13 Eliminating mother-to-child transmission of HIV in South Africa, 2002–2016: progress, challenges and the Last Mile Plan

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The South African programme for the prevention of mother-to-child transmission of HIV (PMTCT) began 15 years ago. Underpinned by strong political will and civil involvement, evidence-based national policy updates culminated in January 2015 with the introduction of lifelong triple antiretroviral therapy (ART) for all HIV-positive pregnant and lactating women (PMTCT Option B+), and three-monthly HIV testing of HIV-negative pregnant and lactating women. This chapter tracks the development and impact of the South African PMTCT programme from 2002 to 2016.

District and facility-based quality improvement, mentorship, strong national leadership and civil action has led to rising antenatal HIV testing uptake (≥95% by 2015/16) and triple ART coverage (≥93% by 2015/16). Consequently the national risk of early (six weeks postpartum) mother-to-child transmission of HIV (MTCT), plummeted from approximately 25-30% prior to 2001 to an estimated 1.4% in 2016. There are no routine data sources monitoring long-term PMTCT effectiveness. However, data from the South African Medical Research Council measured the risk of MTCT at 18 months as 4.3% (3.7–5.0%). Possible game-changers to increase PMTCT effectiveness include strengthening safe-sex and family-planning services, pre-pregnancy through breastfeeding and beyond; repeat maternal and infant HIV testing at every contact with the health system; viral-load monitoring with immediate action for high-risk mothers; strengthening postnatal care; implementing a unique identifier to facilitate routine monitoring; real-time tracking of HIV-exposed infants and their mothers; early ART initiation for HIV-positive pregnant women and their HIV-positive family members in accordance with revised guidelines; mentorship and supervision of healthcare providers; and increasing accountability of communities and health care personnel at all levels.

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Introduction

This chapter tracks the development and impact of the South African programme to prevent mother-to-child transmission of HIV (PMTCT), from 2002 to 2016. The information presented is drawn from published literature, and from national reports and consultations.

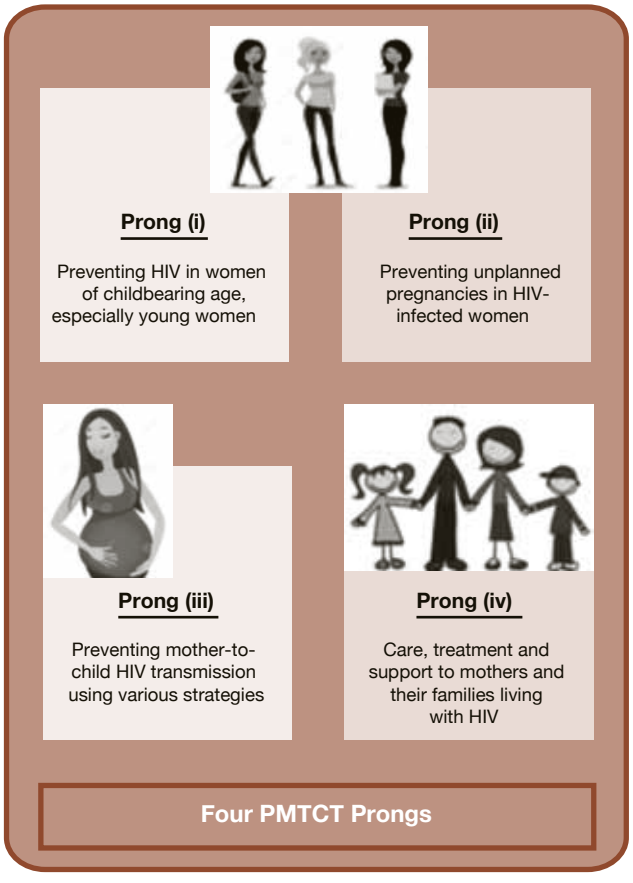
Global context

Globally, PMTCT is located within a broad framework that emphasises four broad interventions:

- preventing new HIV infections among mothers;
- preventing unplanned pregnancies in HIV-positive women;
- reducing vertical HIV transmission; and
- care and treatment and support for HIV-positive women and their families.

As early as 2002, the World Health Organization (WHO) reflected this perspective in a three-pronged PMTCT strategy, which expanded to a four-pronged approach to PMTCT in 2004 (Figure 1).[1,2]

Figure 1: World Health Organization four-pronged approach to PMTCT, 2004



Source: World Health Organization, 2004.[1]

These PMTCT prongs guided the development of PMTCT interventions globally. As evidence emerged that the early initiation of antiretroviral (ARV) drugs significantly reduced mother-to-child transmission of HIV (MTCT), and that lifelong triple antiretroviral therapy (ART) for HIV-positive pregnant and lactating women may be the key game-changer in a public-health approach to eliminating MTCT (EMTCT), global PMTCT recommendations were improved and simplified. Recommendations transitioned from single-dose nevirapine (NVP) in 1999, to lifelong ART for all HIV-positive pregnant and lactating women (PMTCT Option B+), regardless of immune status (CD4 cell count) in 2015.[3–6] Consequently, given the progress in reducing MTCT globally, the global agenda transitioned from PMTCT between 2001 and 2011, to EMTCT by 2014. In 2014 the WHO recommended two impact and three process criteria to validate EMTCT (Box 1).[7–9]

Box 1: World Health Organization criteria to assess elimination of mother-to-child transmission of HIV

Impact criteria:

- Case rate of new paediatric HIV infections due to MTCT of ≤ 50 per 100 000 live births (case rate)
- A MTCT rate of <5% in breastfeeding populations, and <2% in non-breastfeeding populations

Both of these criteria should be achieved for one year at the lowest sub-national level.

Process criteria:

- ≥95% antenatal care coverage (among all pregnant women)
- ≥95% HIV testing coverage (among all pregnant women)
- ≥90% of antiretroviral treatment coverage among HIV-positive pregnant women.

Each of these criteria should be achieved for two years at the lowest sub-national level.

Source: UNAIDS, 2011; World Health Organization, 2014; UNAIDS, 2011.[7–9]

Additionally, global targets for MTCT were included in the Millennium Development Goals (MDGs) 2000–2015, and in the Sustainable Development Goals (SDGs) 2015–2030.[10]

EMTCT interventions to end paediatric AIDS are programmatically complex, as care spans across various levels of the healthcare system (from community level to quaternary) and several delivery points (from pre-conception, through antenatal to postnatal), and involves at least two users (mothers and their children). Furthermore, there has been recent recognition of the critical role that families and partners play in improving maternal and child health uptake and outcomes.[11] Consequently, for optimal outcomes, evidence-based updated EMTCT interventions should be implemented within strong health systems, at community and facility levels. Access, coverage, quality and safety of health interventions must be optimised to improve the efficiency and responsiveness of the health system, to reduce financial risk, and to improve health outcomes.[12]

South Africa's journey towards EMTCT

South Africa's PMTCT programme began in 2001 at 18 pilot sites, with the implementation of a comprehensive package of care including single-dose NVP regimen for HIV-positive mothers at the onset of labour and for their HIV-exposed infants within 72 hours of delivery; modified obstetric practices; and avoidance or early cessation of breastfeeding.[13] In 2002, a court order mandated the scale-up of the 2001 comprehensive package of care to prevent MTCT.[13] In 2004, policies recommended ART for pregnant women

with a CD4 cell count <200 cells/mm^3;[14] in 2008, dual prophylaxis with azidothymidine (AZT) from 28 weeks gestation and NVP at the onset of labour;[15] in 2010, WHO PMTCT Option A was instituted, with lifelong ART for HIV-positive women with a CD4 cell count of 350 cells/mm^3 or less and six weeks of infant NVP prophylaxis, or alternatively, AZT from 14 weeks' pregnancy for all other HIV-positive women with maternal single-dose NVP during labour, and infant NVP prophylaxis throughout breastfeeding.[5,16] In 2013, a standardised ART regimen was introduced to treat HIV-infected pregnant women (regardless of CD4 cell count) during pregnancy and breastfeeding, with continuation of ART after breastfeeding cessation for women with CD4 counts of 350 cells/mm^3 or less (Option B).[6,17] In 2015, the guidelines were extended to Option B+, which provides lifelong ART to all HIV-positive pregnant and breastfeeding women, regardless of CD4 cell count or WHO clinical stage of disease.[18] At the start of the PMTCT programme in 2001, infant HIV testing was recommended at six weeks of age, at six weeks' post-breastfeeding cessation, and at 18 months of age.[16] In 2015, the six-weeks test was replaced with HIV testing at birth and after 10 weeks, or 18 weeks for infants who received extended post exposure prophylaxis, to identify HIV-infected infants early and fast-track them into care.[18]

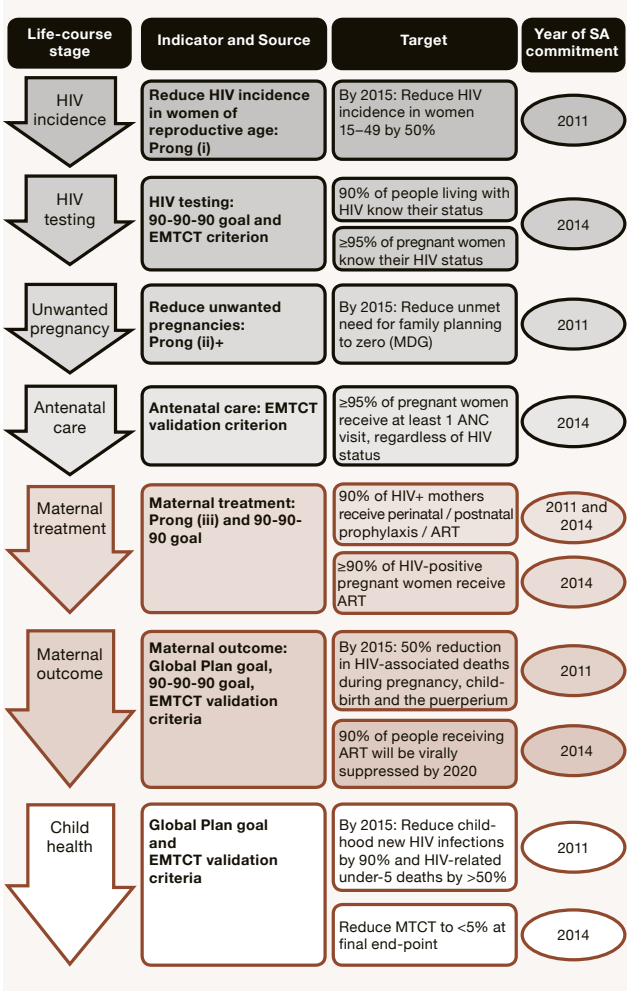
Between 2008 and 2016, quality improvement (QI) at facility and district levels played a role in the rapid and effective scale-up of the PMTCT programme following the success of QI demonstration projects pre-2008.[19] In 2008, the national PMTCT accelerated plan (A-plan) was launched. The aim was to reduce MTCT from 12% in 2008 to less than 5% by 2011, in accordance with the National Strategic Plan 2007–2011.[20,21] The QI approach was bottom-up: facility staff were engaged to focus on data-driven decision-making, system integration and change management, which culminated in building of capacity and leadership at facility, district, provincial and national levels.[22] The use of QI methods resulted in rapid progress in achieving effective national-scale implementation of PMTCT interventions across a large range of different geographic and socio-economic contexts, with varying HIV prevalence rates.[22]

The systematic use of data to monitor and evaluate the PMTCT programme was part of the QI approach,[23] and has been achieved using laboratory data from the National Health Laboratory Services (NHLS),[24] routine data captured by the South African public health sector using the District Health Information Software (DHIS),[25] and population-based data derived from surveys conducted by the South African Medical Research Council (SAMRC).[26,27]

Since 2011, using bottleneck analysis, colour-coded dashboards, QI tools/methodology, and building up from facility and district level, a National Prevention of PMTCT Action Framework (2011–2015) has been implemented, striving for continuous improvement based on data monitoring.[23] Selected PMTCT indicators are used to monitor integration and to track quarterly progress through the 'Data for Action' reports at national, provincial and district levels.

Key activities of the framework include improving the rates of HIV counselling and testing for all pregnant and lactating women (including ongoing repeat testing for HIV-negative women during pregnancy and breastfeeding); improving linkages to ART treatment, care and support services; scale-up of laboratory diagnostics; and improving the use of data for action at decentralised levels.

Figure 2: Global PMTCT targets adopted by South Africa, 2011–2014



In 2014, South Africa committed to the 90-90-90 Strategy, which aims to ensure that 90% of people living with HIV know their status, 90% of HIV-positive people receive ART, and 90% of people receiving ART are virally suppressed by 2020.[28] Figure 2 summarises South Africa's PMTCT-related commitments over the past five years.

Monitoring PMTCT impact in South Africa

Four main methods have been used to monitor PMTCT impact in South Africa, namely reviewing routine laboratory data, reviewing the District Health Information Software (DHIS), and conducting surveys and modelling.

Using routine laboratory data to monitor PMTCT effectiveness

The NHLS Corporate Data Warehouse (CDW) stores laboratory data for all pathology tests performed in the public sector, representing data for approximately 80% of the South African population.[29] The CDW has been used for real-time monitoring of infant HIV testing coverage, early (<6 weeks postpartum) MTCT, progress with birth HIV testing, and to fast-track children into care (see Table 1 and Figure 3).

Table 1: Laboratory-based monitoring of MTCT in South Africa, 2012–2016

Use of NHLS CDW	Findings
To track national coverage of early infant HIV diagnosis	2012 coverage rate 72.6% 2014 coverage rate 87.0%
To track early MTCT	2012 early MTCT rate 2.4% 2015 early MTCT rate <1.8%
To track progress with birth PCR testing	2016 CDW data demonstrate that the national coverage of birth testing was 87.3% and the in-utero transmission rate was 1.0%, with an average of 196 neonates infected per month.
To fast-track HIV-positive children into care	Weekly HIV PCR 'Results for Action' reports collate HIV PCR results in real-time for a facility or district, and are distributed weekly to the responsible healthcare worker to fast track HIV PCR-positive children into care.

Source: Sherman et al., 2014,[24] Sherman et al., 2017.[29]

The CDW data lack unique identifiers; thus some individuals are possibly counted more than once, making it difficult to determine the number of patients tested and the true MTCT risk, and to conduct cohort monitoring using laboratory data.

Laboratory assays have been used to measure HIV incidence; however, these measurements are largely retrospective using historical samples, and are not real-time. Limitations include the need for large sample sizes, the influence of ART in interpretation of results, variable mean durations of recent infection, and false recent rates.[30]

Using routine DHIS data to monitor PMTCT effectiveness

The *District Health Barometer* (DHB), an annual publication of the Health Systems Trust since 2005, synthesises key indicators across a variety of health areas at provincial and district levels.[25] The PMTCT-related indicators reflect two PMTCT prongs, namely:

- Couple year protection rate[a] (prong (i));
- Antenatal client initiated on ART rate[a] (prong (iii) and the 90-90-90 targets);
- Infant first test around 6–10 weeks uptake and positivity rates (prong (iii) and EMTCT validation criteria).

In addition, three other PMTCT-related indicators (see Figure 2) are also measured:

- Mother's 1st postnatal visit before 6 days rate;[a]
- Antenatal first visit before 20 weeks rate;[a]
- Maternal mortality in facility ratio (relates to the overall aim of the Global Plan);

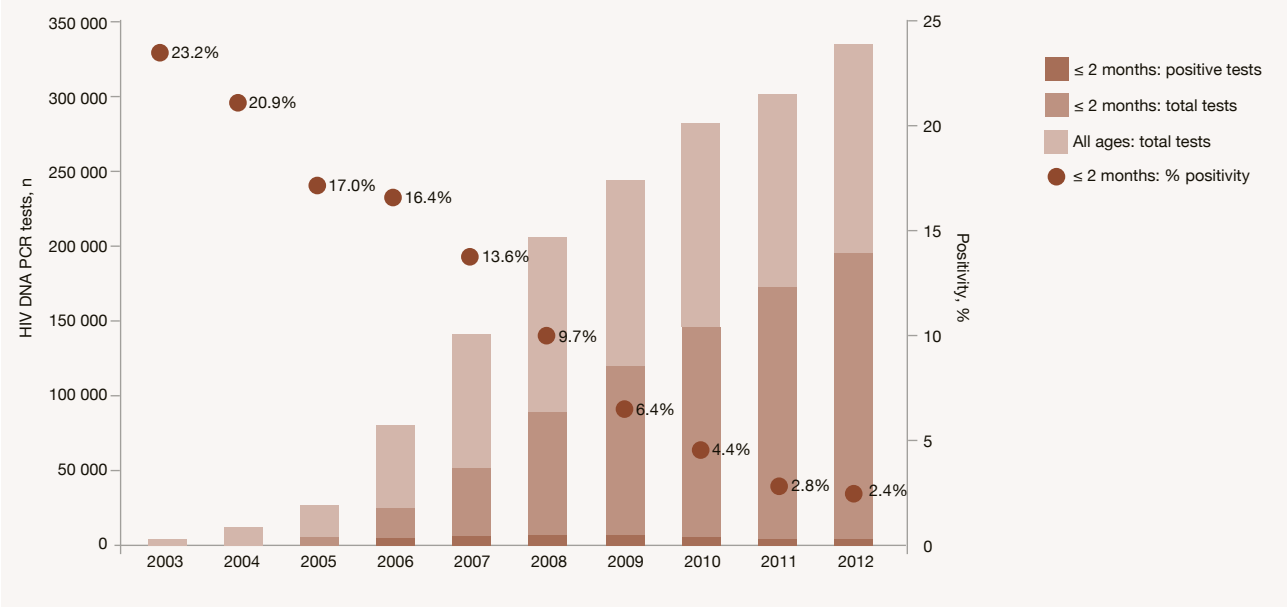
No routine indicators are available to monitor:

- HIV incidence among women of reproductive age (prong (i));
- Unplanned pregnancy and unmet need for family planning (prong (ii));
- HIV testing uptake among pregnant women or women of reproductive age (prong (iii))
- HIV-related under-5 deaths (Global Plan goal);
- Retention in care at 6 and 12 months postpartum;
- Postnatal transmission rates in infants.

The 2016/17 data, drawn from the DHIS, demonstrate an increase in antenatal 1st visit before 20 weeks rate, an increase in ART uptake, an increase in the couple year protection rate, a persistently low MTCT at 6–10 weeks, and increasing uptake of first postnatal visit within 6 days rate (Table 2).[25]

a Note: the term 'rate' is used as this is the name of the indicator in the DHIS. It does not imply statistical analyses relating to time.

Figure 3: Uptake of infant HIV DNA PCR tests and percentage HIV-positivity using routine laboratory data in South Africa, 2003–2012



Note: Data from KwaZulu-Natal are not included for 2003–2005.

Source: Sherman et al., 2014.[24]

Table 2: Key indicators drawn from the DHIS, South African National Department of Health, 2014–March 2017

Indicator	FY 2014/15	FY 2015/16	FY 2016/17*	FY 2016/17 Target	Scoring **
Antenatal 1st visit before 20 weeks: Numerator: Antenatal 1st visit before 20 weeks Denominator: Antenatal 1st visits, total	53.8%	61.2%	65.5%	60%	
Antenatal client initiated on ART rate: Numerator: Antenatal client initiated on ART Denominator: Antenatal client eligible for ART	91.2%	93.0%	94.3%	95.5%	
Couple year protection rate (annualised): Numerator: Contraceptive years dispensed Denominator: Population 15–49 years female	63.4%	66.7%	69.4%	63%	
Infant 1st PCR test positive around 10 weeks rate (prior to 2016/17 use 6 weeks): Numerator: Infant 1st PCR test positive around 6 weeks Denominator: Infant 1st PCR test around 6 weeks	1.5%	1.5%	1.5%	1.4%	
Mother postnatal visit within 6 days rate: Numerator: Mother postnatal visit within 6 days of delivery Denominator: Delivery in facility total	72.8%	68.5%	69.4%	75%	

Note: *Data from April–October 2016, i.e. not for a full financial year (FY).
** Based on revised definition in line with international guidelines.
Blue shading denotes attainment of the national target in the 2016/17 Annual Performance Plan (APP); grey shading indicates measurements just below the national target.

Source: DHIS, National Department of Health (NDoH).

In 2015/16, 13 districts (25%) had ART initiation rates less than 90%, which is one of the global EMTCT process indicator targets.[31]

The DHB presents indicators by socio-economic quintile (SEQ). Nationally, in 2015/16 there was little gradient in the uptake of antenatal client ART initiation by socio-economic quintile, with uptake ranging from 91.5% in the least-deprived quintile to 94.6% in the most-deprived quintile.[32] Although no confidence intervals (CIs) are provided, the uptake among quintiles is quite close, illustrating that equity is being achieved for this indicator.

Routine data obtained through the DHIS facilitate monitoring of national, provincial and district-level progress; however, limitations include the aggregate nature of the data, reliance on correct capturing and relay of information between different levels of the healthcare system, and denominator estimations resulting in more than 100% uptake on some indicators. Additionally, the routine DHIS data cannot currently be used to monitor cohorts of mothers and their children, as there is no unique identifier linking mothers and their children across different levels of care and facilities.

Using national surveys to monitor PMTCT effectiveness

Three nationally and provincially representative South African PMTCT Evaluations (SAPMTCTEs) have been undertaken. Conducted in 2010, 2011–2012 and 2012–13, these surveys measured six-week MTCT as 3.5% (95% CI: 2.9–4.1%), 2.7% (95% CI: 2.1–3.2%) and 2.6% (95% CI: 2.0–3.2%), respectively.[26,27]

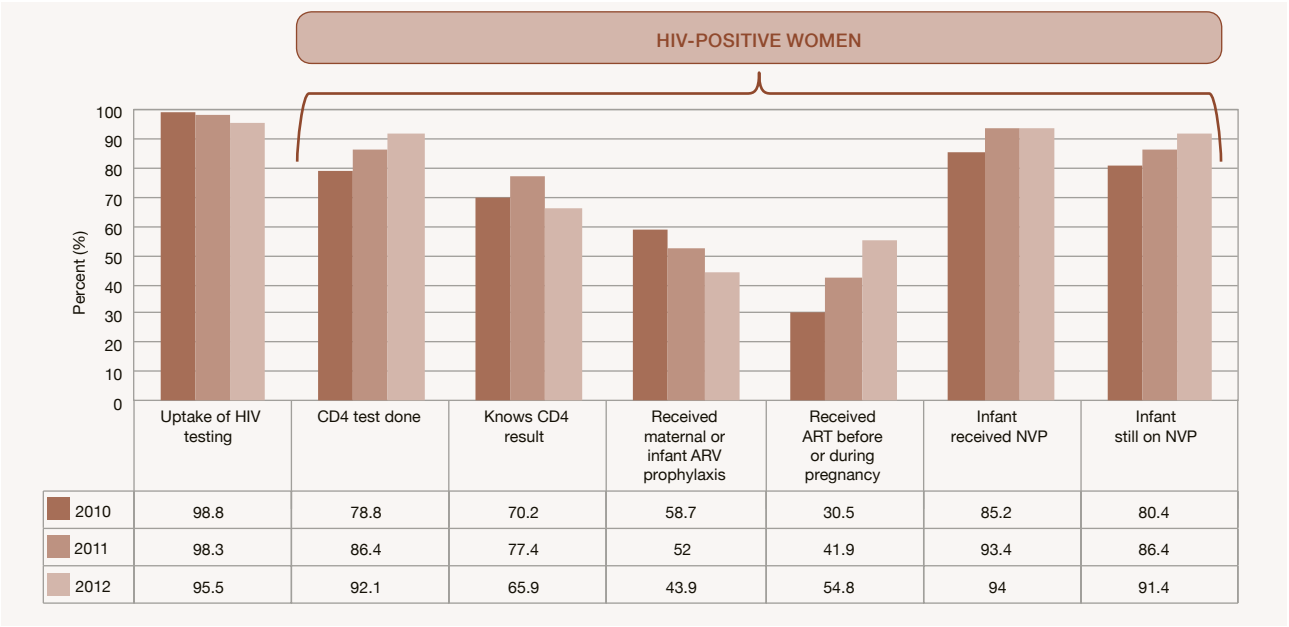
The surveys gathered PMTCT coverage data and demonstrated >95% antenatal HIV testing uptake; >92% uptake of CD4 cell count testing; increased ART uptake with concomitant decrease in ARV prophylaxis; and increased uptake of infant NVP (Figure 4).[26,33]

Additional analyses of survey data yielded nationally representative information on several PMTCT prongs and main outcomes:

- HIV incidence (prong (i)) was measured as 3.3% (2.8–3.8%) among HIV-negative mothers.[34]
- Unplanned pregnancy (prong (ii)) was reported in 56–64% of mothers at six weeks post-delivery.[27]
- Early MTCT was reported as 1.2% in mothers who initiated ART during or before the first trimester of pregnancy.[26]
- Providing two or fewer staff per facility for HIV testing was associated with an increase in early MTCT.[35]
- Uptake of infant HIV testing (prong (iii)): 35% of HIV-positive mothers intended to request EID at the six-week immunisation visit.[36]
- Adolescents had three times lower uptake of PMTCT interventions and three times higher incidence of early MTCT than adults 20 years or older.
- Cumulative 18-month MTCT was 4.3% (3.7–5.0%).[37]
- Cumulative 'MTCT-or-death' (as a combined outcome) was 6.3% (5.5–7.3%).[37]
- 81% of the cumulative 18-month MTCT and 67% of 'MTCT-or-death' occurred by six months postpartum.[37] Thus the first six months is a critical period for infant HIV prevention, early HIV detection, and paediatric treatment initiation.

Synthesis of these results shows that the main characteristics associated with poor access to care or MTCT include being a teenage mother; discrimination reported by the mother; poor or late ARV uptake; not knowing a partner's HIV status; late antenatal care booking; and limited maternal education/knowledge. These surveys did not measure maternal viral load.

Figure 4: Weighted uptake of HIV testing amongst all women, and along the PMTCT cascade among self-reported HIV-positive women in South Africa, 2010-2013



	Uptake of HIV testing	CD4 test done	Knows CD4 result	Received maternal or infant ARV prophylaxis	Received ART before or during pregnancy	Infant received NVP	Infant still on NVP
2010	98.8	78.8	70.2	58.7	30.5	85.2	80.4
2011	98.3	86.4	77.4	52	41.9	93.4	86.4
2012	95.5	92.1	65.9	43.9	54.8	94	91.4

Source: South African Medical Research Council, 2016;[26] 2015.[27]

Although surveys have been used successfully, limitations include:

- The need for a large sample size to obtain information that is nationally and provincially representative;
- The high cost and complexity of implementation, requiring national systems for successful fieldwork implementation;
- Surveys do not necessarily build routine monitoring and evaluation systems.

Using modelling to monitor PMTCT Effectiveness

In the absence of survey data or accurate routine laboratory or DHIS data, modelling has been used to track PMTCT progress. According to the 2015 African HIV Spectrum Estimates, South Africa has reached almost all targets outlined in the Global Plan for EMTCT, with the final MTCT rate estimated to be 2.0% at 18 months and 1.4% at six weeks.[38] Although helpful, modelling has several limitations: the outputs are only as valid as the data and assumptions that go into models, and inputs often rely on suboptimal quality or incomplete routine data, which compromise the quality of the final result.

Impact of PMTCT in South Africa: Summary of data obtained using laboratory systems, DHIS, surveys and modelling

Data demonstrate marked progress in achieving prong (iii) and (iv) targets, but slow progress in achieving prong (i) and (ii) targets. Data on reducing HIV incidence is difficult to obtain in South Africa, and we tend to use population-level estimates obtained from the Thembisa and Spectrum models. In 2014, modelled estimates gave the number of new infections nationally among women of reproductive age in 2014 as 160 000 (150 000–180 000).[38]

Data are scarce on unmet need for family planning (prong (ii)). However, all three SAMRC surveys reported more than 50% of women as saying that their pregnancy was unplanned.[33] Regarding prong (iii), early MTCT (six weeks postpartum) decreased from 5.8% in 2009 to 1.5% in 2014/15 (Figure 5). Despite the decreasing early MTCT, high maternal HIV prevalence led to significant numbers of children still being infected; consequently, the number of paediatric HIV infections per 100 000 live births is above the elimination target (<50 new paediatric HIV infections through MTCT per 100 000 live births), exceeding this by five- to ten-fold.

As indicated in the sections above, data from the SAMRC surveys[26,27] and from the DHIS[25] demonstrate increased ART access, with attainment of the national target and the 90-90-90 target on ART access. However, data on virological suppression among pregnant and lactating women following increased ART access are not readily available.

Key EMTCT challenges in South Africa

Although significant MTCT reductions have occurred in South Africa (Figure 5), challenges exist around PMTCT implementation, drug availability and impact monitoring.[39] Implementation challenges have been discussed at provincial and national EMTCT stock-taking meetings, and 13 main bottlenecks identified. These have been categorised according to the WHO's health system building blocks:[12]

Health workforce:

1 Suboptimal implementation of family planning

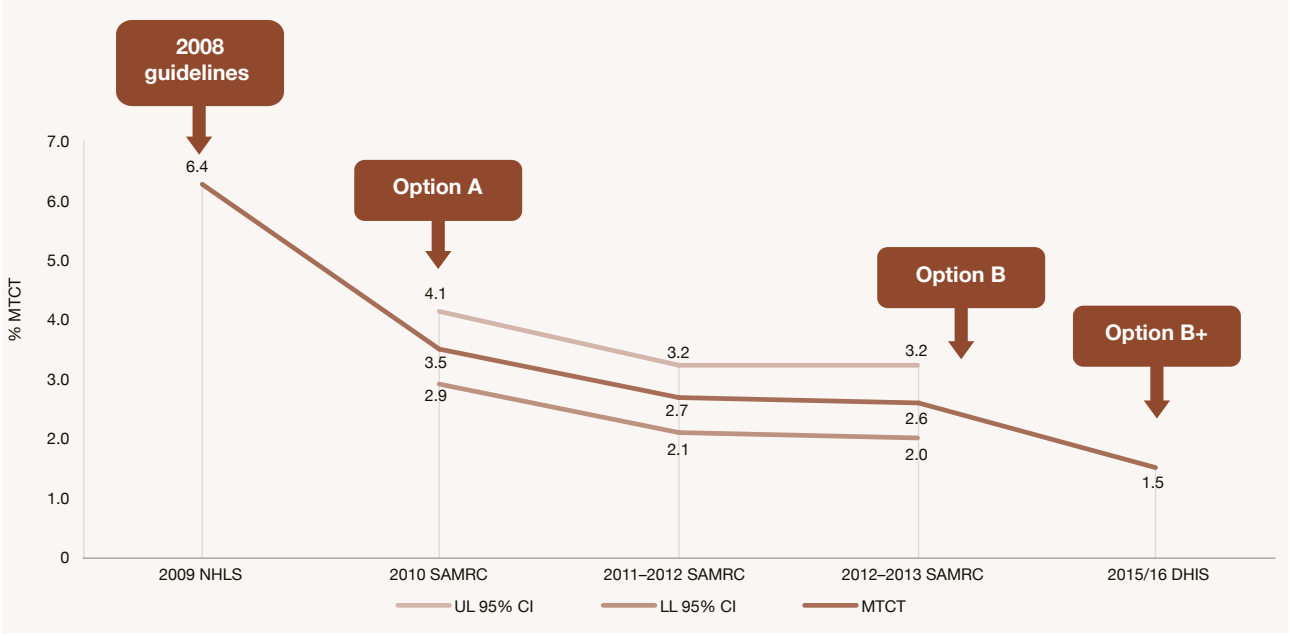
2 Suboptimal quality of infant dried-blood-spot specimens

3 Poor use of data and QI approaches at facility level.

Medical products/technologies:

4 Stock-outs of ARV drugs in 2013/14.

Figure 5: Trends in early MTCT in South Africa, 2009–2014/15[a]



Information and research:

5 Lack of routine data to monitor postnatal PMTCT effectiveness, until the end of breastfeeding

6 Tools (registers and tally sheets) not aligned with the new guidelines.

Service delivery:

7 Late antenatal care booking after 20 weeks

8 Low coverage for ART initiation of HIV-positive pregnant women in some districts

9 Suboptimal repeat testing for HIV-negative pregnant and breastfeeding women in some districts

10 Poor integration of family planning and HIV activities into antenatal care and postnatal services

11 Lack of focused programmes to reach adolescents and young people

12 Suboptimal postnatal mother-infant follow-up and infant-feeding counselling

13 Suboptimal community outreach mechanisms, including tracking of mothers and infants, and suboptimal community engagement.

The Last Mile Plan for EMTCT

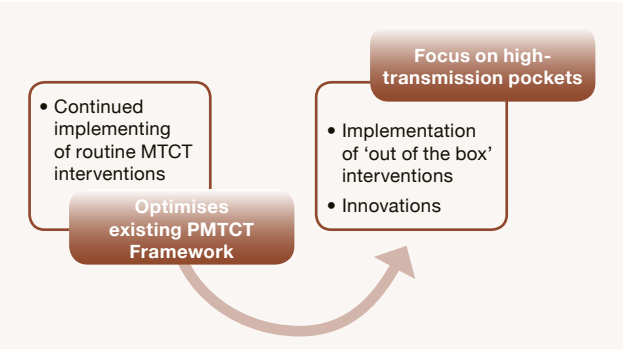
In light of these key bottlenecks, the NDoH has developed a 'Last Mile Plan for EMTCT' in South Africa.[40]

The plan highlights the critical need to reach the 'unreached'; to ensure that all women and their partners receive quality sexual and reproductive health education and services, and that all children receive comprehensive child-health services so as to improve overall health and development. Consequently, a dual approach has been adopted (Figure 6) to:

1 optimise the implementation of high-impact interventions to prevent MTCT, and optimise maternal and child health (MCH) outcomes along the continuum of care from the antenatal to the postnatal period, with scale and quality, across all provinces, districts and facilities (regardless of MTCT rates, HIV counselling and testing and ART rates);

2 intensify postnatal tracking of, and support for, mothers and babies in 'targeted' and 'hot spot' districts at facility level in order to understand leaks in the PMTCT continuum of care/cascade in real time and to implement tailored actions and responses.

Figure 6: The dual approach adopted in the Last Mile Plan for EMTCT in South Africa, 2014



a We are grateful to the South African Medical Research Council for providing and compiling this information for the purposes of this chapter using a multitude of data sources as indicated in Figure 5.

Several game-changers have been identified in the Last Mile Plan for EMTCT.[40] Each author of this chapter prioritised these and other potential game-changers individually, using a Likert scale. The top eight game-changers identified during this process are listed in Table 3.

Table 3: Eight potential key game-changers to increase PMTCT effectiveness

Game-changers	
1	Strengthening services for safe-sex and family planning (pre-conception, and throughout pregnancy and breastfeeding (BF))
2	Strengthening repeat HIV testing amongst HIV-negative persons of reproductive age at high risk of HIV (pre-conception and through pregnancy, delivery and BF)
3	Early ART initiation for HIV-positive women and their infected family members, in accordance with revised guidelines
4	Viral-load testing (pre-conception, and through pregnancy, delivery and BF), with immediate action for high-risk mothers
5	Strengthening postnatal retention in care, with involvement of community linkages and ward-based outreach teams
6	Implementing a unique identifier to facilitate real-time routine monitoring
7	Real-time tracking of HIV-positive women and their infants
8	Mentoring and supportive supervision of key healthcare providers

The way forward

Various data sources exist in South Africa to assess progress in attaining the Global Plan, EMTCT and 90-90-90 targets, and to measure PMTCT effectiveness. Additionally, close collaboration exists between programmatic and research institutions to monitor PMTCT progress and EMTCT.

EMTCT is a complex health intervention involving mothers and infants at all levels of the healthcare system and affected by the actions of their partners (through their HIV status) and other members of the community (through stigmatisation and discrimination). As such, structural and health-system factors that facilitate or hinder implementation must be examined.

Given South Africa's response to PMTCT in the context of maternal and child health over the past 15 years (Table 4), we hypothesise a high likelihood of further success with EMTCT if gaps are addressed and key game-changers are implemented.

Table 4: South Africa's response to eliminating MTCT

WHO building block 1: Leadership/governance	
1	The highest level of government, including the Minister of Health, has committed to the Last Mile Plan for EMTCT.
2	Leadership is encouraged at all levels of the healthcare system.
WHO building block 2: Healthcare financing	
3	All the essentials of the PMTCT and EMTCT programmes have been self-funded from the public sector without reliance on donor funding for essential commodities and supplies, e.g. drugs.
4	Collaborating partners have made clinic-based mentoring and national surveillance possible.
WHO building block 3: Health workforce	
5	South Africa is investing in Ward-based Outreach Teams, District Clinical Specialist Teams, support staff (mother mentors) and community workers to bolster the health workforce.
WHO building block 4: Medical, products, technologies	
6	Although drug stock-outs have occurred, the 'Stop Stock-out' coalition monitors trends closely and informs the National Department of Health to facilitate quick resolution.
WHO building block 5: Information and research	
7	Close collaborations with districts, partners, laboratories and research organisations have enabled monitoring of key PMTCT indicators and sharing with key groups.
WHO building block 6: Service delivery	
8	Key priorities have been identified, such as family planning, adolescent services and integration between HIV-related care and antenatal and postnatal care.

Conclusions

Since the scale-up of PMTCT interventions in 2002, South Africa has walked a straight and focused path, guided by evidence in an attempt to optimise EMTCT interventions for all people. This is exemplified in the recent 'Last Mile Plan'. These steps have resulted in remarkable gains in reducing early MTCT and keeping mothers healthy; however, several gaps exist specifically relating to postnatal follow-up and measuring long-term PMTCT effectiveness.

The eight game-changers listed should be discussed at national, provincial and district levels, with prioritisation exercises to guide future investments at each level, and in specific 'hot spots' where HIV transmission is particularly high. This will facilitate intensified implementation of targeted interventions, as and where they are most needed. Additionally, and most importantly, eliminating MTCT must be aligned with strategies that aim to improve the overall health of women, children and adolescents, allowing them to 'survive, thrive and transform'.

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