Closing the gaps to eliminate mother-to-child transmission of HIV (MTCT) in South Africa: Understanding MTCT case rates, factors that hinder the monitoring and attainment of targets, and potential game changers

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Background. Ninety percent of the world's HIV-positive pregnant women live in 22 countries. These 22 countries, including South Africa (SA) have prioritised the elimination of mother-to-child transmission of HIV (EMTCT). Since 2016 all 22 countries recommend lifelong antiretroviral treatment for all HIV-positive pregnant and lactating women. To measure South African national, provincial and district-level progress towards attaining EMTCT, we analysed the number of *in utero* (IU) paedatric HIV infections per 100 000 live births (IU case rate), and synthesised factors hindering the monitoring of EMTCT progress and attainment from the viewpoint of provincial and district-level healthcare managers and implementers. We highlight potential innovations to strengthen health systems and improve EMTCT programme delivery.

Methods. We reviewed national-, provincial- and district-level birth HIV testing data from routine National Health Laboratory Services (NHLS) records between April 2016 and March 2017. To obtain a qualitative perspective from healthcare managers and implementers, we synthesised information from the nine 2016 provincial-level EMTCT stock-taking workshops. These workshops involve key provincial and district-level staff, mentors and supporting partners. Lastly, we highlight potential innovations presented at these workshops to overcome operational challenges.

Results. The national IU mother-to-child transmission (MTCT) rate was 0.9%, which translated to an IU case rate of 245 HIV-positive neonates per 100 000 live births. Provincial IU percent MTCT risk ranged from 0.6% to 1.3%, with IU case rates ranging between 168 and 325 cases per 100 000 live births. District-level IU percent MTCT risk ranged from 0.4% to 1.9%. Potential game changers include: pre-conception counselling to optimise maternal-partner health, weekly dissemination of HIV polymerase chain reaction (PCR) and viral load reports from the NHLS to specific individuals who trace mothers and infants needing care, use of ward-based outreach teams and community caregivers to trace HIV-infected mothers and their infants to link them into care, inclusion of a unique identifier in patient-held infant Road to Health booklets to facilitate infant tracing and continuous quality improvement (CQI) processes within facilities and districts and implementation of an HIV-positive baby tool to understand the characteristics and risks of HIV-positive infants. On an ecological level, provinces and districts using community-based approaches and CQI methodology seemed to have lower MTCT and IU case rates.

Conclusions. More quantitative analyses are needed to understand what proportion of the success can be attributed to community-based and CQI approaches and the impact of the potential game changers on progress towards EMTCT.

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Ninety percent of the world's HIV-positive pregnant women live in 22 countries. These countries, including South Africa (SA), have prioritised the elimination of mother-to-child transmission of HIV (EMTCT), measured using three coverage and two impact indicators (Fig. 1).[1] The two impact indicators are the percentage mother-to-child HIV transmission (MTCT) among HIV-positive mothers (MTCT risk) and the number of new paediatric HIV infections per 100 000 live births (MTCT case rate). The global target is <5% final MTCT in breastfeeding countries and ≤50 new paediatric HIV infections per 100 000 live births. Consequently, to achieve EMTCT, all 22 countries currently recommend lifelong antiretroviral treatment for all HIV-positive pregnant and lactating women. This is known as PMTCT Option B+. Between the 1980s and 2015 the discovery of more effective biomedical interventions to prevent mother-to-child transmission of HIV (PMTCT) accelerated the improvement of global and national PMTCT policies; such rapid advancements in policy required flexible, responsive health systems, services and staff to assure implementation.[1-6] For example, in 2001 the SA national

MTCT rate, as defined by WHO: % HIV-exposed infants who acquire HIV infection from their mothers

Case rate: number of new HIV infections in children per 100 000 live births

In utero case rate: number of new HIV infections in children measured at <7 days of age, per 100 000 live births

Fig. 1. Key concepts in the elimination of mother-to-child transmission of HIV (EMTCT).

PMTCT programme recommended single dose nevirapine (NVP) for HIV-positive pregnant women at the onset of labour and for HIV-exposed infants within 72 hours of delivery. These recommendations were made alongside modified obstetric practices and avoidance or reduced duration of breastfeeding.[7] Between 2008 to 2013, national PMTCT improved dramatically to include the initiation of maternal antiretroviral drugs (ARVs) earlier in gestation or at higher CD4 cell counts.[8-10] By January 2015, the national PMTCT policy recommended lifelong triple antiretroviral therapy (ART) for all pregnant and lactating HIV-positive women (PMTCT Option B+ policy), with infant HIV testing at birth to identify *in utero* infection early, expedite ART initiation and improve infant outcomes, which are poor if ART initiation is delayed.[11-12] In 2016, SA also launched the Last Mile Plan for EMTCT. This multipronged plan acknowledges the importance of delivery systems for EMTCT and prioritises five pillars, namely: (*i*) leadership, governance and coordination; (*ii*) scaling up PMTCT coverage; (*iii*) integrating PMTCT interventions into routine maternal and child healthcare (MCH) and primary healthcare (PHC); (*iv*) monitoring and evaluation; and (*v*) increased community awareness and involvement.[13] The PMTCT policy and Last Mile Plan require implementation at all levels of the healthcare system, during the preconception, antenatal and postnatal care periods, and involve mother, father, baby and in some instances the extended family, illustrating the complexities of PMTCT programme delivery.

In a national-level review published in 2017, we demonstrate that these policy changes yielded a concomitant decrease in the national risk of early (6 weeks postpartum) MTCT, from 3.5% in 2010 to 1.1% in 2015-16 (Fig. 2).[13-16] Additionally, cross-sectional surveillance data suggest that ART initiation prior to conception or during the first trimester of pregnancy could reduce early MTCT to <1.2%.[14] Despite these national-level successes, inter-provincial and inter-district differences in MTCT and maternal ART uptake exist: the provincial *in utero* percent MTCT risk ranged from 1.4% to 5.9% in 2010 and 0.7 - 1.7% in 2015/16; maternal ART uptake ranged from 78% to 98% in 2015/16.[14,15] The district-level early MTCT rate ranged from 2.2% to 8.1% in 2010 and 0% to 3.4% in 2015/16 (Fig. 2),[15,17,18] while maternal ART uptake varied from 46% to 100% in 2015/16.[15]

We analysed the number of IU paediatric HIV infections per 100 000 live births (IU case rate) as an initial step to monitor district- and provincial-level progress with EMTCT.

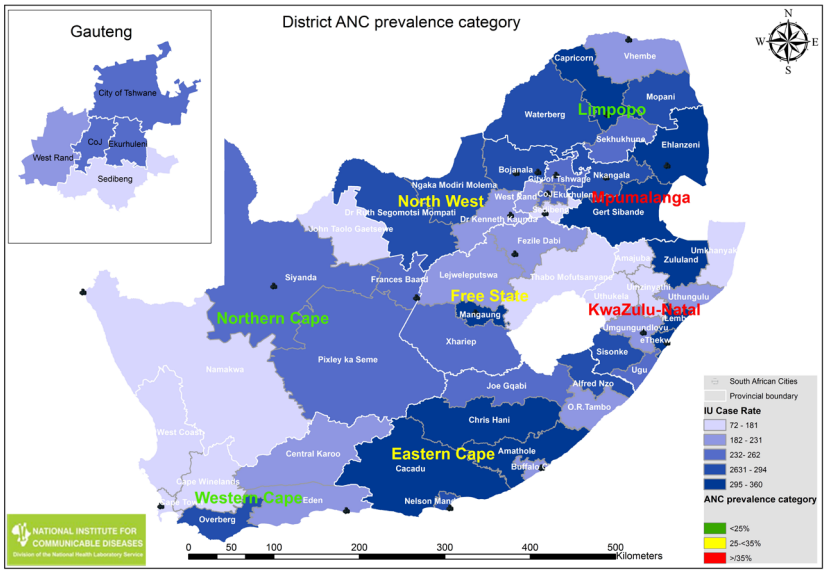


Fig. 2. Early mother-to-child transmission measured at national, provincial and district levels in South Africa.

Table 1. Definitions applied to routine NHLS data

Definition	Numerator	Denominator
Birth testing coverage: Total number of HIV PCR tests performed in HIV-exposed infants within the first 7 days	Total number of HIV PCR tests performed in neonates aged <7 days old	This is an estimate calculated from the DHIS total live births multiplied by the antenatal HIV seroprevalence rates obtained from the 2013 national antenatal HIV seroprevalence survey[30]
IU % MTCT risk: % MTCT within the first 7 days of life	Neonates within the first 7 days of life with a positive HIV PCR test	Total number of neonates tested during the first 7 days of life
IU case rates: Number of new HIV infections among- infants <7 days old expressed as a standardised rate per 100 000 live births	Number of HIV PCR-positive neonates per 100 000 live births	Total live births obtained from the DHIS

PCR = polymerase chain reaction; DHIS = District Health Information System; IU = *in utero*; MTCT = mother-to-child-transmission.

Additionally, we synthesised factors that hinder the monitoring of EMTCT progress and attainment, from the viewpoints of provincial- and district-level healthcare managers and implementers. We have highlighted potential innovations to strengthen healthcare systems and improve EMTCT programme delivery. We include a focus on district-level, as opposed to a sole focus on national level data; inclusion of district-level data increases the granularity of our analysis.

Methods

We aimed to deepen our understanding of district- and provincial-level progress with eliminating MTCT using mixed methods (quantitative and qualitative). Thus, we sought data that represent an entire district or province, rather than data from one single clinic or hospital.

Quantitative data review

Only two district-level sources of data are available in SA, namely the District Health Information System (DHIS) and the National Health Laboratory System (NHLS).[19] Data from the DHIS were muddied by the fact that changes to guidelines were not accompanied by changes to DHIS indicators. There have also been concerns about the accuracy and completeness of routine DHIS data.[20] Consequently, we analysed birth HIV testing data from the routine NHLS Corporate Data Warehouse (CDW), between April 2016 and March 2017. We focussed on NHLS data because the NHLS has protocols in place to clean and monitor data quality. We focussed on MTCT at birth for four reasons. Firstly, the SA National Department of Health (NDoH) recommends HIV testing at birth for all HIV-exposed infants. Secondly, no other data are available to determine the precise number of HIV-infected neonates. Thirdly, birth polymerase chain reaction (PCR) results are a marker of preconception and antenatal care for women. Fourthly, birth PCR results serve as an early warning sign of gaps in early infant diagnosis and PMTCT.

HIV PCR test data for HIV-exposed neonates tested before 7 days of age were extracted from the NHLS CDW. A patient-linking algorithm using deterministic matching of patient demographics (using name, surname and date of birth) and probabilistic matching was used to identify duplicates among birth HIV tests and to deal with minor mismatches created by spelling errors. Additional manual matching was performed to ensure that HIV PCR-positive neonates were not doubly counted. Programmatic outcomes namely, birth testing coverage, IU percent MTCT risk, and IU case rates were calculated at national, provincial and district level from the de-duplicated data (Table 1).

As maternal antenatal HIV sero-prevalence and number of live births influence the absolute number of IU-infected neonates, and the case rate, we separated provinces and districts into three antenatal HIV sero-prevalence categories of <25%, 25 - 35% and ≥35%. Within these categories, provinces with ≥90% and districts with ≥85% birth testing coverage, were ranked by case rates.

Qualitative synthesis

There are sparse published qualitative national-, provincial- or district-level data on factors affecting the monitoring of EMTCT progress and attainment, and innovative solutions to accelerate progress towards EMTCT. Consequently, to understand district-level perspectives, we reviewed reports from the provincial-level EMTCT stock-taking workshops conducted between April 2016 and March 2017. These workshops are conducted annually, are co-ordinated by the NDoH across all 52 districts, and are part of the institutionalised monitoring and evaluation activities outlined in the National Action

Table 2. Percentage positivity and case rates at the provincial level for in utero HIV infections: April 2016 - March 2017, NHLS

Antenatal prevalence (%) Category	Province	Antenatal prevalence (%) 2013*	Total live births in facility DHIS Apr 2016 - Mar 2017	PCR-positive Total PCR tests infant <7 days NHLS Apr 2016 - Mar 2017	PCR-positive infant <7days (deduplicated)	IU percent MTCT risk	IU case rate/100 000 live births	% Testing coverage	Lowest IU case rate/antenatal prevalence category
25 - <35	South Africa	29.7	878 675	243 925	2 153	0.9	245	93.5	
<25	Northern Cape	17.5	19 847	3 809	42	1.1	212	109.7	
	Western Cape	18.7	91 798	15 092	154	1.0	168	87.9	WC
	Limpopo	20.3	117 491	23 088	301	1.3	256	96.8	
25 - <35	Gauteng	28.6	203 885	53 076	488	0.9	239	91.0	
	North West	28.2	55 422	14 721	146	1.0	263	94.2	
	Free State	29.8	39 703	13 101	86	0.7	217	110.7	FS
	Eastern Cape	31.4	101 468	27 032	259	1.0	255	84.8	
≥35	Mpumalanga	37.5	70 995	25 173	231	0.9	325	94.6	
	KwaZulu-Natal	40.1	178 066	68 833	446	0.6	250	96.4	KZN

NHLS = National Health Laboratory Services; IU = *in utero*; PCR = polymerase chain reaction; IU Case Rates are measured per 100 000 live births in that province according to DHIS (April 2016 - March 2017); FS = Free State; KZN = KwaZulu Natal; WC = Western Cape *2013 Antenatal HIV Prevalence Survey South Africahttps://africahealthnews.com/antenatal-hiv-prevalence-survey-south-africa-published/

Framework, 2011 - 2015, as well as the Last Mile Plan, 2016 - 2021.[13] The workshops provide an opportunity for districts to review district implementation plans (DIPs) and to track the achievement towards current targets.[21] All workshop reports were systematically reviewed by one author (WC) using the following framework questions: (*i*) what challenges are reported at provincial and district levels?; (*ii*) what game changers, i.e. radical innovations that fundamentally change PMTCT implementation, have been identified?;[23] and (*iii*) have the effects of the game changers been measured? This approach was consistent with our aims of moving away from a 'broad-brushed' national approach to understanding EMTCT progress, as well as increasing the granularity of our understanding.

Results

Quantitative data review

Birth testing coverage was 93.5% (range 85% - 111% at provincial level); some percentages are >100% as denominators are estimated, leading to smaller denominators than the actual. The national percentage IU percent MTCT risk was 0.9%, which translated to a national IU case rate of 245 HIV-positive neonates per 100 000 live births. Provincial IU percent MTCT risk ranged from 0.6% to 1.3%, with IU case rates ranging from 168 to 325 cases per 100 000 live births (Table 2). The Western Cape, Free State and KwaZulu-Natal had the lowest case rates within each HIV prevalence category (Table 2). District-level IU percent MTCT risk and IU case rates range from 0.4% to 1.9% and 72 to 360, respectively (Fig. 3 and Table 3).

Qualitative synthesis

The 2016/17 EMTCT stock-taking workshops identified several factors that hinder EMTCT attainment, including poor internet connectivity, poor alignment between routine indicators and programmatic interventions, lack of longitudinal monitoring, poor maternal viral load monitoring and inconsistent feeding advice (Fig. 4). Despite these challenges, the workshops highlighted the following points: (*i*) an increasingly strong focus on strengthening pre-conception, antenatal and postnatal maternal and child health services; (*ii*) alignment between PMTCT interventions, the last mile EMTCT plan and DIPs, to improve programme outcomes; (*iii*) an increased level of accountability at district and facility levels; (*iv*) that discussions enabled prioritisation of high MTCT districts; and (*v*) the importance of involving different district management team members (District Clinical Specialist Teams (DCSTs), PHC- and programme managers) in ongoing monitoring visits to ensure PMTCT integration into routine services. Ten potential game changers that are currently implemented to achieve fundamental healthcare system strengthening and durable improvement in the programme came to the fore (Fig. 4). Despite the fact that KwaZulu-Natal (KZN) was the province with the second highest number of live births and had the highest antenatal HIV prevalence, its IU MTCT risk was the lowest of all provinces (0.6%), while its IU case rate was the fifth highest (250 per 100 000 live births). Ecological observations could attribute a portion of this success to the continuous quality improvement undertaken by the province: monthly teleconferences are held with district co-ordinators to review key indicators; PCR, antenatal care and postnatal care linkage forms are used to link mothers and children into care; and weekly teleconferences are held with facilities and districts to facilitate PCR monitoring.[23]

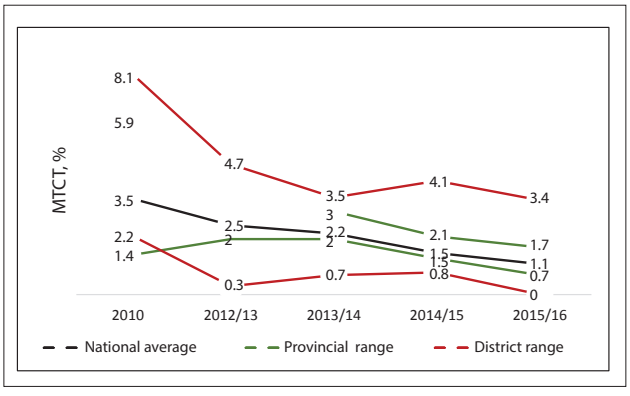


Fig. 3. Spatial distribution of IU case rates, by provincial antenatal HIV prevalence category.

Discussion

Our quantitative analysis of birth MTCT data demonstrates varying MTCT risk and case rates by province and district, with no specific relationship between antenatal HIV prevalence, IU percent MTCT risk and case rates. The IU percent MTCT risk at birth was much

1. Poor internet connectivity and access to the weekly emails containing the NHLS Results for Action reports.
2. Poor alignment between routine indicators and PMTCT programmatic interventions. Additionally, non-reporting and inconsistent reporting yield poor quality data.
3. Lack of longitudinal cohort monitoring.
4. Poor maternal viral load monitoring.
5. Inconsistent infant feeding advice or practices.

Fig. 4. Challenges identified during the elimination of mother-to-child transmissionstock-taking workshops.

Pillar 1: Leadership, governance and co-ordination

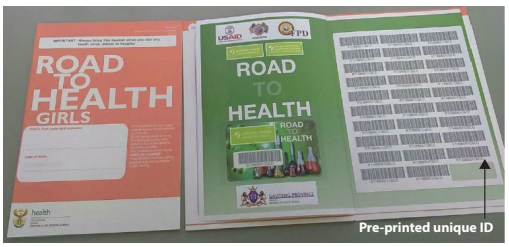
- The shift in priority to district, subdistrict and facility levels, with support from DCSTs and other managers.

Pillar 2: Scaling up coverage of PMTCT interventions

- Quality improvement interventions linking mothers to community-based healthcare personnel
- The Mothers2Mothers 'Mother Mentor' programme, which facilitates coverage and retention in care.

Pillar 3: Integrating PMTCT into MCH

- Providing safe pre-conception services to couples: Two Gauteng-based services have supported >800 couples with preconception care. There have been no recorded vertical or horizontal HIV transmissions and early antenatal care booking rates have improved for women achieving pregnancy. Additionally, no HIV-negative women have tested HIV- positive at the time of pregnancy confirmation.
- A pre-printed unique identifier (ID) in each Road-to-Health Booklet (image) is being tested in the Tshwane District. This number can be used as an additional identifier on the NHLS laboratory form to facilitate continuity of care.



- The Positive Baby Tool, which retrospectively assesses where breakdowns in the PMTCT cascade occurred, culminating in a vertical HIV transmission. This helps districts obtain a better understanding of their risk profiles.

Pillar 4: Best practices relating to monitoring and evaluation

- Dashboards and cascades at facility and district levels that examine numbers as well as percentages facilitate understanding of progress and risk
- The NHLS HIV PCR and Viral Load Results for Action reports provide weekly reports to health personnel within districts and identify children that require follow-up

Fig. 5. Potential game changers to strengthen health systems and programme delivery for the elimination of mother-to-child transmission of HIV. (DCSTs = district clinical specialist teams; PMTCT = prevention of mother-to-child transmission of HIV; MCH = maternal and child health; NHLS = National Health Laboratory Service; PCR = polymerase chain reaction.)

Table 3. Percentage positivity and case rates at district level for in-utero HIV infections: April 2016 - March 2017, NHLS

Province	District	Total live births in facility*	Antenatal prevalence †	Total PCR tests infant<7 days‡	PCR positive infant <7 days - intrauterine (IU) infections (deduplicated)‡	IU percent MTCT risk	IU case rate/ 100 000	Coverage(%)§	Five lowest IU case rate/ antenatal prevalence category (rank)
<25% Antenatal HIV prevalence									
NC	Namakwa	1 396	2.3	86	1	1.2	72	267.8	Namakwa (1)
WC	Central Karoo	931	6.9	103	2	1.9	215	160.3	
WC	West Coast	4 828	9.6	537	8	1.5	166	115.9	West Coast (4)
WC	Overberg	3 193	13.9	549	9	1.6	282	123.7	
WC	Cape Winelands	13 579	15.0	1 442	15	1.0	110	70.8	Cape Winelands (2)
LP	Vhembe	28 874	15.0	4 286	54	1.3	187	99.0	
NC	Pixley Ka Seme	2 759	15.1	442	7	1.6	254	106.1	
WC	Eden	8 964	15.6	1 087	17	1.6	190	77.7	
LP	Greater Sekhukhune	24 558	18.1	4 425	58	1.3	236	99.6	
NC	Frances Baard	7 280	18.2	1 656	19	1.1	261	125.0	
NC	Siyanda/ ZF Mgcawu	3 924	20.1	594	10	1.7	255	75.3	
LP	Capricorn	25 863	21.1	5 265	79	1.5	305	96.5	
WC	City of Cape Town Metro	60 303	21.7	11 374	103	0.9	171	86.9	City of Cape Town Metro (5)
NW	Ngaka Modiri Molema	14 593	22.3	3 604	39	1.1	267	110.7	
NC	John Taolo Gaetsewe	4 488	23.2	1 031	5	0.5	111	99.0	John Taolo Gaetsewe (3)
GP	City of Tshwane Metro	49 375	23.4	11 982	126	1.1	255	103.7	
NW	Dr Ruth Segomotsi Mompati	8 921	23.4	2 263	25	1.1	280	108.4	
LP	Mopani	23 904	24.6	5 231	68	1.3	284	89.0	
25 - <35% Antenatal HIV prevalence									
EC	Alfred Nzo	11 590	25.3	3 366	34	1.0	293	114.8	
FS	Xhariep	764	25.8	298	2	0.7	262	151.2	
FS	Fezile Dabi	6 489	25.9	2 205	15	0.7	231	131.2	
LP	Waterberg	14 292	27.3	3 881	42	1.1	294	99.5	
GP	City of Johannesburg Metro	66 984	27.3	17 006	167	1.0	249	93.0	
EC	Cacadu/ Sarah Baartman	5 621	27.5	1 433	17	1.2	302	92.7	
GP	Sedibeng	13 627	29.2	3 530	20	0.6	147	88.7	Sedibeng (2)
EC	Buffalo City Metro	14 423	29.5	3 952	33	0.8	229	92.9	
FS	Thabo Mofutsanyana	11 507	30.1	3 587	14	0.4	122	103.6	Thabo Mofutsanyana (1)
FS	Mangaung Metro	12 434	30.4	4 280	39	0.9	314	113.2	

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Table 3. (continued) Percentage positivity and case rates at district level for *in utero* HIV infections: April 2016 - March 2017, NHLS

Province	District	Total live births in facility*	Antenatal prevalence†	Total PCR tests infant<7 days‡	PCR positive infant <7 days - intrauterine (IU) infections (deduplicated)‡	IU percent MTCT risk	IU case rate/ 100 000	Coverage(%)§	Five lowest IU case rate/ antenatal prevalence category (rank)
EC	Joe Gqabi	4 644	30.7	1 474	12	0.8	258	103.4	
EC	Nelson Mandela Bay Metro	18 491	31.4	3 995	50	1.3	270	68.8	
NW	Bojanala Platinum	20 001	31.5	5409	55	1.0	275	85.9	
NW	Dr Kenneth Kaunda	11 907	31.8	3 445	27	0.8	227	91.0	
FS	Lejweleputswa	8 509	32.3	2 731	16	0.6	188	99.4	Lejweleputsa (5)
EC	O R Tambo	27 939	32.6	6 905	52	0.8	186	75.8	O R Tambo (4)
KZN	Amajuba	8 440	32.8	2 853	15	0.5	178	103.1	Amajuba (3)
GP	West Rand	14 739	33.0	4 190	33	0.8	224	86.1	
GP	Ekurhuleni Metro	59 160	33.5	16 368	142	0.9	240	82.6	
MP	Nkangala	18 678	34.4	5 344	52	1.0	278	83.2	
EC	Chris Hani	10 657	34.5	3119	33	1.1	310	84.8	
≥35% Antenatal HIV prevalence									
EC	Amathole	8 103	35.3	2788	28	1.0	346	97.5	
KZN	Umzinyathi	10 604	35.7	3 235	16	0.5	151	85.5	Umzinyathi (1)
KZN	Harry Gwala	7 593	36.6	2 913	20	0.7	263	104.8	
MP	Ehlanzeni	36 424	37.6	12 846	131	1.0	360	93.8	
KZN	Zululand	16 327	38.1	5 794	49	0.8	300	93.1	
KZN	uThungulu (King Cetshwayo-DHIS)	18 064	38.9	6 611	36	0.5	199	94.1	uThungulu (4)
KZN	Ugu	12 062	39.9	5 027	28	0.6	232	104.5	
KZN	uThukela	11 592	40.0	4 381	21	0.5	181	94.5	uThukela (3)
MP	Gert Sibande	15 893	40.8	6 983	48	0.7	302	107.7	
KZN	eThekwini Metro	54 150	41.1	21 774	172	0.8	318	97.8	
KZN	uMkhanyakude	13 834	44.1	5 505	22	0.4	159	90.2	uMkhanyakude (2)
KZN	iLembe	9 683	45.9	3 998	32	0.8	330	90.0	
KZN	uMgungundlovu	15 717	42.5	6 742	35	0.5	223	100.9	uMgungundlovu (5)

IU = *in utero*; PCR = polymerase chain reaction; EC = Eastern Cape; FS = Free State; GP = Gauteng; KZN = KwaZulu-Natal; LP = Limpopo; MP = Mpumalanga; NW = North West; NC = Northern Cape; WC = Western Cape;
*IU Case Rates are measured per 100 000 live births in that district according to DHIS (April 2016 - March 2017).
†2013 Antenatal HIV Prevalence Survey South Africa.
‡NHLS April 2016 - March 2017.
§some coverage is >100% because of the difficulty with de-duplicating data and challenges with denominators.

lower than the 5% MTCT target, which demonstrates success (Fig. 1 and Tables 2 and 3), but IU case rates at the district level are up to seven-fold higher than the global target. IU case rates depend on the number of HIV-exposed infants, and thus maternal HIV prevalence. From the synthesis of district-level discussions, several game changers are currently being implemented in a non-systematic way to strengthen healthcare systems and close the gaps in EMTCT programme delivery in SA. The implementation of any game changer requires close collaboration between health facilities, laboratories, communities, healthcare staff and supporting partners as data from Uganda demonstrate that the failure to strengthen healthcare systems could be a rate-limiting step to sustainable PMTCT success.[24] Evidence demonstrates that PMTCT programme outcomes improve after integration into the mainstream routine healthcare system for maternal and child health.[25] Game changers should not add to the complexity of PMTCT implementation, but should strengthen routine systems to improve service delivery.

One key stumbling block to the attainment of EMTCT is poor monitoring of maternal viral suppression. Data from more experienced Option B+ countries corroborate this key challenge.[26,27] In fact, a systematic review and meta-analysis in 51 countries demonstrated 73.5% overall ART adherence (defined as >80% intake of recommended pill doses), which disaggregates into 75.7% during pregnancy and 53.3% postnatally.[26] Being on triple antiretroviral therapy rather than prophylaxis reduced the odds of adherence.[26] Individual-level data from 19 facilities in Malawi demonstrated that ART initiation among pregnant women with high CD4 cell counts were five times more likely to miss follow-up visits and women who started ART while breastfeeding were twice as likely to miss follow-up visits, compared with pregnant women needing ART for their own health.[27] This begs the question: Why do women not adhere to their ART and follow-up visits? SA data demonstrate that conflict with work commitments, negative treatment from healthcare workers and the lack of disclosure reduce retention in care, and by deduction, adherence.[28] HIV viral load monitoring is now even more critical following the 2016 WHO infant feeding update, which recommends exclusive breastfeeding for 6 months and continued breastfeeding for 24 months or longer for HIV-negative and HIV-positive women.[29] Thus, strengthening healthcare systems and implementing game changers that promote retention in care and infant follow-up are urgently needed.

Ongoing monitoring and in-depth qualitative and quantitative studies are needed to identify high-burden districts and to test the impact of potential game changers on maternal and child health outcomes.

Conclusion

IU percent MTCT risk is significantly less than the 5% final MTCT global target however, final MTCT rates at the district, provincial and national levels need to be closely monitored, as we anticipate a national increase in breastfeeding prevalence after the 2016 infant feeding update. IU case rates are considerably higher than the global target, because of high maternal HIV prevalence. We hypothesise a possible link between using community-based approaches and CQI and lower IU percent MTCT risk/IU case rates in one province (KZN) with the highest antenatal HIV prevalence. However, more in-depth studies and data are needed to understand what quality improvement methods have the greatest impact and what proportion of the success can be attributed to community-based approaches. More district-level systematic studies are needed, to quantify bottlenecks to EMTCT and to test the impact of potential game changers on the health, development, growth, and HIV-free survival of HIV-exposed infants until breastfeeding cessation, and the health of their mothers.

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