



# A Longitudinal Qualitative Study of Infant-Feeding Decision Making and Practices among HIV-Positive Women in South Africa<sup>1</sup>

Tanya Doherty,<sup>2,3,5\*</sup> Mickey Chopra,<sup>3,4,5</sup> Lungiswa Nkonki,<sup>2,3</sup> Debra Jackson,<sup>4</sup> and Lars-Ake Persson<sup>5</sup>

<sup>2</sup>Health Systems Trust, Cape Town, 7700 South Africa; <sup>3</sup>Health Systems Research Unit, Medical Research Council, Tygerberg, 7505 South Africa; <sup>4</sup>School of Public Health, University of the Western Cape Bellville, 7535 South Africa; and <sup>5</sup>Department of Women's and Children's Health, Uppsala University, 75185 Uppsala, Sweden

## Abstract

This study examined the challenges that HIV-positive women face at different stages of early infant feeding using a longitudinal, qualitative design. The study explored factors influencing infant-feeding decision-making and behavior of HIV-positive mothers and identified characteristics of women and their environments that contributed to success in maintaining exclusivity of their infant feeding practices. The study was undertaken at 3 sites in South Africa. Participants consisted of a purposive sample of 27 women who had a positive HIV test result during antenatal care and were intending to either exclusively breast-feed or exclusively formula-feed their infants. Women were interviewed once antenatally and at 1, 4, 6, and 12 wk postpartum. Just under one-half of the women who initiated breast-feeding maintained exclusivity and over two-thirds of the women who initiated formula-feeding maintained exclusivity. Key characteristics of women who achieved success in exclusivity included the ability to resist pressure from the family to introduce other fluids and to recall key messages on mother-to-child transmission risks and mixed feeding. Among women who maintained exclusive breast-feeding, a strong belief in the benefits of breast-feeding and a supportive home environment was important. For women using formula milk, having resources such as electricity, a kettle, and flask made feeding at night easier. Support for infant feeding that extends beyond the antenatal period is important to enable mothers to cope with new challenges and pressures at critical times during the early postpartum period. *J. Nutr.* 136: 2421–2426, 2006.

## Introduction

The availability of effective short course antiretroviral (ARV) regimens in the peripartum period provides the potential for significant reductions in in utero and intrapartum mother-to-child HIV transmission (MTCT)<sup>6</sup> (1,2). With the widespread introduction of prevention of mother-to-child transmission (PMTCT) programs containing peripartum ARV prophylaxis, MTCT in the postpartum period through breast-feeding is becoming increasingly important. Exclusive breast-feeding or complete avoidance of breast-feeding through exclusive replacement feeding is currently the main focus of attention, but little is known about how to achieve these practices (3,4).

UNICEF/WHO has recommended that HIV-positive women avoid all breast-feeding when replacement feeding is acceptable, feasible, affordable, sustainable, and safe for their circumstances. If the available replacement feeding methods do not meet these

criteria, exclusive breast-feeding (EBF) is recommended during the first months of life (5). The application of these recommendations in operational settings is a challenge. Both clinical trials and evaluations of PMTCT programs have found that rates of exclusive infant feeding, both breast-feeding and formula-feeding, are suboptimal (6–9). In South Africa, although the majority of mothers initiate EBF, only 10.4% exclusively breast-feed until their infant is 3 mo of age and the percentage decreases to 1.2% for those who breast-feed their infant until 6 mo of age (10).

There is increasing literature on the determinants of successful EBF (11,12) but very little in the context of HIV and we could find no studies that have examined nonbreast-feeding HIV-positive mothers. Many of the studies exploring the infant feeding practices of HIV-positive women have been quantitative and cross-sectional in design (6,13,14) and subsequently underplay the dynamic nature of infant feeding behavior, especially in the first few weeks of life. The aim of this study was to examine, in a longitudinal qualitative study, the characteristics of HIV-positive women and their environments that contributed to success in maintaining either exclusive breast-feeding or exclusive formula-feeding.

## Materials and Methods

We conducted a longitudinal qualitative interview study between May 2004 and January 2005 in 3 sites in South Africa (Paarl, Rietvlei, and

<sup>1</sup> This research was supported by a grant from the WHO Department of Child and Adolescent Health and Development and an exchange grant through the Swedish-South Africa Cooperation (SIDA/NRF).

<sup>6</sup> Abbreviations used: EBF, exclusively breast-fed; EFF, exclusively formula-fed; MTCT, mother-to-child HIV transmission; PEB, Paarl exclusive breastfeeder; PMTCT, prevention of mother-to-child HIV transmission; REB, Rietvlei exclusive breastfeeder; UEB, Umlazi exclusive breastfeeder; UEF, Umlazi exclusive formula feeder.

\* To whom correspondence should be addressed. E-mail: tanya@hst.org.za.

Umlazi). Paarl (Western Cape) is a peri-urban farming area that is well-resourced (higher socio-economic profile and more available health care systems than the other 2 sites) and has an antenatal HIV prevalence of 9%; 70% of HIV-positive women in the PMTCT program chose exclusive formula-feeding and 30% chose exclusive breast-feeding (15). Rietvlei (Eastern Cape) is a rural area in one of the poorest regions of South Africa. The antenatal HIV prevalence is 28%; 69% of HIV-positive women in the PMTCT program chose exclusive formula-feeding and 31% chose exclusive breast-feeding (15). Umlazi (KwaZulu-Natal) is a peri-urban area with formal and informal housing. It is intermediate with regard to resources compared with the 2 sites, and the antenatal HIV prevalence is 47%; 36% of HIV-positive women in the PMTCT program chose exclusive formula-feeding and 64% chose exclusive breast-feeding (15).

**Sample.** HIV-positive women were recruited from 3 local antenatal clinics at  $\geq 34$  wk gestation by trained field researchers. Women who had been through voluntary counseling and testing and who had received an HIV-positive test result were informed about the study by a clinic nurse and, if they agreed to participate, were introduced to the field researcher. Purposive sampling (a method of selecting individuals with qualities of interest to the research question) was used to select the first 3–5 HIV-positive women who intended to formula-feed and the first 3–5 HIV-positive women who intended to breast-feed at each site. The sample size of  $\sim 5$  women in each feeding group per site was chosen to enable different experiences of these feeding methods to be obtained from women within and across sites. The final sample size was determined after a review of the initial interview transcripts and once we determined that no new information was being obtained and with consideration for resource limitations.

Exclusive breast-feeding (EBF) was defined as the infant receiving breast milk only with no other fluids or foods. Abrupt cessation of breast-feeding with no further breast-feeding reported at subsequent visits was also classified as exclusive breast-feeding in accordance with the South African PMTCT program recommendations (16). Exclusive formula-feeding (EFF) was defined as the infant receiving formula milk with no breast milk. Foods and fluids other than breast milk were allowed.

The study protocol was approved by the ethics committee of the University of the Western Cape. Field researchers gave women detailed information about the study and signed informed consent was obtained. Interviews were conducted at home or at a convenient place where women felt comfortable at 1, 4, 6, and 12 wk postpartum. These time periods were selected in order to describe unique experiences and challenges related to infant feeding during distinct phases of the postpartum period. Mothers were given the equivalent of \$5 as a gesture of appreciation for their time.

A total of 27 HIV-positive mothers were recruited into the study antenatally. Twenty-four mothers completed follow-up to 12 wk postpartum, resulting in a total of 116 interviews. Two babies died before 12 wk, both from Rietvlei site and in the formula-feeding group. One mother relocated out of the study area between wk 6 and wk 12. All completed interviews from these 3 mothers were included in the analysis.

**Data collection and analysis.** Open-ended interview guides were used to explore infant-feeding decision-making, experiences of early infant-feeding practices, and factors that enabled success in maintaining infant-feeding practices (including family involvement, disclosure, and health worker interactions). Interviews were conducted by 3 field researchers with experience in qualitative interviewing. The interviews were conducted in the participants' preferred language (Xhosa or Zulu) and lasted between 30 and 60 min.

All interviews were audiotaped, transcribed verbatim, and translated into English. Transcripts of interviews were made anonymous using participant codes. Data analysis followed the thematic content method, which involved identifying key categories and recurrent themes concerning infant feeding in order to determine common characteristics of women and enabling factors, personal and environmental, that contributed to exclusive infant feeding. Data analysis was conducted manually without use of a software program. Sections of text were marked and linked to sections of text from other interviews that covered similar

issues or experiences. Three members of the research team read the transcripts independently and jointly reviewed emerging themes. The interpretations of individual researchers and the themes identified were debated and challenged in a series of team meetings, from which further analytical refinements emerged. Data analysis continued until no new themes or ideas were emerging.

## Results

The mean age of mothers was 25 y and the mean parity was 2 live births. Eighteen mothers had disclosed their HIV status to someone, most commonly their own mother. Of the 27 mothers, 11 planned to exclusively breast-feed and 16 planned to exclusively formula-feed. There were no major differences in age and parity between women who planned to breast-feed and those who planned to formula-feed (Table 1). Overall, 2 (18%) of the women who initiated breast-feeding were still exclusively breast-feeding at 12 wk and 3 abruptly stopped breast-feeding between 6 and 12 wk but were exclusively breast-feeding up to the point that they weaned. Of the formula-feeding women, 14 (88%) did not report giving breast milk to their infants (Fig. 1).

**Antenatal period.** An HIV-positive diagnosis placed great pressures on mothers during the antenatal period especially with regard to choosing an infant-feeding option. We found that 2 issues influenced mothers' infant feeding choices at this time: their own beliefs about breast-feeding and their experiences of antenatal counseling.

Seven out of 11 women who chose EBF had previous breast-feeding experience and several of these women had knowledge about the benefits of breast-feeding: "I have this virus, but I liked him to start in the breast. I like that breast milk is not bought and it has vitamins which are very important in the baby's body while he is still young" (REB2 mother who maintained EBF).

The recall of key messages, despite sometimes being incorrect in terms of actual risk (over-estimating the risk of transmission through breast-feeding), was important as it gave mothers information that they could use to explain their behavior to family members and gave them a greater understanding of the reasons for maintaining exclusivity (Appendix 1). Many of the exclusive breast-feeding mothers also recalled that the health worker allowed her to make her own choice, taking into consideration home circumstances and practical constraints of the 2 feeding options.

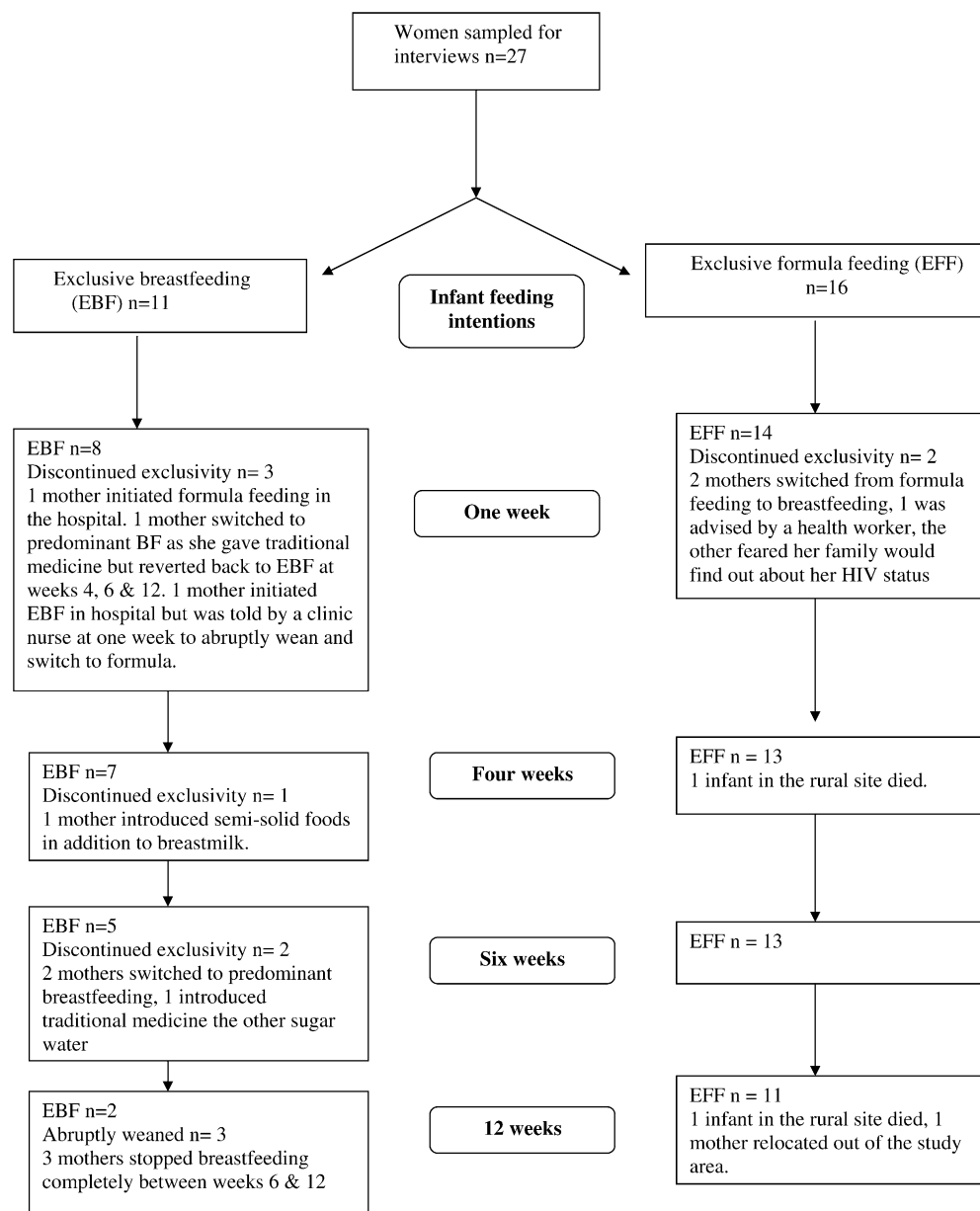
**Early postnatal period (1–2 weeks).** During the early postnatal period, both formula-feeding and breast-feeding mothers already faced pressures from health workers and family that led

**TABLE 1** Baseline characteristics of women interviewed<sup>1</sup>

	Intention to formula-feed	Intention to breast-feed
<i>n</i>	16	11
Maternal age, <i>y</i>	24.7 $\pm$ 5.7	25.7 $\pm$ 4.9
Parity, <i>n</i>	2.0 $\pm$ 0.8	2.0 $\pm$ 1.4
Married, <i>n</i> (%)	2 (12.5)	4 (36.4)
Single, <i>n</i> (%)	14 (87.5)	7 (63.6)
Disclosed HIV status, <i>n</i> (%)	10 (62.5)	8 (72.7)
No formula milk in house <sup>2</sup> , <i>n</i> (%)	6 (37.5)	–

<sup>1</sup> Values are means  $\pm$  SD or *n* (%).

<sup>2</sup> On day of interview.



**Figure 1** Flow diagram of women intending to exclusively breast-feed (EBF) or exclusively formula-feed (EFF) showing drop off from exclusive feeding at each point of follow up and the reasons for these changes in practice.

them to change their original feeding intention. Among women intending to exclusively breast-feed, 3 changed their practices. One woman switched from breast-feeding to formula-feeding at 1 wk due to the instruction of a health worker: “They said I was not supposed to agree to start breast-feeding because the baby might be infected with HIV. I was not happy about the idea of bottle feeding I felt very bad, but if they say, I must stop” (PEB3 mother who did not maintain EBF). Another woman gave her infant traditional medicine for “bad spirits” but reverted back to exclusive breast-feeding, and the final woman switched to formula milk in the hospital because her “milk would not come out” and her child had been given formula milk while she was recovering from a caesarean section.

Among formula-feeding mothers, 2 had switched to breast-feeding; one changed in the hospital because she was advised to do so by a health worker “after I had been to take a bath she gave it (the baby) to me and said I must breast-feed him ... she did not ask what I had chosen to do” (UEF2 mother who did not maintain EFF). The other mother changed from formula milk to

breast milk when she was discharged from the hospital because she was worried that her family would associate formula-feeding with HIV and she had not disclosed her status to anyone at home. “It was my wish to give the baby formula because I did not trust he was going to be okay with my breast milk, but I changed my mind because people that I live with are very observant yet they do not know about my status. They do know that if the baby takes this kind of formula it means the mother is HIV and they are going to ostracize him” (UEF5, mother who did not sustain EFF).

**Four to 6 weeks.** Approximately 1-mo postpartum, many of the mothers reported considerable pressure from family members to modify their feeding behavior, in particular, to introduce other liquids and, in some cases, semi-solid foods. Women who reported self-confidence and knowledge of the importance of exclusivity were able to resist the pressure placed on them by family members (Appendix 2). At this stage, some mothers also had to spend time away from home to look for work, or to

perform household chores such as shopping or collecting water, and did not have the knowledge or skills to maintain EBF during periods apart: "I bought a small tin of 'Pelargon' I am trying in case I go and the person left with him will be able to feed him" (REB3, mother who did not maintain EBF). None of the women in this study reported expressing breast milk.

Of the women who were still exclusively breast-feeding at 1 wk, 3 had stopped by 6 wk. One mother started giving porridge, in addition to breast milk, because she reported insufficient milk and sought advice from her grandmother about introducing solid foods. One mother started giving a traditional liquid at wk 6 when she needed to leave the child: "when I leave there is this babies' *muthi* (traditional medicine); I just give it to him and rush where I am supposed to rush" (REB3, mother who did not maintain EBF). One mother gave glucose water at wk 6 because the child was constipated.

Among formula-feeding women there were no further lapses to breast-feeding. One infant in the rural site died at wk 4 as the result of an infectious respiratory illness. Six mothers reported that they had run out of formula-milk supplies. This was either because they had run out before the scheduled date to collect more or because the clinic was out of stock: "I want to know how many tins of formula milk I am supposed to get from the clinic, because this milk does not help me too much, I always buy every week. I spend R100 (\$15) per week on milk.... If it gets finished, you wait for the date, you do not just go and tell them that it is finished" (UEF3, EFF mother who introduced soft porridge at 4 wk).

Of the women who maintained EBF to this stage, the majority had a husband or partner who was supportive of their feeding choice. The living situation at home, in particular, having disclosed to people at home, was also associated with the maintenance of EBF. Of the women who maintained EBF, most (5) lived with their own mothers to whom they had disclosed.

For mothers to maintain uninterrupted formula-feeding, having a supply of electricity, cash, and the availability of other resources such as an electric kettle, a bottle-cleaning brush, and a flask is what mattered. Five (31%) of the women who chose formula-feeding did not have electricity in their homes. Five of 6 women who reported running out of formula milk were able to purchase additional formula milk to provide an uninterrupted supply for their infants. Having a flask to store boiled water was an enormous help for feeding at night: "at night, I make it and store it in a flask and then pour a little bit to feed him. When it is cold, I mix it with the warm one from the flask and then he will have it warm" (UEF4).

**Twelve weeks.** Only 2 women continued to EBF at 12 wk; however, 3 women abruptly weaned between 6 and 12 wk and had switched to formula and porridge. One of the women was told by the clinic to stop breast-feeding at 12 wk, another was often out of the house looking for work and decided to avoid mixed feeding, and the third woman was told by the clinic to stop breast-feeding because her infant had oral thrush. The remaining 2 women were planning to stop breast-feeding at 24 wk but were unsure how to achieve this. The advice given to women about the appropriate duration of breast-feeding varied between 12 and 24 wk, depending on the site (but not by the mother's individual situation). One baby in the formula-feeding group in the rural site died at 12 wk following a period of illness and repeated hospitalizations for pneumonia from wk 4.

Overall, disclosure of HIV status was found to be important for those who maintained exclusive feeding. Approximately two-thirds of women choosing formula milk had disclosed their

HIV status, whereas a slightly larger percentage of women choosing to breast-feed disclosed their HIV status (Table 1). Most disclosure took place antenatally. The most common people to disclose to were a partner (33%), mother (33%), or other family members and friends. Disclosure of HIV status to family members assisted some mothers by giving them the confidence to justify their infant-feeding practices (Appendix 3). Mothers who had not disclosed their status found it more difficult to explain to family members why exclusive feeding was important and they feared negative consequences of disclosure such as less help from the family in looking after their children. "I will not come forward and tell them because I won't know what their reaction will be; sometimes they will even refuse to carry my baby" (UEB5). The 2 women who did not maintain exclusive formula-feeding (i.e., introduced breast milk) lived with their families and had not disclosed to anyone.

## Discussion

To our knowledge, this study is the first to examine the challenges HIV-positive women face at different stages of early infant feeding using a longitudinal, qualitative approach. It is also unique in that it examines the challenges associated with formula-feeding in the context of HIV in resource-constrained settings.

This study has found that HIV-positive women face a series of challenges in sustaining exclusive infant feeding. During the initial postpartum period, inadequate support from health workers can lead women to change from their intended feeding option. At ~1 mo women face increasing pressure from family members to introduce other liquids, and a lack of disclosure makes resistance to such pressures difficult. By 3 mo many women have to spend time away from home and do not have the skills and support to sustain exclusive breast-feeding during periods of absence. For women using formula milk, fear of stigmatization can lead to the introduction of breast milk, and erratic clinic supplies can lead to the early introduction of weaning foods. These findings highlight the dynamic nature of infant feeding during the critical early postpartum period.

Pressure from family members to introduce other liquids has a strong influence on infant-feeding practices, particularly for young mothers (12,17), and a high level of confidence and self-efficacy is important to resist such pressures (18). Both groups of mothers also recalled key messages relating to the risk of MTCT and the dangers of mixed feeding. This confirms the findings from other research where women having knowledge of EBF were less likely to end EBF early (19). This has implications for the counseling of mothers, which is often more of an instructive exercise than an interaction that allows the mother to ask questions and to confirm what she has heard (20).

**Circumstances of mothers who maintained exclusive breast-feeding.** A strong belief in the advantages of breast-feeding, having someone in the home with whom the mother had disclosed to and who could support their feeding choice, and not being away from home were all factors associated with successful EBF. These factors have also been found in other studies associated with greater success in exclusive breast-feeding (19,21).

Despite being successful at EBF during the first few months, these women faced challenges in terms of their knowledge of and competency in expressing breast milk should they need to spend periods of time away from their infants. Knowledge about how to abruptly wean their infants from breast milk between 4 and 6 mo, as advised in the South African PMTCT program, also

presents a challenge to many women (16). Little is known about the feasibility of early and abrupt cessation of breast-feeding. Studies that have explored this have found that HIV-positive mothers find it difficult to stop breast-feeding earlier than the norm and that sufficient support for early and abrupt cessation is lacking (22).

**Circumstances of mothers who maintained exclusive formula-feeding.** Despite the provision of free formula milk, over one-third of mothers had run out of formula milk within the first 3 mo. This was due to both insufficient supplies and short intervals at which supplies were given, which had cost implications for women in terms of travel to the clinics. This has been described in other African settings where formula milk is provided as part of the PMTCT program (23) and suggests that a policy to provide free formula needs to be accompanied by the necessary health system infrastructure to ensure milk supplies.

Being in a position to purchase additional supplies during these times was crucial in sustaining exclusive formula-feeding. Other resources, such as having electricity, a kettle, and, especially for night feeding, a flask for storing hot water, also contributed to success in exclusive formula-feeding. In a context where the unemployment rate of women is >50% (24) this situation makes women even more dependent on their partners or family members for the cash resources to maintain their feeding option.

Only 2 women switched to breast-feeding and this was done within 1 wk of delivery. Avoidance of breast-feeding while giving formula is an important finding in terms of the risk of postnatal transmission. However, the conditions under which formula-feeding is being used may not be appropriate. In this sample, a third of women who chose to formula-feed had electricity in their homes. Furthermore, in the Rietvlei site, only one-third of women have piped water in their homes. (25) The unsafe preparation and handling of formula milk may have contributed to the deaths of the 2 formula-fed infants, both of whom lived in the Rietvlei site and died from infectious causes. Proper assessment of the home situation and an explanation by health workers of the competing risks between HIV infection and the protection offered by breast-feeding is essential.

**Generalizability of the findings.** Our sample size, typical of qualitative research, was small, and the accounts presented here do not reflect the experiences of all HIV-positive mothers. These women may be different from other women living with HIV as a high proportion had disclosed their HIV status and had a socio-economic situation that enabled many to purchase formula milk and to remain at home with their infants during the first few months of life. However, the pattern of adherence to exclusive infant feeding is similar to what has been found in other studies (6,9,26), which suggests that there are some similarities between this group and other HIV-positive mothers living in similar circumstances. To our knowledge, this is the first qualitative longitudinal study addressing HIV and infant feeding and the results provide insights into the dynamic nature of infant feeding in the early postpartum period as well as the characteristics of women and environmental factors that contribute to success in maintaining infant-feeding choices.

It remains a challenge to motivate and enable HIV-positive mothers to practice exclusive infant feeding. Mothers face new pressures and challenges during critical times in the early postpartum period and need confidence, knowledge, and skills to overcome these. Antenatal counseling needs to prepare mothers for common challenges during the postpartum period and

especially for resisting family pressures and dealing with perceived milk insufficiency. In addition, postpartum maternal and child health services need to be structured, and health workers need to be trained to support these women after birth in maintaining their infant-feeding choice and to assist them through difficult transition periods.

## Acknowledgments

We would like to acknowledge Pumza Mbenenge, Helen Keswa, Weliswa Binza, and Thoko Ndaba, who conducted the interviews.

## Literature Cited

1. Lallemand M, Jourdain G, Le Coeur S, Mary JY, Ngo-Giang-Huong N, Koetsawang S, Kanshana S, McIntosh K, Thaineua V. Single-dose perinatal nevirapine plus standard zidovudine to prevent mother-to-child transmission of HIV-1 in Thailand. *N Engl J Med.* 2004;351:217–28.
2. Dabis F, Bequet L, Ekouevi DK, Viho I, Rouet F, Horo A, Sakarovich C, Becquet R, Fassinou P, et al. Field efficacy of zidovudine, lamivudine and single-dose nevirapine to prevent peripartum HIV transmission. *AIDS.* 2005;19:309–18.
3. Coutoudis A, Pillay K, Kuhn L, Spooner E, Tsai WY, Coovadia HM. 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;15:379–87.
4. Iliff PJ, Piwoz EG, Tavengwa NV, Zunguza CD, Marinda ET, Nathoo KJ, Moulton LH, Ward BJ, Humphrey JH. Early exclusive breast-feeding reduces the risk of postnatal HIV-1 transmission and increases HIV-free survival. *AIDS.* 2005;19:699–708.
5. WHO. New data on the prevention of mother-to-child transmission of HIV and their policy implications: conclusions and recommendations. Geneva: UNAIDS/UNFPA/UNICEF/WHO; 2000.
6. Omari AA, Luo C, Kankasa C, Bhat GJ, Bunn J. Infant-feeding practices of mothers of known HIV status in Lusaka, Zambia. *Health Policy Plan.* 2003;18:156–62.
7. Nduati R, John G, Mbori-Ngacha D, Richardson B, Overbaugh J, Mwatha A, Ndinya-Achola J, Bwayo J, Onyango FE, et al. Effect of breast-feeding and formula feeding on transmission of HIV-1: a randomized clinical trial. *JAMA.* 2000;283:1167–74.
8. Rollins N, Meda N, Becquet R, Coutoudis A, Humphrey J, Jeffrey B, Kanshana S, Kuhn L, Leroy V, et al. Preventing postnatal transmission of HIV-1 through breast-feeding: modifying infant feeding practices. *J Acquir Immune Defic Syndr.* 2004;35:188–95.
9. Shapiro RL, Lockman S, Thior I, Stocking L, Kebaabetswe P, Wester C, Peter T, Marlink R, Essex M, Heymann SJ. Low adherence to recommended infant feeding strategies among HIV-infected women: results from the pilot phase of a randomized trial to prevent mother-to-child transmission in Botswana. *AIDS Educ Prev.* 2003;15:221–30.
10. Department of Health/Medical Research Council/Measure DHS. South Africa demographic and health survey 1998. Pretoria: National Department of Health; 1998.
11. Aidam BA, Perez-Escamilla R, Lartey A, Aidam J. Factors associated with exclusive breast-feeding in Accra, Ghana. *Eur J Clin Nutr.* 2005;59:789–96.
12. Duong DV, Lee AH, Binns CW. Determinants of breast-feeding within the first 6 months post-partum in rural Vietnam. *J Paediatr Child Health.* 2005;41:338–43.
13. Suryavanshi N, Jonnalagadda S, Erande AS, Sastry J, Pisal H, Bharucha KE, Shrotri A, Bulakh PM, Phadke MA, et al. Infant feeding practices of HIV-positive mothers in India. *J Nutr.* 2003;133:1326–31.
14. Poggensee G, Schulze K, Moneta I, Mbezi P, Baryomunsi C, Harms G. Infant feeding practices in western Tanzania and Uganda: implications for infant feeding recommendations for HIV-infected mothers. *Trop Med Int Health.* 2004;9:477–85.
15. Doherty T, Besser M, Donohue S, Kamoga N, Stoops N, Williamson L, Visser R. Case study reports on implementation and expansion of the PMTCT programme in the nine provinces of South Africa. Durban: Health Systems Trust; 2003.

16. National Department of Health. Protocol for providing a comprehensive package of care for the prevention of mother to child transmission of HIV (PMTCT) in South Africa. Pretoria: South African National Department of Health; 2001.
17. Thairu LN, Pelto GH, Rollins NC, Bland RM, Ntshangase N. Sociocultural influences on infant feeding decisions among HIV-infected women in rural Kwa-Zulu Natal, South Africa. *Maternal and Child Nutrition*. 2005;1:2–10.
18. Dennis CL. Theoretical underpinnings of breast-feeding confidence: a self-efficacy framework. *J Hum Lact*. 1999;15:195–201.
19. de Paoli M, Manongi R, Helsing E, Klepp KI. Exclusive breast-feeding in the era of AIDS. *J Hum Lact*. 2001;17:313–20.
20. Chopra M, Doherty T, Jackson D, Ashworth A. Preventing HIV transmission to children: quality of counselling of mothers in South Africa. *Acta Paediatr*. 2005;94:357–63.
21. Haider R, Kabir I, Hamadani JD, Habte D. Reasons for failure of breast-feeding counselling: mothers' perspectives in Bangladesh. *Bull World Health Organ*. 1997;75:191–6.
22. Coutsoudis A. Infant feeding dilemmas created by HIV: South African experiences. *J Nutr*. 2005;135:956–9.
23. Linkages. A review of UNICEF experience with the distribution of free infant formula for infants of HIV infected mothers in Africa. Washington, DC: AED/Linkages/UNICEF; 2004.
24. Health Systems Trust. South African health review 2003/04. Durban: Health Systems Trust; 2004.
25. Equity. Primary health care in the Eastern Cape Province 1997–2000. Bisho: Equity Project and Eastern Cape Department of Health; 2001.
26. Bland RM, Rollins NC, Coutsoudis A, Coovadia HM. Breast-feeding practices in an area of high HIV prevalence in rural South Africa. *Acta Paediatr*. 2002;91:704–11.

## APPENDIX 1. Key messages retained by exclusively feeding mothers

“If my breast has cracks I should quickly go to the clinic and tell them that my breast has cracked so they will advise me what to do and I must always check my breasts for cracks.”

—PEB1 mother who maintained EBF to week 11

“They said if the baby is bottle-fed and breast-fed it is easy for the baby to get the diseases. You have to feed him on one because if you bottle-feed and breast-feed the bottle damages the intestines inside. And if you breast feed the baby maybe there is a disease that you have it is easy for you to pass it to the baby.”

—UEB1 mother who maintained EBF to week 12

“Before taking blood they firstly explained that taking blood is good when you are pregnant so that you know. And that after giving birth you must not breast-feed the baby when you know that you are positive.”

—UEF2 mother who maintained EFF

## APPENDIX 2. Mother's ability to resist family pressures to mix feed

“He (baby's father) was happy such that he wanted him to bottle-feed and breast-feed. He even said he is going to buy the bottle and the tin (formula). And I said they said at the hospital he must be fed on one. As he is breast-fed he will breast-feed until he is 6 months and after that he will bottle-feed.”

—UEB1, mother who maintained EBF to week 12

“Someone has told me to give my baby both breast milk and formula milk. I refused and told her that if he doesn't get enough with breast milk that means he won't get enough with formula milk too.... She said there is no such thing I am starving the baby.”

—UEB1, mother who maintained EBF to week 12

“They do not entertain that (exclusive feeding) in this household because the baby is not supposed to be only breast-fed. It is compulsory that he breast-feeds and also bottle feeds....I just say time has not come for the baby to bottle feed.”

—REB4, mother who abruptly weaned from EBF at 12 weeks

## APPENDIX 3. Case study

A 27-year-old married woman. This is her second pregnancy. She lives with her husband and first child of 8 y. She attended ANC and received some infant feeding counseling that strongly emphasized that she should not practice mix feeding. She disclosed to her husband antenatally, “he accepted it because it was clear that if I am positive he is also positive... he has not tested, he said there is no need.” They agreed that they will not tell anyone else her status. After delivery she started giving formula milk in hospital. When she went home she started buying her own formula milk. At 4 wk she went to access the free formula from the clinic as she was struggling to afford to buy her own. She fetches the formula in a bag that people can't see through. At 6 wk she had started giving other commercial weaning foods. Her mother came to visit and was very upset that she is not breast-feeding: “My mother came and shouted at me for not breast-feeding, she nearly hit me. She said I must give the children breast milk. I refused I told her that it was late to give them breast milk. She insisted that I must breast-feed because milk is not yet finished in my breast.... She then agreed because I am now staying in my house but said I wouldn't be doing that if I was staying in her house.... I felt bad that I had a proper explanation about the situation, but I could not tell her about it” (UEF3 mother who maintained EFF). She was able to resist giving breast milk due to her independence from her mother and support of her husband.