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Infant feeding counselling of HIV-infected women in two areas in Kenya in 2008

Kiersten Israel-Ballard¹, Margaret Waithaka² and Ted Greiner³

Abstract

While WHO no longer recommends individual infant feeding counselling to HIV-positive women, it may still be practised in some settings and for specific cases. In any case, lessons can be learned by examining how well front line health workers are able to take on counselling tasks. This qualitative study was designed to assess how counsellors deal with challenges they face in two Kenyan provinces. It consisted of brief post-counselling exit interviews with 80 mothers, observations of 21 counselling sessions and 11 key informant interviews. Much infant feeding counselling was of reasonable quality, better than often reported elsewhere. However, nutrition and infant feeding were given low priority, counsellors' training was inadequate, individual postnatal counselling as well as growth monitoring and promotion were rarely done and complementary feeding was inadequately covered. Acceptable, feasible, affordable, sustainable and safe (AFASS) assessments were not of satisfactory quality. Breast milk expression was mentioned only to a minority and the possibility of heat treatment during the transition to cessation was not mentioned. Counsellors were often biased in discussing risks of breastfeeding and replacement feeding. Implementing the new WHO guidance will reduce the need for AFASS assessments, greatly simplifying both the government's and counsellor's tasks.

Keywords

Breastfeeding, HIV, Kenya, prevention of mother-to-child transmission, counselling

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Background

Postnatal transmission of HIV can occur via breastfeeding,¹ requiring health authorities and HIV-positive women to make difficult decisions on how their infants should be fed. In low-income settings, where unsanitary conditions and lack of resources often exist, not breastfeeding has been shown to increase the risk of morbidity and mortality in all infants and young children.^{2–4} Early breastfeeding cessation proved not to offer the best balance of risk (optimal HIV-free survival), especially in rural Africa.⁵ In one Zambian trial, breastfeeding up to a year of age and beyond appeared to be optimal.⁶

WHO has provided guidance in balancing these risks since 1998 but as the evidence base and field experience grew, it changed in 2000, in 2006 and again in 2010 (after the present study was complete). The 2000 guidance stated that HIV-infected mothers should replacement feed if it was acceptable, feasible, affordable, sustainable and safe (AFASS) and otherwise should breastfeed exclusively for six months. At six months breastfeeding should stop if replacement feeding was

AFASS, including the provision and maintenance of a nutritionally adequate and safe diet.^{7,8} The 2010 guidance⁹ encourages breastfeeding for at least one year while providing prophylactic antiretroviral (ARV) drugs to either mother or infant, stopping at 12 months only if deemed safe and appropriate. It encourages countries to decide whether replacement feeding or breastfeeding with antiretroviral therapy (ART) are likely to offer the best results and to formulate policy accordingly rather than continuing to counsel all HIV-infected mothers.

Data suggest that one of the weakest aspects of prevention of mother-to-child transmission (PMTCT)

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interventions has been counselling women on infant feeding. PMTCT counselling is complex, with activities carried out by different staff in different places and at different times and follow-up often lacking.¹⁰ Even in well-established programmes, adherence to PMTCT programmes may be poor.¹¹

Several reports^{12–14} have found inadequate knowledge among health care workers, resulting in inadequate or biased infant feeding counselling. One study, which examined barriers to PMTCT in selected areas of South Africa, found that women practised mixed feeding as a result of ‘poor and ad hoc’ counselling, which was often inappropriate for the resources women had access to, and was instead based on counsellor’s own preferences.¹⁵ Another study found that lack of high-quality counselling by health care workers results in confused and incorrect maternal beliefs.¹⁶

Most PMTCT infant feeding counsellors have been health workers, often overworked, suffering from resource constraints,¹⁷ often uncomfortable about being put in the role of a counsellor¹⁸ and sometimes failing to discuss with the mother her circumstances related to AFASS. In addition, counsellors rarely have appreciated the complex network of social relations within which HIV-infected mothers make and implement infant feeding decisions, particularly in Africa.^{19–21}

Mothers have frequently experienced confusion and at times even coercion, which may have been responsible at times for mixed feeding (breastfeeding while also feeding other liquids or solids),²² increasing the risk of HIV transmission.^{23–25}

Most studies have found facility-based infant feeding counselling to have little impact on mothers’ feeding practices and/or vertical transmission rates.^{26,27} In one report, ‘health staff suggesting formula use’ was apparently effective, being the only factor besides infant hospitalisation predicting which mothers stopped breastfeeding before four months (odds ratio >4).²⁸ In South Africa, Woldesenbet²⁹ found that counselling of poor quality was associated with a 55% increased risk of HIV transmission or mortality. In another South African study, infant feeding choices by the majority of mothers did not match what individual AFASS assessment implied was the safest option for them.³⁰

Attempting to adhere to shifting recommendations has also proven to be challenging. Researchers in Malawi noted that a lack of consensus among policy makers resulted in difficulties for health workers to uniformly counsel mothers on appropriate feeding options.³¹

A study at one Kenyan hospital showed relatively high acceptance for routine counselling and testing.³² With funding from USAID, PATH, an international

non-profit organisation, collaborated with the Ministry of Health of Kenya to conduct an assessment of infant feeding counselling and feeding practices in the context of HIV. The objectives of this research were to evaluate how well counsellors were dealing with the challenges facing them and recommend methods to assist them to function as better counsellors. In 2008, when the field work for this study was conducted, Kenya policy stated that mothers should make a choice based on meeting the AFASS criteria, and then they should breastfeed or replacement feed exclusively for the first six months.

Methods

This study consisted of brief post-counselling exit interviews with mothers, counselling session observations and key informant interviews. Both types of interviews consisted primarily of closed-ended questions with a few open-ended questions to allow for thorough responses. Counselling session observations utilised a checklist. Data collection occurred between May and September 2008. At that time, the Kenya Ministry of Health had not yet adopted the 2006 WHO guidance that breastfeeding cessation occur at six months *only* if replacement feeding was AFASS, but rather stated that HIV-infected mothers should not breastfeed for more than six months.³³

The study took place at health facilities affiliated with the USAID-funded APHIA II (AIDS, Population and Health Integrated Assistance) Program, one facility each in the Kakamega, Vihiga, Hamisi and Bungoma districts of Western Province (WP) and in the Kitui, Makueni, Kibwezi, Machakos, Mwala, Yatta, Mwingi and Mbooni districts of Eastern Province (EP). Free infant formula was not offered to HIV-positive women attending these clinics. We did not ask what training individual counsellors had received, but in APHIA sites nearly all would have received routine PMTCT training.

At the time these regions were selected, the study areas of WP were generally food secure and those of EP food insecure. However, under more normal conditions infant health is likely to be better in the EP, where in 2000 the infant mortality rate was 57 per 1000 live births, compared to 87 in WP.³⁴ According to the 2008 Kenya Demographic and Health Survey,³⁵ 96% of children born during the previous five years in EP and 98% in WP were ever breastfed. However, the median duration of exclusive breastfeeding was 2.6 and 1.1 months, respectively (compared to 0.5 and 0.7 months, respectively in the 2003 Kenya DHS). According to the 2007 Kenya AIDS Indicator Survey,³⁶ 4.7% of adults in EP and 5.1% in WP were infected with HIV.

The study team for WP included one field supervisor and four research assistants fluent in the local Luhya and Swahili languages. The study team for EP included one field supervisor and four research assistants fluent in Kamba and Swahili. Technical assistance in design of the study, development of the instruments used to collect data, analysis and report writing was provided by staff in PATH Kenya, Seattle and Washington DC offices.

Post-counselling exit interviews were conducted with 80 women (50 in EP, 30 in WP); 39 of these were antenatal and 41, postnatal. During periods when research staff were recruiting at each site, all women who were known to be HIV-positive and either pregnant or with an infant at three, six, nine or 12 months of age were recruited upon leaving an antenatal or postnatal PMTCT counselling session at a health facility.

Nine counselling sessions of HIV-positive women who were either pregnant or had an infant <12 months of age were observed in EP and 13 in WP, one per counsellor. In EP, four of these observations were antenatal and five postnatal; in WP nine were antenatal and four postnatal. Antenatal mothers were recruited in the PMTCT section of the antenatal care (ANC) clinic. Postnatal mothers were recruited at a comprehensive care centre or a maternal and child health hospital ward. Two observations in WP and one in EP were of ANC group counselling sessions rather than individual sessions. The observer used a checklist to record whether a specified topic had been covered during the session. No counsellors or mothers refused to participate. The mothers whose counselling was observed were not included in the exit interview sample.

Additionally, key informant interviews were conducted with 11 local stakeholders, including district and provincial nutritionists and nursing officers from Nairobi, EP and WP regarding HIV and infant feeding, using a pretested questionnaire. No stakeholder refused to participate.

This study was approved by the PATH Research Ethics Committee and by the Kenya Medical Research Institute National Ethical Review Committee. Verbal informed consent from all participants was obtained prior to their participation.

Results

Post-counselling exit interviews

Thirty-nine of the women interviewed were pregnant and receiving PMTCT counselling at the ANC; of an additional 22, 13, three and three had infants aged three, six, nine and 12 months, respectively. Most (61%) reported seeing a nurse for this counselling session, while 28.8% saw a doctor and 6.3% a nutritionist. The mothers' reasons for attending the clinic were for

ART (47%), ANC (34%) and PMTCT (24%), some for multiple purposes. Many indicated that their counselling session was fairly comprehensive and included questions about the mother's eating habits (52.5%) or other potential health issues (78.8%), and weighing of the mother and/or baby (82.5%), although few at the postnatal visit (24.4%) said the child welfare card was examined or used. Counsellors discussed infant feeding practices with 71% of sample mothers.

Among ANC mothers who received infant feeding counselling, 69% were told about exclusive breastfeeding and 55% were advised to practise it; almost 10% were advised to use other milks. No infant feeding options were discussed with 29%, who were told that how to feed their baby was up to them. Exclusive breastfeeding was recommended to 41% of mothers with three-month-old infants. Of the 13 mothers with six-month-old infants, eight were told about feeding of other milks.

How to stop breastfeeding was discussed with 42% postnatally, but some mothers had probably already stopped breastfeeding (current feeding method was not asked). Among these women, discussion topics included at what infant age breastfeeding should stop (82%) and over what time period (68%), the initiation of replacement feeding (77%) and issues related to disclosure (68%), and stigma (50%). Manual expression to relieve engorgement was discussed with 24%. We did not explore whether there are cultural issues in this area constraining this practice.

While 70% of all counselling sessions were reported to have included discussion of the risks of HIV transmission from breastfeeding (82% of ANC mothers, 59% of postnatal mothers), only 40% discussed the risks of using infant formula/replacement foods (49% of ANC mothers, 32% of postnatal mothers) or provided information on hygiene (38% of ANC mothers, 41% of postnatal mothers).

Complementary feeding was discussed with 36% of mothers interviewed at ANC visits, increasing to 69% (9/13), 67% (2/3) and 33% (1/3) for mothers with infants six, nine and 12 months of age, respectively. Primary topics during these latter discussions included quality of the foods (63%) and the use of locally available foods (72%), with less attention given to frequency (25%) and quantity (38%). As percentages of the entire sample, postnatal advice was mostly for complaints of insufficient breast milk (26%), cracked nipples (20%), stigma (19%), poor positioning (18%), crying baby (18%) and engorged breasts (16%).

Counselling session observations

Of the 18 individual counselling sessions observed, 67% took place in a private room. In 67% of these,

counsellors introduced themselves to the mother. In the total 22 sessions observed, 90% of counsellors inquired about HIV testing and 62% asked about disclosure. No information, education and communication (IEC) materials were available to guide the counsellor or for distribution to the mothers.

All 13 of the observed ANC counselling sessions included discussion of exclusive breastfeeding, usually for the first six months; the majority including the dangers of mixed feeding as well as risks of replacement feeding. However, some messages were mixed or confused. For example, a student nutritionist counselling mothers in EP said,

The more you breastfeed, the higher the chances of infecting the baby. The less you breastfeed, the safer your baby. You should breastfeed only if you're not able to afford food for the baby. By all means, don't exceed 4 months.

All ANC sessions also included AFASS assessments covering several topics, though none included all the critical AFASS components (Table 1). More emphasis was placed on the risks associated with replacement feeds than the risks from breastfeeding. Eight of the 13 ANC counsellors mentioned how a mother should transition from breastfeeding.

Most of the nine postnatal counsellors inquired about current feeding practices and provided positive feedback to the mother. Seven discussed how a mother should stop breastfeeding, including waiting until the infant is six months old, that AFASS criteria should be in place regardless of infant age, how a mother physically stops breastfeeding (i.e. reduce number of breastfeeds per day) and how long the transition should take. Only two of the nine counsellors mentioned manual expression as a strategy to relieve engorgement.

Table 1. Percentage of observed antenatal care counsellors who discussed topics related to AFASS assessment.

AFASS topics	Percentage of counsellors observed to discuss the topic (n = 13)
Water supply	23.1
Refrigerator	7.7
Costs of replacement milks	15.4
Availability of replacement milks	23.1
Family support	38.5
Hygiene	61.5
Stigma from not breastfeeding	30.8

AFASS: acceptable, feasible, affordable, sustainable and safe.

Six of the postnatal counsellors discussed complementary foods, yet few mentioned that the introduction of foods should be delayed until six months; nor did discussion include critical issues like the amount of food to give, quality of the foods, frequency of meals or use of locally available foods.

In contrast to the ANC counselling sessions, most postnatal counsellors emphasised the risk of HIV transmission from breastfeeding more than risks of replacement foods. Although five of the nine postnatal counsellors were observed weighing infants, only three of these actually marked the weight on the child welfare card. In order of frequency, mothers sought advice from the counsellor on not having enough breast milk, what type of food to feed their infant, engorged breasts, cracked nipples and stigma.

Key informant interviews

The 11 district and provincial nutritionists and nursing officers felt that the primary constraint facing Kenya regarding infant feeding for HIV-exposed infants is poverty. Second was judged to be a lack of training among health care staff, resulting in insufficient nutrition knowledge and mixed messages to mothers. One said, 'I am the District Nutritional Officer and yet have not undergone IYCF training'. A member of the National Infant Feeding Committee said, 'In this country, infant feeding is the weakest link in PMTCT in terms of how much time is allocated to it'.

Most key informants felt that the primary factor in a mother's infant feeding choice was the counselling she received at the health centre. Indeed, most felt that infant feeding practices often reflected the biases of the counsellor. One informant said, 'I feel that those who fully understand the counseling are most likely to exclusively breastfeed'. All felt that HIV-exposed infants who were exclusively breastfed had better growth and development than those who were replacement fed and that infants they see in their communities who were not breastfed have higher risk of morbidity, stunted growth, underweight and malnutrition.

When asked how mothers feed their babies after breastfeeding stops, regional differences were apparent. They estimated that during the current drought in EP, up to half of mothers may not have enough food for their baby. Milk, often diluted with unsafe water, is shared among all household members. In WP, the informants generally observed adequate food availability; the greatest challenge there was felt to be the lack of knowledge among mothers and health care workers regarding which local foods are nutritionally adequate for an infant.

The additional challenges they felt were most pressing included cultural beliefs, stigma, lack of

youth-friendly counselling for teenage mothers, lack of nutrition expertise among management, staff shortages, low literacy, inadequate availability of maternal nutrition counselling, lack of IEC materials and inadequate systems to identify and follow-up HIV-exposed infants. In addition, HIV-positive mothers have little support for optimal infant feeding from their families. They called for a major campaign promoting male involvement in infant feeding.

Some training mechanisms were available, including seminars for continuing education in basic PMTCT (in provincial and district hospitals) and IYCF (in UNICEF-supported sites). However, few counsellors actually received infant feeding training, no refreshers were provided to those that did, and the basic PMTCT training was inadequate regarding infant feeding (only one of the eight modules focused on nutrition, approximately one of seven days allocated to PMTCT training).

Informants indicated that infant feeding information was conveyed to mothers at several opportunities, the majority during individual counselling sessions. However, due to time constraints and staff shortages, this was usually limited to a single post-test counselling session, though more was provided to clients who asked questions. One said, 'If you take a mother through one-on-one counseling, most will then exclusively breastfeed successfully'. In larger facilities with staffing shortages, group counselling was common, and relevant issues were only covered in broader talks on a variety of health issues. *Malezi Bora* campaigns ('good nurturing' in Kiswahili) occurred two weeks each year and encouraged mothers to bring their infants for routine integrated care, attracting many mothers who would otherwise be missed. Support groups existed in some areas, but the lack of financial and logistical support for them limited their effectiveness.

To improve the quality of infant feeding counselling, informants called for reduced staff workloads; the development of community level capacity; encouragement of nurses to focus on nutrition, not just clinical issues; and the strengthening of nurses' confidence regarding nutrition. Two potential opportunities not fully realised were clinic health talks with clients that could expand beyond the routine morning sessions, and the addition of nutrition information to group counselling sessions on ART adherence.

Discussion

This study examined how well Kenyan health workers were coping with the challenges of providing infant feeding counselling to HIV-positive mothers in two provinces. As discussed below, the 2010 WHO guidance recommends approaches that will greatly reduce the

need for such counselling. However, health workers will always be expected to conduct various kinds of counselling and thus lessons can be learned from examining how well they manage under various conditions.

Similar to what has been earlier reported elsewhere from Kenya,³⁷ our informants reported that nutrition and infant feeding were accorded low priority within the health sector, limiting the quality of the counselling on infant feeding within PMTCT services.

It is not possible to draw definitive conclusions regarding the adequacy of some of the infant feeding information provided by counsellors because data on current infant feeding patterns were not obtained. Nor are we certain how much counselling sample mothers may have received before the sessions examined here. There was often little consonance between the findings of the exit interviews and the observations, but we do not believe it is worth the effort to attempt to explain or interpret these seeming contradictions.

Probably due to the heavy work burdens, few post-natal counselling sessions (many of which were done on a group basis, especially in WP) included a review of the infant's child welfare card. Such a review is important in HIV-exposed infants, as they may be at higher risk of low weight for gestational age.³⁸

Counselling on complementary feeding was often inadequately covered, especially advice on frequency and quantity, even for mothers about to stop breastfeeding. Nevertheless, infant feeding appeared to be discussed much more often than was found in an earlier study that included Kenya,³⁹ where in-depth counselling on infant feeding took place in only 6% of cases.

While 71% of women in the post-counselling exit interviews stated they received counselling on infant feeding, based on the observations of counselling, AFASS assessments did not tend to be comprehensive. Hygiene was the only factor included in the majority of cases. Only about one-fourth of counsellors asked about the mother's water source, commonly rivers, dams or open ponds in these areas (data not presented). Diarrhoea incidence is high among infants in Kenya, whether the mother has HIV or not,⁴⁰ and is linked to growth faltering and hospitalisation following breastfeeding cessation.⁴¹

During the observed counselling sessions, counsellors rarely discussed the costs and sustainable availability of replacement feeding. Earlier studies elsewhere in Africa also found AFASS assessments to be inadequately performed.^{42,43}

Mothers were often subjected to provider bias and thus may not have been given the comprehensive and objective information they needed to make their own fully informed decisions. Regarding cessation of breastfeeding, counselling sessions often did include discussion around how to stop breastfeeding, the need to

avoid doing so too hastily, to do so only after six months of exclusive breastfeeding and only if AFASS criteria could be fulfilled at that point. Manual expression was rarely mentioned as a strategy during this transition, including the fact that it can relieve engorgement and subsequently prevent cracked nipples and mastitis. In one study in Kenya, 11% of HIV-infected mothers had mastitis and 12%, breast abscess,⁴⁴ and these, as well as nipple lesions, are known to significantly increase maternal breast milk viral load and the risk of HIV transmission.⁴⁵

At the time of the study, Kenya had not yet fully decided how to implement the 2006 WHO guidance. After data collection for this study was complete, early presentations of evidence demonstrating ARV interventions to the infant or HIV-infected mother significantly reduced HIV transmission during the breastfeeding period^{46–48} which prompted WHO to issue its 2010 guidance.⁹ These new recommendations encourage nations to adopt a single infant feeding option, either breastfeeding with ARV prophylaxis or avoidance of all breastfeeding, based upon each country's situation. Avoidance of breastfeeding or early cessation should still only be considered when specific environmental conditions are met, similar to the AFASS criteria. It is hoped that these revisions will result in a more clearly defined implementation strategy for infant feeding in the context of HIV.

This latest 2010 guidance from WHO should result in substantial changes in the infant feeding component of PMTCT around the world. While many countries may continue using individual AFASS assessment for all HIV-infected mothers, taking time to decide whether to adopt the 2010 WHO guidance, doing so would allow countries like Kenya to prioritise scarce counselling resources for the minority of situations in which it might still be needed:

1. When ARV prophylaxis during breastfeeding is not available;
2. When deciding if stopping breastfeeding at one year is appropriate.

We believe that counselling regarding stopping at one year will be somewhat simpler than doing so at six months. This is partly because infant vulnerability has declined, while capacity has increased to consume a wider variety of foods, especially family foods that are simpler to make. In particular, one year olds can more easily drink milk without the use of feeding bottles, which are particularly dangerous in low-income settings.

In any case, the new approach would greatly reduce the complexity and cost of comprehensive and continual training, including supportive supervision and follow-up. However, these will continue to be necessary

to ensure that health care providers have accurate and up-to-date knowledge on infant feeding risks and benefits^{12,49} and on current national policy. While ART was available at our research sites, we did not obtain data on how widely it was provided to the mothers attending. Clearly this is critical in deciding how and whether counselling should be conducted. Even once access to ARV regimens is universal, mothers and health care workers must continue to receive the education and support they need to ensure safe infant feeding and ultimately optimal levels of HIV-free survival in each setting.

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Conflict of interest

The authors declare no conflict of interest.

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References

1. WHO Special Programme on AIDS. *Statement from the consultation on breast-feeding/breast milk and human immunodeficiency virus (HIV)*. Geneva: WHO, 1987.
2. WHO Collaborative Study Team on the Role of Breastfeeding on the Prevention of Infant Mortality. Effect of breastfeeding on infant and child mortality due to infectious diseases in less developed countries: a pooled analysis. *Lancet* 2000; 355: 451–455.
3. Mbori-Ngacha D, Nduati R, John G, et al. Morbidity and mortality in breastfed and formula-fed infants of HIV-1-infected women: a randomized clinical trial. *JAMA* 2001; 286: 2413–2420.
4. Creek TL, Kim A, Lu L, et al. Hospitalization and mortality among primarily nonbreastfed children during a large outbreak of diarrhea and malnutrition in Botswana, 2006. *J Acquir Immune Defic Syndr* 2010; 53: 14–19.
5. Homsy J, Moore D, Barasa A, et al. Breastfeeding, mother-to-child HIV transmission, and mortality among infants born to HIV-Infected women on highly active antiretroviral therapy in rural Uganda. *J Acquir Immune Defic Syndr* 2010; 53: 28–35.

6. Kuhn L, Sinkala M, Semrau K, et al. Elevations in mortality associated with weaning persist into the second year of life among uninfected children born to HIV-infected mothers. *Clin Infect Dis* 2010; 50: 437–444.
7. WHO and UNICEF. *HIV and infant feeding: a guide for health-care managers and supervisors*. Geneva: WHO and UNICEF, 2004.
8. World Health Organization. *HIV and infant feeding. New evidence and programmatic experience. Consensus statement from a technical consultation*. Geneva: WHO, 2007.
9. World Health Organization. *Guidelines on HIV and infant feeding 2010*. Geneva: WHO, 2010, p.58.
10. Horwood C, Haskins L, Vermaak K, et al. Prevention of mother to child transmission of HIV (PMTCT) programme in KwaZulu-Natal, South Africa: an evaluation of PMTCT implementation and integration into routine maternal, child and women's health services. *Trop Med Int Health* 2010; 15: 992–999.
11. Nassali M, Nakanjako D, Kyabayinze D, et al. Access to HIV/AIDS care for mothers and children in sub-Saharan Africa: adherence to the postnatal PMTCT program. *AIDS Care* 2009; 21: 1124–1131.
12. Shah S, Rollins NC and Bland R. Breastfeeding knowledge among health workers in rural South Africa. *J Trop Pediatr* 2004; 15: 15.
13. Piwoz EG, Ferguson YO, Bentley ME, et al. Differences between international recommendations on breastfeeding in the presence of HIV and the attitudes and counselling messages of health workers in Lilongwe, Malawi. *Int Breastfeed J* 2006; 1: 2.
14. Chopra M, Piwoz E, Sengwana J, et al. Effect of a mother-to-child HIV prevention programme on infant feeding and caring practices in South Africa. *S Afr Med J* 2002; 92: 298–302.
15. Sprague C, Chersich MF and Black V. Health system weaknesses constrain access to PMTCT and maternal HIV services in South Africa: a qualitative enquiry. *AIDS Res Ther* 2011; 8: 10.
16. Hardon A, Vernooij E, Bongololo-Mbera G, et al. Women's views on consent, counseling and confidentiality in PMTCT: a mixed-methods study in four African countries. *BMC Public Health* 2012; 12: 26.
17. Falnes E, Tylleskär T, de Paoli M, et al. Mothers' knowledge and utilization of prevention of mother to child transmission services in northern Tanzania. *JIAS* 2010; 13: 36.
18. Leshabari S, Blystad A, Paoli M, et al. HIV and infant feeding counselling: challenges faced by nurse-counsellors in northern Tanzania. *Hum Resour Health* 2007; 5: 1–11.
19. Delva W, Mutunga L, Quaghebeur A, et al. Quality and quantity of antenatal HIV counselling in a PMTCT programme in Mombasa, Kenya. *AIDS Care* 2006; 18: 189–193.
20. Doherty T, Chopra M, Nkonki L, et al. Effect of the HIV epidemic on infant feeding in South Africa: "When they see me coming with the tins they laugh at me". *Bull World Health Organ* 2006; 84: 90–96.
21. Burke J. *Jamii, social ties and networks: managing HIV and infant feeding in Central Tanzania*. Sydney: School of Social Science and International Studies, University of New South Wales, 2009, p.401.
22. Sibeko L, Coutoudis A, Nzuza S, et al. Mothers' infant feeding experiences: constraints and supports for optimal feeding in an HIV-impacted urban community in South Africa. *Public Health Nutr* 2009; 12: 1983–1990.
23. Coutoudis A, Pillay K, Kuhn L, et al. Method of feeding and transmission of HIV-1 from mothers to children by 15 months of age: prospective cohort study from Durban, South Africa. *AIDS* 2001; 15: 379–387.
24. Iliff PJ, Piwoz EG, Tavengwa NV, et al. Early exclusive breastfeeding reduces the risk of postnatal HIV-1 transmission and increases HIV-free survival. *AIDS* 2005; 19: 699–708.
25. Becquet R, Ekouevi DK, Menan H, et al. Early mixed feeding and breastfeeding beyond 6 months increase the risk of postnatal HIV transmission: ANRS 1201/1202 Ditrane Plus, Abidjan, Cote d'Ivoire. *Prev Med* 2008; 47: 27–33.
26. Ochola SA, Labadarios D and Nduati RW. Impact of counselling on exclusive breast-feeding practices in a poor urban setting in Kenya: a randomized controlled trial. *Public Health Nutr* 2013; 16: 1732–1740.
27. Rollins N, Little K, Mzolo S, et al. Surveillance of mother-to-child transmission prevention programmes at immunization clinics: the case for universal screening. *AIDS* 2007; 21: 1341–1347.
28. Goga AE, Van Wyk B, Doherty T, et al. Operational effectiveness of guidelines on complete breast-feeding cessation to reduce mother-to-child transmission of HIV: results from a prospective observational cohort study at routine prevention of mother-to-child transmission sites, South Africa. *J Acquir Immune Defic Syndr* 2009; 50: 521–528.
29. Woldesenbet S. *Infant feeding strategies and other determinants of postnatal HIV-free survival rate in South Africa: parameter values for modeling postnatal HIV-free survival rate in South Africa*. MPH Thesis. Cape Town, South Africa: School of Public Health, The University of Western Cape, 2008.
30. Doherty T, Chopra M, Jackson D, et al. Effectiveness of the WHO/UNICEF guidelines on infant feeding for HIV-positive women: results from a prospective cohort study in South Africa. *AIDS* 2007; 21: 1791–1797.
31. Chinkonde JR, Sundby J, de Paoli M, et al. The difficulty with responding to policy changes for HIV and infant feeding in Malawi. *Int Breastfeed J* 2010; 5: 11.
32. Chersich MF, Luchters SMF, Othigo MJ, et al. HIV testing and counselling for women attending child health clinics: an opportunity for entry to prevent mother-to-child transmission and HIV treatment. *Int J STD AIDS* 2008; 19: 42–46.
33. Republic of Kenya Ministry of Health. *Kenya national guidelines on nutrition and HIV/AIDS*. Nairobi: Ministry of Health, 2006.
34. UNICEF. *Multiple indicator cluster surveys (MICS2)*. Kenya: UNICEF, 2000.
35. Kenya National Bureau of Statistics (KNBS) and ICF Macro. *Kenya demographic and health survey 2008–09*. Calverton, MD: KNBS and ICF Macro, 2010.

36. National AIDS and STI Control Programme, Ministry of Health, Kenya. *Kenya AIDS Indicator Survey 2007: preliminary report*. Nairobi, Kenya: Author, 2008.
37. Chopra M, Doherty T, Mehattru S, et al. Rapid assessment of infant feeding support to HIV-positive women accessing prevention of mother-to-child transmission services in Kenya, Malawi and Zambia. *Public Health Nutr* 2009; 12: 2323–2328.
38. Ezeaka VC, Iroha EO, Akinsulie AO, et al. Anthropometric indices of infants born to HIV-1-infected mothers: a prospective cohort study in Lagos, Nigeria. *Int J STD AIDS* 2009; 20: 545–548.
39. Chopra M and Rollins N. Infant feeding in the time of HIV: rapid assessment of infant feeding policy and programmes in four African countries scaling up prevention of mother to child transmission programmes. *Arch Dis Child* 2008; 93: 288–291.
40. van Eijk AM, Brooks JT, Adcock PM, et al. Diarrhea in children less than two years of age with known HIV status in Kisumu, Kenya. *Int J Infect Dis* 2009; 14: e220–e225.
41. Thomas T, Masaba R, van Eijk A, et al. Rates of diarrhea associated with early weaning among infants in Kisumu, Kenya. In: *14th conference of retroviruses and opportunistic infections*. Los Angeles CA, USA, 25–28 February 2007.
42. Rutenberg N and Rubenberg S. *Evaluation of United Nations-supported pilot projects for the prevention of mother-to-child transmission of HIV*. New York: UNICEF and Population Council, 2003.
43. Chopra M, Doherty T, Jackson D, et al. Preventing HIV transmission to children: quality of counselling of mothers in South Africa. *Acta Paediatr* 2005; 94: 357–363.
44. John GC, Nduati RW, Mbori-Ngacha DA, et al. Correlates of mother-to-child human immunodeficiency virus type 1 (HIV-1) transmission: association with maternal plasma HIV-1 RNA load, genital HIV-1 DNA shedding, and breast infections. *J Infect Dis* 2001; 183: 206–212.
45. Embree JE, Njenga S, Datta P, et al. Risk factors for postnatal mother-child transmission of HIV-1. *AIDS* 2000; 14: 2535–2541.
46. Shapiro RL, Hughes MD, Ogwu A, et al. Antiretroviral regimens in pregnancy and breast-feeding in Botswana. *N Engl J Med* 2010; 362: 2282–2294.
47. Chasela CS, Hudgens MG, Jamieson DJ, et al. Maternal or infant antiretroviral drugs to reduce HIV-1 transmission. *N Engl J Med* 2010; 362: 2271–2281.
48. de Vincenzi I. Triple antiretroviral compared with zidovudine and single-dose nevirapine prophylaxis during pregnancy and breastfeeding for prevention of mother-to-child transmission of HIV-1 (Kesho Bora study): a randomised controlled trial. *Lancet Infect Dis* 2011; 11: 171–180.
49. Bland RM, Rollins NC, Coovadia HM, et al. Infant feeding counselling for HIV-infected and uninfected women: appropriateness of choice and practice. *Bull World Health Organ* 2007; 85: 289–296.