A, Lamorde M, Hermans S, et al. Evaluating the cost-effectiveness of combination antiretroviral therapy for the prevention of mother-to-child transmission of HIV in Uganda. *Bull World Health Organ*. 2012;90:595–603.

20. Cost-Effectiveness of Integrating PMTCT and MNCH Services: An Application of the LiST Model for Malawi, Mozambique, and Uganda. DHS Occasional Paper No. 7. Available at: <https://dhsprogram.com/publications/publication-op7-occasional-papers.cfm>.
21. Odekunle FF, Odekunle RO, Shankar S. Why sub-Saharan Africa lags in electronic health record adoption and possible strategies to increase its adoption in this region. *Int J Health Sci*. 2017;11:59–64.
22. Akanbi MO, Ocheke AN, Agaba PA, et al. Use of electronic health records in sub-Saharan Africa: progress and challenges. *J Med Trop*. 2012;14:1–6.
23. Radin AK, Abutu AA, Okwero MA, et al. Confronting challenges in monitoring and evaluation: innovation in the context of the global plan towards the elimination of new HIV infections among children by 2015 and keeping their mothers alive. *J AIDS*. 2017;75(Suppl 1):S66–S75.
24. Aker J, Mbiti I. Mobile phones and economic development in Africa. *J Econ Perspect*. 2010;24:207–232.
25. *The Economist*. In Much of Sub-saharan Africa, Mobile Phones Are More Common than Access to Electricity; 2017. Available at: <https://www.economist.com/graphic-detail/2017/11/08/in-much-of-sub-saharan-africa-mobile-phones-are-more-common-than-access-to-electricity>. Accessed August 4, 2019.
26. Vrazo AC, Sullivan D, Phelps BR. Eliminating mother-to-child transmission of HIV by 2030: 5 strategies to ensure continued progress. *Glob Health*. 2018;6:249–253.
27. Hill A, Clayden P, Thorne C, Christie R, Zash R. Safety and pharmacokinetics of dolutegravir in HIV-positive pregnant women: a systematic review. *J Virus Erad*. 2018;4:66–71.
28. Galadanci HS, Gaya SA, Abubakar S, Iliyasu Z. Decentralization of prevention-of-mother-to-child transmission services in Nigeria: aminu Kano teaching hospital's experience. *J HIV Hum Reprod*. 2013;1:64–69.
29. Suthar AB, Hoos D, Beqiri A, Lorenz-Dehne K, McClure C, Duncombe C. Integrating antiretroviral therapy into antenatal care and maternal and child health settings: a systematic review and meta-analysis. *Bull WHO*. 2012;91:46–56.
30. Jahn A, Barr BT, Houston J, et al. Malawi's Option B+ 2011-2015: the impact of rapid ART decentralization. In: *Proceedings and Abstracts of the Conference on Retroviruses and Opportunistic Infections*. February 22, 2016 [Boston, Mass].
31. Turan JM, Onono M, Steinfeld RL, et al. Implementation and operational research: effects of antenatal care and HIV treatment integration on elements of the PMTCT cascade: results from the SHAIIP cluster-randomized controlled trial in Kenya. *J AIDS*. 2015;69:e172–e181.
32. Perez F, Aung KD, Ngoro T, Engelsmann B, Dabis F. Participation of traditional birth attendants in prevention of mother-to-child transmission of HIV services in two rural districts in Zimbabwe: a feasibility study. *BMC Public Health*. 2008;8, 401-401.
33. Lippmann QK, Mofolo I, Bobrow E, et al. Exploring the feasibility of engaging traditional birth attendants in a prevention of mother to child HIV transmission program in Lilongwe, Malawi. *Malawi Med J*. 2012;24:79–80.
34. Cheelo C, Nzala S, Zulu JM. Banning traditional birth attendants from conducting deliveries: experiences and effects of the ban in a rural district of Kazungula in Zambia. *BMC Pregnancy Childbirth*. 2016;16, 323-323.
35. Bulterys M, Fowler MG, Shaffer N, et al. Role of traditional birth attendants in preventing perinatal transmission of HIV. *BMJ*. 2002;324: 222–224.

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APPENDIX G**Semi structured interview guide and data collection for key stakeholders in sub-Saharan African countries.**

Responses will be recorded

- 1 Can you tell me yourself and about the organization where you are currently working?
- 2 What is your understanding about the current management of HIV infection in general and your country?
- 3 What are the issues that your organization has faced regarding prevention of mother to child transmission of HIV in [include relevant country]?
- 4 Why did your organization decided to implement strategies for the prevention of mother to child transmission of HIV in [include relevant country name]?
- 5 What are the challenges surrounding prevention of mother to child transmission in [include relevant country] and how does this relate to adherence to ART among the pregnant women?
- 6 What factors have helped in preventing mother to child transmission of HIV in [include relevant country] in relation to adherence to ART among the pregnant women?
- 7 What interventions implemented by your organization have led to a reduction in the rate of new pediatric HIV infection in the country?
- 8 What do you think are the key lessons to be learnt regarding prevention of mother to child transmission of HIV in [include relevant country name], especially as it relates to ART adherence in pregnant women, which you would like to share with me?
- 9 Is there anything else you would like to add regarding prevention of mother to child transmission of HIV in [include relevant country name]?