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STARTING WELL:
INFANT FEEDING IN THE FIRST SIX MONTHS, SOWETO, SOUTH AFRICA

BY

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A THESIS

Submitted to the Faculty of Health Sciences, University of Witwatersrand, in fulfilment of the requirements for the degree of

Doctor of Philosophy

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Declaration

I, Sara Jewett Nieuwoudt, declare that this thesis is my own original, unaided work. It is being submitted for the degree of Doctor of Philosophy at the University of the Witwatersrand, Johannesburg, South Africa. It has not been submitted before for any degree or examination at any other University or institution.

Signed on the

24th day of May, 2019 in Johannesburg, South Africa

Dedication

This PhD is dedicated to all of the parents and healthcare workers who strive every day to help children get the best start to their lives possible. For those of you who have no optimal choice to make or offer, I see and hear you. I will do my best to use what I've learned to improve the contexts of choice. For those who were creative and defiant to achieve the seemingly impossible, I salute you and thank you for the seeds of inspiration. For the rest of you, whose journeys have been a mix of successes and failures, thank you for the honest reality check. You have reminded me of how important it is to be compassionate with one another.

Thesis Material

Original peer-review publications

For all of the listed publications, Sara Jewett (Nieuwoudt) contributed to the study design, research management, training and supervision of fieldworkers, data collection, data management (including cleaning/coding and analysis), and first authorship:

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Nieuwoudt, SJ & Manderson, L. Frontline health workers and exclusive breastfeeding guidelines in an HIV endemic South African Community: a qualitative exploration of policy translation. *International Breastfeeding Journal.* 2018; 13:20 doi:10.1186/s13006-018-0164-y

Nieuwoudt, SJ, Manderson, L. & Norris, SA. Infant feeding practices in Soweto, South Africa: Implications for health providers. *South African Medical Journal.* 2018; 108(9): 756-62 doi: 10.7196/SAMJ.2018.v108i9.13358

Nieuwoudt, SJ Being a good mother: HIV and infant feeding decisions. In: *Connected Lives: Families, Households, Health and Care in Contemporary South Africa*. Edited by Mkhwanazi, N. & Manderson, L. Pretoria, South Africa: Human Sciences Research Council ***(accepted)***

Other publications

Nieuwoudt, SJ How health workers have adapted to South Africa's breastfeeding policy. The Conversation Africa. July 12, 2018. https://theconversation.com/how-health-workers-have-adapted-to-south-africas-breastfeeding-policy-99688 (Republished by News24, Huffington Post, and IOL & Radio interview with Radio 789, a Cape Town Community radio)

Conference presentations

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MomConnect: National Steering Committee for Gates Initiative Funds (2016-2018)

Providing technical advice about breastfeeding promotion messages for HIV-infected mothers reached by the SmartParent project (run by Gateway Health Initiative)

Peer reviewed articles for International Breastfeeding Journal, PLOS One; BMC Pregnancy and Childbirth; and Reproductive Health (BMC) as result of PhD publications

Joined SACSoWACH Nutrition Technical Working Group (2018)

Abstract

Background

The health and development benefits of exclusive breastfeeding (EBF) for the first six months of life are well documented. However, breastfeeding has also been associated with HIV transmission. With around 30% of pregnant mothers testing HIV-positive during antenatal visits nationally, the potential HIV risks of breastfeeding have been weighed against the benefits. This has resulted in numerous different infant feeding guidelines over the past 20 years, changing with the evidence base for this risk-benefit equation. The latest guidelines were passed in South Africa in 2011, with the South African government deciding to support EBF only for all mothers and to end the programme that, from 2000, had provided free formula to HIV-exposed infants. However, infant feeding decisions are not influenced by health advice alone. Such decisions are made within a context that also includes family, friends, colleagues and social norms; in this context knowledge does not always reign supreme. Interventions to promote breastfeeding need to address existing barriers and amplify facilitators if South Africa hopes to continue increasing EBF beyond the current rate of 32%. In order to invest in the right mix of interventions, insight is needed into the levers of decision-making.

Methods

A mixed methods study design was applied to respond to the question, "What influences infant feeding decisions during the first six months?" To gain a national and historical perspective, a mixed methods systematic review of 71 articles was conducted for the period 1980-2018 on EBF influences specific to South Africa. Primary cross-sectional data were also collected from 2015-2016 in Soweto, a large urban township outside of Johannesburg. Data collection included a survey of 298 mothers of infants below six months, who were accessing care at community health clinics, and of whom two thirds were HIV positive. Qualitative in-depth interviews with mothers (46), frontline health workers (11) and

key informants (3) were also conducted. For the systematic review, articles were analysed by method and the findings were then synthesized. Descriptive and inferential statistics were used to analyse the quantitative findings from the survey and thematic analysis was used for qualitative data.

Findings

Collectively, the findings highlighted longstanding challenges, such as mixed feeding norms and beliefs in milk insufficiency, as well as context-specific barriers to EBF, such as the government's free formula programme. Evolving definitions of "optimal" feeding were not developed in consultation with communities and thus reflected strong biomedical biases. Health worker counselling content and approaches were identified as highly influential for breastfeeding initiation, with waning influence during the postnatal period except in community health worker programmes. Mothers' HIV status was very influential in terms of following exclusive feeding practices out of fears of transmission, which was also reflected health workers' focus on EBF as an HIV-specific issue. Family influences were cited as reasons for abandoning breastfeeding, along with the need for the mother to return to school or work. Honouring traditions and culture were other reasons to mix feed. Specific factors were identified and discussed at all levels of the socio-ecological model. Blind spots in research were also found in terms of who is researched (mostly Black Africans), where (provinces with large research universities) and how (minimal participatory designs).

Conclusion

A multi-sectoral and multi-level initiative is needed to bring about continued improvements in EBF. Mothers will not be able to act on knowledge without supportive environments, whether they are in health facilities, at home, work, school or in public spaces. Messages about breastfeeding need to emphasize the benefits for all infants, rather than HIV-exposed infants only. Similarly, the health risks of mixed feeding need to be explained in a

clear, but culturally sensitive manner. Mothers and frontline health workers have abundant insights that can be drawn upon in the creation of supportive interventions. The postpartum period is particularly important, which means more needs to be done to engage directly with families and communities. For those mothers who will not or cannot opt for EBF, there are still mechanisms within public health responses to support the nutrition and growth of their infants. Rather than blaming mothers, collective efforts are needed to support a healthy start for all infants in South Africa.

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I would first like to acknowledge God, who placed in my heart a passion for the vulnerable. I convey my deepest gratitude to the Johannesburg Health District for permitting me to conduct this study and my supervisors, without whom this PhD would never have reached fruition.

Prof. Shane Norris invited me to join the Developmental Pathways Health and Research Unit (DPHRU) and nest my PhD therein. He also facilitated the World Health Organization (WHO) funding for my cross-sectional study. Prof. Norris' willingness to introduce me to key leaders in the breastfeeding community, coach me on the quantitative elements of my study, and clarify my overall thinking about the PhD was invaluable. My participation in the DPHRU postgraduate community also enriched my learning over the course of the PhD.

Prof. Lenore Manderson pushed me to deepen my work conceptually, to read broadly and to draw as much as possible from my mixed-methods design. Her personal work ethic and writing skills were models which I hope to emulate as a researcher and supervisor. Prof. Manderson knew when empathy and compassion were needed or when a stern note was required to keep my PhD moving. I am humbled to have shared this journey with her and hope we will continue to collaborate moving forward, as I still have much to learn.

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To the Consortium of Advanced Research Training in Africa (CARTA), my PhD fellowship and everything that came with it was one of the greatest unexpected joys of my PhD journey. Beyond the many research and leadership skills I gained, I am now connected to a brilliant network of scholars, the majority based in Africa, with whom I can collaborate moving forward. You are part of my academic family now.

My family, especially my son Lincoln and husband Reynaud, your unconditional love and understanding as I've pursued this PhD have been amazing. To my parents, thank you for traveling to South Africa to babysit every time I had to go on a CARTA JAS. To my brother John, you have inspired me with your academic commitment and career path. Mildah, you kept me sane! You all are remarkable people who I am blessed to call family.

Finally, none of this would have been possible without the study participants who were willing to share their experiences. Without people who open up their lives to the scrutiny of a stranger's eyes and analysis, this kind of research would be fruitless. The shortcomings of my work are my own. The bright spots are due to the generosity of study participants. May their contributions be honoured through this work to the benefit of society, particularly children.

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Acronym and Abbreviation List

AIDS	Acquired Immunodeficiency Syndrome
AFASS	Acceptable, Feasible, Affordable, Sustainable, and Safe
ART	Antiretroviral Therapy
ARV	Antiretroviral
BFHI	Baby friendly Hospital Initative
CARTA	Consortium for Advanced Research Training in Africa
CHC	Community Health Clinic
CHW	Community Health Worker
Code	International Code of Marketing of Breastmilk Substitutes
COJ	City of Johannesburg
CQI	Continuous Quality Improvement
Declaration	Tshwane Declaration of Support for Breastfeeding in South Africa (2011)
DHS	Demographic Health Survey
DOE	Department of Education
(N)DoH	(National) Department of Health
DTI	Department of Trade and Industry
DPHRU	Developmental Pathways Health and Research Unit
EBF	Exclusive Breastfeeding
EC	Eastern Cape Province
EFF	Exclusive Formula Feeding
eMTCT	Elimination of Mother to Child Transmission
FB	Feeding Buddies
FS	Free State Province
GP	Gauteng Province
GRADE	Grading of Recommendations Assessment, Development and Evaluation

HIV	Human Immunodeficiency Virus
HIVSA	HIV South Africa
HW	Health Worker
IDI	In-depth Interview
IFA	Infant Feeding Association
IMB	Information – Motivation – Behavioral Skills model
IYCF	Infant and Young Child Feeding
KII	Key Informant Interview
KZN	KwaZulu Natal province
LMIC	Low and Middle-Income Countries
LP	Limpopo Province
MBFI	Mother-Baby Friendly Initiation
MM	Mentor Mother
mHealth	Mobile Health
MP	Mpumalanga Province
NC	Northern Cape Province
NGO	Non-Governmental Organisation
NOS	Newcastle-Ottawa Scale
NW	Northwest Province
ORS	Oral Rehydration Solution
PhD	Doctorate in Philosophy
PI	Primary Investigator
PMTCT	Prevention of Mother to Child Transmission
RA	Research Assistant
RCT	Randomised Controlled Trial
REDCap	Research Electronic Data Capture
SACSoWACH	South African Civil Society for Women's Adolescent's and Children's Health

SBCC	Social and Behaviour Change Communication
TPB	Theory of Planned Behaviour
UIF	Unemployment Insurance Fund
UNICEF	United Nations Children's Fund
WBOT	Ward-based Outreach Teams
WC	Western Cape Province
WHO	World Health Organization

Preface

A case for children and mothers

All children should have an opportunity to thrive. No child should die or be set on a path of ill health due to preventable poor nutrition in their first months. Nor should they be infected with HIV. But if these come to pass, their mothers should not be blamed.

In this preface, I begin with a vision and three statements of what *should not* be. The first two *should not* statements are morally based. The third statement flies in the face of a belief purveyed by the biomedical community (and many others) that infant health is the primary responsibility of mothers. In my Literature Review, I demonstrate the pervasiveness of the perception that mothers control infant feeding decisions. This belief underlies policy, interventions and communication. Within this context, I focus specifically on "breast is best" discourse on which epidemiologists and public health experts currently agree for optimal feeding.

Though believing a mother is capable and willing to act on that message seems rational, through this PhD, I argue for embracing a discourse of collective responsibility for infant feeding decisions and their consequences. My argument, built on empirical evidence and ethics, contests that mothers cannot be held solely responsible for infant feeding decisions in isolation of their contexts, whether it is HIV stigma, load shedding, a domineering mother-in-law or an unsympathetic employer. The implication for policies, interventions and communication is that a broader collective must be held responsible for children to thrive in their early months.

My position reflects a socio-ecological perspective that has growing support in the research community. However, it is not a position I developed theoretically. This study is one built on the scaffolding of my own observations and experiences as a humanist, activist and as a mother.

Soweto is one of many contexts where my PhD research could have been conducted. It was a rich ecosystem for this topic, particularly in the context of HIV. My application of a wider ecological lens comes from a desire to identify ways to improve child health and wellbeing outcomes through means that are supportive (versus punitive or judgemental) of mothers.

Infant feeding as a case study for collective responsibility

Though I only registered for this PhD in February 2015, the ideas for this study date from 2001, following the deaths of two children in Ethiopia. I was running a support group for HIV infected children in Addis Ababa at a time when antiretroviral therapy (ART) was not yet available. Early in 2001, Samineh, a bright-eyed 5-year-old boy and Tizita, an artistic 12-year-old girl, both died of AIDS, within one month of each other. My grief was profound. However, when I overheard community members blaming their already-deceased mothers, I felt outrage. To the accusers, the exact mode of infection, breastfeeding or otherwise, was irrelevant. The mothers had failed to protect their children. The same accusers were silent about the men who had impregnated and infected their mothers and the communities that could have prevented disease transmission or upheld those affected. To me, the silence about those factors was deafening.

I could not understand how people living in the same family and community systems as Samineh's and Tizita's mothers could absolve themselves or their government of the travesty of young lives cut short. To process their loss, I sketched a picture of the interconnections of the life of one child with her immediate family, surrounding community, country's policies and the global economy (in this case ART access). This was my first attempt at visualising a socio-ecological model, although I did not appreciate this at the time. I made a promise to myself that I would try to address the determinants of injustices, such as the preventable deaths of children. The pictures of Samineh and Tizita sit on my office desk and remind me of this commitment.

Fast forward to 2013 – South Africa. I was a postgraduate Public Health lecturer and had received a PhD fellowship. As a new mother, I was obsessed with the literature on early life. What I was learning about the importance of early life care overwhelmed me. In brief, I was reading about huge proportions of preventable infant deaths linked with malnutrition, coupled with growing evidence that early nutrition could predispose children to other health risks in later life. At the time, after over a decade of frequent guideline revisions, infant feeding guidelines were coalescing to a single World Health Organization (WHO)-endorsed message of exclusive breastfeeding (EBF) for the first six months. EBF was promoted as the best nutritional start for an infant for all mothers, given the right conditions, even though these conditions seemed to be lacking in many South African communities and households. Then I watched a video on UNICEF's South Africa website, claiming that the failure of mothers to exclusively breastfeed was a problem of "mentality." This mother-blaming touched an old chord, reminding me of Ethiopia and the sketch I had drawn. Wasn't this just another manifestation of the same thing? I had my PhD research topic.

At the time of selecting this topic, infant feeding was a personal preoccupation. I breastfed my firstborn, seemingly constantly, during my four-month (paid) maternity leave. When I returned to work, I had to express and store my milk, hoping that he would accept a bottle during the day and return to the breast when I came home. When he started solids, just after he turned five months old, I felt guilty buying processed baby food to supplement the homemade food I tried to make over weekends. Both of his grandmothers had breastfed and then made their own complimentary food. Anxiety and guilt were common emotions of my motherhood. Whenever I took him to the clinic, I keenly tracked his growth on the chart they supplied, as a measure of my own value as a mother. This was a wanted child and I had many resources to support my feeding choices.

At this time, I became aware of a mother in rural South Africa going through another very different experience of infant feeding. She learned about her HIV infection at the same time her pregnancy was confirmed. The father was a 29 year old married man. She was 16. She refused her mother's pressure to get an abortion and told nobody about her HIV diagnosis. Her mother instructed her to breastfeed, because the family could not afford infant formula. The clinic sisters also encouraged breastfeeding, giving her ART and nevirapine syrup for her infant son, along with advice to eat more vegetables, which she did. Her mother insisted that she stay in school, so she left her son with an aunt during the day. This aunt supplemented her breastmilk with a traditional porridge. When she asked permission from her mother and aunt to shift to formula feeding because of a 'problem' with her milk, her aunt went to the clinic, where a nurse disclosed her HIV diagnosis. In light of her HIV status, the infant's grandmother supported the shift to formula by taking an extra job. Though this infant struggled with serious diarrhoea after shifting to formula, he is HIV free.

These two stories differ in context, but they reinforce a dominant narrative of mothers taking responsibility for their child's feeding. And certainly, my argument for the need for collective responsibility does not diminish the important roles of mothers. However, what can be lost in the dominant 'mother narrative' are the underlying feeding guidelines, policies, norms and interpersonal relationships that shaped how and what our sons were fed. One question I asked early in my PhD was, how can we blame mothers when we, as a research community, cannot even agree on consistent guidelines?

I came to this PhD with a desire to illustrate how infant feeding, like HIV prevention, is a collective responsibility that is shaped by politics, economics, community norms and interpersonal dynamics, in addition to an individual mother's determination to give her baby the best start possible. Through this integrated narrative, I hope that I will be able to convince the readers of the evidence behind this position. I draw on my professional training as a

behavioural scientist and experience as a social and behaviour change communication (SBCC) practitioner and academic to propose a set of action-based recommendations.

Translated for public health, the question I sought to answer was: what influences infant feeding during the first six months of an infant's life, in the context of HIV and recent shifts in infant feeding policy in South Africa? The PhD consisted of a systematic review, which formed a baseline understanding of infant feeding influences, followed by a mixed-methods cross-sectional study conducted in Soweto, nested within the Developmental Pathways Health and Research Unit (DPHRU) infrastructure based at Chris Hani Baragwanath Hospital. The cross-sectional mixed methods study enabled me to compare measures of breastfeeding practices and to explore associated factors from the perspectives of mothers, other community members, primary healthcare providers as well as policy experts. An adapted socio-ecological framework that accounted for shifts over time guided the overall PhD design and analysis.

Structure of Integrated PhD

This PhD submission is structured as follows:

Introduction and Literature Review

This first chapter provides a background of infant feeding globally and particularly in South Africa, with a short introduction to antenatal HIV rates. This is followed by a Literature Review focused largely on the determinants of infant feeding decisions, with a strong focus on the period from 1980 until present. This is presented using the socio-ecological theoretical framework that guided the overall PhD. The overall aim and objectives of the PhD are presented here.

Methods

This second chapter presents the overall methodological approach to the PhD, tying together the different components that make up the whole. It does not repeat the methods of the

individual papers, but rather justifies the study design and overall construction of the PhD. This is where ethical considerations also are discussed.

Results

Chapter 3 comprises one manuscript and three publications that were produced from this PhD, drawing on multiple perspectives. My co-authors have agreed for their inclusion in this submission (See Appendix A). Together, they demonstrate how guidelines and the ways in which messages are framed can influence social practices and norms.

Discussion

In this integrative chapter (Chapter 4) I revisit the overall aim and objectives of the PhD against what was found. I reflect on the research findings, tying together the individual publications and highlighting key themes. In addition, I update the original theoretical framework based on empirical evidence. In this way, this chapter serves as the integrated heart of the PhD. This is the chapter where my background as a behavioural scientist comes to the fore with the literature of bringing about change. I also discuss study limitations.

Conclusion and Recommendations

Building on the preceding chapter, the final chapter (Chapter 5) presents recommendations in the following three areas: policy, programming, and further research. In essence, this is the "way forward" chapter, which presents applications of the PhD findings to a range of stakeholders, particular policy makers, those who develop and implement programmes (government, civil society and grassroots), and researchers.

1 Introduction and Literature Review

While breastfeeding may not seem the right choice for every parent,

it is the best choice for every baby.

~Amy Spangler, Lactation Consultant, Registered Nurse and Teacher

This chapter provides a background of infant feeding globally and particularly in South Africa, with a focus on both policy and the context of a prolonged HIV epidemic. This is followed by an introduction to the socio-ecological framework that guided the PhD. The literature is presented according to this framework, with a strong focus on the period from 1980 until 2018.

1.1 Background

All children should have the right to begin life free from the threat of death, compromised development, or preventable poor nutrition. However, national 2016 statistics show that one third of children in Gauteng (GP) and Free State (FS) provinces were stunted due to poor nutrition, and severe acute malnutrition was attributed as the cause of death in 8% of children under five (National Department of Health et al., 2017). In 2012/13, over 60% of children who died in South African health facilities before the age of one were classified as either underweight or severely malnourished (Stephen, 2016). There is a growing body of evidence that suggests that the nutrition an infant receives in utero and in the first few years of life (a.k.a. the first 1000 days) influences their health and development trajectories (Owen et al., 2005, Victora et al., 2016, Horta et al., 2015a, Horta et al., 2015b). The WHO defines EBF for the first six months as the best nutritional start for any infant, given the right conditions (World Health Organization and United Nations Children's Fund, 2016). The most common feeding choices for South African infants, however, often do not align with this WHO standard (Lazarus et al., 2013, Du Plessis et al., 2016).

International trends in infant feeding policies have largely guided the policies of South Africa (Martin-Wiesner, 2018). For instance, South Africa is signatory to the 1990 and 2005 Innocenti Declaration on the Protection, Promotion and Support of Breastfeeding Call for Action (Unicef, 1990, Unicef, 2005), the International Code of Marketing of Breastmilk Substitutes (World Health Organization, 1981), and the International Labour Organization's 2000 Maternity Protection Convention Recommendation R191 (International Organization of Migration, 2000) which set standards for protecting and supporting breastfeeding among working mothers. All of these documents highlight the multi-sectoral nature of breastfeeding, whereby the involvement of labour, trade and other sectors are required to influence breastfeeding practices. The South African National Department of Health guidelines have

mirrored WHO and United Nations Children Fund (UNICEF) recommendations around infant and young child feeding.

It was not until a national policy shift to promote EBF-only in 2011 (Department of Health, 2011) that South Africa's EBF rates beyond 12 weeks began to increase; they were consistently reported as being at or below 10% previously (Tylleskar et al., 2011, Du Plessis et al., 2016). One reason given for low breastfeeding rates was the prior government policy of promoting six months of either EBF or exclusive formula feeding (EFF) for HIV-exposed infants (Doherty et al., 2011a). Scholars also described strong social norms to mixed feed infants as a barrier to EBF (Sibeko et al., 2005, Sibeko et al., 2009). The most recent officially reported EBF rate from government is 32% (National Department of Health et al., 2017). This is a marked increase over around seven years, although it still below the average of 37% for low and middle–income countries (LMICs) (Victora et al., 2016).

A key contextual factor that must be accounted for in infant feeding studies in South Africa is HIV. The provincial HIV prevalence rates among pregnant women have not been updated by the DoH since 2013 (Goga et al., 2018), when the national and Gauteng provincial rates were 29.7% and 28.6% respectively (National Department of Health, 2013). Until late 2011, many HIV positive mothers were counselled to either EBF or EFF. Despite strong evidence of reduced HIV transmission risk with the use of antiretroviral therapy (ART) (World Health Organization and United Nations Children's Fund, 2016, World Health Organization, 2010b) and the many other benefits of EBF for infants not exposed to HIV (Victora et al., 2016), the evidence has not yet shifted the way most infants are fed in South Africa.

Another key factor that cannot be overlooked is South Africa's historical context, which has racialized what it means to raise an infant in the country. Until 1994, South Africans lived under the racist system of apartheid, with segregated political, health, educational and social systems (Alexander, 2003). Through social engineering, people were categorised according to

subjective ideas of race, with members of the same family sometimes designated differently and afforded different opportunities in life (Posel, 2001). Legally, Black Africans were the most oppressed, with Indians and "so called coloured" people also having fewer rights than Whites; these categories continue to be reproduced in bureaucratic forms in present day South Africa (Alexander, 2007). During apartheid, Black Africans were often forcibly removed from their land and resettled in areas like Soweto, where primary data collection took place for this study. The relationship between citizens and the health system was very hierarchical, in part as a means to reinforce the overall apartheid apparatus. Erwin (2012: 95) argues that "Apartheid is part of a living past: generations of South Africans alive today had first-hand experience of its violent oppression and unjust privileges" with many relationships continuing to be reproduced post-apartheid. Some of these people act as primary caregivers of infants, particularly grandmothers. Many of our health workers were trained during the apartheid era as well.

1.2 Conceptual framework

Behavioural theories to explain and predict infant feeding have been use by researchers seeking to identify levers of change. The belief that mothers are central to decision-making has belied most of these theories. Among these, a meta-analysis has shown that the Theory of Planned Behaviour (TPB) is particularly robust at predicting breastfeeding, which is directly associated to breastfeeding intention (Guo et al., 2016). The intention to breastfeed, in turn, is associated with having a positive attitude about breastfeeding, believing others support breastfeeding (that is, subjective norms) and feeling that one has the power/control to breastfeeding (this is, perceived behavioural control) (Guo et al., 2016). Another theory-based intervention based on the Information–Motivation–Behavioural Skills (IMB) model was applied in South Africa to increase breastfeeding, where a randomised controlled trial (RCT) focused on increasing the information mothers had on EBF, their motivation (attitudes and subjective norms) and skills (Tuthill et al., 2017b). The evaluation of the IMB intervention

also measured mother's self-efficacy (confidence) to breastfeed; this was the only factor significantly associated with breastfeeding initiation and duration (Tuthill et al., 2017b).

While individual theory-based studies have explained some breastfeeding behaviour, they overlook the broader context in which decisions are made, as they presume that EBF is an individual decision. Challenging this notion, I adopted a socio-ecological model (Sallis et al., 2008, Bronfenbrenner, 2005) as the overarching framework within which to place concepts or factors that influence infant feeding behaviours. Cross-cutting features of socio-ecological models are that 1) behaviour must be explored or addressed in context, 2) contexts consist of multiple layers (e.g. individual, interpersonal, community, and societal) and, 3) the layers interact with each other (Sallis et al., 2008).

While socio-ecological models can be used to explore any behaviour, researchers have applied them since the mid-1990s (at least) to analyse infant feeding practices (Hector et al., 2005, Mcdade and Worthman, 1998, Allen and Pelto, 1985, Kimani-Murage et al., 2015, Dunn et al., 2015). The advantage of these models is that they support the design of multi-level interventions (Rollins et al., 2016, Sallis et al., 2008). Recent calls in South Africa for a focus on higher-level influences on infant feeding reaffirm the applicability of socio-ecological frameworks (Lazarus et al., 2013, Du Plessis et al., 2016, Zulliger et al., 2013). Another advantage is that socio-ecological models can integrate constructs from different theories, such as self-efficacy, attitudes and subjective norms.

While socio-ecological models sound good in theory, they are difficult to apply. A limitation of most existing infant feeding ecological models is that time has been collapsed into a single dimension (Mcdade and Worthman, 1998, Dunn et al., 2015, Hector et al., 2005). The behavioural theorist Bronfenbrenner presents a solution, with his inclusion of a time dimension, called the chronosystem (Bronfenbrenner, 1993, 2005). This system

> encompasses change or consistency over time not only in the characteristics of the person but also of the environment in which that person lives (e.g., changes over the life course in family structure, socioeconomic status, employment, employment). (p.40)

The chronosystem is amenable to time-sensitive behaviours (Bronfenbrenner, 2005, Cairns and Cairns, 1995), such as breastfeeding, by accounting for multiple levels of influence at different points in time. So, while healthcare workers influence feeding intentions during pregnancy, family members play a more important role after the infant is born (Sibeko et al., 2005, Sibeko et al., 2009, Mphego et al., 2014, Jama et al., 2017a, Buskens et al., 2007, Yako and Nzama, 2013). While a life course perspective accounts for how an individual's nutrition at one point can influence their health at a later stage (Fall et al., 2011, Bar et al., 2016), the chronosystem also tracks how higher-level ecological factors shift or remain constant. For instance, changes in infant feeding guidelines in South Africa have led to confusion among healthcare workers as to what they should advise HIV positive women, which has been associated with lower uptake of EBF (Goga et al., 2012a, Doherty et al., 2005, Doherty et al., 2006b).

The socio-ecological model used for the thesis went through two adaptations: 1) the inclusion of time and 2) the differentiation of observations and interventions. The first step was to review socio-ecological models that explained infant feeding, but were not specific to South Africa (Kimani-Murage et al., 2015, Hector et al., 2005). While useful, these did not overtly include a time dimension, meaning that key shifts in policy and guidelines had not been reviewed systematically. Drawing on Bronfenbrenner's system terminology for the different levels (Bronfenbrenner, 2009, 2005, 1993), I developed a South Africa-specific framework to illustrate infant feeding decisions. Figure 1.1 illustrates this framework. However, Figure 1.1 was limited in that both observational data and intervention data were presented together, making it challenging to make recommendations related to health promotion.

Macrosystem	Feeding guidelines PMTCT programmes Labour policies		
Exosystem	Interactions between the macro and mesosystems at different times (Bronfenbrenner, 1993)		
Mesosystem – *interactions between multiple microsystems that include the individual* (Bronfenbrenner, 1993)	Healthcare vs. household member feeding advice	Household vs work support	
Microsystem – *activities, social roles and interpersonal relations in different settings (home, work, community)* (Bronfenbrenner, 1993)	Healthcare worker support Household member support Peer support	Work support	
Infant – *biological and behavioral characteristics*	n/a	Latching Weight gain Health Sleep patterns	
Mother/Caregiver – *biological, cognitive and behavioral characteristics*	Intention to breastfeed Self-efficacy to EBF Subjective norms HIV status, Age Parity, Employment	Feeding practice(s) Feeding experiences	
Chronosystem →	**During pregnancy**	**Infant < 1 month after birth**	**Infant 1-6 months**

Figure 1.1. Socio-ecological model for six months of EBF in South Africa

Since developing the original conceptual framework for this thesis (see Figure 1.1), Rollins and colleagues (2016) presented a simplified three-level model (individual, settings and structural) that included an added dimension of multi-level interventions (see Figure 1.2). The individual level mirrored the original framework in Figure 1.1., which included socio-demographic information as well as cognitive factors, such as knowledge, attitudes and breastfeeding self-efficacy. The settings level combined the micro- and mesosystems proposed by Bronfenbrenner (1993), including interactions and activities within both the household and the health setting, workplace and other relevant community settings. The structural level (that is, meso-level) represented societal norms and larger market forces, such as trade (Rollins et al.,

2016). Conceptually, what they added was the importance of distinguishing observational data from interventions. This was useful from an application standpoint, particularly for the systematic review, which included manuscripts that reported on interventions (both RCT and quasi-experimental designs). I adapted Rollins and colleagues model by expanding on the time dimensions. Namely, I added intention to the time period of interest for the mother-infant dyad and I sought to track four policy periods, from 1980 until present.

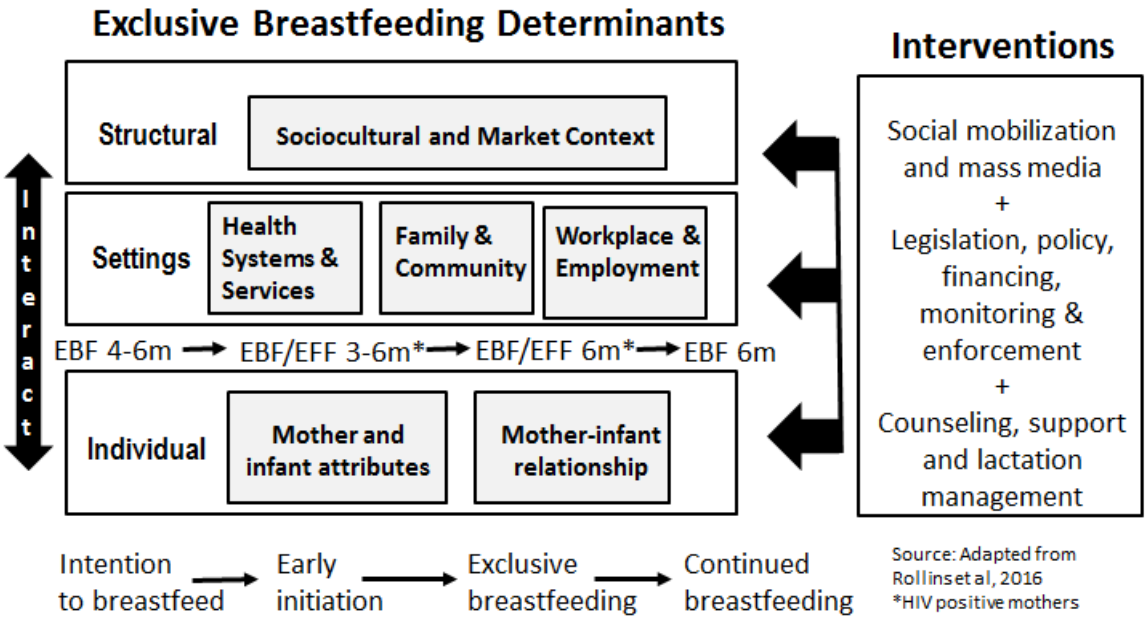

Figure 1.2. Adapted socio-ecological model for six months of EBF in South Africa

To measure changes in time, the framework developed by Rollins and colleagues (2016) began with early initiation and included exclusive breastfeeding and continued breastfeeding. Given the high prediction level of breastfeeding intention with breastfeeding (Guo et al., 2016), I added intention to the adapted framework. By doing so, interventions focused on pregnant women and antenatal settings are included, in contrast to those that focus on the postnatal period only. The conceptual framework in Figure 1.2 guided the following synthesis of literature on the topic of infant feeding in South Africa. The framework was further refined in the Systematic Review (see Figure 3.1.1) and is discussed in Chapter 4.

1.3 Literature Review

1.3.1 Defining and measuring infant feeding

In order to develop guidelines and policy, policy makers rely on empirical evidence, based on measurement. Defining infant feeding, particularly "optimal feeding," was one preoccupation of this PhD. First was the question of which quantitative measures of feeding to trust, next was the question of the outcomes against which to measure, and then a reflection on how "optimal" has been determined for setting infant feeding guidelines and related policies. Current definitions of optimal feeding were approached as fallible, given historical shifts.

At the heart of quantitative infant feeding definitions lies a tension between the emphasis on the *content* and/or *modality* of feeding, followed by duration (see Figure 1.3). The most commonly used definitions in infant feeding research, defined as "core indicators" by the WHO, emphasise the *content* of feeds, be that breast milk, formula or any other solid or liquid feed (World Health Organization, 2008). In the context of HIV prevention studies, the WHO further differentiates between infant formula feeding and other types of replacement or complementary feeds, such as animal milk (World Health Organization, 2010a, World Health Organization and United Nations Children's Fund, 2016).

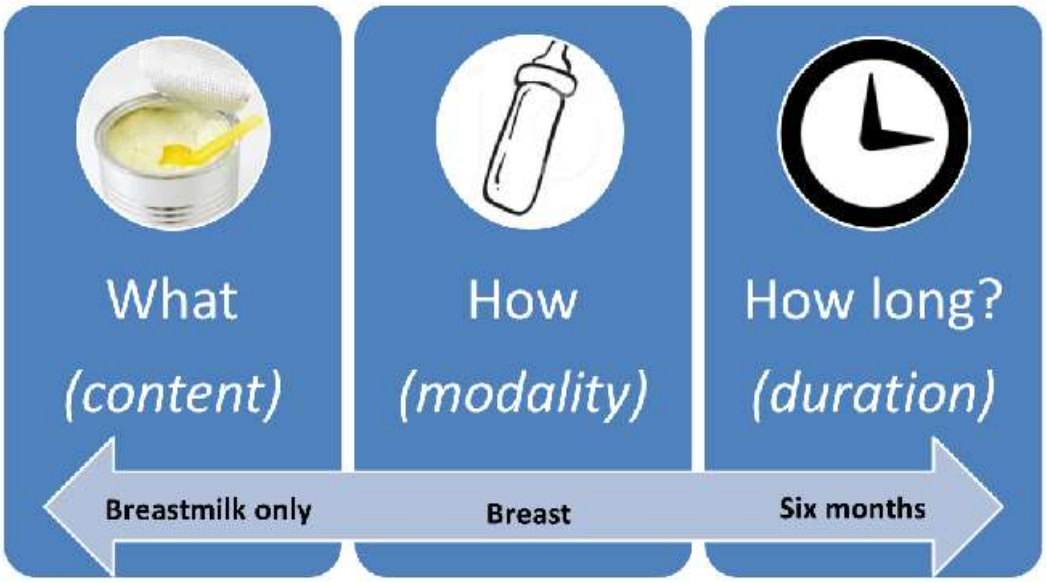

Figure 1.3. Components of infant feeding definitions: content, modality & duration

In terms of content, there is a three-tier hierarchy of breastmilk, commercial formula and then other types of replacement feeds. The differentiation between formula and other replacement feeds is not mirrored in the WHO core indicators, which may reflect objections to infant formula being presented as an alternative to breast milk. This became contentious in the 1980s following the association of infant formula with increased child mortality (Dobbing, 1988). However, nutritionists have noted that infant formula should be treated differently to other forms of replacement feeds, given the superior nutritional content of infant formula over other replacement milks and the role of formula (to date) in HIV prevention (Koletzko et al., 2005, Dobbing, 1988, Papathakis and Rollins, 2004). Table 1.1, adapted from the World Health Organization (2008) definitions, presents the infant feeding measures used for the quantitative component of this study, which primarily highlight the modality or content components of infant feeding.

Table 1.1 Infant feeding definitions

Feeding practice	Definition
Exclusive breastfeeding (EBF)	Nothing other than breast milk (including milk expressed or from a wet nurse) and oral rehydration solution (ORS), drops, and syrups (medical, vitamin, mineral)
Predominant breastfeeding	Nothing other than breast milk (including milk expressed or from a wet nurse) as predominant source of nutrition, with some liquids (water, water-based drinks & fruit juice), ritual liquids, and ORS, drops, and syrups (medical, vitamin, mineral)
Bottle-feeding	Any liquid (including breast milk, non-human milk and formula) or semi-solid food from a bottle with a nipple/teat
Replacement feeding (WHO, 2016)	Feeding an infant who is not receiving any breast milk with a diet that provides all the nutrients children need until they can be fully fed on family foods. During the first six months, this should be with a suitable breast milk substitute: commercial infant formula milk.
Mixed-feeding*	An infant younger than six months of age is given other liquids and/or foods together with breast milk. This could be water, other types of milk or any type of solid food.
Exclusive formula feeding*	Same as EBF definition, except for commercial infant formula milk

*****These were applied in the literature, but were not part of the original WHO core indicators.

In addition to content, measuring how an infant is fed (*modality*) is important for identifying contextual risk factors for infant health. Noel-Weiss and colleagues (2012) voiced concern about measuring the content of what infants are fed without specifying how they are fed, because feeding modes – for example, breastfeeding versus bottle-feeding expressed milk – mediate health outcomes. Bottle-feeding (regardless of the content therein) exposes infants to the risks of diarrhoea, linked to unsterilized or contaminated bottles (Veldman and Brink, 2004, Dobbing, 1988). While the WHO (2008) includes an optional indicator on bottle-feeding, as shown in Table 1.1, this indicator does not specify content. Other modalities of feeding, such as cup and spoon feeding, are often overlooked, although they are measured in WHO-recommended tools (World Health Organization et al., 2010). The consequence is that some of the differences observed between breastfeeding and child growth markers in different countries (Giugliani et al., 2015) may be explained because EBF feeding *modalities* were not accounted for in those contexts. Given the linkage between access to clean water and health (Obi et al., 2006) and documentation of bacteriological contamination of bottles and water in South Africa

(Andresen et al., 2007a), modality was presented in the PhD alongside content to characterise potential risk.

The validity and reliability of the infant feeding measures are also important, particularly as maternal recall is the most common form of reporting infant feeding practices. Simple questions such as "Do you exclusively breastfeed?" may be problematic in terms of validity, as mothers often do not know the clinical definition of EBF (Chopra et al., 2005), which would result in overestimates. Epidemiological studies often ask lifetime questions (*have you ever…?*), 7-day recall and 24-hour recall, based on standard WHO indicators (World Health Organization et al., 2010). While the 24-hour recall is often used as the "gold standard" of recall periods, Abdel-Hady and El-Gilany (2016) have recommended reporting both "Ever" and "24-hour" as their respective weaknesses are offset. For instance, the WHO 24-hour recall overestimates lifetime EBF rates compared with lifetime measures, but has the advantage of capturing mixed feeding practices. If repeated, the 24-hour recall also can capture the phenomena of "episodic EBF," a return to EBF after a short break. Ambikapathi et al. (2016) have characterised the promotion of episodic EBF as an opportunity to extend infant exposure to breastfeeding. In their eight-site cohort study, they found that, on average, mothers returned to EBF twice after short breaks (Ambikapathi et al., 2016).

Combining the measurement of content with feeding modalities provides a more context-rich picture of infant health risks linked to infant feeding. A review of the history of infant feeding from 3000 B.C. onwards highlights that both the content and modes of feeding infants have varied widely by culture, context and over time (Fildes, 1986). This challenges the perception that EBF was the main mode of feeding infants before the introduction of commercial infant formula, a point emphasized by Dobbing (1988). Qualitative studies on infant feeding in South Africa highlight the complexity and variability of feeding practices, where early ethnographers (Hunter, 1961) and more recent studies (Zulliger et al., 2013, Sibeko

et al., 2005) both emphasize the cultural embeddedness of mixed feeding before six months. More simply put, breastfeeding may have been common, but EBF was never the feeding norm in South Africa, even prior to paediatric HIV. Indicators, accordingly, should reflect local contexts, both in terms of the types of liquids and foods introduced to infants as well as the types of feeding practices applied. Even if existing indicators on content and feeding modality are not modified, presenting them together provides a better picture of risk and a more precise way of identifying populations or communities where interventions could be targeted.

1.3.2 Defining optimal feeding

In order to define what feeding practices are "optimal," it is necessary to first determine an outcome: optimal for what? The content (breastmilk, commercial formula or other products), modality (breast, bottle, cup) and duration of feeding are elements of exposure, with content most often the main element of interest. The 2016 Lancet series review of breastfeeding highlighted 28 outcomes for infants, children and adolescents and mothers, ranging from infant mortality to type 2 diabetes and ovarian cancer (Victora et al., 2016). These outcomes reflected a bias towards nutritional and life course disciplines. There are another group of scientists working in infectious disease and environmental science who are interested in breastmilk as a vector for transmitting viruses, such as HIV (Coutsoudis et al., 2001, Coutsoudis, 2000), or toxins, such as DDT or other pesticides (Okonkwo et al., 2008, Bouwman et al., 2006). When seeking to interpret breastfeeding studies and their conclusions about which feeding is "optimal." it is important to clarify the health or development outcome(s) against which conclusions are made. For the PhD, the primary outcome of interest for infants was child survival and for mothers was quality of life.

The juxtaposition of breastmilk as either a nutritional nectar or vector of disease has been particularly complex in the context of pediatric HIV in South Africa, which emerged as an issue in the 1990s (Du Plessis et al., 2016). In the context of HIV-free survival as an

outcome, commercial formula became an accepted feeding option for HIV exposed infants for over a decade (Meyer et al., 2007, Du Plessis et al., 2016), supported by WHO guidelines (World Health Organization, 2005).



Figure 1.4. Changing images of formula between 1980 and the 1990s in South Africa

During this period, scholars weighed up the benefits and risks of breastfeeding with HIV-infection and overall mortality (Kindra et al., 2012, Coutsoudis et al., 2004, Coutsoudis et al., 2003, Rollins et al., 2013). For HIV-exposed infants receiving replacement feeds, studies were conducted to compare the nutritional content of different regimes to maximize nutritional benefits and health outcomes, finding that formula was superior to homemade replacement feeds (Papathakis and Rollins, 2004). A close reading of the latest update on HIV and infant feeding guidelines from the WHO/UNICEF (World Health Organization and United Nations Children's Fund, 2016) reflects ongoing tensions around the quality and scope of evidence being used to set guidelines for infant feeding in the context of HIV. For

instance, on 2016 provide a considerable discussion on how the WHO's Guideline Development Group came to make a strong (vs. conditional) recommendation based on "low" and "very low" quality evidence related to the safety of prolonged breastfeeding for breastfeeding mothers (World Health Organization and United Nations Children's Fund, 2016)(p.20).

In terms of optimal feeding, in addition to the medical discourse a feminist critical discourse must be recognized. A sociologist observing the tension during this period, Seidel (2004) described researchers as falling either into the "AIDS camp" or "breastfeeding camp." Those in the AIDS camp were biased towards replacement feeding to prevent HIV while those in the breastfeeding camp were biased towards the overall nutritional benefits of breastmilk, with both camps reluctant to yield space for mother's choice in the matter. Seidel (1998) outlined the "dominant critical discourse" of both camps in an earlier article, and argued cogently for an awareness of social scripting in analyzing the topic:

> Representations of and discourses on breastfeeding need to be interpreted not as discrete meanings systems, but in relation to other discourses. These are principally the social scripts that construct gender (Patton, 1994, Scherr et al., 1997, Kit et al., 1995, Epstein, 1998); women's health (Doyal, 1996) and maternal and child health which represent distinct, if at times overlapping paradigms (Raikes, 1992); and of the ordering and disordering of the female body. (p.66)

A rich body of literature highlights how infant feeding contributes to constructions of womanhood or what is meant to be the "good mother" (Marshall et al., 2007, Mahon-Daly and Andrews, 2002); this is an important facet of defining what it means to be optimal. An awareness of this literature has been carried forward into this PhD, albeit with a more agnostic approach than one claiming a particular critical stance.

1.3.3 Individuals: Attributes of the exclusively breastfeeding mother

One approach to understanding why a practice is not a norm, such as EBF, is to explore the population who is engaging in the practice, called a positive deviance approach (Marsh et al., 2004). According to the South African literature, several individual attributes are associated with EBF. Being HIV infected has been associated with EBF and longer duration of EBF, attributed to the additional fear of HIV transmission not experienced by non-HIV infected mothers (Nieuwoudt et al., 2018, Mnyani et al., 2016, Nor et al., 2012b, Jama et al., 2017a, Yako and Nzama, 2013). In such instances, disclosing one's HIV status to one or more person increased the likelihood of EBF among HIV-positive mothers because of the resulting support (Mphego et al., 2014, Madiba and Letsoalo, 2013). However, a recent large cross-sectional study of infant feeding practices in KZN did not find an association between EBF and HIV status, suggesting that there may be a shift underway that is rendering HIV status less important as a predictor of infant feeding practices (Horwood et al., 2018).

Keeping with global trends (Rollins et al., 2016), unemployed mothers are more likely to EBF, which is explained in association with the cost of formula and having greater flexibility than working mothers (Jama et al., 2017a, Ijumba et al., 2014, Goosen et al., 2014b, Doherty et al., 2012). Returning to work or school are key barriers to EBF (Horwood et al., 2018). Regardless of HIV status, a few studies have shown that mothers with a higher knowledge of the benefits of breastfeeding are significantly more likely to EBF (Mnyani et al., 2016, Horwood et al., 2018). The theory-based constructs discussed in 1.2, such as self-efficacy to breastfeed, subjective norms and breastfeeding intention have also been identified in the global literature, with breastfeeding self-efficacy (Tuthill et al., 2017b) and intention to breastfeed (Swarts et al., 2010, Zulliger et al., 2013, Yako and Nzama, 2013) both being tested and confirmed as predictors of breastfeeding in the South African context.

Characteristics of the infant, both individually and in relation to its mother/caregiver, have also been important in influencing infant feeding decisions. Once an infant is born, personal characteristics such as growth, temperament (crying and sleep), and the ease with which a baby attaches, if breastfeeding, can all influence infant feeding choices (Goosen et al., 2014b, Nor et al., 2012b). Parental perceptions of healthy weight gain and satiety (if the child is full or not) often result in early introduction of complementary feeding if expectations are not met (*Ibid*).

1.3.4 Settings interventions: Shifting feeding guidelines

Of high concern from the onset of this PhD was the potential for unintended consequences from South Africa's frequent shifts in infant feeding guidelines over time. Despite their basis in epidemiologic evidence, guidelines can still cause harm when applied incompletely. In 2002, the best evidence on infant feeding and child survival led the WHO to recommend EBF for six months, with provision in paragraph 24 for replacement (formula) feeding of HIV exposed infants (World Health Organization Secretariat, 2002). Some researchers argue that this provision, when translated into policy, led to higher levels of infant mortality among children of formula-fed versus exclusively breastfed HIV-exposed infants, because Acceptable, Feasible, Affordable, Sustainable and Safe (AFASS) criteria were not applied by nurses to inform counselling (Doherty et al., 2011b). Responding to these concerns, and with growing evidence of reduced HIV transmission with antiretroviral (ARV) use (Marazzi et al., 2009), the WHO revised infant feeding guidelines in 2010 to promote a "single message" of either EBF or EFF (World Health Organization, 2010b, World Health Organization, 2010a), to be determined by country context. South Africa's Department of Health's subsequent Tshwane Declaration in 2011 discontinued the provision of free infant formula in public clinics as part of its promotion of EBF for all (Department of Health, 2011). At the time, Saloojee and colleagues (2011) raised a concern that this approach might imperil

HIV-exposed children if additional supports were not put in place to change pervasive mixed-feeding practices. They also questioned how mothers would trust infant feeding advice from health workers who were frequently changing their guidance. While things like patterns of mixed feeding could be monitored quantitatively through epidemiological studies, issues like trust were best monitored through qualitative methods. The importance of monitoring the response to the Tshwane Declaration, as has been done with past guidelines (Doherty et al., 2011a), was identified as valuable for avoiding (or mitigating) unintended consequences. This informed my decision to adopt a mixed-methods approach.

Beyond the provision of formula and counselling practices, a number of other health setting factors have been identified as important in the promotion of breastfeeding. Encapsulated in the Baby Friendly Hospital Initiative (BFHI) led by UNICEF, 10 steps have been identified within the hospital setting to set infants and mothers on the right track (World Health Organization and Unicef, 2009). Among these are organizational practices, like the active promotion of breastfeeding during pregnancy, allowing mothers to "room-in" with their infants, and facilitating initiation of breastfeeding within the first hour. Although 75% of public hospitals were accredited as being Mother-Baby friendly in 2015 (Martin-Wiesner, 2018), multiple studies conducted in South Africa have found that such hospitals do not always follow the 10 steps (Swarts et al., 2010, Ghuman et al., 2009, Sepeng and Ballot, 2016a).

1.3.5 Settings: Households, workplaces and community

The institution of the family is located within Rollins and colleagues' settings level. This unit (or dis-unit) is often cited to be one of the most influential in mothers sustaining their infant feeding choices. Family members, normally partners or mothers (i.e. grandmothers of the infant), wield a huge amount of influence over how infants are fed (Lazarus et al., 2013, Du Plessis et al., 2016, Mphego et al., 2014, Madiba and Letsoalo, 2013). Cultural norms, particularly for young and/or financially dependent mothers, lead to expectations that the

wishes of these other family members are fulfilled (Varga and Brookes, 2008, Jama et al., 2017a). The threat of violence or rejection for not following family dictates is real for some mothers, particularly those who might be hiding a HIV-positive status (Buskens et al., 2007). Communal living and caregiving also means that mothers must account for others in the household, often being pressured to mixed feed to keep their child from crying or to formula feed to make it easier for others to care for their infant when they are at work or school (Jama et al., 2017a).

Existing studies in South Africa illustrate how infant feeding practices depend on a number of actors beyond mothers. Practices of cooperative caregiving are common, whereby a mother may leave her infant in the care of another family member or child minder so that she can work, return to school or engage in other activities (Matji et al., 2008, Lazarus et al., 2013, Mphego et al., 2014). If this does not happen immediately after birth, a national (unpaid) maternity leave policy of four months (Meyer et al., 2007, Department of Labour, 1998) means that virtually every working mother in South Africa is forced into such a situation before the optimal six months for EBF. The provision of childcare or lactation breaks is optional for employers (Department of Labour, 1998). Beyond shared feeding responsibilities, the decision of how, when and what to feed an infant is also influenced by people beyond the mother, including health workers, her partner, relatives, and employers (Sibeko et al., 2005, Mphego et al., 2014, Madiba and Letsoalo, 2013). When an infant is fed something other than breastmilk, access to clean water and electricity becomes vitally important for hygiene and to prevent disease (Andresen et al., 2007a); these are often beyond the control of the mother or even her immediate family.

1.3.6 Structural: Infant feeding discourse and norms

Until recently, South Africa's infant feeding discourse largely minimised the responsibility of policy makers and communities for infant feeding practices, despite evidence

to the contrary. The idea that mothers should be the main target of infant feeding messages reflects a bio-medical perspective which tends to relate to mothers first as a biological resource (Mahon-Daly and Andrews, 2002, Dykes, 2005), sometimes even a national asset (Seidel, 2000), given their ability to produce breastmilk. This is reflected in communication campaigns and infant feeding guidance which encourage delivering a "single message" (World Health Organization, 2010a) to exclusively breastfeed for six months, suggesting a homogenous producer. Such messages were hailed by UNICEF as a positive development in South Africa, as there are no longer different messages targeting different populations (Unicef, 2012). The problem with this logic is that just because something is simple to communicate does not make it easy to act upon for the diverse mothers receiving the message (Lazarus et al., 2013, Laher et al., 2012). It also inadvertently blames mothers if they do not breastfeed or struggle to do so, when both theory (Melkote and Steeves, 2001) and evidence suggest that there are "numerous internal and external factors that influence the decision" (Matji et al., 2008:.114).

The language we use is a form of socialisation, which can happen within the healthcare setting. A study by Desclaux and Alfieri (2009) documented how infant feeding discourses became part of the socialisation of health professionals and were absorbed into infant feeding counselling practices in Burkina Faso, Cambodia and Cameroon. The importance of a mother adhering to the country guidelines for the sake of her baby's health became the dynamic of the counselling encounter rather than counselling in the true sense of discussing options appropriate for the individual mother and child (Desclaux and Alfieri, 2009). For countries like South Africa that have embraced a human rights discourse, including the right of mothers to choose their feeding option (Seidel, 2000), the "single message" prerogative could be interpreted as a call to advise or tell patients what to do. Indeed, this power dynamic of clinic staff counselling has resulted in mothers feeding pressured into a feeding option in South Africa both before (Seidel, 2004) and after the Tshwane Declaration (Zulliger et al., 2013).

There has been a recent reframing of infant feeding as a collective responsibility which reflects more ecological thinking. This change can be seen in WHO breastfeeding promotion materials (World Health Organization, 2018), which now have messages targeting law-makers, unions, co-workers, dads, family and friends, and employers in addition to mothers. In December 2016 during the World Breastfeeding Conference in Johannesburg, the Department of Health, jointly with UNICEF South Africa, launched a campaign which included messages such as: "Why don't families support mothers to breastfeed?" and "Why don't communities support mothers to breastfeed?" (Unicef South Africa, 2017). The stated intent of this campaign was:

> to promote discussion among the public so that various people in communities, families and workplaces actively engage with the question. The aim is for everyone to appreciate and know their role in supporting all mothers to breastfeed. (p.2)

The final messages followed the pre-testing of messages, designed by men (Feeley, 2018), that blamed mothers for not breastfeeding with messages like, "Why will mothers do anything for their children, like getting up at 3am every day to go to work to pay for school fees, except breastfeed them?" The use of pre-testing to avoid unintended consequences and involve affected communities (Bessette, 2004) and partnership between government and civil society organisations to shift social practices and norms (Bicchieri, 2016) were encouraging from an intervention perspective. This happened after the PhD data collection was complete and will be discussed in line with recommendations as a way forward (see Chapter 5).

1.3.7 Interventions to increase EBF

At the policy level, key interventions to promote breastfeeding have been outlined in the Tshwane Declaration, which pointed to systems level changes required to promote breastfeeding. As already discussed, this has included actions like the removal of free commercial formula, except in cases of medical necessity (Department of Health, 2011). The

Tshwane Declaration's encouragement of Mother-Baby Friendly Initiatives (MBFI) to be taken up in public hospitals and clinics has resulted in an increase from 12% to 75% accredited hospitals from 2002 to 2015, but the ongoing monitoring of these and extension of these to baby-friendly communities is less evident (Martin-Wiesner, 2018). This has also been seen through the Department of Health's Phila[1] campaign's move towards engaging both public and private healthcare institutions in adopting MBFI standards. However, more policy action is required in the employment sector (Martin-Wiesner, 2018).

Of interventions that have been evaluated, RCTs focusing on EBF have targeted the postnatal period and community setting. Goodstart was a cluster randomised effectiveness trial of a community-based PMTCT intervention in Durban, involving multiple postnatal visits from CHWs who covered a range of maternal and child health topics. Goodstart nearly doubled exclusive breastfeeding rates, with a dose response with each additional home visit (Tomlinson et al., 2014b). Goodstart was more encouraging than the earlier multi-country PROMISE-EBF trial,[2] which also used CHWs to visit mothers. In the PROMISE-EBF study, the five South African intervention communities only achieved 10% EBF at 12 weeks, dropping to 2% by 24 weeks (Tylleskär et al., 2011). Although the 10% was statistically higher than EBF in the control communities, this rate was far lower than other PROMISE-EBF countries: 79% in Burkina Faso and 82% in Uganda at 12 weeks (Tylleskär et al., 2011). A more recent cluster randomised trial in Durban seeking to improve the quality of CHW maternal and child work through increased supervision, named Continuous Quality Improvement (CQI), also measured higher EBF rates in the intervention arm than control (76.7 vs 65.1%) (Horwood et al., 2017a). The high EBF rates they recorded in comparison to other studies in South Africa were not

[1] Nguni language for "Door to Health or Life"

[2] The acronym stands for Promoting Infant Health and Nutrition in Sub-Saharan Africa: Safety and Efficacy of Exclusive Breastfeeding Promotion in the Era of HIV

explained. Most other EBF interventions that have been evaluated have involved educating mothers. This has ranged from education sessions provided in the clinic (Hoffman et al., 1984c) to more complex interventions, like mothers2mothers (m2m), which involved peer mentor visits to HIV-infected mothers (Baek et al., 2007). For m2m, exclusive formula feeding increased significantly through the mentor intervention (when EFF was still considered optimal), but the intervention did not impact on EBF at all (Baek et al., 2007).

Interventions have cost implications, which need to be considered when prioritising action. A cost-impact analysis of maternal and child survival interventions was published in 2015, included costing for breastfeeding promotion (Chola et al., 2015). Although breastfeeding saved the most lives (3,000) at 95% coverage, the cost of running effective breastfeeding campaigns (estimated to be $8,896 per life-year gained) was far higher than other interventions. For cost reasons, breastfeeding promotion did not feature in the authors' recommendations for the top 15 interventions for National Department of Health (NDoH) to pursue (Chola et al., 2015).

1.4 Problem Statement

Despite ongoing efforts to address infant morbidity and mortality, South African children continue to suffer from nutritional deficiencies linked to infant feeding, malnutrition and stunting among the outcomes (Steinberg, 2012, Bamford, 2013, Du Plessis et al., 2016). How and what infants are fed has short term implications for child survival and prevention of HIV transmission as well as longer term implications over the life course (Victora et al., 2016). Quantitative infant feeding measures need to be viewed with a critical eye, as they may mask higher-risk feeding practices (Noel-Weiss et al., 2012), overestimate exclusive breastfeeding rates (Mulol and Coutsoudis, 2018) or dismiss the experiences of mothers through what is not asked. An analysis of policy change and health promotion efforts cannot be left to quantitative interpretation alone.

The implications of recent government initiatives, e.g. breastfeeding promotion and ending the free provision of formula, were in the early stages of exploration when I embarked on the PhD. There was a strong focus on the mothers' public health services, less so on service providers. By addressing gaps in our understanding of the nature and influence of feeding determinants, with a particular focus on caregiver perspectives, cooperative caregiving structures, and community norms, innovative strategies could be conceived of to improve infant nutrition in the first months of life, building on the rich data that already existed and was being simultaneously generated during the time I conducted the PhD.

1.5 Research Gap

As the literature review highlights, the imperative for fresh thinking on the topic of infant feeding was present going into the PhD and continues to be relevant today, particularly as South Africa seeks to increase EBF rates beyond recent gains (National Department of Health et al., 2017). A degree of scientific humility is merited in reflecting on the historical quest for precise behavioural measures of infant feeding to identify risk populations or communities for targeted interventions, given the frequency with which these have changed (Du Plessis et al., 2016). Global as well as South African studies also show that we need to look beyond the mother-infant dyad. Family and community influences on infant feeding decisions for older infants have been far less studied (Yako and Nzama, 2013, Mphego et al., 2014, Madiba and Letsoalo, 2013) than health setting influences. Even fewer studies have sought to explore the interplay of factors between more than two levels of influence (Laher et al., 2012). Few researchers in South Africa have overtly applied theoretical frameworks to their analysis of infant feeding (Tuthill et al., 2017b). Interventions to promote optimal infant feeding beyond the clinic setting require engagement with the perspectives of stakeholders at all levels of the child's ecology, from mothers and proxy caregivers to policy makers. Drawing on a theoretical

basis for proposing such interventions contributes to the translation of infant feeding research in South Africa to policy and practice.

This will be the first South African study, to my knowledge, to present a comprehensive socio-ecological model, building on the work of infant feeding researchers such as Hector et al. (2005) and Kimani-Murage et al. (2015). The way in which the model accounts for time, not only of the dyad but also of policy periods, constitutes a theoretical contribution to the global infant feeding discourse.

1.6 PhD aim and objectives

The overall study aim was **to explore what influences infant feeding in Soweto, South Africa in the context of policy shifts in relation to HIV**, through the following study objectives:

1. Identify factors that have supported or constrained breastfeeding in South Africa in the context of changes in infant feeding guidelines from 1980 (pre-HIV) to present.
2. Describe infant feeding patterns and their correlates using both standard and novel quantitative indicators for a Soweto-based sample of mothers with infants below six months.
3. Describe what healthcare workers and other key actors believe are "the best" feeding practices for infants, in the context of HIV in Soweto.

The intent is that the thesis will contribute to the development of multi-level interventions that optimise the uptake of infant feeding practices and ultimately health, based on community insights and aspirations, and to the *theoretical discourse* around the application of ecological models.

2 Methods

The important thing is not to stop questioning. Curiosity has its own reason for existence. One cannot help but be in awe when he contemplates the mysteries of eternity, of life, of the marvellous structure of reality. It is enough if one tries merely to comprehend a little of this mystery each day.

~Albert Einstein, "Old Man's Advice to Youth: 'Never Lose a Holy Curiosity.'" *LIFE Magazine* (2 May 1955) p. 64

This chapter presents the overall methodological approach to the PhD, tying together the different components that made up the whole. It does not repeat the methods of the individual papers, but rather justifies the study design and overall construction of the PhD. This is where ethical considerations are also discussed.

2.1 Study setting

South Africa is a country of 55.7 million people, 13.4 million (24.1%) of whom reside in Gauteng province (Statistics South Africa, 2016). With a Gini coefficient of 0.63 in 2015, South Africa holds the dubious place of being the most unequal country in the world in terms of income (The World Bank, 2018). This also translates into health, where South Africa's quadruple burden of disease (maternal, newborn and child health; HIV/AIDS and tuberculosis (TB); non-communicable diseases; and violence and injury) affects different populations inequitably (Mayosi et al., 2012, Bradshaw et al., 2003).

South Africa has the largest HIV epidemic in the world, representing 19% of people living with HIV and 15% of new infections globally (Unaids, 2018). The paediatric HIV epidemic only came to light in the mid- to late-1990s. PMTCT efforts were central to the highly-publicized efforts of the Treatment Action Campaign (TAC) to increase access to ARVs (2018). In fact, in 2002 the TAC and other civil society partners successfully sued the government to provide HIV-infected mothers access to nevaripine (an ARV) (2002). Perinatally-infected children, such as Nkosi Johnson, became the face of South Africa's AIDS epidemic and a moral clarian call for action (Nkosi's Haven, 2018). As noted in Chapter 1, the PMTCT programme included the provision of free commercial formula for six months until 2011/12.

While the systematic review covered the whole of South Africa, all primary research was conducted in Gauteng province, and particularly Soweto (see Image 1). Soweto, located in the southwest of Johannesburg, has a population over one million. It was originally reserved for Black South Africans until apartheid ended in 1994, although demographic distribution since then has seen little change. The antenatal HIV rates in Johannesburg at the time this study commenced mirrored provincial and national rates of nearly 30% (Mnyani et al., 2016, Goga et al., 2018). The five community health clinics (CHC) where study participants were recruited

saw between 50 to 100 new pregnancy bookings per month (Mnyani et al., 2016). The study office, where many mothers completed their questionnaires, was located on the grounds of Chris Hani Baragwanath Hospital (see Image 2), which records the highest number of births in all of sub-Saharan Africa.

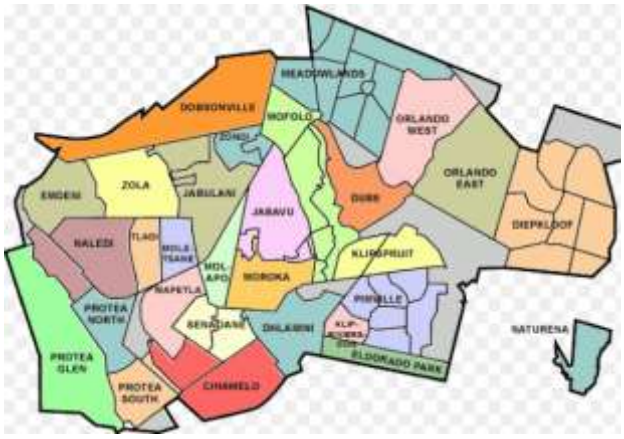

Image 1. Map of Soweto

Source: *Nomfundo Xulu-Lentsoane, Google Images*



Image 2. Hospital Entrance

Source: *Thabiso Makisa, Google Images*

2.2 Study design

An integrated mixed methods study design was applied both to the systematic review and the cross-sectional study, where qualitative and quantitative data were collected concurrently, analysed separately and then synthesized to draw conclusions and deeper meaning (Zhang and Creswell, 2013). This is known as a convergent design in the discourse surrounding mixed method systematic review strategies (Gough, 2015).

2.3 Summary of PhD study population and methods

The manuscripts in the results section go into great detail on study population, sampling, data collection, analysis and links to the theoretical framework that was described in Chapter 1. Table 2.1 summarises these according to the three study components.

Table 2.1. Summary of PhD study components

Study component	Study sample	Data Collection Tool(s)	Analysis	Conceptual contribution
Mixed-methods systematic review (see 3.1)	73 articles (39 quantitative, 30 qualitative, 4 mixed methods) from 7 search engines	-Extraction guide (Appendix B)	Mixed-methods systematic review: -Descriptive tables -Thematic synthesis (Thomas and Harden, 2008) -Triangulation	Entire socio-ecological framework, including interventions
Cross-sectional quantitative survey (see 3.2)	298 mothers from five community health clinics	-Questionnaire (Appendix C)	Descriptive and inferential statistics (logistic regression)	Structural, Systems, and Individual level factors
Qualitative (see 3.3 and 3.4)	11 HCWs 46 mothers 3 key informants	-HCW, mothers and key informant IDI guides (Appendices D - F) - Field notes	Thematic analysis (hybrid) Triangulation with quantitative findings	Structural, Systems, and Individual level factors

2.3.1 Study Sample

While the details of each population, sampling strategy and results are presented in results, the rationale behind each is highlighted here. This includes sampling for the systematic review as well as the study populations sampled for the quantitative and qualitative components of the cross-sectional study: mothers, health workers and key informants.

For the systematic review (see 3.1), I wanted to be as inclusive as possible to develop a rich picture of infant feeding determinants between 1980 and 2018. For this reason, seven search engines were searched and all study designs were included as long as the results presented primary data on the outcome(s) of interest and fit inclusion and exclusion criteria, reported in 3.1.

The rationale for the cross-sectional study population (see 3.2), was sampling sufficient mothers from different segments (HIV status, feeding practice and infant age) to identify similarities or differences in determinants of their choices. Known HIV status was considered an important factor, given high antenatal HIV prevalence in South Africa (Department of Health, 2014) and the documented influence of HIV on decision-making described in past studies (Sibeko et al., 2009, Doherty et al., 2006a). By segmenting by infant age, I hoped to separate out age-related factors that influence feeding practises, such as maternity leave policies (Bamford, 2013). The decision to segment HIV-infected mothers by their main feeding modality was to have enough observations of both breastfeeding and formula feeding to distinguish between any determinants linked to the previous PMTCT policy of promoting either EBF or EFF. The purposive selection of a subset of mothers to participate in in-depth interviews (see 3.4) was guided by the same rationale.

Maximizing variation in our findings also guided the sampling strategy for frontline health workers who provided antenatal and postnatal services at CHCs in the study area (see 3.2). We accepted any clinic-affiliated health worker who had been involved in infant feeding counselling both before and after the Declaration. Facility managers assisted our research team in identifying staff who would be most knowledgeable on the subject. We welcomed a range of job types/cadres, resulting in nurses, ward-based outreach team (WBOT) members and non-governmental organisation (NGO)-seconded staff.

The final population was experts on policy and infant feeding research in South Africa, in the form of key informants (see 3.2). Through emails, I directly invited for interviews key informants who were well-published and recognised individuals in the field of infant feeding in South Africa.

2.3.2 Data Collection

Table 2.1 summarises the tools used for collecting data for each study component. For the systematic review, these were data extraction tables. For the mixed-methods cross-sectional study these included a questionnaire and interview guides. The data collection itself was managed by a three-person team comprising me and two RAs, who are described here, as space did not allow in the publications. The two trained DPHRU RAs, Molebogeng Motlhatlhedi and Deborah Makobe, both lived in Soweto and spoke local languages, including seSotho, isiZulu and isiXhosa. One was older (late 30s) with children, while the other was in her mid-20s. Both were critical in approaching mothers in the five CHCs and following up with them until an appointment could be scheduled either at DPHRU or their homes. Their tenacity and patience in this process were outstanding. They were also extremely thorough in ensuring that all consent processes were followed, questionnaires were completed without missing data and that their field notes were completed after each interview. They played many roles that often go unrecognized in research write-ups, such as comforting babies while their mothers completed a questionnaire. I conducted most HW interviews (see 3.3) and conducted all KIIs (see 3.4), two in person and a third over Skype as the informant was based overseas.

2.3.3 Data Processing

The details of all data processing are elaborated upon in respective publications, which are presented in Chapter 3. For the systematic review, this is 3.1. The processing of quantitative data is described in 3.2. The processing of qualitative data is mostly discussed in 3.3, but a bit of elaboration is needed on quality control. All audio recorded interviews were uploaded onto a secure cloud network and then transcribed by a professional service into verbatim English transcripts. For English interviews, I provided quality oversight checks by listening to the audios and checking against the transcriptions. In cases when interviews were conducted in local languages, simultaneous translation and transcription were undertaken an independent

professional, and the RAs supported the quality checks. Observations and field notes were also imported into Word and analysed in NVivo 10.0.

2.3.4 Data Analysis

Various types of data analysis were applied over the course of the PhD, given the number of data sources and methods. These are described in detail with each publication (see Results Chapter) and summarised in Table 2.1. Analyses were supported by different software programmes. All quantitative data were analysed in Stata 13 software. I ran a combination of descriptive and analytic tests (bivariate and logistic regression) to test hypothesis about feeding determinants as well as contribute to the literature about the measurement of feeding. For instance, I presented two common breastfeeding recall measures (ever and 24-hour) and separated out measures of content (breastmilk vs. formula) from modality (bottle vs. other). All narrative and visual data were analysed in NVivo software. Thematic analysis was applied, with the researcher first reading or viewing texts multiple times before developing codes and, later, themes. Lenore Manderson reviewed and discussed codes to assess reliability. Themes were discussed until consensus was formed, with the findings analysed according to the study objectives.

2.4 Researcher Positionality

My own role as a researcher was that of an outsider. I am not South African and could not speak the first languages of most study participants. Furthermore, I was a white woman entering a Black space established through a racist system of governance, a legacy from the apartheid system which ended, formally, in 1994. Whenever I left the confines of Chris Hani Baragwanath Hospital to visit the CHCs and homes of study participants, I was keenly aware of this social distance. When I walked the halls of the CHCs, I was often mistaken for a doctor or clinic staff, presumably because of the colour of my skin. My RAs were constantly educating me about Soweto and social dynamics would help participants open up. As “insiders” to the

community, I relied on my RAs heavily, particularly when collecting data (survey and IDIs) from mothers.

My previous work in Ethiopia with AIDS orphans, mentioned in the preface, influenced me tremendously in terms of my passion for HIV prevention. The experience of losing loved children to AIDS also made me wary of policies that might reduce PMTCT tools, particularly after Cuba was able to eliminate MTCT through the use of exclusive formula feeding near the beginning of my research (World Health Organization, 2015). I had to constantly check myself so that I would be able to engage with the data about the Tshwane Declaration from an agnostic perspective. Similarly, I was self-aware of how my own experiences with breastfeeding might hinder my ability to listen openly to what the data were saying. My RAs and supervisors all assisted with quality assurance in this regard through discussion, challenging me to provide evidence for my assertions and through cross-checking my analysis.

2.5 Ethical Considerations

The systematic review, cross-sectional study and overall PhD had separate protocols. A protocol for the systematic review was first registered with PROSPERO (Reg No.: CRD42014010512) in June 2014 and was updated in June 2018 with the inclusion of a new team member and improved quality assessment tools. The cross sectional study as well as the overall PhD protocol had Human Research Ethics Committee certificates. On all of these, I was identified as the Primary Investigator (PI). During the piloting of the quantitative survey, some amendments were made. The final PhD HREC certificate (HREC M140803) can be reviewed in Appendix G. In addition, permission was needed from the City of Johannesburg Research Committee, which was also received for a first period and then extended until May, 2016 (see Appendices H-I). Permission was granted from each of the five CHC facility managers to recruit during the periods of time covered by the COJ.

The importance of informed consent and maintaining the anonymity of study participants was stressed throughout the data collection process. The consent process was managed by the RAs, who were able to explain all processes in local languages as appropriate. All participants were informed of their rights before the study in the form of information sheets (see Appendices J-M) and they were given unique identification numbers in place of names. Data were only collected after written consent was received for the study (See Appendix N for example) as well as audio recording for interviews (See Appendix O for example). All paper-based data were only accessed by me and my RAs, and was kept under lock and key; electronic data are stored in password-protected files.

3 Results

Those women are too hasty who, after only 40 days, try to give cereal food (as do those for the most part who find nursing a burden).

~Sonorus of Ephesus, Greek physician (98-117 AD) in his work *Gynecology*, quoted in Fildes (1986)

In this chapter I present the publications that were produced from this PhD in an effort to highlight the importance of perspective and answer the study objectives. Together, they demonstrate how the construction of guidelines and the ways in which messages are framed can influence social practices and norms.

The following four manuscripts/articles generated from this PhD are presented in this chapter. Slight modifications have been made, such as removal of acronyms that have already been introduced and the removal of abstracts and journal-specific requirements, such as conflict of interest statements. Otherwise, they are presented as published or submitted with the permission of co-authors:

Nieuwoudt, S., Ngandu, C.B., Manderson, L., Norris, S. Factors associated with optimal breastfeeding in South Africa between 1980 to 2018: A mixed-methods systematic review *(submitted to South African Health Review 2019)*

> This mixed methods systematic review forefronts different infant feeding guidelines and the factors that constrained or facilitated breastfeeding in South Africa from 1980 through 2018. While some factors persisted across different policy periods, other policies altered how decision-making took place. The significance of this systematic review is in highlighting intervention points for promoting breastfeeding, while also advocating for public health practitioners and scientists to reflect on our own framing of 'optimal feeding' with a historical lens. The article also discusses how other policies beyond the scope of the review, such as labour and trade, have influenced the context of breastfeeding.

Nieuwoudt, S. & Manderson, L. Frontline health workers and exclusive breastfeeding guidelines in an HIV endemic South African Community: a qualitative exploration of policy translation. *International Breastfeeding Journal* (2018) 13:20 https://doi.org/10.1186/s13006-018-0164-y

> This article gives voice to a group of frontline healthcare workers who are meant to translate policy into practice. The take away point from this paper is that healthcare workers are not able to enact policy guidelines that are based on false assumptions about context. The paper warns about the risk of using healthcare workers to disseminate messages without providing them with evidence and training in risk communication.

Nieuwoudt, S., Manderson, L. & Norris, S. Infant feeding practices in Soweto, South Africa: Implications for health providers, *South African Medical Journal* , 108(9) https://doi.org/10.7196/SAMJ.2018.v108i9.13358

This article presents the feeding patterns and associated socio-ecological factors of 298 mothers public health clinics in a Soweto health sub-district. The sample includes mothers of self-reported accessing HIV positive and negative status' with an even number of infants below three months and three to six months old. The paper highlights increased trends in EBF, despite high levels of mixed feeding (increasing with age). It also how HIV influences exclusive feeding practices, with HIV positive mothers more likely to feed exclusively for longer. The importance of highlighting the overall health and development benefits of EBF is emphasized, alongside addressing socio-ecological barriers.

Nieuwoudt, S. Being a good mother: HIV and infant feeding decisions. In: *Connected Lives: Families, Households, Health and Care in Contemporary South Africa*. Edited by Manderson, L. & Mkhwanazi, N. Pretoria: Human Sciences Research Council ***(accepted)***

This mixed method case study, explores motherhood in the context of infant feeding in Soweto. Three mother and infant pairs are described, drawing on interview and questionnaire data, to highlight the point that local understandings of infant feeding stretch far beyond public health framings and can shift rapidly over time and by context. The case illustrates the importance of family support, social norms and stigma in decision-making.

3.1 Factors supporting or constraining breastfeeding from 1980-2018

An abstract of this manuscript has been submitted to the Health Systems Trust for inclusion in the South African Health Review 2019. It reviews 72 eligible articles on the topic of infant feeding influences. The content of this mixed-methods systematic review will be of greatest interest to researchers and practitioners in South Africa. In addition, the ecological framework and policy framing make it unique in the field of infant feeding (and even other mixed-method systematic reviews).

The proposed title and order of authors, before feedback, is as follows:

Nieuwoudt, S., Ngandu, C.B., Manderson, L., Norris, S. Factors associated with optimal breastfeeding in South Africa between 1980 to 2018: A mixed-methods systematic review

Factors associated with optimal breastfeeding in South Africa between 1980 to 2018: A mixed-methods systematic review

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Introduction

Children depend on their families and communities to make dietary decisions on their behalf. The contexts of such decisions change over time. The guidelines on what is the best for infants also change (Du Plessis et al., 2016). The current public health consensus is that EBF for the first six months is the best start for health and development (Victora et al., 2016). There is a large volume of breastfeeding research that has been conducted in South Africa, which has not been systematically reviewed to identify factors that promote EBF. Identifying factors that promote (or are barriers to) behaviour is a first step for the design of evidence-based policies and interventions (Rollins et al., 2016) that are relevant to South Africa.

Scientific knowledge of the life-saving benefits of EBF have not been translated into practice in South Africa. Globally, exclusively breastfed infants' risk of death is 12% that of infants who not breastfed (Victora et al., 2016). The same authors estimate that universal EBF would avert an estimated 13.8% of deaths of children below age two (Victora et al., 2016). However, South Africa's 6-month EBF rate only recently rose to 32% (National Department of Health et al., 2017) from rates closer to 10% (Du Plessis et al., 2016). In a multi-country randomised control trial to promote EBF, only 8% of the South African intervention group reported EBF at 12 weeks, with the control group even lower, at 4% (Tylleskar et al., 2011).

One explanation for South Africa's previous low rates of EBF is the country's high HIV prevalence and the past practice of advising HIV positive mothers not to breastfeed to avoid

transmission of HIV and providing them with free formula to support that choice (Doherty, Sanders, Goga, & Jackson, 2011). An outcome of the 2011 Tshwane Declaration for the promotion of breastfeeding in South Africa was the discontinuation of the free formula programme (Department of Health, 2011). However, high levels of mixed feeding, even among HIV positive women, suggest that free formula was only part of the explanation for low EBF rates (Goga et al., 2012). Consistent with an understanding of the multiple factors that shape infant feeding, and the complexity of infant feeding decision-making, scholars have argued for comprehensive interventions (Lazarus et al., 2013, Rollins et al., 2016).

Given that a complex mix of factors influence a seemingly simple behaviour, for this review a conceptual framework was adopted to synthesize and analyse factors that influence EBF. Rollins and colleagues proposed a three level conceptual framework as well as a time component for the mother-child dyad (Rollins et al., 2016). Our own adaptation was to integrate a time component that accounts for changes over time, conceptualized at both the structural and individual levels (see Figure 3.1.1). As we were particularly interested in infant feeding guideline changes, these four periods (see Table 3.1.1) were specifically named.

Table 3.1.1. Infant feeding policy periods in South Africa

Policy Period	Years	Characteristics
Period 1	1980-1999	EBF for 4-6 months promoted for all mothers
Period 2	2000-2007	EBF 6 months promoted for HIV negative mothers; EBF for 3-6 months promoted or EFF (if AFASS met) for 6 months for HIV positive mothers
Period 3	2008-2011	EBF for 6 months promoted for HIV negative mothers EBF or EFF for 6 months promoted HIV positive mothers
Period 4	2012-2018	EBF for 6 months promoted for all mothers

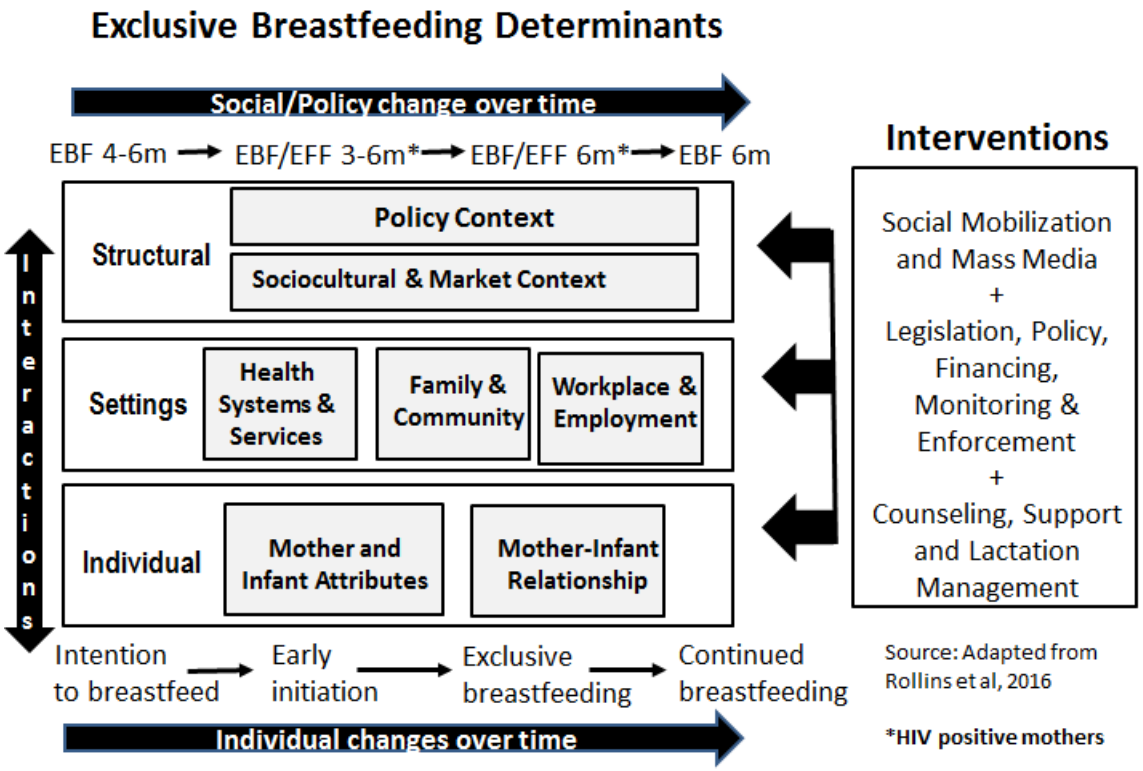

Figure 3.1.1. Adapted model for breastfeeding determinants and interventions

This systematic review analysed four critical policy periods during which advice related to infant feeding changed, summarised in Table 3.1.1. During Period One, EBF was promoted for all mothers for a period of 4-6 months. In Period Two, beginning in 2000, this advice changed for all mothers according to HIV status. HIV-positive mothers were officially counselled to either EBF for three to six months or EFF for six months before rapidly weaning (Behr, 2018). On the other hand, health workers were instructed to promote EBF for six month (vs. 4-6) to HIV uninfected mothers; the WHO changed its policy to promote EBF for six months the following year (World Health Organization Secretariat, 2002). Period Three reflects when South Africa amended PMTCT guidance to advise HIV-positive mothers to EBF for six months (National Department of Health, 2008). During this period, HIV positive mothers continued to receive counselling that EFF for the first six months was an optimal option if they met acceptable, feasible, affordable, sustainable, and safe (AFASS) criteria. Period Four began in 2012, after South Africa declared itself a country that actively

promoted, protected and supported EBF for all, regardless of HIV status (Department of Health, 2011). This was when free formula at public clinics was discontinued, with the exception of approved medical conditions. Since this declaration, still policy today, all mothers are actively encouraged to EBF for six months, regardless of HIV status. This advice has persisted through a number of revisions to PMTCT policy between 2010 until present, including shifts from Plan A, to B and B+ (Landon-Myer, 2018). If mothers decide to formula feed infants after counselling and they meet AFASS requirements, health workers are instructed to support them.

The overarching research question that the review sought to answer was 'What *factors support* EBF for six months postpartum among women in South Africa?' This reflects a positive deviance approach (Schooley and Morales, 2007, Marsh et al., 2004), given the infrequency with which EBF is observed in the South African population. The review sought to explore what differs in the profiles or contexts of women who manage to exclusively breastfeed in order to inform policy and/or interventions. As indicated in the conceptual framework, these are classified as individual, settings or structural factors.

Methods

PICO criteria

The key population of interest was women in South Africa giving birth to a healthy baby with known infant feeding practices through at least the first month postpartum. The intervention or exposures (referred to as factors, hereafter) were left open intentionally, as these were the object of exploration. However, significant factors were noted from both observational studies and intervention evaluations, e.g. RCTs and quasi-experimental designs. The key comparator of interest was EBF. Overall, we also looked at any breastfeed (yes vs. no) and, among those breastfeeding, the duration (longer vs. shorter). For those

studies that had the data, we disaggregated by the mother's HIV status. The key outcome of interest was exclusive breastfeeding for up to six months postpartum.

Literature Search

The protocol first was registered with PROSPERO in June 2014 (CRD42014010512) and updated in June 2018 to reflect changes to the original team and the strategy for quality assessment. The search strategy, apart from dates, remained exactly the same. To be included in the review, a number of criteria had to be met, as summarised in Table 3.1.2.

Table 3.1.2. Review Selection Criteria

Selection Criteria	Standard
Study type	Peer-reviewed primary studies employing quantitative and/or qualitative methods and well as primary studies reported in the grey literature. Commentaries and opinion pieces will not be included.
Settings	South Africa. Multi-country studies will be permitted, but only data from South Africa will be extracted.
Publishing date	1980 to 2018 (data collection dates not older than 1975)
Outcomes	Breastfeeding practices (not intention)

The following seven databases were consulted through the University of the Witwatersrand (Wits) library: Africa-Wide, PubMed, Popline, PsychINFO, CINAHL, Global Health, and The Cochrane Library. Search strategies for each of the search engines were developed in consultation with two experts; the full search strategies can be found in Appendix P. The search terms included variations of the following: infant feeding, breast feeding, bottle feeding, mixed feeding, solid feeding and South Africa, restricted to 1980 to 2018. The citations of relevant articles were also searched and content experts, e.g. UNICEF and Department of Health, were consulted to ensure all relevant articles were included.

The database searches were replicated independently by two of the authors (SJN and CBN) to reduce bias. The search results were independently saved as EndNote libraries and

merged into a single library (n= 20,217) to remove duplicates. After removing duplicates (n=2,528), SJN screened the library using titles and abstracts to exclude ineligible articles based on the selection criteria, after which SJN and CBN conducted full screening on 101 eligible articles based on the predetermined criteria to arrive at the final list of 71 articles. A flow diagram detailing this process using the PRISMA guidelines was maintained (see Figure 3.1.2). All authors were consulted on the final list before data extraction was completed.

As a mixed-methods systematic review, qualitative and quantitative data were extracted and analysed separately. All studies were uploaded into NVivo 10.0 software for systematic data extraction and analysis. Summary data for quantitative studies were extracted by both CBN and SJN into Microsoft Excel and SJN extracted qualitative study data. Both authors did random quality checks for each other. Quantitative findings were extracted by both CBN and SJN. For both methods, we extracted information summarising the study year, study design, study setting, sample, and infant age (signifying feeding duration). Analysis techniques were noted for qualitative. The policy period during which data were collected were also noted. This policy period was based on separate analysis of policy changes over time by SJN, already described. Findings were grouped by policy period within tables to support comparison.

The quality of studies was critically assessed using a range of tools: Grading of Recommendations Assessment, Development and Evaluation (GRADE) for RCTs (Guyatt et al., 2008, Balshem et al., 2011, Guyatt et al., 2011), the Newcastle-Ottawa Scale (NOS) (Wells et al., 2016) for cohort, and an adaptation of NOS for observational quantitative studies. These were summarized as high, medium or low for the sake of comparison in the results summary table. CERQual (Lewin et al., 2015, Lewin et al., 2018) was applied to critically assess qualitative studies. We understand that some qualitative researchers have argued against applying quality criteria for meta-synthesis or meta-ethnography, as it counters their epistemological values of relativism (Downe, 2008). However, we adopted the position that

basic standards of qualitative rigour (transferability, credibility, dependability and confirmability) should be present before the application of meta-synthesis (Downe, 2008). For mixed methods studies, the appropriate tools were applied to the different components.

Results

A total of 71 articles were included in the review, of which 38 were quantitative, 30 were qualitative and three were mixed-methods that contributed to both sets of analyses (see Figure 3.1.2).

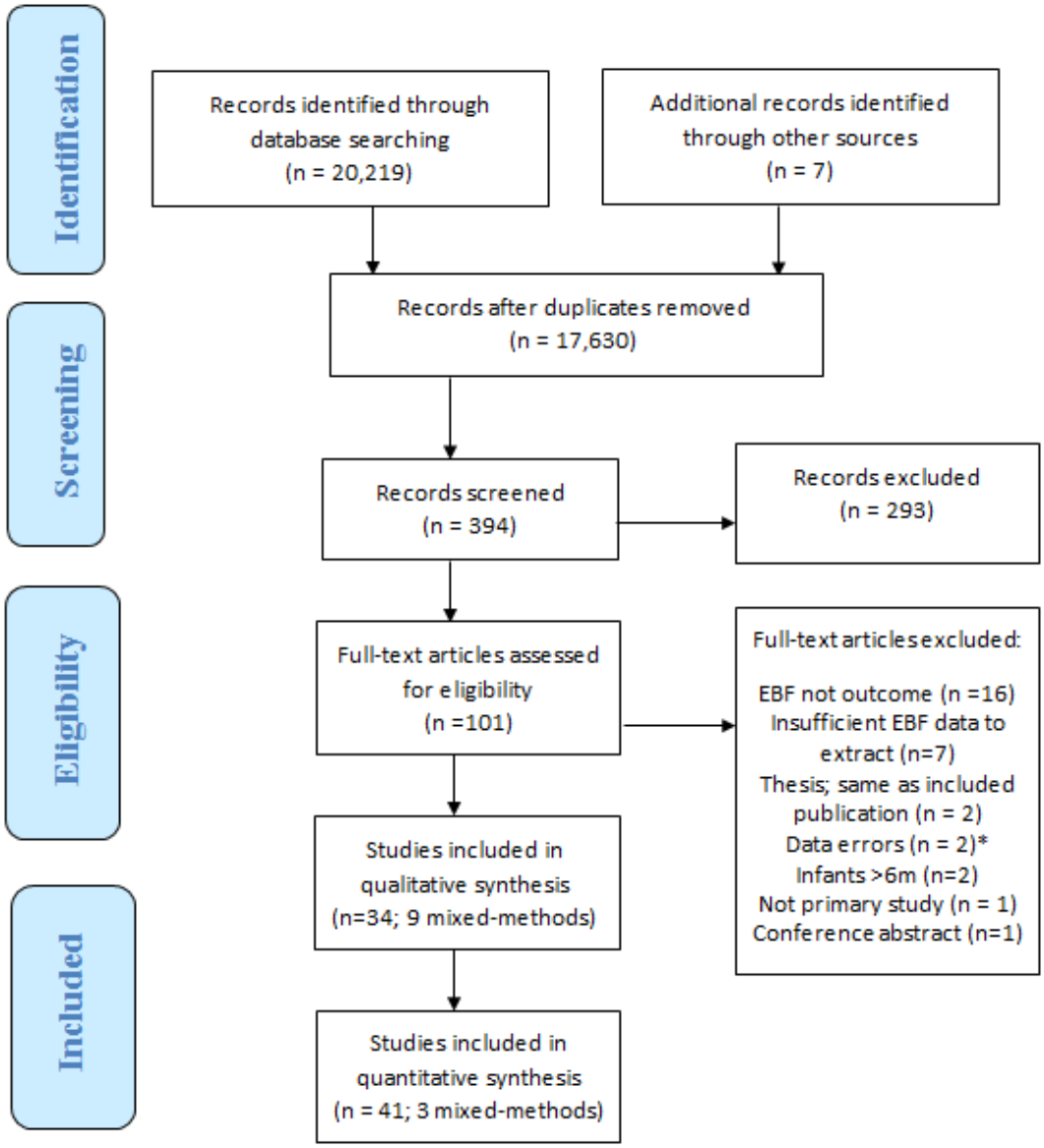

Figure 3.1.2 PRISMA flow chart

Observations on excluded articles

Articles were excluded mostly because EBF was not defined as an outcome or because the data were not presented in a format that aligned with preset review criteria. This was particularly true for articles written in Period 1 and 2, which studied infant feeding decision-making without an EBF outcome, even when 'fully breastfeeding' was included as a synonym. In total, 16 articles were excluded due to absent or poor definitions of exclusivity. Another seven were excluded because the EBF data were presented in ways, e.g. graphs, which did not allow specific numbers to be extracted. In two instances, masters theses (Goosen, 2013, Hoffman, 1984) were excluded because the exact same data were presented in publications first authored by the same person (Goosen et al., 2014b, Hoffman et al., 1984a, Hoffman et al., 1984b). The "data error" exclusions related to significant errors within articles where data were deemed unreliable given flawed interpretations by the authors. For example, Ahmadu-Ali and Couper (2013) interpreted and discussed their findings about the EBF rates of HIV positive and uninfected mothers in the opposite direction of the quantitative results presented in their tables.[3] Articles that included infants above six months in their EBF calculations were also removed, as EBF beyond six months is not recommended. A presentation associated with a conference abstract could not be tracked down from the original authors and one article was discovered to be a commentary rather than primary research. Whenever possible we retained articles, even if we had to recalculate EBF rates to enable comparison, e.g. when the denominator of EBF rates for HIV positive mothers excluded those who had opted to formula feed (Goga et al., 2012b).

[3] After discussing this discrepancy with the authors, they wrote a letter to withdraw their article from the publication, which was refused by the publication.

Quantitative results

A total of 41 articles were identified using quantitative methods to explore EBF and one or more related determinant (see Table 3.1.3). There was a relatively even spread of articles by policy period. Findings were presented from a variety of observational study designs: 18 cross-sectional surveys (including three mixed-methods papers), 10 cohort designs and one record review. EBF interventions used four quasi-experimental designs, one trial and eight RCTs. All but one RCT was conducted in the last two policy periods. The locations where quantitative studies were conducted were largely clustered in Kwa Zulu Natal (KZN; 17), Western Cape (WC; 13), and Gauteng provinces (GP; 10). Five studies reported data from the Eastern Cape (EC). The other provinces were poorly represented, with one study for each of the following three provinces: Northwest (NW), Mpumalanga (MP) and the Free State (FS). No studies were conducted in Limpopo (LP) or the Northern Cape (NC).

The study samples varied widely, most involving mothers of young infants. In analysis, these mothers were disaggregated by age, HIV status, race and/or in relationship to their exposure to an intervention. In a few instances infant caregivers, often family, were sampled. In many cases, only mothers who had an intention to breastfeed or who were breastfeeding were included. Several studies recruited their samples from PMTCT programmes or baby-friendly institutions. These sampling strategies introduced selection bias, likely to overestimate EBF.

There was a high level of variation in EBF durations reported. Many early studies restricted measure of EBF to 12-16 weeks or even less. Reports of EBF prevalence also varied widely, even controlling for duration. As most articles presented EBF measures for different durations and using different definitions, such as including and excluding the use of non-prescribed medicine (Bland et al., 2002) only the strongest and longest duration measures of EBF reported were summarised in Table 3.1.3 for each article.

Table 3.1.3. Studies from which quantitative data were drawn, EBF rates for longest duration measured and quality summary								
#	**Article Ref**	**Design**	**Setting***	**Sample Size**	**Groups Assessed**	**Infant Age(s)**	**EBF [ages]**	**Quality (H/M/L)**
Period 1 (1980-1999)								
1	Bland et al., 2002	Cohort Cross-sectional	R (Hlabisa, KZN)	119 (cohort) 101 (x-sect)	Infant of mothers attending rural clinics (to 16w) 101 mothers or caregivers with infants below 6m	<16 weeks 17-24 weeks	3% (16w; n=119) 22.0% (6m; n=101)	High -aNOS
2	Chalmers, 1986	Cross-sectional	R & U (GP)	171	Pedi mothers who gave birth in a clinic or hospital	Not stated	69.0% (n/s; n=171)	Low -aNOS
3	Chalmers et al., 1987	Cross-sectional	U (Johannesburg, GP)	200	Coloured (mixed race) mothers who had given birth in a hospital	~3 weeks	82.0% (3w; n=200)	Low -aNOS
4	Delport et al, 1988	Cross-sectional	U (GP)	51	Breastfeeding mothers at private maternity hospital	4-5 days	43.1% (5d; n=51)	Low -aNOS
5	Ellison et al., 1997	Cohort	U/T (Soweto, GP)	1267	Mothers enrolled in Birth to 10 cohort, Soweto	<6 months	0.8% (6m; n=not reported)	Low -aNOS
6	Hoffman et al, 1984a	Cohort	U (Heideveld, WC)	169 *-80*	Mothers *-80/89 mothers who reported EBF at 1st interview*	<6 weeks 7-12 weeks	23.7% (16w; n=80)	Low -aNOS
7	Hoffman et al, 1984b	Quasi-experimental (Pre and Post)	U (Heideveld, WC)	124 (Post) *-94*	Mothers for post-intervention assessments were new, but compared with mothers from previous study (see 1984a)	<6 weeks & 7-12 weeks for both groups	38.7% (12w; n=44)	Low -aNOS
8	MacIntyre et al., 2005	Cross-sectional	U (Ga-Rankuwa, GP)	150	Mothers of healthy infants attending a clinic	<9 weeks	4.7% (<9w; n=150)	Medium -aNOS

9	Nikodem et al, 1993	Randomised controlled trial	U (Coronation Hospital, GP)	162	Low-income mothers who gave birth at Coronation Hospital and participated in intervention study (83) or were controls (79)	<12 weeks	32.7% (<12w; n=162)	Moderate -GRADE
10	Van der Elst et al, 1989	Cross-sectional	T (Mitchell's Plain, WC)	78	Mothers (Black & coloured) who had given birth at a baby-friendly maternity hospital at a 6-month follow-up home visit	6 months	32.0% (6m; n=78)	Low -aNOS
Period 2 (2000-2007)								
11	Baek et al., 2007	Quasi experimental (pre- post cross-sectional surveys)	U (Edendale hospital, KZN) PU (Imbalenhule & Mpophonemi, KZN)	320	HIV-positive mothers who provided data on infant feeding practices and exposure to the m2m programme (2x or more).	<3 months	8.1% (4-12w; n=320)	Medium -aNOS
12	Bland et al, 2007	Cohort (pregnancy and postnatal)	R (KZN) PU (KZN) U (KZN)	2260 *-1156* *-1104*	Mother/infant pairs <u>with infant feeding data</u> *-HIV positive (863)* *-HIV negative (902)*	1 week postnatal	78.1% (1w; n=2260) *74.7% HIV+* *81.7% HIV-*	Medium -aNOS
13	Bland et al, 2008	Quasi-experimental (cohort)	R (KZN) PU (KZN) U (KZN)	2436 *-1219* *-1217*	Mothers *-HIV positive* *-HIV negative*	< 180 days (6 months)	45% HIV- 40% HIV+ (6m)	Medium -aNOS
14	Bork et al, 2013	Cohort	U (Durban, KZN) R/PU (Somkhele, KZN)	278	HIV-1 positive mothers with CD4 between 200-500	<6 months	10.8% (6m; n=269)	Medium -aNOS
15	Du Plessis, 2009	Mixed methods (for quant: 2 cross-sectional questionnaires)	U (Johannesburg, GP)	124 *-55 (phase 1)* *-69 (phase 2)*	Primigravidae mothers who breastfed or attempted to breastfeed for at least 3 weeks who attended a baby clinic	>6 weeks	39.0% (6w; n=124)	Low -aNOS

16	Goga et al, 2012	Cohort study	R (Rietvlei, EC) PU/T (Paarl, WC, Umlazi, KZN)	775 (at 3 weeks)	Mothers were recruited during pregnancy with a HIV- positive & -negative enrolment (3:1)	<36 weeks (visits at 3, 5, 7, 9, 12, 16, 20, 24, 28, 32 and 36 wks)	14.0% (12-14w; n=665)	Medium -aNOS
17	Ghuman et al, 2009	Cohort study	R (Ugu, KZN)	168 (birth) *-117 (14 weeks)*	Mothers who gave birth at baby friendly clinic	Birth 14 weeks	18.0% (14w; n=117)	Low -aNOS
18	Kassier et al, 2003	Cross-sectional	U (Durban, KZN)	300 *-150 -150*	Zulu mothers *Attending PTMTC clinics Attending non- PTMTC*	<6 weeks 6-14 weeks 15 weeks-6 m	5.0% (15w-6m; n=80)	Medium -aNOS
19	Petrie et al, 2007	Cross-sectional	U (Cape Town, WC)	20	HIV positive mothers age 18-39 attending community health clinic with infant feeding data	<6 months	5.0% (<6m; n=20)	Low -aNOS
20	Sibeko et al, 2005	Cross-sectional	PU/T (Langa, WC)	117	115 mothers with 117 healthy babies, currently breastfeeding	1-6 months	0.0% (1-6m; n=117)	Medium -aNOS
Period 3 (2008-2011)								
21	Goosen, McLachlan & Schübl, 2014	Mixed methods (Cross-sectional)	PU/T (Avian Park & Zwelenthemba, WC)	140	Primary caregivers of infants aged 0 to 5.9 months in study area	0-5.9 months	6.0% (<6m; n=140)	High -aNOS
22	Ijumba et al, 2015	Cluster-randomised trial	PU (Umlazi, KZN)	3494 *1629 study 1865 control*	Mothers from 30 community clusters at 12 weeks in GoodStart RCT	12 weeks	20.1% (12w; n=3494)	High -GRADE
23	Ladzani et al, 2011	Cross-sectional	R (Gert Sibande, MP)	815	HIV positive mothers from 47 PMTCT clinics	3-6 months	35.6% (3-6m; n=815)	High -aNOS

24	Rotheram-Borus et al., 2014	Cluster randomised controlled trial	T (Cape Town, WC)	1238	Mothers from 24 neighbourhoods (12 study matched with 12 control)	<6 months (2 week & 6 month visits)	6.4% (6m; n=1157)	Moderate -GRADE
25	Some et al, 2017 *[Data collected 2009-2013; relevant data pre-2012]*	Clinical trial	U (East London, EC)	213	Adult (age 18+) HIV+ mothers attending ineligible for HAART who expressed intention to breastfeed at enrollment	<26 weeks	93.4% (1 w; n=213)	Low -GRADE
26	Swarts, Kruger & Dolman, 2010	Mixed methods (Cross-sectional)	R (Lower Umfolozi District, KZN)	100 *-37 HIV+ -63 HIV-/unknown*	Mothers in post-natal ward of baby-friendly hospital *-HIV status retrieved from clinical records*	Neonates	72.0% (<1w; n=100)	Medium -aNOS
27	Tomlinson et al, 2014	Cluster randomised controlled trial	PU (Umlazi, KZN)	3494 *1629 study 1865 control*	Mothers from 30 community-based clusters at 12 weeks in GoodStart RCT	12 weeks	20.8% (12w; n=3494) *24% study 16% control*	High -GRADE
28	Tylleskar et al, 2011	Cluster randomised trial	R (Rietvlei, EC) PU/T (Paarl, WC, Umlazi, KZN)	1020 *535 study 485 control*	Mothers who planned to breastfeed prior to giving birth	<28 weeks	1.5% (22-24w; n=1020)	Moderate -GRADE
Period 4 (2012-2018)								
29	Budree et al, 2017	Cohort	PU (Paarl, WC)	1076	Infants of 1071 mothers age 18+ in cohort of a mixed-race community and Black-African community	6 months (6-10, 14-16, and 6m)	13.0% (6m; n=710)	Medium -aNOS

30	Horwood et al, 2017	Cluster randomised controlled trial	R (Ugu Health District, KZN)	1342 total *736 baseline* *606 follow-up*	Adult (age 18+) mothers with an infant <12 months and living in a household served by a participating CHW (both HIV+ and -)	6 weeks (for EBF measure)	68.8% (6w; n=629 baseline) 70.6% (6w; n=531 follow up)	High -GRADE
31	Myer et al, 2018(Myer et al., 2018)	Randomised controlled trial	U (Cape Town, WC)	471 *233 Study* *238 Control*	Mothers (age 18+) HIV+ at MCH clinic less than 6 weeks postpartum who had initiated ART during pregnancy and were breastfeeding at screening	<6m (3m and 6m)	21.6% (6m; n=430)	Moderate -GRADE
32	Mnyani et al, 2016	Cross-sectional	PU (Soweto, GP)	180 *67 HIV+* *113 HIV-*	Mothers accessing primary health clinics	<9 months (avg age 5.5 HIV- and 5.9 HIV+)	68.0% (<6m; n=100)	Medium -aNOS
33	Pillay et al, 2018	Cross-sectional	R (Umlazi, KZN)	73	Teenage (<19) mothers attending a Well-Baby Clinic for 14-week immunization	14 weeks	50.7% (14w; n=73)	Medium -aNOS
34	Reimers et al., 2017	Cluster randomised trial	U/PU/R (uThungulu District, KZN)	490 *255 study* *235 control*	Adult (age 18+) HIV+ mothers attending PMTCT program with intention to EBF at enrollment	<6 months (day 3, weeks 6, 14 and 22)	43.7% (22w; n=490)	Moderate -GRADE
35	Sepeng & Ballot, 2016	Retrospective record review	U (Johannesburg, GP)	404	Non-ICU records of neonates admitted to a BFHI tertiary hospital	Neonates within 72 hours of birth (at discharge)	23.3% (<1w; n=404)	Med -aNOS

36	Siziba et al, 2016	Cross-sectional	U/PU (NW, GP, FS, EC)	580	Mothers/caregivers of infants <6m accessing one of 40 high-volume health facilities selected from the four provinces	<6 months	12.0% (6m; n=34)	Medium -aNOS
37	Steyn et al, 2017	Cross-sectional	U (Cape Town, WC)	104	Mothers attending International Board Certified Lactation Consultant private practices	Not stated	55.8% (n/s; n=104)	Low -aNOS
38	Thomas et al, 2017	Cohort	PU (Drakenstein, WC)	720 *(for multivariable analysis)*	Mother-infant dyads from 2 primary health care clinics: Mbwekeni (black African) and TC Newman (mixed ancestry) patients	Up to 24 months (6–10 weeks, 14 weeks, 6 months)	% not given (<6m; n=720) *Mean duration 2m (IQR 1-4)*	Medium -aNOS
39	Tuthill et al, 2017	Randomised controlled trial	T (Sweetwaters and Edendale, KZN)	58 *29 Study 29 Control*	Mothers (age 18+) HIV+ using ART attending one of the 2 clinics	6 weeks	81.5% (6w; n=58)	Moderate -GRADE
40	Tuthill et al, 2017	Retrospective cohort	T (Sweetwaters and Edendale, KZN)	58	Mothers (age 18+) HIV+ using ART attending one of the 2 clinics	6 weeks	81.5% (6w; n=58)	Low -aNOS
41	Yako & Nzama, 2013	Cross-sectional	T (Mdantsane, EC)	60	Mothers attending their 6 week postnatal visit at a community health clinic PMTCT programme, irrespective of HIV status	~6 weeks	13.3% (6w; n=60)	Medium -aNOS
* R=rural; PU/T= peri-urban/ township; U=urban								

Table 3.1.4 summarizes EBF findings by policy period. As indicated, during the first period, EBF for six months was observed at highly variable rates (0.0-32.0%). Interventions to increase EBF during this period did not measure to six months because guidelines at the time recommended 4-6 months. The next policy period, when PMTCT programmes began, reported lower rates of EBF for six months (0.0-13.0%) across observational study designs, but a higher rate for the quasi-experimental study. Rates declined further during the third policy period in those studies that measured EBF up to 6 months (1.5- 6.4%). In policy period 4, after the Tshwane Declaration, EBF increased, between 12.0-43.7%, with particularly high rates measured for RCTs specifically seeking to improve EBF for six months

Table 3.1.4 EBF ranges by policy period and study design

Policy Period	EBF Ranges (Design)	Infant age at measurement
1. 1980-1999	0.0% to 32.0% (Cross-sectional)	6 months
	0.8%; *3.0% to 23.7%* (Cohort)	6 months; *12-16 weeks*
	32.7% to 38.7% (Quasi-experimental)	*12 weeks*
2. 2000-2007	0.0% to 5.0% (Cross-sectional)	6 months
	10.8% to 13%; *14.0% to 18.0%* (Cohort)	6 months; *14 weeks*
	45% (Quasi-experimental)	6 months
3. 2008-2011	*6.0% to 35.6%* (Cross-sectional)	*<6 months*
	1.5% to 6.4%; *20.1% to 20.8%* (RCTs)	6 months; *12 weeks*
4. 2012-2018	12.0%; *14.0%* (Cross-sectional)	6 months; *14 weeks*
	13.0% (Cohort)	6 months
	21.6% to 43.7% (RCTs)	6 months

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Most of the studies were deemed as low to moderate quality. The introduction of bias in the sampling strategies was most often the reason for low or moderate scores (see Appendix Q for quality cacluations). In such instances, only mothers who intended to breastfeed were included in the original samples, with exclusivity or introduction of complementary feeding being the main object of interest. This was particularly true for studies conducted with HIV positive mothers, as EFF was deemed an optimal alternative to breastfeeding at the time. Nearly all studies introduced selection bias by recruiting mothers from health facilities (hospitals or clinics) instead of the community. Other sources of weakness included small sample sizes, which were not powered to pick up differences and limited use of advanced analytic techniques, such as regression analysis, to address confounding. Reliance on simple descriptive statistics or measures of association was the norm in studies conducted in the 1980s and 1990s, as compared with more recent studies. In addition, earlier studies were often more likely to exclude details of the study, such as the relationship of the researchers to the sample, including blinding for RCTs.

Quantitative findings on factors associated with EBF

A range of factors across the individual, settings and structural levels were explored in relation to their influence on EBF. Table 3.1.5a focuses on the factors identified in observational studies (cross-sectional, cohort and record reviews). Where regression analyses were not conducted with EBF as the outcome, only descriptive statistics could be used to characterize the study findings for EBF (Ladzani et al, 2011). In a few instances, secondary analyses from RCTs were integrated into this table. Findings related to actual interventions are presented in Table 3.1.5b, with final regression model results presented where multiple models were tested.

Table 3.1.5a Observational evidence on EBF barriers (-) and facilitators (+)		
Levels and factors	**Article references for *significant* findings**	**Notes on evidence**
Individual level		
Mother attributes		Until recently, HIV has been linked to EFF (vs. EBF), but that may be changing. Recent studies are finding both positive and negative associations with HIV status. Linked to HIV, fear of transmission influences decisions, while time of diagnosis may play a role in avoiding EBF. Health concerns may support EBF, except when milk insufficiency is perceived, which was consistently a barrier to EBF over time. Being employed or in school were two of the greatest barriers to EBF. Knowledge about EBF, positive attitudes and intention were associated with EBF in a few studies, although many studies looking at these variables did not find associations. Data on marital status is unclear. Higher SES (and related indictors) has also been noted as a barrier, although not in all cases.
HIV status of mother (+/-)	[12,16,17,19,26,29,35, 36,38,41]	
Fear of HIV transmission (+/-)	*[17,19,23,26]*	
Pre-pregnancy HIV diagnosis (-)	*[38]*	
Infant health concerns (+)	[17,18,20]	
Milk insufficiency beliefs (-)	*[1,6,8,9,10,15,17,20,33, 36,37]*	
Employment (-)	[6,8,10,17,19,20,25,34, 36,38,41]	
In school (-)	[8,17,20,33,36,41]	
Urban (-/+)	[5,13,34]	
Completed education (-)	[1,14]	
Higher SES (-)	[33,36]	
Own fridge (-)	*[13,17]*	
Electricity, gas, parrafin (-)	*[12,13]*	
EBF knowledge (+)	[3, 19, 32]	
Positive breastfeeding attitudes (+)	[2]	
Breastfeeding intention (+)	[1,4,12]	
Married (-/+)	[25,32,38]	
Older age of mother (+)	[25,26,41]	
Higher parity (-/+)	[25,37]	
Delivery by c-section (-/+)	[15,34]	
Mother ill (-)	[1,8,12]	
Past breastfeeding experience (+)	[34]	
EBF emotionally challenging (-)	[37]	
Low confidence/self-efficacy (-)	[15,41]	
Prenatal depression	[40]	
Living with infants grandmother (+)	[40]	
Alcohol use (-)	[17]	
Infant attributes		As infants get older, EBF reduces. Infants who actively refused breastmilk or who exhibited discomfort, usually described as crying or thirst, were more likely to be fed complementary foods.
Infant age (-)	[8,18,22,29,32,37]	
Refusal of breastmilk (-)	[20,36,37]	
Colic/constipation (-)	[1,21,41]	
Crying (-)	[29]	
Recusitatated at birth (-)	[35]	
Birth asphyxia (-)	[35]	
Perceived to be hungry/thirsty (-)	[36]	
Growth (+)	[20]	
Mother-infant relationship		Breast problems were a major reason for stopping EBF.
Breast problems, e.g. mastitis, flat nipples, pain (-)	[1,6,8,10,13,15,17,20,36 ,37,41]	
Feeding problems, poor latching (-)	[10,13,15]	

Settings level		
Health systems and services Medical advice (+/-) Postnatal support/visits (+) Free formula programme (-) Prelacteal feeds (-) Separation of mother & infant (-) District hospital delivery (+)	 [1,3,8,15,18,36,37] [6,7,8,12,34] [13,19,23] [4,10] [4,14] [1]	The advice mothers received from health workers is important, and can support or undermine EBF. Postnatal support was positive, whereas hospital practices and the free formula programme undermined EBF.
Family & Community Family advice (-/+) Shared caregiving (-)	 [1,3,17,18,19,32,36,41] [20]	Families were influential, but not consistently in support of EBF.
Workplace & School -Maternity leave vs. none (-) (See employment/school at individual level)	 [3]	Counterintuitively, having maternity leave was associated with returning to work earlier in one case.
Structural level		
Socio-cultural context Infant cleaning rituals/practices, e.g. use of muthi (-) Dirty milk – expressing (-) Unspecified cultural factors (-)	 [1,18,20] [22] [34]	Socio-cultural factors were consistently reported as barriers to EBF.
Market context		No studies measured mass media exposure

The factors influencing EBF fell across all three levels of the socio-ecological framework, with most related to mother attributes, hospital and family settings and socio-cultural factors at the structural level. As quantitative studies can only report results on what they measure, the number of studies finding significant results for any given variable should be read with caution. For instance, few studies measured depression among mothers, but those that did found associations. The quality of the studies and persistence over time are both worth considering. A general trend in study quality was observed with earlier studies being less sophisticated, particularly with analysis, than those published in the last two policy periods. Some variable outcomes changed over time. For instance, while fear of HIV transmission used to be a barrier to EBF, more recently it has become a facilitator, with increased access to ART. This will be discussed further with the triangulation of quantitative and qualitative findings.

Of the 13 interventions reviewed, nine showed significant EBF improvements. The other four did not observe significant differences between the intervention and control groups. Short once-off interventions, such as playing a video (Nikodem et al., 1993) or a one-time counselling session (Tuthill et al., 2017b) did not work. Postnatal support by "peers" (Baek et al., 2007) or individuals nominated by mothers, "buddies" (Reimers et al., 2017), had less success than interventions that used already-employed CHWs (Tomlinson et al., 2014a, Ijumba et al., 2015, Horwood et al., 2017b, Bland et al., 2008). The two RCTs that employed peer workers and found some effect, Tylleskar et al (2011) and Rotheram-Borus et al. (2014), reported lower EBF rates than others. While their findings were statistically significant, the population-level benefit of increasing EBF to the levels they reported would be questionable. Postnatal support provided by CHWs with at least 10 days training and between four to seven visits reported the most impressive EBF increases. RCTs that applied health system reforms, such as integrated care for mothers and infants (Myer et al., 2018) or educating health staff (Hoffman et al., 1984b) also saw significant EBF improvements. Meta-analysis was not possible given the high variation in study designs and outcome measures.

Table 3.1.5b EBF promotion intervention results			
Article and study design	**Intervention description**	**Primary outcome**	**Results**
Policy period 1			
Hoffman et al, 1984b Pre-post, quasi-experimental	The intervention comprised six steps: 1. The birth notification form was duplicated so that one copy could be sent to the appropriate health visitor immediately after a birth while the other copy could be processed through the normal channels. 2. Breastfeeding clinics were introduced, allowing prospective mothers to see breastfeeding in action and learn by example. 3. Community talks on the advantages of breastfeeding. 4. Cape Town Breastfeeding Association contact numbers of volunteers available to help mothers with problems were circulated to all clinics in the area. 5. A letter to all the local family practitioners, encouraging breastfeeding promotion 6. Health visitors and nurses at the local clinic encouraged to promote breastfeeding. Their subject knowledge enhanced by lectures, demonstrations and a symposium.	'Fully breastfed'	Significant findings observed **p<0.01 (chi-square test)** Pre-intervention <6w: 52.7% Post-intervention <6w: 75.8% **p<0.01 (chi-square test)** Pre-intervention 6-12w: 23.7% Post-intervention 6-12w: 38.7%
Nicodem et al, 1993 Randomised control trial	Breastfeeding mothers were allocated, by means of randomly ordered cards in sealed opaque envelopes, to view one of two health education video programmes within 72 hours after delivery. The first programme gave information and specific motivation concerning the importance of breastfeeding and the correct positioning of the baby. The second gave information about healthy eating habits for adults. Results were tested 6 weeks postpartum through a blinded questionnaire interview, with 47.6% follow up rate.	'Breastfed only' at 6 weeks	Not significant for EBF at 6 w **OR 1.38 (.68-2.81); p=0.431** Study: 30/83 (36.1%) Control: 23/79 (29.1%)

Policy period 2			
Baek et al., 2007 Pre-post, quasi-experimental study design	Three evaluation sites in the Pietermaritzburg area of KZN recruited urban and peri-urban mothers (18-49) who knew their HIV status and were either 6–9 months pregnant or 12 weeks or less postpartum.Two cross-sectional surveys were conducted, baseline prior to mothers to mothers (m2m) intervention and another one year after m2m was introduced. At baseline data collection in 2005 before m2m was introduced. m2m was a peer support program that provided education and psychosocial support to HIV-positive pregnant women and new mothers through health talks, counselling & support groups and outreach. Two or more contacts were counted as study exposure.	Exclusive feeding practices: EBF EFF	Not significant for EBF **p>0.05 (bivariate) for EBF** Study: 11% Control: 15% **p<0.01 (bivariate) for EFF** Study: 78% Control: 61%
Bland et al, 2008 Non-randomized intervention cohort	Lay counsellors trained on theWHO/UNICEF Breastfeeding Counselling Course visited HIV-positive and HIV-negative women in KZN to support EBF: four times antenatally and once within 72 hours of birth. Mothers initiating breast-feeding received a further three home visits in the first 2 weeks and fortnightly thereafter for 6 months.	EBF* for six months *WHO definition	Significant for EBF at 4 months **aOR 2.07 (1.56–2.74), P<0.0001** HIV- mothers receiving visits **aOR 2.86 (2.13–3.83), P<0.0001** HIV+ mothers receiving visits
Policy period 3			
Ijumba et al, 2015 Cluster-randomized trial	The intervention was provision of community-based counselling during the first 12 weeks after birth. The intervention was delivered by 15 trained CHW living in the clusters though a structured home visiting schedule. Each visit was designated to cover specific topics related to the outcomes of the study. Visits in the intervention arm included two home visits during pregnancy, one in the first 48 h after delivery, then at 3–4 d, 10–14 d, 3–4 weeks and a final visit at 8–9 weeks. All neonates with low birth weight (≤2500 g) received two extra visits during the first week.	EBF (24h recall) for the first 12 weeks *Adjusted for cluster, household asset score level and maternal education level*	Significant for EBF at 12w **Total: aOR 2.31 (1.82-2.93)** Study: 441/1629 (27.1%) Control: 260/1865 (13.9%) **HIV- : aOR 2.70 (2.01-3.70)** **HIV+ : aOR 1.70 (1.32-2.20)**

Rotheram-Borus et al., 2014 Cluster-randomized trial	The intervention was a home visiting intervention by community-based workers (CBWs) trained in cognitive-behavioural strategies to address health risks (by the Philani MCH and Nutrition Programme), in addition to clinic care (the control). CBW home visitors were selected from community role models prior to training.	EBF for six months	Significant for EBF at 6m **OR=3.59 (1.91-6.75)); p<0.001** Study: 10.3% Control: 3.1%
Some et al, 2017 Clinical trial (RCT)	The intervention was provision of infant prophylaxis in the breastfeeding period plus one week from day 7 to 50 weeks of age with either lopinavir/ritonavir or lamivudine in four countries. HIV-1 positive mothers enrolled in the RCT were not eligible for HAART due to CD4 counts >350 cells/mm3. Country-specific hazard ratios for shorter duration of EPBF were calculated for a number of variables (see Table 3.1.5a).	Combined EBF and Predominant BF into one group (EPBF) * *PBF very low	Significant for shorter EPBF **aHR 3.0 (1.6-5.5) for lop/rit** aHR 1.4 (1.1-1.9) age 25-30 aHR 1.6 (1.2-2.1) married aHR 1.3 (1.0-1.6) employed aHR 1.6 (1.2-2.1) multiparous
Tomlinson et al, 2014 Community-based cluster RCT	Goodstart was a structured home visiting intervention where study CHWs provided two pregnancy visits and five post-natal home visits in Umlazi, Durban, South Africa. CHWs were living in the mothers' neighbourhoods and received a10-day training on PMTCT, Integrated Management of Childhood Illness, lactation counselling and newborn care guidelines. They were also trained on motivational interviewing techniques.Control CHWs provided information and support on accessing social welfare grants and conducted three home-based visits: one during pregnancy and two during weeks 4–6 and 10–12 post-delivery.	EBF for 12 weeks	Significant for EBF at 12 weeks **RR 1.92 (1.59-2.33); all** Study: 28.6% EBF Control: 14.9% EBF **RR 1.53 (1.22-1.94); HIV+** **RR 2.16 (1.71-2.73) ; HIV1**
Tylleskar et al, 2011 Cluster RCT	In the PROMISE-EBF intervention group, peers living around the study areas were trained for one week. Study peers provided 1 antenatal breastfeeding visit and 4 post-delivery visits. Control peer cousellors followed the same schedule, but assisted families in obtaining birth certificates and social welfare grants. The peer counsellors for the intervention and control clusters were kept separate during the study.	EBF at 12 and 24 weeks using 24h and 7 day recall measures *Adjusted for clustering and site*	Significant for all EBF measures; 24 week prevalence ratios (PR) shown **PR 5.70 (1.33-24.26); 24 hr** **PR 9.83 (1.40-69.14); 7 day** Study: 2% (both 24h & 7 day) Control: <1% (both 24h & 7 day)

Policy Period 4			
Horwood et al, 2017 Cluster RCT	The continuous quality improvement (CQI) intervention, CHWs provided home-based education and support to pregnant women and mothers. All CHWs received a10-day government training on community-based care of women and infants.Intervention CHWs received a 2-week training in WHO Community Case Management followed by 12 months of mentoring.	EBF for 6 weeks	Significant for EBF at 6 weeks **OR 1.7 (1.1-2.7); at follow-up** Study: 76.7% Control: 65.1% **OR 2.3 (1.4-4.0); change before and after intervention**
Myer et al, 2018 Parallel arm RCT	The MCH-ART intervention provided integrated postnatal service to HIV+ mothers and their infants within the MCH clinic. At each postnatal visit nurse-midwives asked questions about infant feeding. The local standard of care acted as a control and involved immediate postnatal referral of HIV+ women on ART to general adult ART services and their infants to separate routine infant follow-up.	EBF at 6 months* *Calculated from Figure 4 numbers	Significant for EBF 6 months **p<0.001** Study: 67/211 (31.8%) Control: 26/219 (11.9%)
Reimers et al, 2017 Cluster RCT	For this intervention, HIV+ mothers identified "Feeding Buddies" (FB) to support them. Two hour-long training sessions were scheduled prior to delivery at regular ANC visits. Two follow-up training sessions occurred at the 3 day and 6 week well-baby clinic visits. Where possible, the mother and her buddy were trained together. Mother-buddies were also given a take-home booklet to reinformce messages.	EBF at 22 weeks	Not significant for EBF at 22 w **p = 0.67** Study: 109/255 (42.75%) Control: 105/235 (44.68%)
Tuthill et al, 2017 RCT	The Information–Motivation–Behavioural Skills (IMB) model was applied for HIV+ women on ART during their third trimester of pregnancy. The intervention was a one-time, 45-minute tailored, one-on-one motivational interviewing counselling session with a trained female counsellor. The control was standard of care.	EBF at 6 weeks	Not significant for EBF at 6 w **p=1.00** Study: 81.5% Control: 81.5%

Qualitative findings

A total of 34 qualitative studies (including nine mixed-methods studies from which qualitative data were extracted) representing 31 distinct studies[4] were reviewed (see Table 3.6.1). Although the publication dates only ranged from 2000 to 2017, all policy periods were covered. Four studies were conducted in the first period, three led by the sociologist Gill Seidel. Most studies were conducted during Periods 2 (n=14) and Period 3 (n=11), highlighting the increased value placed on qualitative inquiry. Since then, in Period 4, five studies using qualitative methods have been published on the influences on infant feeding in South Africa.

A range of qualitative study designs were applied, from ethnography [5, 6 & 17] to phenomenology [27], although 17/25 publications that used purely qualitative methods did not name a design or simply referred to their methods as qualitative. In terms of settings, studies were conducted in urban, peri-urban/township, and rural settings, with a bias for peri-urban or township environments. The most popular study provinces were KZN (n=13), WC (n=13), GP (n=8), and the EC (n=6) followed by LP (n=3) and the NW (n=1). Strikingly, no qualitative studies meeting search criteria had ever been published from Mpumalanga, Free State, or the Northern Cape provinces, highlighting a gap.

[4] Articles 2 and 3, 5 and 6, and 21 and 22 in Table 3.1.6 reported on different aspects of the same studies.

Table 3.1.6. Articles from which qualitative data were extracted, by policy period							
#	**Article Ref**	**Study Design**	**Setting (R=rural; PU/T= peri-urban/ township; U=urban)**	**Sample Characteristics**	**Data Collection Methods**	**Infant Age**	**Analysis**
Period 1 (1980-1999)							
1	Kruger & Gericke, 2001	Mixed methods	R (Moretele, NW)	154 caregivers *-24 caregivers of infants <6m*	24 FGDs *-4 FGDs*	0-36 months	Ethnographic content analysis
2	Seidel, 2000	Sociological, informed by discursive theory & feminist scholarship	U (Pietermaritzburg, KZN)	Healthcare workers	IDIs (semi-structured & open)	Not relevant	Social constructionism
3	Seidel, 2004	Sociological, using ethnographic and multiple qualitative methods Critical & discursive theory, feminist	R & U (Sundumbili, Songonzima Songonzima, Edendale & Pietermarizburg, KZN)	120 multiparous mothers Traditional birth attendants (TBAs) Health workers, AIDS counsellors & doctors	IDIs (semi-structured & open) Group discussions Interviews	Not stated	Discursive
4	Seidel et al., 2000	Sociological	U (Durban, KZN)	13 HIV+ mothers who attended a peer support group	2 in-depth discussions, including role play	Not stated (some dead)	Social constructionism

Period 2 (2000-2007)							
5	Buskens & Jaffe, 2008	Ethnographic	R (Watersmeet, KZN, Idutwa, EC) PU/T (Soweto, GP; Langa & Hanover Park, WC, Motherwell, EC) U: (Ladysmith, KZN, Ravonsmead, WC) *+ Namibia & Swaziland*	82 HIV+ mothers in PMTCT 2 pregnant women 15 relatives 7 counsellors 7 nurses 3 PMTCT coordinators	In/formal interviews; 7 FGDs; Observations	Not specified	Conceptual framework analysis and analytic retroduction
6	Buskens, Jaffe, & Mkhatshwa, 2007	Ethnographic	Same as above	Not disaggregated by country; likely same as above	In/formal interviews; FGDs; Observations	Not specified	Conceptual framework analysis
7	Chopra et al, 2002	Mixed methods, rapid assessment	PU/T (Khayelitsha, WC)	11 HIV+ mothers 11 counsellors	IDIs (structured)	Not specified	Content analysis
8	Doherty et al, 2006 (a)	Qualitative	R (Rietvlei, EC) PU/T (Paarl, WC, Umlazi, KZN)	40 HIV+ mothers Community health workers (CHWs)	40 IDIs (semi-structured) 3 FGDs (8-10 in each)	8 months (mean age)	Thematic content
9	Doherty et al, 2006 (b)	Qualitative, longitudinal	Same as above	27 HIV+ mothers at pregnancy then, 1, 4, 6 12 weeks postpartum	116 IDIs	12 weeks	Thematic analysis

10	Du Plessis, 2009	Mixed methods	U (Johannesburg, GP)	6 primigravidaes attending new mother support group at private clinic	6 IDIs	>6 weeks	Descriptive analysis
11	Hildebrand, Goemaere & Coetzee, 2003	Mixed methods	PU/T (Khayelitsha, WC)	38 HIV+ mothers in a PMTCT programme	FGDs	12 weeks mean age	Not specified
12	Mackowski, 2005 [MA Thesis]	Qualitative	PU/T (Khayelitsha, WC)	5 HIV+ mothers in the m2m programme 3 mentor mothers 3 site coordinators	11 IDIs (semi-structured)	3-9 months	Grounded theory approach
13	Nor et al, 2009	Qualitative	R (EC) PU/T (WC) PU/T (KZN)	27 mothers	17 IDIs 10 Observations	12-24 weeks	Not specified
14	Nor et al, 2011	Qualitative, emergent inductive design	See above	17 HIV+ and HIV- mothers	17 IDIs (semi-structured)	12-16 weeks	Qualitative interpretive description & social constructivist conceptual framework
15	Sibeko et al., 2009	Qualitative	PU/T (KZN)	11 mothers (HIV+ and HIV-)	IDIs	3 months (avg.)	Content analysis
16	Stinson & Myer, 2012	Not stated [Qualitative]	U (Cape Town, WC)	11 HIV+ ≤ 6-month postpartum *17 HIV+ pregnant*	IDIs	<6 months	Thematic approach to narrative analysis

17	Thairu et al, 2005	Ethnographic nested in cohort study	R (KZN)	22 HIV+ mothers, part of cohort study	Ethnographic interviews (semi-structured)	Not stated	Conversation and thematic analysis
18	Varga & Brookes, 2008	Narrative research - Participatory	PU/T (Mankweng , LP) R (Siloam, LP)	10-15 teen mothers, clinic staff, VCT counsellors & young adults 100 teen mothers (50 rural:50 urban) Teen (15-19 year old) mothers	2 Key informant workshops Community-based survey 2 FGDs (10-12 each)	Not stated	Grounded theory approach
Period 3 (2008-2011)							
19	Andreson et al, 2013	Mixed methods, longitudinal	R (Butterworth & Nozuko, EC)	12 HIV+ mothers 12 "Buddies"	IDIs (3x) IDIs (3x)	2-6 months by end	Content analysis
20	Chaponda, Goon & Hoque, 2017	Qualitative	U (Thembisa, GP)	30 HIV+ mothers in postnatal wards	IDIs Observations	Not specified	Thematic analysis
21	Goosen, McLachlan & Schübl, 2014 (a)	Mixed methods	PU/T (Avian Park & Zwelenthemba, WC)	65 mothers *-17 EBF/predom.* *-19 partial BF* *-29 no BF* 26 fathers 20 grandmothers 9 healthcare workers (HCWs)	7 FGDs *-2 FGDs* *-2 FGDs* *-3 FGDs* 3 FGDs 2 FGDs 1 FGD	<6 months	Thematic

22	Goosen, McLachlan & Schübl, 2014 (b)	Qualitative	See above	36 mothers *-17 EBF/predom.* *-19 partial BF* 26 fathers 20 grandmothers 9 HCWs	4 FGDs *-2 FGDs* *-2 FGDs* 3 FGDs 2 FGDs 1 FGD	See above	Content analysis
23	Ijumba et al, 2012 *[NB: all formula feeding mothers]*	Qualitative	PU/T (KZN)	11 HIV+ mothers 9 HIV- mothers 14 grandmothers 13 fathers 13 teen mothers	11 IDIs 9 IDIs 2 FGDs (7;7) 2 FGDs (7; 6) FGD HIV+ (7) FGD HIV- (6)	<6 months	Thematic analysis
24	Laher et al, 2012	Mixed methods, concurrent	PU/T (Soweto, GP)	45 HIV+ mothers of HIV+ infants in PMTCT programme	35 structured interviews 2 FGDs (10)	Not stated	Thematic and content analysis
25	Madiba & Langa, 2014	Qualitative 2011-2012	U/T (Tshwane, GP)	43 HIV+ mothers	5 FGDs	3-6 months	Thematic data analysis
26	Madiba & Letsoalo, 2013	Not stated [Qualitative]	U/T (Tshwane, GP)	25 HIV+ mothers in PTMCT programme	4 FGDs	6 weeks to 6 months	Thematic data analysis
27	Ramara, Maputle & Lekhuleni, 2010	Phenomen-Ological	R (Mankweng, LP)	10 HIV+ mothers	30 IDIs (3x)	2-24 weeks	Tesch's open-coding
28	Swarts, Kruger & Dolman, 2010 **Unclear sample size*	Not stated [Mixed methods]	R (Lower Umfolozi District, KZN)	22 mothers staying at hospital lodge (infants had complications)	4 FGDs (8 each), but only 3 used b/c data saturation*	Not stated	"Coded by topic"

29	Zulliger, Abrams, & Myer, 2013	Mixed methods, convergent parallel	PU/T (Gugulethu, WC)	12 HIV+ mothers (out of 34, which included pregnant)	IDIs (semi-structured)	"Recent postpartum"	Open-coding and Thematic
Period 4 (2012-2018)							
30	Hunter-Adams et al, 2016	Qualitative	U (Cape Town, WC)	23 Congolese, Somali and Zimbabwean mothers 21 men and 27 women from three countries	IDIs 9 FGDs (3 male & 6 female, by origin)	Mothers had to have given birth in past 2 years	Thematic analysis
31	Jama et al, 2017	Qualitative, longitudinal cohort	R (KZN) U (KZN)	22 mothers (including some teenagers 15-19, HIV+ and working) who intended to EBF	125 IDIs	<6 months	Framework analysis
32	Modiba, 2015 *[NB: all formula feeding mothers]*	Qualitative, exploratory, descriptive & contextual	U (GP)	12 HIV+ mothers enrolled at least 3 months in PMTCT Programme	IDIs (semi-structured)	Not stated	Thematic content
33	Mushaphi et al., 2017	Nested qualitative in cohort study	R (Dzimauli, LP)	37 caregivers	4 FGDs (7-10 each)	6 months	Thematic content analysis
34	Ntuli & Modibedi, 2015	Qualitative, exploratory	U (Tshwane, GP)	32 HIV+ mothers in PMTCT programme	5 FGDs (6-8 each)	6 weeks to 6 months	Thematic content analysis & open coding

The people sampled for qualitative studies were strongly biased towards exploring the feeding influences of HIV positive mothers (23/34). Less than half of the studies included mothers who were HIV negative (4) or had an unspecified HIV status (8). Among mothers, some were purposively sampled based on age, parity, work status or feeding preference. The ages of the mothers' infants was not stated in all cases. Where it was, there was variation, from mothers of neonates [20] to those whose infants had an average age older than 6 months [8] and some whose infants had died [4]. This is relevant in terms of interpreting feeding influences. Health workers, as key influencers, were also common study participants, featuring in eight studies. Five studies included family members, usually fathers or grandmothers. Four studies also included PTMCT or intervention programme staff in their sampling strategy. A total of 21 (61.8%) studies used interviews for data collection, with group discussions being the second most popular form of data collection (15/34), often with a mixture of the two. The use of novel [2-4, 17] and participatory [18] methods were used in a few instances, complementing more traditional forms of data collection. Qualitative data were analysed in a number of ways, with variations of thematic, content, and framework analyses being the most common.

Table 3.1.7. Qualitative findings by themes and sub-themes by ecological level, with article references	
Levels and factors	**Article references**
Individual level	
MOTHER ATTRIBUTES **Mother HIV positive status:** Being HIV positive has influenced feeding choices and exclusivity across policy periods, mostly towards EFF but recently EBF: ***Fear of HIV transmission to the infant*** was discussed mostly around mixed feeding, although fears of any breastmilk were expressed consistently ***Knowledge about transmission risk*** in breastmilk and while on ART tended to be inaccurate, usually overestimating risk (except early on) ***Fear of disclosure through feeding method (formula and/or exclusivity)***, based on perceived community norms (see Community) ***Timing of HIV diagnosis***	[2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 14, 15, 16, 17,19,20, 21, 23, 24, 25, 27, 28, 31] *[4, 5, 6, 7, 8, 9, 11, 12, 14, 15, 16, 17,19, 20, 21, 23, 25, 27, 28, 29, 31, 32, 34]* *[2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 14, 15, 17, 19, 20, 25, 27, 32]*
Employment: The need to find work and/or go to work, resulted in formula feeds ***Unemployment:*** While generally supporting EBF, financial dependence also limited perceived choice	[2, 3, 4, 7, 9, 11, 22, 28, 29, 30, 31, 33] *[1, 2, 3, 7, 11, 17, 22, 23,25]*
Young age/Adolescent: Young mothers talked about having less power to decide on feeding choices (see also Household). Some age-specific barriers to EBF: ***Return to school,*** resulting in a shift to formula ***Body image***,such as sagging breasts due to breastfeeding	[17,23] *[2, 7, 23, 28, 31, 33]* *[2, 4, 23, 29]*
Past feeding experiences: Depending on the outcomes of experiences, this could influence current choices	[3, 4, 5, 6, 7, 12, 13, 29, 30, 34]

Breastfeeding knowledge: Accurate knowledge assisted EBF, particularly: ***Milk sufficiency****:* Knowing that breastmilk was enough for an infant ***Duration:*** Knowing how long to breastfeed exclusively ***Superiority:*** Being able to cite the superiority of breastmilk over formula ***Low cost:*** Avoidance of formula costs supported breastfeeding choice	[1, 2, 4, 5, 6, 7, 8, 9, 11, 12, 19, 20] *[4, 5, 6, 11, 12, 14, 15, 19, 20, 22,27, 29, 30]* *[5, 10, 12, 14, 20]* *[1, 2, 3, 4, 6, 8, 17, 25, 28, 29, 31, 33]* *[3, 11, 13, 19, 20, 25, 28]*
Contamination beliefs: Ideas that social or behavioural interactions could taint the quality of breastmilk and be passed onto infants threatened EBF	[2, 3, 11, 22]
Self-efficacy/confidence to breastfeed: When low, this was also a threat to EBF	[7, 8, 12, 31]
Expressing: Willingness and ability to express breastmilk supported EBF	[3, 31]
<u>INFANT ATTRIBUTES</u>	
Temperment, especially crying: Crying was often interpreted as hunger or discomfort, leading to mixed feeding. Feeding was also used to silence crying.	[1, 3, 4, 7, 12, 14, 15, 19, 21, 22, 27, 30, 31, 33]
Growth: Mothers used growth to identify if feeding choices were appropriate.	[1, 4, 5, 6, 14, 15, 19, 22, 28, 30]
Health events: Conditions like oral thrush or HIV conversion led to feeding changes, usually away from EBF	[3, 4, 9, 10, 11, 15]
<u>MOTHER-INFANT RELATIONSHIP</u>	
Current feeding experiences: The way feeding was experienced by mothers influenced whether feeding choices were maintained or not	[1, 3, 4, 5, 6, 9, 10, 11, 12, 13, 14, 20, 29, 31]
Practicality/ease: How well a feeding choice was perceived to fit with lifestyle	*[1, 3, 6, 9, 12, 20, 23, 25, 28, 29, 30, 31, 33, 34]*
Percieved sufficiency: Whether mothers felt their infant was satiated by milk	*[1, 3, 4, 5, 6, 7, 9, 10, 11, 14, 15, 20, 30, 31, 34]*
Bonding/love: Mothers feeling closer to their infants supported EBF	*[3, 5, 6, 11, 12, 14, 28]*
Breast problems: Mastitis, engorgement, and cracked nipples hindered EBF	*[1, 3, 6, 10, 11, 12]*
Food insecurity: Mothers felt their own food insecurity contributed to insufficient milk, which led to mixed feeding	*[6, 30]*
Latching: When infants struggled to latch, breastfeeding was abandoned	[10, 32]

Settings level	
<u>HEALTH SYSTEMS AND SERVICES</u> **Medical advice/counselling:** Health workers were reported to influence feeding choices, both for or against EBF, based on their advice and the following: ***(In)consistency of messages:*** Within-facility inconsistencies were particularly damaging to EBF, often noted between PMTCT and labour wards ***(In)adequate messages:*** Mothers often felt there were not told things that would have assisted them to make a choice or prepare for challenges ***EBF only:*** If clear, single messages supported EBF, but messages were also experienced as inconsistent with community knowledge and/or experiences	[1, 2, 3, 4, 5, 7, 8, 9, 10, 12, 14, 15,17, 20, 22, 24, 25, 27, 28, 29, 31, 32, 33, 34] *[3, 4, 5, 7, 8, 9, 10, 12, 14, 15, 20, 24, 27, 29, 31, 32]* *[1, 2, 3, 4, 5, 7, 10, 12, 14, 15, 17,20, 22, 24, 29, 31]* *[3, 4, 5, 14, 20, 25, 29, 31, 34]*
Free formula programme: This reduced EBF practices and had its own issues: ***Insufficient/stock-outs:*** Mothers using the programme reported not having enough to feed their infants and resorting to mixed feeding ***Brand stigma:*** Associations between Pelargon formula from government and HIV meant mothers tried to buy alternatives or hide brand	[3, 4, 5, 6, 8, 9, 12, 14, 15, 16, 19, 20, 24, 25, 28] *[4, 6, 7, 8, 9, 12, 14, 15, 17,19, 24, 25]* *[12, 24,27, 29, 32]*
Mother-Baby Friendly Hospitals: These facilities were noted by mothers, often by the forceful attitudes of staff as well as pro-breastfeeding practices: ***Restricting bottles or formula:*** This was often described in the context of mothers hiding their feeding practices or being "forced" to change practices ***Lack of separation***, where mothers were able to stay with infants helpd breastfeeding, although not all MBFH's followed through ***Latching support***, provided by health workers was highly appreciated	[2, 4, 5, 10, 12, 31, 34] *[2, 4, 5, 10, 12, 34]* *[9, 10, 31]* *[31, 33]*
<u>FAMILY SETTING</u> **Family influence:** Family members, particulary mothers, influence decisions. Fathers and siblings also influence. Specific influences included: ***Socio-cultural:*** Pressuring mothers to follow cultural/family practices of feeding or cleaning that threaten EBF ***Living/caregiving arrangements:*** Influenced decisions, giving family members more say over feeding practices, especially of young mothers	[1, 2, 3, 4, 5, 6, 8, 9, 10, 12, 14, 15, 17, 18, 19, 20, 22, 23, 24, 25, 26, 27, 29, 31, 32, 33, 34] *[2, 3, 4, 5, 6, 8, 9, 12, 14, 15, 17, 18, 20, 22, 25, 26, 31, 33]* *[2, 3, 4, 8, 9, 12, 15, 17, 20, 22, 23, 25,27,28,29]*

Financial dependency: Families who financially supported mothers and infants had more say over feeding practices	*[2, 3, 6, 8, 9, 12, 14, 15, 20, 22, 23]*
Family support for HIV positive mothers: This was strongly linked to support for EBF if the mothers disclosed	[2, 4, 5, 6, 7, 8, 9, 12, 15, 17, 18, 19, 20, 23, 25,26,27]
Threat of violence/abandonment: These fears worked against disclosure	*[2, 3, 4, 5, 6, 18, 27, 32]*
WORKPLACE/SCHOOL SETTING	
Employee letters: One mother talked about trying to influence an employer to support EBF through a letter from the clinic.	[27]
COMMUNITY SETTING	
Gossiping/HIV stigma: This was raised as an EBF barrier, as the practice is linked to HIV, which mothers addressed in the following ways:	[3, 4, 5, 6, 7, 8, 12, 13, 14, 15, 17, 18, 24, 25, 26, 27, 28, 29, 32, 34]
Concealment: Where mothers hid their true feeding practice to avoid stigma	*[3, 8, 12, 15, 17, 24, 25, 26, 27, 29, 31, 32, 34]*
Explanation: Where community is educated about importance of EBF to gain support and to address/reduce HIV stigma	*[5, 12, 19]*
Community support interventions: Several articles described these directly:	[5, 11, 12, 13]
Buddies/peers/mentor mothers: Mothers appreciated locally available support to advise or encourage them in the community setting	*[12, 13, 19]*
Postnatal support: A variety of ideas were suggested by mothers in addition to actual support through postnatal counselling, support groups and income generation projects.	*[5, 7, 11, 12, 22, 31]*
Milk bank/wet nurse: This was noted as a support option only once	*[3]*
Structural level	
SOCIO-CULTURAL CONTEXT	
Mixed feeding norms: Expecations to mixed feed from family and community were consistently referenced as a challenge for EBF	[1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 14, 15, 18, 23, 25, 26, 31, 33]
Breastfeeding norms: They expectation to breastfeed (often as part of mixed feeding) was noted by mothers across all policy periods	*[1, 2, 3, 4, 11, 12, 14, 15, 17, 32]*

Motherhood norms: Ideas of what it meant to be a good mother influenced decisions	[2, 3, 4, 5, 6, 16, 31]
HIV stigma against formula feeding, was reported widely	[2, 3, 4, 7, 8, 9, 11, 12, 14, 15, 16, 17, 19, 24, 25, 28, 29, 32]
HIV stigma towards any sort of exclusive feeding was also reported	[2, 3, 4, 5, 7, 8, 9, 14, 15, 34]
HIV stigma towards intervention, such as buddies, was another experience	[12, 13]
MARKET CONTEXT	
Culture of commercial formula: A few articles highlighted how use of commercial formula is perceived as a culture in South Africa, preferred above other complementary foods	[21, 22, 30]
Breastfeeding promotion: Mothers talked about how materials/campaigns promoting breastfeeding influenced their decisions, with a call for clear messages	[14, 15]
Media engagement: Mothers discussed channels they use to seek out information on infant feeding via the Internet or social media	[33, 34]

Synthesis of qualitative and quantitative findings across ecological levels

The HIV epidemic and prevention efforts are an important part of the breastfeeding narrative, with multiple chapters. Following HIV positive mothers over time helped us understand breastfeeding decision-making. A meta-synthesis of the qualitative studies (see Table 3.1.7) helped us gain insight into how, as guidance about transmission risk changed from EFF to EBF, mothers' behaviours also changed to provide the best health prospects for their infants. Both quantitative (Tables 3.1.5a) and qualitative studies (Table 3.1.7) are clear that fear of HIV transmission has informed the choices of most HIV-positive mothers, particularly demonstrated by their greater commitment to exclusive feeding when compared with HIV-negative counterparts. Those with recent diagnosis seem more influenced by external actors, such as health workers, about infant feeding recommendations (which are now more EBF-promoting).

Women's intentions to follow health advice have been mitigated by fears that their HIV status would be disclosed by their feeding practices (see Table 3.1.8), which was particularly clear in the qualitative studies. HIV positive mothers expressed fear of gossip and stigma at the community level, and referred to the risk of inadvertent disclosure. During the period that the government provided formula, mothers did not want to be seen with the government brand of formula, Pelargon, going so far as to sell it to buy other brands or by transferring the formula into the tins of commercial brands. While the end of the free formula programme has made these strategies mute, any sort of exclusive feeding practice has been described with fear. This is because mixed feeding avoidance is perceived by community members to be practiced only by HIV-positive mothers. Active disclosure to intimate partners and family members was often described as a positive experience, but it was avoided when mothers feared violence or abandonment. Even with family support, mothers

described strategies conceal exclusive feeding practices in public since perceived exclusive feeding was assumed always associated with HIV positive status, with little if any campaigns to disabuse them of this notion.

Young and unemployed mothers have been particularly vulnerable to abandoning EBF for reasons of gendered cultural expectations in their households and low perceived power. Those who wished to return to school opted for formula; expressing milk was not mentioned as a viable option, nor did anyone mention negotiating breastfeeding in the school setting. It was not uncommon for such young mothers to pass on child rearing responsibilities to their mothers; in doing so, they surrendered any ability to influence and determine decisions over infant feeding (Ijumba et al., 2014). Within patriarchal kinship networks, females faced expectations of unquestioning submission to the instructions of their elders, with mother-in-laws wielding particular power (if married). When elders differed in their beliefs about feeding, young mothers described deferring to family wishes and lying to health workers as their most common strategy to negotiate infant feeding. Financial dependence created added pressure to adhere to family wishes. In some instances, young mothers wanted to keep the baby's father involved by requesting that he provide formula. Concerns about their body, e.g. saggy breasts, were also mentioned as barriers by younger women, although these concerns were mentioned far less often than powerlessness in the family unit.

Older mothers face their own set of challenges. Those who were employed or looking for work opted for formula or mixed feeding. Those with more than one child, often based their decisions on how the firstborn fared. If he or she survived mixed feeding, shifting to exclusive feeding was less likely, especially because of community mixed feeding norms. Practical considerations were often raised. Mothers who felt that breastmilk was cheap and easy, breastfed, whereas those who experienced pain and did not mind preparing formula went the opposite way. The discomfort and demands of breastfeeding, ranging from

complaints of breast problems to sleepless nights, were rarely disclosed to new mothers and described as reasons for abandoning breastfeeding.

Both young and older mothers reported family and community pressure to mixed feed across all four policy periods. Some of this advice comes from traditional practices or requirements. The most consistent reasons for complying with family pressure related to seeking to quiet a crying baby or fulfilling expectations about what an infant "needs." Common beliefs about milk being insufficient have a strong role to play here at both household and community levels, which feed into mixed feeding norms. All of these factors contribute to whether a mother feels confident or has self-efficacy to EBF, which is strongly linked to the practice. One more recent study has also highlighted the role of mental health, particularly antenatal depression, as a barrier to EBF.

The healthcare setting has been noted as a critical space for establishing breastfeeding or not and as a source for breastfeeding (and HIV tramission) knowledge. Inconsistent and inadequate counselling by health workers was most often attributed with abandoning EBF. Confused mothers often referred back to lay knowledge and direct observations of their children's growth in a context where they were not given clear and consistent messages. This was more pronounced for HIV positive mothers. The free formula programme, most often discussed during policy periods 2 and 3, eroded trust in EBF. While it no longer directly influences choice, confusion about optimal feeding among both mothers and healthworkers has carried into the current policy period. Other practices related to MBFI have also been reported across all periods. While the practice of prelacteal feeds (health workers feeding infants formula before breastfeeding could be established) was only reported in the first two periods, experiences of mothers being separated from their infants after delivery have persisted. We focused on MPFI practices versus accreditation, because of reports of MPFI accredited facilities not following the 10 steps. On the positive side, health services provided during the

postnatal period, including home visits and support groups, have been linked to increased and longer EBF, particularly when trained CHWs were involved.

There are gaps in terms of exploration of school- or work-based interventions that can promote EBF in the South African context. Neither promotes EBF. Commercial formula marketing and the media space in general have been understudied.

Discussion

While different policies and guidelines have influenced infant feeding, most obviously through health workers counselling practices and the free formula programme, this systematic review has highlighted the most persistent multi-level influences of EBF over time. The observation by Lazarus et al (2013) about the complex factors that constitute infant feeding decision-making are clearly illustrated in this review. While some clearly require health systems responses, such as limiting the time mothers and infants are separated after delivery, many fall well outside of the health system. Referring back to the adapted conceptual framework (see Figure 3.1.1), a range of interventions are needed to address barriers to EBF and build on existing opportunities and efforts. These recommendations are made by level:

Interventions to support mothers and infants remain important. Counselling and information sharing that clarifies the benefits of EBF for all infants and the risk of HIV transmission through breastfeeding are needed for mothers and HWs alike. Specific attention needs to be paid to engaging with past experiences and individual risk for infants. Early diagnosis and treatment of depression is also likely to help. For mothers facing HIV disclosure and the potential of violence or abandonment, specialized attention is needed. For young mothers, engagement with their families and school environments is most likely to increase EBF rates.

Table 3.1.8. Synthesis of key positive (green; --), negative (red; - -), and mixed (yellow; **) influences on EBF from 1980-2018

Period 1 (1980-1999)	Period 2 (2000-2007)	Period 3 (2008-2011)	Period 4 (2012-2018)
Structural (Sociocultural & Market)			Social media/Internet
Breastfeeding promotion		Commercial formula "culture"	
Mixed feeding norms			
Breastfeeding norms			
HIV stigma against formula…			
Motherhood expectations	and exclusive feeding		
Settings – Hospital			
Health worker counselling/advice			
Prelacteal feeds			
Separating mothers & infants			
Postnatal visits/support by HWs			
Free formula programme			
Settings – Household			
Family advice & caregiving support			
Infant cleansing rituals			
Gender & power relations			
Support for mother after disclosure			

Settings - Community			
HIV stigma/gossip			
Community-based support efforts			
Work/school environments			
Infant Attributes			
Growth			
Disposition (crying, calm, etc.)			
Health events, e.g. HIV conversion			
		Breastmilk refusal	
Mother Attributes			
HIV-infected (Fear of transmission)			
Breastfeeding benefits knowledge			
Breastmilk contamination beliefs			
Milk insufficiency belief			
Employed or in school			
Past feeding experience			
Young and dependent on family			
	Self-efficacy/confidence		
			Antenatal depression

Within the community, there is clear scope to continue HIV stigma reduction efforts. This remains a huge barrier to HIV-positive mothers and even a disincentive to EBF for HIV-negative mothers. Norms around mixed-feeding, which is expected to be performed in public, must also be addressed through mass media and community mobilisation efforts, such as done by Alive and Thrive in other contexts (Nguyen et al., 2017). School and work policies and environments also need to be addressed systematically to shift perceptions that they are incompatible with breastfeeding.

The hospital setting presents a number of opportunities for institutions to align with MBFI practices, particularly around keeping mothers and infants together after delivery. If this is not done, the practice of hospital staff introducing prelacteal feeds or complementary feeding will continue to undermine breastfeeding. The importance of clear and compassionate counselling has been emphasized across all policy periods as a way to promote (or undermine) EBF. This needs to include content clarity on duration and what challenges to expect early on.

Our synthesis also highlight how families, particularly partners and surrogate caregivers, need to be engaged both directly and through mass media on how to support optimal feeding choices. They wield tremendous influence over infant feeding practices. By targeting these populations, individual mothers should experience less pressure to negotiate exclusive feeding in a context where it is culturally not accepted. Strategies on how to acknowledge the source of socio-cultural beliefs and respect them, without endangering the infants' health, are also needed.

A limitation of this review is that despite the large number of articles, significant population groups have not been studied: almost all studies are with African women. Cultural considerations of different ethnic groups, including Indian populations (both Muslim and Hindu) and whites, are absent from these studies. Higher socio-economic status women have

been largely neglected as well. Only one or no studies have been conducted in four provinces. As mentioned earlier, there has also been a much stronger focus on mothers than their contexts, leading to gaps in our understanding about work and school environments, and accommodation of infant feeding. The role of the media in promotion or undermining breastfeeding is also missing from conceptual frameworks. There were many studies that did not meet PICO requirements that still addressed many of the questions raised about EBF. Our framing of policy into four periods did not account for nuanced changes to PMTCT between 2010 and 2015, from Plan A, to Plan B and finally B+, which may have indirectly influenced health worker willingness to promote EBF (Landon-Myer, 2018). Finally, the quality of studies was highly variable. We applied an exploratory approach to uncover as many factors as possible, rather than excluding factors based on poor study design, except in a minority of cases discussed earlier.

Conclusion

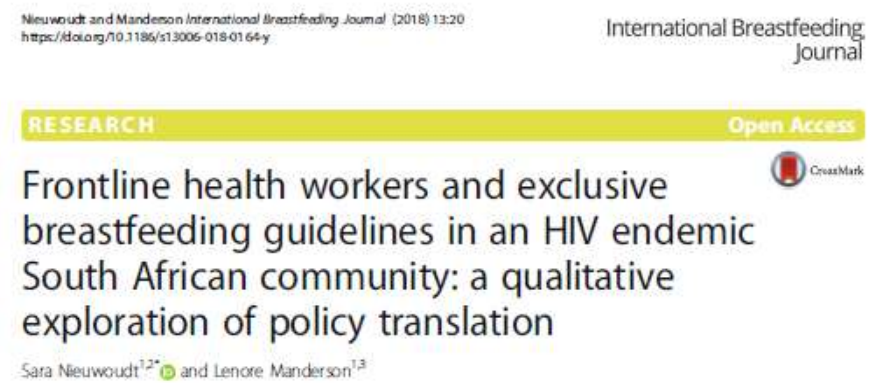
Exclusive breastfeeding for six months is possible, but it is challenging in the South African context. Beyond common barriers highlighted globally that occur at individual, settings and structural levels, South Africa must contend with an HIV epidemic that permeates all levels (South African National Aids Council, 2017). As illustrated in our synthesis, the epidemic has wreaked havoc in particular on counselling, with practices such as separating infants from their mothers also affecting EBF within the healthcare setting. This review also highlights gaps in our understanding, in relation to populations and potential blindspots in our focus on the market context, where formula and breastfeeding are promoted (or not). Barriers such as HIV transmission knowledge are relatively easy to address, whereas other factors, such as mixed feeding norms, require creative approaches that go beyond counselling individuals.

3.2 Policy Translation: Frontline health workers

The following paper was published online in the *International Breastfeeding Journal* in May 2018. It represents an exploration of the in-depth interviews with health workers about their experiences with policy change. It responds to the objective of describing what healthcare workers and other key actors believe are "the best" feeding practices for infants, in the context of HIV in Soweto. The official citation and URL are as follows:

Nieuwoudt, S. & Manderson, L. Frontline health workers and exclusive breastfeeding guidelines in an HIV endemic South African Community: a qualitative exploration of policy translation. *International Breastfeeding Journal.* (2018) 13:20 https://doi.org/10.1186/s13006-018-0164-y

Short URL: https://rdcu.be/UFUO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https://doi.org/10.1186/s13006-018-0164-y

International Breastfeeding Journal

RESEARCH Open Access

Frontline health workers and exclusive breastfeeding guidelines in an HIV endemic South African community: a qualitative exploration of policy translation

Sara Nieuwoudt[1,2*] and Lenore Manderson[1,3]

Figure 3.2. International Breastfeeding Journal article title

What follows are the title and body of the paper formatted for this integrated document.

Frontline health workers and exclusive breastfeeding guidelines in an HIV endemic South African Community: a qualitative exploration of policy translation

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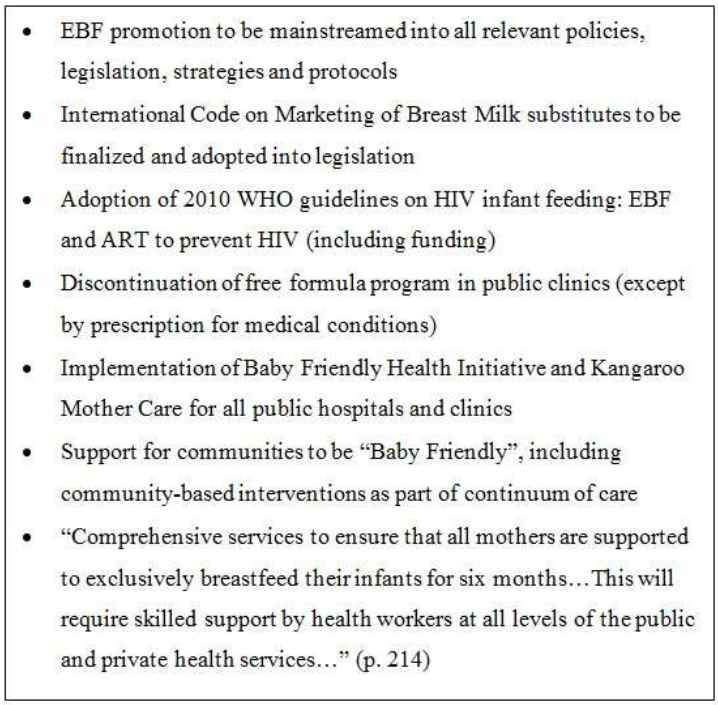
Background

All children deserve a chance not just to survive, but to thrive. The way that they are fed in the first 1000 days, particularly the first six months, plays a part in setting them on particular health and development trajectories (Rollins et al., 2016). The WHO has endorsed EBF for the first six months as optimal for all infants (World Health Organization and United Nations Children's Fund, 2016, World Health Organization, 2010a, World Health Organization, 2002), yet in 2016 only an estimated 37% of infants in low and middle income countries were exclusively breastfed (Victora et al., 2016). The definition of EBF is feeding only breastmilk, with no other liquids or solids, save prescribed medications or vitamins (World Health Organization et al., 2010).

In the complex social ecology of how infant feeding decisions are made (Hector et al., 2005), health workers (HWs) play a central role. In studies of decision making on infant care in South Africa, mothers have consistently referred to the importance of the advice they receive from HWs (Sibeko et al., 2009, Jama et al., 2017a). HW advice, when consistent, can assist mothers to persevere against community norms or family pressure to mixed feed (Mphego et al., 2014, Bland et al., 2007). Likewise, inconsistent or misguided feeding advice can confuse mothers and contribute to suboptimal practices (Sibeko et al., 2009, Jama et al., 2017a). The employment of different cadres of HWs to counsel mothers, from clinic sisters to community health workers (Horwood et al., 2017a), has increased the need to focus on the consistency and

quality of infant feeding counseling reaching mothers as they interact with the health system from the ante to postnatal period (Doherty et al., 2012, Daniels et al., 2010).

A policy feature of South Africa is that EFF for six months, also known as replacement feeding, was supported as part of the PMTCT program from 2001 to 2011; EFF was deemed optimal by HWs for HIV exposed infants during that 10-year period (Du Plessis et al., 2016). In 2011, however, the Tshwane Declaration of Support for Breastfeeding (hereafter, the Declaration) shifted infant feeding guidelines, requiring changes to the health system and counseling. The Ministry of Health's announcement of the Declaration called for unified messaging to support exclusive breastfeeding for all women and to phase out free formula to HIV positive mothers (Department of Health, 2011) (see Figure 3.2.1). The Declaration followed from the WHO's passage of new guidelines on HIV and infant feeding recommending that countries adopt either EBF with ARVs or EFF (World Health Organization, 2010b, World Health Organization, 2010a). The formula phase out in South Africa was completed in 2012.



- EBF promotion to be mainstreamed into all relevant policies, legislation, strategies and protocols
- International Code on Marketing of Breast Milk substitutes to be finalized and adopted into legislation
- Adoption of 2010 WHO guidelines on HIV infant feeding: EBF and ART to prevent HIV (including funding)
- Discontinuation of free formula program in public clinics (except by prescription for medical conditions)
- Implementation of Baby Friendly Health Initiative and Kangaroo Mother Care for all public hospitals and clinics
- Support for communities to be "Baby Friendly", including community-based interventions as part of continuum of care
- "Comprehensive services to ensure that all mothers are supported to exclusively breastfeed their infants for six months…This will require skilled support by health workers at all levels of the public and private health services…" (p. 214)

Figure 3.2.1. Tshwane Declaration Highlights

The behavioral impact of the Declaration appears to have been significant. By 2016, 31.7% of children under six months were exclusively breastfed (National Department of Health et al., 2017), compared to less than 10% in the decades preceding the policy change (Du Plessis et al., 2016). This occurred despite the challenges associated with changes, as a result of the Declaration, in the meaning of what was considered to be consistent counseling for HWs and optimal feeding for HIV positive mothers. Those who counseled before and after the change would have been subject to different infant feeding metrics, and the previously "good" practice of EFF for six months for HIV-exposed infants was replaced by an emphasis on EBF for all infants.

While the Declaration heralded higher EBF rates in South Africa, guidelines alone do not produce behavior change (Lazarus et al., 2013). Guidelines need to be translated into a format that can be interpreted and used by HWs (Baker et al., 2012). Even then their advice is only one factor: feeding is negotiated within a complex social ecology (Lazarus et al., 2013, Rollins et al., 2016, Hector et al., 2005). Our interest was in how HWs at the primary facility level, positioned at the crossroads of guidelines and communities, experienced this policy change and by implication either inhibited or supported policy translation.

While much is known about the role of HWs prior to the Declaration, less is known about how they responded to the policy change. For two decades HWs were trained in conflicting messages: that breast was "best" for child survival and that HIV could be transmitted from mother to child via breastmilk (Doherty et al., 2011a, Seidel, 2004). During this period, there was clear documentation that HW counseling was not meeting mothers' needs (Buskens and Jaffe, 2008); mothers were often confused with mixed messages (Sibeko et al., 2009, De Paoli et al., 2008, Lazarus et al., 2009). Many researchers advocated promoting a single feeding option (Doherty et al., 2011a), although some feared that this might

unintentionally increase mixed feeding among HIV positive mothers (Lazarus et al., 2013, Saloojee et al., 2011).

We applied qualitative methods to explore in depth how HWs attached to community health clinics (CHCs) in Soweto, Johannesburg, understood and were implementing the new infant feeding guidelines in late 2015 and early 2016. In this article, we explore 1) HW knowledge of the Declaration; 2) how formula removal and training influenced their counseling; and, 3) their impressions about changes in breastfeeding practices. Drawing on a phenomenological approach and its focus on lived experience (Dodgson, 2017), we asked HWs to share and reflect upon their upbringing, experiences of infant feeding, and values as these related to their experiences.

This study contributes to policy analysis, particularly policy translation. It is important for policy-makers and public health practitioners to understand how HWs experience and interpret infant feeding guidelines, as they play a critical role overall in infant feeding decision making. This case is particularly interesting because community norms about the intersection of HIV and infant feeding have been formed over more than a decade. The inclusion of HWs who were HIV positive brings to light the power of the personal as it relates to policy.

Methods

Study design

This study was embedded within a cross-sectional mixed-methods study called "Infant feeding in the Context of HIV: Soweto, South Africa," which applied a socio-ecological framework to explore infant feeding influences in one sub-district of Soweto in the context of HIV. The larger study included a quantitative cross-sectional survey of 298 HIV-infected and uninfected mothers with infants below six months of age who accessed one of the five CHCs in

the study sub-district in Soweto. The survey explored infant feeding patterns and associated factors. From this sample, 48 mothers participated in in-depth interviews to explore their decision-making processes in greater depth. Three research experts in infant feeding research in South Africa participated in key informant interviews to provide insight on policy guideline shifts. To address the health system level, eleven HWs, three of whom were HIV positive, were recruited from four of the five CHCs, and were interviewed to represent frontline service provider perspective. These interviews are the focus of this paper.

Study site

Soweto, located in the southwest of Johannesburg, has a population over one million. It was originally reserved for Black South Africans until apartheid ended in 1994, although demographic distribution since then has seen little change. At the time this study commenced, Johannesburg had antenatal HIV rates of nearly 30% (Department of Health, 2014). Health workers were recruited from four of the five busy provincial CHCs serving the study sub-district, with the aim of interviewing three to five HWs from each facility. The manager of the fifth CHC in the sub-district was also approached for permission to interview health workers, but she was unwilling to provide permission given the negative impact of previous (unrelated) studies on staff morale.

Sample

The study population was frontline HWs who influenced infant feeding decisions. Inclusion was open to any clinic staff member directly involved in counseling mothers on infant feeding; this included health center employees and non-governmental staff formally seconded to the clinics. The Primary Investigator (PI, first author) and two RAs purposively recruited eligible HWs, based on facility manager recommendations. To be eligible, study participants had to be involved in counseling both before and after the Declaration, as we wanted to explore their

experiences of the introduction of the guidelines and the influence of this on their interactions with women. Three distinct cadres of HWs were identified:

- Professional nurses (2): Stationed in antenatal, postnatal and labor wards, they conduct group health talks and individual counseling about infant feeding, and demonstrate feeding techniques. In the labor ward, they ensure mothers can feed their infants either breastmilk or formula prior to discharge; this includes breastfeeding support by ensuring latching, demand feeding and managing milk let down and supply. According to one nurse (CHC4), this was usually accomplished within six hours for breastfeeding mothers; women who formula fed took longer to discharge, as infants also had to pass meconium. Mothers who had a cesarean section also took longer to discharge because of recovery.
- Ward-based Outreach Teams (5): WBOTs are linked to the clinic and managed by government, with responsibility for home-based visits in the surrounding community (Kinkel et al., 2013, Naledi et al., 2011). They observe infant feeding and refer complicated cases to nurses, social workers, or Mentor Mothers (M2m, 2015). We identified no formal role for WBOTs to counsel pregnant mothers to breastfeed in this study. In other health contexts, WBOTs would be recognized as community health workers.
- Seconded NGO employees (4): HIV South Africa (HIVSA) employees support nurses with health education in antenatal and postnatal wards. Mentor Mothers (MMs) are HIV positive women trained by Mothers2Mothers as community health workers to support mothers attending the clinic, both inside and outside the clinic setting (M2m, 2015). All MMs we interviewed were previously clinic staff.

We conducted 11 semi-structured interviews, using a guide, between October 2015 and March 2016. Based on the richness of the interview content and convergence of findings related to their experiences, we elected to publish results, although sampling targets were unmet

due to ethical approvals expiring. As targets were not met, we did not compare clinic environments, where three from each site would have been needed as a minimum.

Data collection

Most interviews were individual, led by the PI or one of the RAs; the second author joined one interview, with the participant's consent. Both RAs were residents of Soweto: one had lived there her entire life while the other had moved there as an adult. All interviews were conducted in English and audio-recorded. In two instances, RAs supported the PI because the interviewees preferred to speak in isiZulu or Setswana at certain points. Two interviews took place at the study office, one at a NGO worker's home; the remainder took place in CHC facilities, either in private rooms or private covered outdoor areas. All eligible HWs who we approached agreed to participate.

The PI took field notes and debriefed with RAs during data collection as part of a grounded approach to incorporate new insights into the data collection process, so that beyond deductive lines of inquiry the team was able to identify iterative themes inductively. Debriefing meetings were recorded. All recordings were transcribed and translated by a professional service and quality checked by the PI (and RAs for local language). English transcripts were then imported into NVivo 10.0.

Data analysis

The PI applied thematic content analysis, using a hybrid of inductive and deductive coding (Braun and Clarke, 2006, Fereday and Muir-Cochrane, 2006). An initial framework for the codebook was created based on the study objectives to guide detailed exploration of concepts like policy knowledge and counseling content. The transcripts were then coded inductively using constant comparison, drawing on the grounded approach, to identify

participants' experiences. The PI analyzed and grouped the codes into concepts, discussed these with the second author, and further refined them into the themes and sub-themes presented here. Anonymised data are available on request from the authors.

Results

The eleven HWs ranged in age from 29 - 62. One was an auxiliary nurse and another was an advanced professional midwife. Six had matriculated from high school; the remaining three – all WBOTs – had not finished high school. In addition to being professionals, they also were mothers who at some stage in their life had to grapple with their own infant feeding decisions related to mixed feeding and duration of breastfeeding; three had a known HIV positive status and had directly experienced the changing guidelines pertaining to PMTCT. They drew on these personal experiences to support the women they counseled. As per the eligibility criteria, the HWs had been involved in infant feeding counseling before the guideline went into effect, although some had held different positions to the ones they held at the time of the interviews, such as community health workers. The amount of time they had been involved in counseling infant feeding practices ranged from five to 33 years.

Policy knowledge: Mostly organic

There was uncertainty about the policy's origin. Nurses, WBOTs and NGO staff all believed cost was a significant reason for ending the formula program. WBOTs explained that "the government can't afford it" or "can't keep giving." A minority believed that the health system changes were the result of women cheating the program to get extra formula, as one nurse explained:

> *It's a good thing that it stopped because those mothers they were so greedy most of them … they were using the cards to come and collect their milk and then she will come*

and tell that the card is vanished in the house. "I can't see it." They make another card. The person having two cards. Now she'll come with this card to collect the milk. Next time, the other card. (Nurse, CHC4)

Most were unclear about why the formula program had ended.

Specific training on the Declaration was reported only by three NGO staff members, and they were also only participants to mention the scientific basis of the Declaration. One explained:

Before the formula was given to this HIV-positive mothers, nê, and then the problem it was they don't know how to measure the formula and the babies got sick with vomiting and diarrhea. The Government researched more about formula, that the mothers should not give the formula to their babies. They must at least breastfeed, because of when they breastfeed, the breastmilk it's available always, all the time, they don't have to measure. … sometimes the place where they stay, there's no electricity there's no running water. That is why it's safer for them to breastfeed … That is why they've changed the guidelines of the mothers … They must breastfeed, all of them. (NGO1, CHC2)

A strategy of re-emphasizing old messages was how many HWs handled the new EBF-only imperative. Women explained that they had previously counseled HIV-infected women to either EBF for six months or EFF to prevent HIV transmission. NGO workers noted that now the emphasis was placed on providing all women, regardless of HIV status, the same advice:

The government is saying when you are HIV positive or not, you have to breastfeed exclusively for the first six months. … And we have to explain about the HIV, because there are lots of studies, researches about HIV. And it's when they said, no, breastfeed

exclusively. Something new is coming up every day. So whatever they are telling us to preach, we have to preach it the right way. (NGO2, CHC2)

Nurses and WBOTs had also received training on infant feeding, although mostly in the context of PMTCT, WBOTS during their orientation and nurses during the course of their service. Neither group received training specific to the Declaration. Accordingly, their counseling included reference to both formula and EBF, although now with greater emphasis on EBF.

Motivated HWs developed their own systems to remain updated on policy and to share what they learned from training opportunities*:* "When we come back, we share the information so that we are spreading one voice in the community" (NGO2, CHC2). When the free formula program ended, many emphasized the benefits of breastfeeding in counseling, as recalled from previous trainings, observations at the clinics, and personal experiences:

[Breastfeeding] saves the mother's time. It saves the mother's money, because most of our people are not working. And it gives baby a very good growth. Babies who are breastfeeding don't come to the doctor regularly. They don't get sick every time. (Nurse, CHC2)

Counseling Exclusivity: Making it exceptional

Because most HW training was not grounded in the evidence base that informed the Declaration, HWs interpreted EBF only promotion for themselves, often drawing on their knowledge from PMTCT training. This led to them to continue to focus particularly on HIV positive mothers. One nurse explained:

Each and every one who comes to the clinic to give birth we advise them …breast is best. But we focus mainly on the positive mothers. We do talk to the negative mothers but we do talk to the, we focus on the positive mostly. (Nurse, CHC4)

An unexpected finding was the difficulty HWs had in describing how to advise HIV negative women about EBF. Rather than mentioning the nutritional benefits of exclusive breastfeeding,

they focused on using condoms ("condomizing") to avoid HIV seroconversion. A WBOT explained:

> *You are breastfeeding and you've got your results as a negative mother and you also gave birth to a healthy baby child. So you start playing with your man. So we say condomize, because what will happen if you get infected and then that's why it increase that the child can – this is the other way of the child getting HIV. So if you don't condomize, you have the chance to be infected during the time of breastfeeding.* (WBOT3, CHC4)

When the PI asked one HW if she discouraged mixed feeding among HIV negative mothers, she struggled, understanding exclusive feeding's main objective to be HIV prevention. While she advocated breastfeeding, she could not see the point of emphasizing exclusive feeding for HIV negative women and their infants.

Counseling Dissonance: Promoting difficult behaviors

How does one promote a behavior one has not managed to achieve? Most HWs described their role, as counselors, to support mothers to make the final choice. "We can't choose for them, some want to feed, some they don't." (WBOT, CHC4) They expressed a desire to give "correct" advice to protect both the infant and the mother and described breastfeeding as "best," even though few had fed their own children this way. Most found it challenging to persuade women to breastfeed in ways that were consistent with the Declaration, and had experienced the same barriers their patients described in terms of family pressures, work or school responsibilities, and mixed feeding norms. One nurse started mixed feeding her son at five months due to pressure from her husband:

> *My husband was like, "No, when the child is crying ... It's because you don't want to*

give baby food. He is hungry. Hey, you are all with this stuff for the clinic. Every time clinic says this, clinic says that. No man, you are going with these things of the clinic … Give the baby food." He used to buy many boxes of Purity, Matabela [Local baby foods]. (Nurse, CHC2)

Rather than refer to the Declaration as an aid to their counseling, HWs described supporting each other, particular through teamwork, to address counseling challenges:

They [mothers] encounter a lot of challenges; the [older nurses'] attitude is not good, but with the help of Mentor Mothers and the young staff at the ANC they are helping a lot, because we work hand in hand with them. (Nurse, CHC2)

HWs gave priority in counseling to helping mothers to support their infants generally, rather than to adhere to the Declaration's EBF message. In some instances, they felt the EBF-only focus restricted open communication about choice. One counselor felt that the formula program discontinuation had removed a feeding option: "It seems like [the women] don't have the choice … we're speaking of options and choices, but this seems that they don't have a choice" (NGO2, CHC2). Other HWs discussed how the shift in clinic culture to promote EBF had resulted in some women falsely claiming that they were exclusively breastfeeding:

If they find one person shouted at her, she won't tell the truth … She's so scared, so she thinks that everyone will shout at her, especially the (nursing) sisters. Sisters like to shout at people. (CHC2)

Changes in practices - Breastfeeding 'just like that'

Participants agreed that breastfeeding initiation had increased since the Declaration, although they had not necessarily planned this. A labor ward nurse explained how mothers changed their decisions after learning that free formula was no longer available:

> *That time [pre-Declaration] there were plenty of mothers who were formula feeding. Now there are very few … When we ask them, did you bring the milk or what are you going to give your child? "Formula, I'm going to formula feed." "Did you bring the milk?" "No. Doesn't … doesn't the government issue the milk?" "No. Not anymore. From 2011 it does not issue the milk." "Oh. Okay, then I'll breastfeed." Just like that.* (Nurse, CHC3)

This nurse emphasized that last minute changes happened often, even though the formula program had ended four years earlier. Women's last minute decision-making reflected their general lack of preparedness, associated with late presentation for antenatal care and booking for delivery, and the lack of antenatal education that might have addressed feeding options prior to delivery.

Whether higher rates of breastfeeding initiation meant more EBF was unclear. The general impression across interviews was that mixed feeding (with maize gruel, tea and formula) remained a community norm, and increased breastfeeding was often framed around finance:

> *Breastfeeding is the most popular, because they feel very comfortable and besides baby formula is a bit expensive these days. Some have actually given up baby formula and gone back to breastfeeding … they may end up mix-feeding them and the child may have complications in their digestive system.* (WBOT, CHC4)

Some community-based HWs believed that removing the free formula option meant that women were more likely to introduce mixed feeding once they returned home. They emphasized this risk particularly for mothers returning to work or school, but also for those seeking to accommodate caregiving of infants by multiple people (primarily, but not only, the infant's grandmother). In addition, HWs described the difficulties experienced by HIV positive

mothers who had not disclosed:

> *HIV positive ones are having a problem. Because sometimes they say: "What if I go back to work and I find out that my child is being fed something else and then I have to breastfeed?" Others don't even breastfeed at all, they just give formula because they are scared.* (NGO1, CHC1)

The HWs gave a clear impression that HIV positive mothers continued to fear infecting their infants, despite the government's 2015 policy of providing both mothers and infants with antiretroviral therapy (ART). Multiple HWs felt that the 2015 universal ART policy had resulted in better child survival

> *So many infants died those days. But now it's better because we are using new guidelines. Each and every new HIV positive mum gets [Fixed Dose Combination] which is one hundred per cent suppressing the virus. So many children now, born from these mothers who are getting FDC are HIV negative. Even if they breastfeed, because virus is seriously suppressed.* (Nurse, CHC2)

Nevertheless, some mothers still opted to formula feed rather than risk mixed feeding by family members.

Not all study participants saw the Declaration as creating hardship for HIV positive mothers. One NGO counselor argued that the Declaration made the lives of HIV positive mothers easier, "relieving" women of the need to collect formula from the clinic and the stigma associated with this. Having government formula was previously a clear indicator that someone was HIV positive, and most HWs mentioned persisting HIV stigma in the community.

Discussion

Breastfeeding has become increasingly normative since the Declaration, potentially reducing social barriers to EBF. Observations of feeding behaviors by the HW confirmed a positive shift in breastfeeding uptake, consistent with recent statistics (Mnyani et al., 2016, National Department of Health et al., 2017). This contrasts with patterns a decade earlier, when it was difficult to find exclusive breastfeeding in urban South Africa (Sibeko et al., 2005). Even so, mixed feeding remains a strong community norm. This study also demonstrates that many mothers continue to opt for formula and seek HW advice on this, consistent with other studies conducted since the Declaration has been in effect (Jama et al., 2017a, Mnyani et al., 2016). Early unplanned pregnancy, cooperative caregiving, four-month unpaid maternity leave, food insecurity, and HIV remain barriers to EBF in South Africa (Du Plessis et al., 2016, Lazarus et al., 2013).

Even with limited knowledge of the Declaration's evidence base, HWs had formed strong opinions about the policy's contribution to increased breastfeeding. Facility-based HWs perceived improvements in child survival, consistent with another recent study in Soweto (Mnyani et al., 2016). The HWs in our study partially attributed this to the government's provision of ART to all mothers. Our inclusion of other types of HWs introduced different perspectives. The WBOTs worried that formula removal was increasing mixed feeding among HIV positive mothers, a fear expressed by researchers when the Declaration was passed (Saloojee et al., 2011). These contradictory opinions suggest that the context of care provision (facility versus community) may influence HW policy perspectives.

HWs play a critical role in framing feeding choices. Behavioral theories, such as the Theory of Planned Behavior, can harness knowledge about the nutritional and developmental benefits of EBF to improve mothers' attitudes, intentions and EBF behaviors (Guo et al., 2016). Although HWs did not frame feeding choices on the basis of new knowledge resulting from the

Declaration, their EBF and formula feeding knowledge seemed relatively high compared with government assessments of nutritional counseling by nurses. A government's assessment of nurses' knowledge of counseling messages to mothers whose children were not growing well found that less than 30% of nurses mentioned EBF for six months in two of four provinces (The Presidency, 2014). Their greatest error seemed to be in diminishing the importance of EBF for infants not exposed to HIV, as identified in the other Soweto study (Mnyani et al., 2016). Our study sample likely represented a more knowledgeable cohort of HWs than one might expect nationally, painting a more optimistic picture than elsewhere.

HWs' emphasis on breastmilk as a potential vector of HIV, as opposed to a source of nutrition, reflects South Africa's long history with HIV. The likelihood of transmission is low with ART (World Health Organization and United Nations Children's Fund, 2016). Johannesburg, the municipality where this study was conducted, has among the highest rates of ART initiation (92.1%) and PCR birth testing (70.3%) in the country (Massyn et al., 2016). The risk of seroconversion in the postnatal period exists, but HWs were likely overemphasizing this risk, creating unwarranted concern among women. Educating HWs about HIV risk communication could help them better serve mothers in Soweto (Bennett et al., 2010). In doing this, the cautionary notes of other scholars of risk communication should be heeded: scientific evidence should not be distorted (Wolf, 2007) and social risks should not be discounted (Knaak, 2010) in order to persuade women to adopt a single ideological position adopted by a scientific community or nation.

The Declaration's contribution to confusion about the counseling role needs to be addressed. HWs felt that their counseling role was undermined by the single message. The closest description of what was happening comes from a comparison of HWs from Burkina Faso, Cameroon and Cambodia (Desclaux and Alfieri, 2009); the researchers showed that rather than applying the authentic meaning of counseling to "help a mother decide what to do,"

HWs practiced more or less prescriptive counseling based on country PMTCT guidelines and health systems. A similar observation was made in another study of HWs in South Africa (Buskens and Jaffe, 2008), leading to questions about how HWs are trained to counsel. The HWs interviewed in this study were uneasy about prescribing behaviour to mothers, although many admitted to "preaching." HWs described the ethical dilemmas in counseling HIV positive mothers to breastfeed when they believed they would mix feed, echoing an earlier sociological study on this topic in South Africa (Seidel, 2004). While HIV stigma remains a barrier for disclosure (Du Plessis et al., 2016), such dilemmas are likely to arise for HWs placed in counseling roles. The pressure some HWs felt to "preach" government messages is incongruent with the principles of quality counseling.

Limitations

A key study limitation relates to transferability. We conducted a limited number of interviews from three different types of HWs in four clinics. The likelihood of selection bias was high in terms of infant feeding knowledge and interest, making our findings about low knowledge and need for training particularly interesting, as we would expect a random sample of HWs to highlight findings closer to those of the government (The Presidency, 2014). Multiple interviews would have enabled deeper probing about the intersections between HWs' personal experience, medical knowledge and lay principles, which other scholars have found to shape counseling (Desclaux and Alfieri, 2009). This may have enriched our understanding of cadre-related differences in perspectives. Most of the interviews were carried out in English by an outsider to the community, which may have resulted in social desirability bias. HWs may have wanted to portray themselves is a positive light, given their previous negative portrayals reported by one facility manager. The level of self-reflection and critique in the interviews suggests that this was not the case. Despite such limitations, HWs' behavioral observations of

breastfeeding increases and other challenges faced by mothers were consistent with other studies in the community on infant feeding (Mnyani et al., 2016).

Conclusions

In the Declaration, messages promoting EBF were to be supported by enabling health systems and communities (Department of Health, 2011), and multi-level approaches to support EBF have been strongly endorsed (Rollins et al., 2016). As supports are not yet fully in place, we conclude with a focus on what can be done with HWs to create a more enabling environment. All women need support and advice, including HIV negative mothers, those opting for formula, and those currently mixed feeding. Until interventions adequately address socio-ecological barriers to EBF (Rollins et al., 2016), all HWs need training in counseling that is responsive to the contexts of mothers.

We specifically suggest the following:

Engage the increasingly diverse range of HWs in the health system in EBF promotion and counseling, giving then standardized training. This recommendation is supported by Jama and colleagues (2017). We highlight in particular WBOTs who government has not formally engaged in counseling pregnant mothers about infant feeding choices.

Increase HWs access to information on changes in guidelines, explanations behind these, and the implications of changes, in a clear format. Platforms that enable dialogue and questions, as already exist in South Africa, need to be leveraged. For instance, NurseConnect provides nurses with free information and learning modules on their mobile phones (Health-E, 2016) and could be used to learn about this topic.

Moving forward, we recommend that the National Department of Health create channels for frontline HWs to provide consistent input on guidelines and to share their

experiences as part of a feedback loop. As highlighted in Griswold's recent column on reframing the breastfeeding narrative (Griswold, 2016), health professionals working directly with families in their own communities have unique insights into the contextual factors that affect local behaviors, and can positively influence policymaking. They are best able to identify barriers to EBF that need the greatest attention.

Finally, HWs need training and support on how to communicate with mothers in the most effective manner, particularly in terms of risk communication (Bennett et al., 2010). Translation of the Declaration into practice needs clarification. Are frontline HWs expected to act as counselors, helping women decide from a range of options within their contexts, or are they expected to deliver and reinforce evidence-based information on a single feeding option? If the latter – or either way – we suggest that there is an urgent need to improve the support that mothers receive from HWs, in order to make infant feeding decisions that support their infants' survival and ability to thrive.

3.3 Infant feeding patterns and their correlates

The following paper was published in the September edition of the *South African Medical Journal*. It responds to the second objective of the thesis research, which was to describe infant feeding patterns and their correlates using both standard and novel quantitative indicators for a Soweto-based sample of mothers with infants below six months.

The citation is as follows:

Nieuwoudt, S., Manderson, L. & Norris, S. Infant feeding practices in Soweto, South Africa: Implications for health providers, *South African Medical Journal, 2018:* 108(9): 756-62 doi: 10.7196/SAMJ.2018.v108i9.13358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SAMJ RESEARCH

Infant feeding practices in Soweto, South Africa: Implications for healthcare providers

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Figure 3.3. South African Medical Journal image

The title and full body of the paper have been formatted for this integrated document.

Infant feeding practices in Soweto, South Africa:

Implications for health providers

Introduction

Breastfeeding is optimal for health and development over the life course, including for infants exposed to HIV (Victora et al., 2016). Exclusive breastfeeding for the first six months is the best nutritional start for all infants, given the right conditions (World Health Organization, 2009, World Health Organization and United Nations Children's Fund, 2016). However, mothers need to work around practical challenges and negotiate individual, familial, community (including health settings) and societal factors to select a feeding option(s) that best fits with their lives (Lazarus et al., 2013, Rollins et al., 2016).

The 2011 Tshwane Declaration for the Promotion of Breastfeeding (hereafter, Declaration) (Department of Health, 2011) is considered the turning point for breastfeeding in South Africa (Du Plessis et al., 2016). The Declaration altered South Africa's programme to eliminate mother to child transmission firstly, by dismantling the free formula program in public facilities for HIV-infected mothers, and secondly, by requiring health workers to promote EBF only, rather than EBF or EFF. The Declaration therefore transformed a longstanding programme within the public healthcare system and shifted the balance of feeding options for HIV-infected mothers. South Africa's latest EBF estimate of 32% (National Department of Health et al., 2017), although below the 37% average for low and middle income countries (Victora et al., 2016), is well above the rates of below 10% documented between 1998 and 2011 (Du Plessis et al., 2016, Tylleskär et al., 2011, Mhlanga, 2008).

We hypothesized the higher EBF rates following the Declaration were associated with high early breastfeeding initiation practices and increased support from health workers. We also

believed South Africa's HIV epidemic would influence patterns by HIV status. As conceptualized below (see Figure 3.3.1), we also measured factors, including those within the healthcare setting, that literature has shown to influence infant feeding practices (Rollins et al., 2016), focusing on an HIV endemic community where infant formula was previously provided. To test our hypothesis, we compared the profiles of HIV-infected and uninfected mothers, and explored detailed measures of infant feeding, stratified by infant age. Finally, we tested associations with current EBF through multivariate analysis.

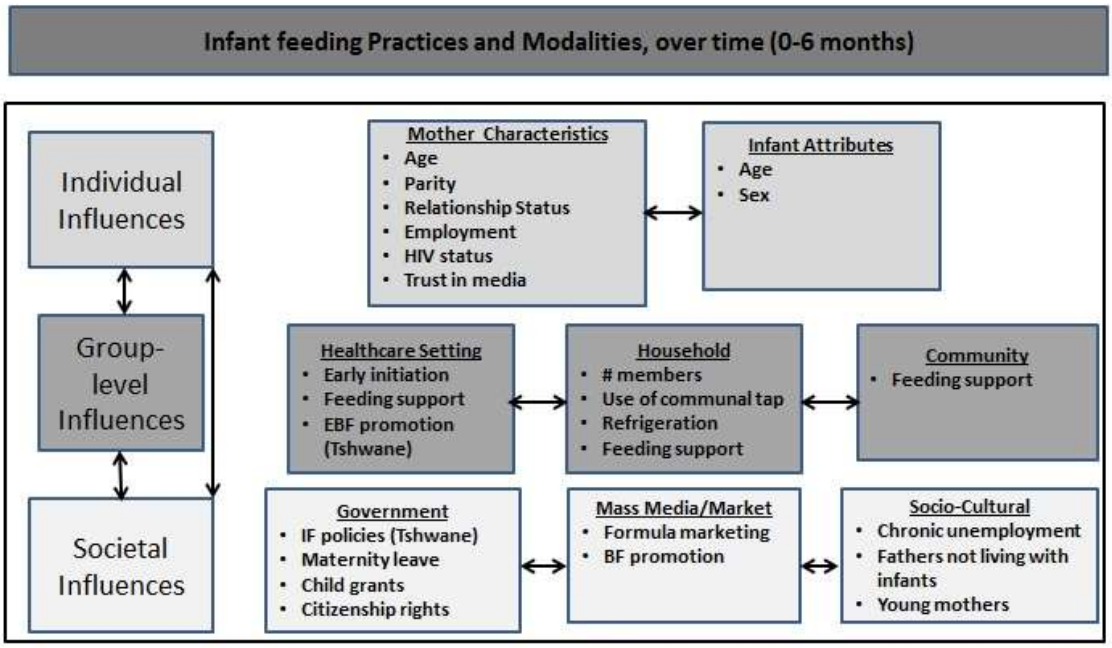

Figure 1. Conceptual framework for infant feeding

Figure 3.3.1 Conceptual framework for infant feeding

Methods

We conducted a quantitative cross-sectional survey of 298 HIV-infected and uninfected mothers with infants below six months of age who accessed community health clinics (CHCs) in Soweto, southwest of Johannesburg, South Africa, between September 2015 and April 2016.

Study setting

The study was conducted in one health sub-district of Soweto, serving a population of 1.3 million. Study participants were recruited from five CHCs, where primary healthcare was provided free of charge; each averaged between 50-100 new pregnancy bookings per month (Mnyani et al., 2016). The CHCs from which we recruited had ANC HIV rates around 30%, consistent with city-wide and national estimates of prevalence (National Department of Health, 2013). The phase out of infant formula had been completed before the end of 2012.

Ethical Considerations

The study protocol received ethics approval from the Wits University Human Research Ethics Committee, the City of Johannesburg Research Committee and the five facilities. Participant screening, consent and data collection was managed by two female RAs who had previous research experience and were residents of Soweto. Both were trained in the protocol by the first author prior to data collection. The RAs' ability to speak a mixture of local languages, including isiZulu, Setswana, and Sepedi and their familiarity with the community enabled participants to seek clarification during the screening and consent processes as well as during data collection. All raw data were managed and stored securely by the first author.

Population and Sampling

The study population for the questionnaire interviews comprised any mother of a singleton accessing public health facilities in the study area aged 18 years or older with a known HIV status. The infant had to be six months or younger at the time of data collection, which took place at a different time than screening.

The study applied a quota sampling approach, seeking 50 mothers in each of six groups (see Table 1). Our primary interest was in comparing feeding practices among HIV-infected mothers post-Tshwane, segmented by infant ages: younger (under 12 weeks) and older (12-36 weeks old). We wanted sufficient HIV-infected mothers who were formula or breastfeeding to

identify differentiating factors, and to compare them with HIV-uninfected mothers of infants in both age categories.

Data collection

The RAs screened eligible participants at the five facilities, approaching mothers in the postnatal, integrated management of childhood illness, expanded program on immunization and labour wards. Of the 968 eligible mothers identified, 303 self-reported that they were HIV positive. Of those, 51% reported that their primary feeding method was breastfeeding and the remaining 49% reported formula feeding. HIV negative mothers were not asked their feeding method. After screening, only 862 (89%) could be reached telephonically for an appointment. Of these, 55 were ineligible because their infants were too old or they had moved. A further 36 refused. The RAs booked appointments with all other women according to availability and based on quota targets. Interviews continued until quota targets were reached. In all, 310 questionnaires were completed. Twelve were discarded because the infant was older than six months, leaving 298 (see Figure 3.3.2).

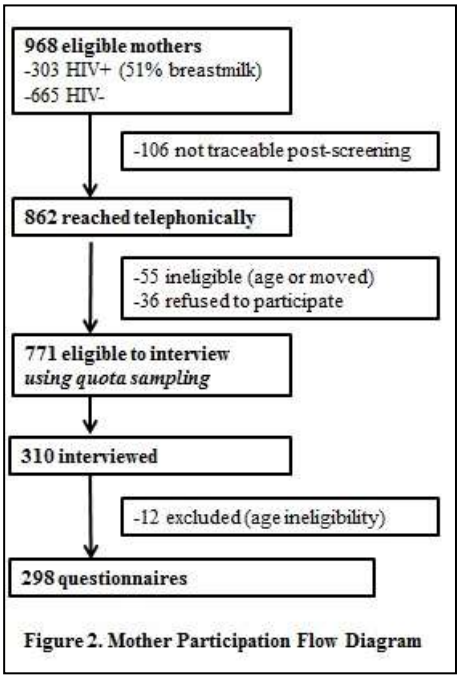

Figure 3.3.2 Mother Participation

The structured questionnaire consisted of five sections: sociodemographic information, initiation of infant feeding, current infant feeding, current health status of mother and infant, and sources of infant feeding information. The two infant feeding sections comprised questions developed by the WHO (World Health Organization et al., 2010), some of which were adapted to better reflect locally-available food. Further amendments were made in the first week to correct skip patterns. These data were retained, as the RAs caught the mistakes. The RAs

interviewed participants using paper-based questionnaires. Most interviews took place in a private room at the study office, with a minority conducted in mothers' homes. Interviews took on average 20 minutes to complete after the consent process.

Data management and analysis

The RAs captured and managed data on the REDCap (Research Electronic Data Capture) electronic data capture tool hosted at the University of the Witwatersrand. The first author for quality assurance monitored this. Discrepancies were checked against the original questionnaires. Data were uploaded into Stata version 13 (Stata Corporation, College Station, USA) for data cleaning, transformation of variables and analysis by the first author.

Outcome feeding measures were calculated both over the infant's lifetime and a current feeding measure of 24-hour recall recommended by the WHO (Abdel-Hady and El-Gilany, 2016). Lifetime measures included ever breastfeeding, time to initiation and transformed variables of EBF, predominant feeding, EFF, and mixed feeding, using WHO definitions (World Health Organization et al., 2010). Current feeding measures included EBF, predominant, EFF and mixed feeding over the past 24 hour period, using a detailed tool. Mothers were also asked about the main modality of feeding (breast, bottle, cup or spoon).

Guided by the conceptual framework, individual, group and social-level variables were considered. Individual variables for mothers included age, parity, self-reported HIV status, relationship status, employment, and media habits, such as where she got information about breastfeeding, mobile phone habits and most trusted sources of information. Infant's age and sex were also captured. Clinic-related indicators included early initiation of breastfeeding, reasons if not, and whether healthcare workers had supported mothers. For households, we captured the household size, refrigeration, use of a communal tap, and support for breastfeeding. Community support for breastfeeding was also captured as a response item. Government social welfare was captured through the Child Grant program. Nationality was

recorded, as discriminatory policies and practices against migrants have been noted (Makandwa and Vearey, 2017). Participants also were asked about breastfeeding promotion in relation to media.

Descriptive analysis was conducted on all outcome, explanatory and confounding variables, followed by bivariate analysis to shortlist variables for inclusion in regression analysis, using t-test, chi-square, and Wald test statistics, with a cut-off of $p<0.20$. To address potential confounding, prior to developing multivariate logistic models for EBF, we tested for collinearity. The selection of variables for the models was based on bivariate analysis as well as theory. Key constructs supported by the literature were forced into the model, such as breastfeeding support and HIV status, even if they did not meet the cut-off. We used forward logistic regression to construct the models based on a theoretical approach and tested for interaction effects, resulting in three models.

Results

Mothers were recruited onto the study based on their self-reported HIV status and feeding practices. A total of 298 mothers completed interviews for analysis (see Table 3.3.1).

Table 3.3.1. Number of mothers by study sample group

Reported HIV* and Feeding at Screening	Infant Age at Questionnaire		**Totals**
	< 12 weeks	*12-36 weeks*	
HIV+ - Breastfeeding	49	50	***99***
HIV+ - Formula feeding	48	49	***97***
HIV- - Any feeding	53	49	***102***
	150	***148***	**298**

* HIV-positive status reported in the questionnaire and "main" modality reported during study screening. Five women reported HIV- at time of screening and a positive status at time of questionnaire administration

Table 3.3.2 presents mothers' sociodemographic characteristics and exposure to breastfeeding promotion. This was a population of mothers accessing CHCs who came from vulnerable backgrounds. Although nearly all owned a mobile phone, three quarters were unemployed, over half accessed child grants and relied on communal taps for drinking water.

Of the unemployed, only 13 (4.4%) were students. Most women lived in households averaging 4.5 individuals, yet only 40.3% lived with the father of their child. Most were South African. Markers of socioeconomic vulnerability persisted across groups. ARV use among the HIV-infected population (not shown) was high, with 99.5% of those who responded (n=191) reporting current ARV use. This did not differ by feeding practice.

Differences between HIV-infected and uninfected mothers were limited. HIV-infected mothers were significantly older than their HIV-uninfected counterparts, possibly due to the sampling strategy, which required HIV disclosure. Consistent with their older age, they also were more likely to be multiparous (82.7%) than those not infected (60.8%). Finally, they were significantly more likely to rely on communal taps (62.2%) than their HIV uninfected counterparts (48.0%).

Main feeding content was also a source of differentiation. Formula-feeding mothers were significantly more likely to be employed (35.6%) than their breastfeeding counterparts (16.3%). For HIV uninfected mothers, those formula feeding were significantly less likely to access water from a communal tap. Aligned with their higher employment, the HIV-negative formula feeding mother group was systematically wealthier than the three other groups.

Table 3.3.2 also highlights whether women had ever received breastfeeding promotion messages on their mobile phone, whether they had any support to breastfeed (n=228), and their most trusted source of breastfeeding information (if any; n=253). Of the 98 mothers who reported receiving information on their phones, 87.8% reported their source as MomConnect, which is sponsored by the National Department of Health. Healthcare workers and family also provided direct breastfeeding support and were named as trusted sources of information, with 81% of women writing in either nurses or other hospital staff as their most important source of information.

Table 3.3.2. Mother characteristics, overall and by self-reported HIV status & content

Mother/Infant Characteristics	OVERALL (n=298)	HIV+ (n=196)		HIV- (n=102)		Sig. Tests*
		BF (99)	FF (97)	BF (67)	FF (35)	
Mother's age, years (med; IQR)	29 (25, 33)	**30 (25, 35)**	**31 (27, 34)**	27 (23, 31)	26 (21, 32)	**0.002**
Infant's age, days (med; IQR)	89 (44, 118)	90 (45, 115)	90 (38, 126)	71 (38,112)	71 (38,112)	
Infant sex - male (#; %)	137 (46.3)	46 (46.5)	48 (50.0)	26 (39.4)	17 (48.6)	
Household size (med; IQR)	4.5 (3, 6)	5 (3, 6)	4 (3, 4)	4 (4, 6)	5 (4, 7)	
Multiparous (#; %)	224 (75.2)	**80 (80.8)**	**82 (84.5)**	44 (65.7)	18 (51.4)	**<0.001**
South African (#; %)	259 (87.2)	85 (85.9)	82 (84.5)	60 (89.6)	32 (94.1)	
Unemployed (#; %)	224 (75.2)	**83 (83.8)**	62 (63.9)	**56 (83.6)**	23 (65.7)	**0.002**
Relationship status (#; %)						
Single	71 (23.8)	29 (29.3)	23 (23.7)	11 (16.4)	8 (22.8)	
Not living with partner	107 (35.9)	34 (34.3)	35 (36.1)	23 (34.3)	23 (42.9)	
Living with partner	120 (40.3)	36 (36.4)	39 (40.2)	33 (49.3)	12 (34.3)	
Child grant (#; %)	167 (56.0)	60 (60.6)	53 (54.6)	40 (59.7)	14 (40.0)	
Uses communal tap (#; %)	171 (57.4)	**63 (63.3)**	59 (60.8)	**40 (59.7)**	9 (25.7)	**0.001**
No refrigeration (#; %)	38 (12.8)	13 (13.3)	17 (17.5)	7 (10.5)	1 (2.9)	
Owns mobile phone (#; %)	294 (98.7)	96 (97.0)	97(100.0)	66 (98.5)	35 (100.0)	
BF info on mobile	*98 (33.5)*	*32 (33.7)*	*32 (33.0)*	*23 (34.9)*	*11 (31.4)*	
Main BF supporter (n=228)[1] (#;%)	180 (79.0)	83 (83.8)	21 (75.0)	50 (74.6)	26 (76.5)	
Partner	*21 (11.7)*	*15 (18.1)*	*1 (4.8)*	*4 (8.0)*	*1 (3.9)*	
Family/friends	*55 (30.6)*	*20 (24.1)*	*5 (23.8)*	*17 (34.0)*	*13 (50.0)*	
Healthcare worker	*104 (57.8)*	*48 (57.8)*	*15 (71.4)*	*29 (58.0)*	*12 (46.2)*	
Trusted BF source [2] (#;%)	253 (85.6)	86 (86.9)	87 (89.7)	52 (77.6)	28 (80.0)	
Clinic/hospital staff	*205 (81.0)*	*73 (84.9)*	*74 (85.1)*	*39 (75.0)*	*19 (67.9)*	
Family/friends	*14 (5.5)*	*2 (2.3)*	*4 (4.6)*	*4 (7.7)*	*4 (14.3)*	
Mass media	*34 (13.4)*	*11 (12.8)*	*9 (10.3)*	*9 (17.3)*	*5 (17.9)*	

[1]Those who never breastfed, were not asked about support to initiate breastfeeding[2] Only those who reported one or more source of breastfeeding information were asked about their most trusted source (n=253) *All tests of significance were chi-square and ANOVA for categorical variables and t-tests for continuous.

Infant feeding practices were explored by infant age, with the exception of ever breastfeeding and breastfeeding initiation (see Table 3.3.3). The proportion of infants ever breastfed was 76.5%; this includes 28.9% of HIV infected women electing to formula feed who reported ever feeding their infants breastmilk. For mothers who breastfed, only 58.4% achieved early initiation. In a pooled analysis of breastfeeding initiation (not shown), 22.0% of those who delayed initiation reported that this was due to delivering via caesarean section. The same proportion reported that their infants had been taken to an intensive care unit (ICU) ward. Over 10% said they "were not given their baby immediately" and another 10% reported that their infants were premature (it was unclear if their infants had trouble latching or they were not given their infants). Another cause for delayed initiation was "milk not coming in." Other reasons were that either they or the infant was sleeping.

Mothers were asked what their infant had ingested during her or his lifetime as a multiple-choice question early in their interview. Lifetime EBF was 44.0% for younger infants and 31.8% for older infants. For EFF the proportion was also higher for younger infants. Mixed feeding, conversely, increased with infant age with a corresponding increase in bottle use for older infants. Unlike current feeding, the lifetime mixed feeding measure was unable to show if breastmilk and formula were given concurrently or if mothers had shifted from one to the other during the infant's life. Predominant breastfeeding was relatively low regardless of infant age. Highly significant differences by HIV status and feeding type followed expected trends given the sampling strategy employed.

Current feeding practices, based on a 24 hour recall allowed us to measure mixed feeding (Table 3.3.3). Current EBF and EFF rates were higher than the lifetime measures, again with mixed feeding increasing with infant age. Exclusive feeding, especially EFF but also EBF, was greater among the HIV-infected mothers.

Table 3.3.3. Infant feeding: Overall, by self-reported HIV status and feeding practice, segmented by infant age (breastfeeding=BF | formula feeding=FF)

Infant feeding practices	#; % OVERALL (n=298)	HIV+ (n=97)		HIV – (n=53)	
		BF (99)	FF (97)	BF (67)	FF (35)
Lifetime feeding					
Ever breastfed	228 (76.5)	99 (100.0)	28 (28.9)	67 (100.0)	34 (97.1)
Early initiation	*125 (54.8)*	*56 (56.6)*	*16 (57.1)*	*41 (61.2)*	*12 (35.3)*
Below 3 months	150 (50.3)	49 (49.5)	48 (49.5)	39 (58.2)	14 (40.0)
Lifetime feeding					
Exclusively breastfed	66 (44.0)	31 (83.7)	0 (0.0)	25 (64.1)	0 (0.0)
Pred. breastmilk	11 (7.3)	5 (10.2)	0 (0.0)	6 (15.4)	0 (0.0)
Mixed fed*	48 (32.0)	3 (6.1)	23 (47.9)	8 (20.5)	14 (100.0)
Exclusively formula	25 (16.7)	0 (0.0)	25 (52.1)	0 (0.0)	0 (0.0)
Current feeding					
Exclusively breast	69 (46.0)	42 (85.7)	0 (0.0)	27 (69.2)	0 (0.0)
Pred. breastmilk	6 (4.0)	3 (6.1)	0 (0.0)	3 (7.7)	0 (0.0)
Mixed feeding	37 (24.7)	4 (8.2)	16 (33.3)	9 (23.1)	8 (57.1)
Exclusively formula	38 (25.3)	0 (0.0)	32 (66.7)	0 (0.0)	6 (42.9)
Mainly bottle-fed	63 (42.0)	1 (2.0)	48(100.0)	1 (2.6)	13 (92.9)
3-6 months	148 (49.7)	50 (50.5)	49 (50.5)	28 (41.8)	21 (60.0)
Lifetime feeding					
Exclusively breast					
Pred. breastmilk	47 (31.8)	34 (68.0)	0 (0.0)	13 (46.4)	0 (0.0)
Mixed fed*	5 (3.4)	2 (4.0)	0 (0.0)	3 (10.7)	0 (0.0)
Exclusively formula	77 (52.0)	14 (28.0)	30 (61.2)	12 (42.9)	21(100.0)
	19 (12.8)	0 (0.0)	19 (38.8)	0 (0.0)	0 (0.0)
Current feeding					
Exclusively breast					
Pred. breastmilk	49 (33.1)	37 (74.0)	0 (0.0)	12 (42.9)	0 (0.0)
Mixed feeding	6 (4.1)	1 (2.0)	0 (0.0)	5 (17.9)	0 (0.0)
Exclusively formula	65 (43.9)	12 (24.0)	22 (44.9)	11 (39.3)	20 (95.2)
	28 (18.9)	0 (0.0)	27 (55.1)	0 (0.0)	1 (4.8)
Mainly bottle-fed	78 (52.7)	6 (12.0)	49(100.0)	2 (7.1)	21 (100.0)

*Does not capture concurrent feeding. Could include changes in exclusive feeding over time.

Bivariate analysis was conducted for both 24 hour and lifetime measures of EBF to determine which variables to include in regression models, using a cut-off of $p<0.20$. The infant's age, unemployment, accessing a child grant, mobile phone ownership, main breastfeeding supporter and most trusted source of breastfeeding information were significant. Early initiation of breastfeeding and parity met the significance cut-offs for lifetime EBF only, but were retained in the model for theoretical reasons. HIV status, relationship status and the presence of breastfeeding support also were retained for theoretical reasons.

All logistic regression models were adjusted for infant age. Model 1 included individual sociodemographic variables, including HIV status (n=298). Unemployed mothers had nearly double the odds (1.88; 95% CI 1.03, 3.44) of exclusively breastfeeding compared to those who were employed. No other individual-level factors were significant in Model 1.

Table 3.3.4. Factors associated with exclusive breastfeeding in past 24 hours, adjusted for infant age

Variables	Individual Model-1 (n=298)	Behaviour Model-2 (n=228)	Support Model-3 (n=180)
Unemployed	**1.88 (1.03, 3.44)**	1.52 (0.73, 3.16)	1.08 (0.45, 2.56)
Receiving child grant	1.55 (0.91, 2.61)	**2.04 (1.09, 3.80)**	1.88 (0.92, 3.86)
Multiparous	1.29 (0.71, 2.36)	1.75 (0.90, 3.42)	1.78 (0.81, 3,91)
Relationship			
Single	-	-	-
Living together	0.82 (0.43, 1.55)	0.75 (0.35, 1.60)	0.65 (0.27, 1.59)
Not living together	0.74 (0.40, 1.39)	0.81 (0.38, 1.75)	0.94 (0.36, 2.41)
Communal tap	0.81 (0.49, 1.35)	0.83 (0.45, 1.52)	1.02 (0.50, 2.08)
HIV positive	0.99 (0.58, 1.68)	**2.45 (1.36, 4.42)**	**2.69 (1.31, 5.51)**
Immediately breastfed		1.12 (0.62, 2.01)	1.14 (0.57, 2.28)
Main breastfeeding support			
Partner (Yes)			-
Health worker (Yes)			1.34 (0.37, 4.83)
Family/friend (Yes)			2.42 (0.80, 7.36)
R^2	0.046	0.118	0.135

NB: All models adjusted for infant age

HIV status in the first model was insignificant, but was highly significant in the subsequent models. Mothers who had never breastfed were excluded from Model 2, reducing the sample size (n=228). When the behaviour of early initiation of breastfeeding was added to the logistic regression (Model 2), employment became insignificant, and EBF was associated with being HIV positive and receiving a child grant. The model's explanation of variance more than doubled to 0.118. In Model 3, the participant's main breastfeeding support was added. In this final model, HIV status was the only factor that was retained as significant. There was no interaction between HIV status and early initiation of breastfeeding.

Discussion

This study reconfirms the trend of EBF increasing in Soweto. The measures of 44.0% EBF for infants below three months and 31.8% for infants between 3-6 months are in keeping with the national statistics of 32% (National Department of Health et al., 2017), though lower that the EBF rate of 68.0% in the Soweto study (Mnyani et al., 2016). The reason for the other study's higher EBF rate could be due to sampling (convenience vs. quota), sample size (100 vs. 298) or in how infant feeding was measured. We used the recommended WHO EBF measure (World Health Organization et al., 2010, Abdel-Hady and El-Gilany, 2016). The sociodemographic characteristics of the two study populations were similar. Both studies reported high ARV use among HIV positive mothers in Soweto: 99.5% for this study and 87.9% of postpartum mothers in the previous study (Mnyani et al., 2016). This is in line with the 92.1% ART initiation rate reported by the government for Gauteng province (Massyn et al., 2016) and bodes well for reduced HIV transmission, even with slight lapses in exclusive feeding (World Health Organization and United Nations Children's Fund, 2016).

Other South African studies also have observed that HIV-infected mothers have higher odds of maintaining EBF than their HIV-negative counterparts probably because of fears of HIV transmission, (Mnyani et al., 2016, Jama et al., 2017a). Exclusive feeding practices among

HIV-infected mothers have been attributed to intensive PMTCT counselling over the past decade (Jama et al., 2017a), but with the result that in some cases, exclusive feeding is perceived as an (involuntary) HIV disclosure (Ramara et al., 2010, Madiba and Letsoalo, 2013). Exclusive breastfeeding needs to be reframed as a child development issue. While the fear of transmission is an important factor that needs to be addressed in counselling HIV-infected mothers (Tuthill et al., 2014), researchers have already shown that fear is insufficient to maintain breastfeeding exclusivity (Doherty et al., 2006b). Furthermore, over 70% of the mothers accessing clinics are not HIV-infected. Factors, such as having supportive family environments to adopt clinical advice, need much more attention (Mphego et al., 2014) for overall EBF promotion.

Mixed feeding increased in all groups as infants grew older, as one would expect with pressures for mothers to return to work and older infants begin to show interest in food. Predominant feeding was lower than we expected. Despite evidence of the benefits of EBF for all infants (Victora et al., 2016), this has not been matched by messaging around the risks of mixed feeding beyond HIV transmission. The pressures mothers face to mixed feed in South Africa are well documented and multi-faceted (Tuthill et al., 2014, Du Plessis et al., 2016), and a clearer communication strategy, particularly for HIV-uninfected mothers, is needed to persuade them of the benefits of EBF and/or risks of mixed feeding for their infants.

The importance of the healthcare system in promoting infant feeding practices was highlighted in this study. Consistent with other South African studies (Du Plessis et al., 2016, Sibeko et al., 2009), healthcare workers were trusted sources of support and as key information sources. In addition, the health system connected mothers to mobile information through MomConnect (Barron et al., 2016), and many women gained information from this source. Although mobile messages were not reported as mothers' first source of information, they still play a reinforcing role.

This study also highlighted how efforts to reduce caesarean sections may have a positive impact on EBF. Specifically, breastfeeding initiation is a critical period for the establishment of breastfeeding (Gebhardt et al., 2015). Delayed initiation reduces the likelihood of EBF and it is also associated with higher rates of neonatal mortality (Edmond et al., 2006). As such, it is highly concerning that over 40% of mothers in this study initiated breastfeeding after more than one hour. Of these, nearly a quarter attributed this to a caesarean section. These rates seem realistic, with another study reporting a rate of 21.5% caesarean section in public facilities (Gebhardt et al., 2015); for mothers covered by private medical schemes the rate is over 70% (Smith, 2014). The WHO target for caesarean sections is below 15% (Gebhardt et al., 2015), which would make a focus on caesarean sections in line with global standards. To further support an argument to focus on caesarean sections and breastfeeding initiation, the inclusion of early initiation into our regression model altered our study findings, suggesting this is a key behavioural factor to support EBF.

We took care during interviews to make participants comfortable to speak freely. Still, the risk of social desirability influencing how mothers answered due to the place of recruitment, identity of interviewers or administration of the interview cannot be discounted. Infant feeding was self-reported. While this is the standard for most infant feeding studies, including those we compare our results with, discrepancies between self-reported and biologically confirmed breastfeeding have been noted (Mulol and Coutsoudis, 2018). We addressed potential confounding by testing for collinearity and controlling for confounders and interactions in regression models.

The use of quota sampling may have introduced an element of sampling bias, although the RAs varied the times and days they visited clinics circulated between all of the different wards to reduce other forms of selection bias. We intentionally oversampled HIV positive mothers given our interest in the policy's impact on this population in terms of feeding

practices. All descriptive tables were disaggregated to highlight these nuances; disaggregation also supports tailored interventions. Quota sampling reflected community practices and most sociodemographic characteristics of our sample were shared across groups. Fewer than 4% of eligible mothers refused to participate when contacted to book an appointment. We have presented our conclusions to reflect our use of nonparametric sampling, which limits our ability to generalise findings.

Conclusion

Despite breastfeeding increases, neither HIV-infected nor uninfected women have fully embraced EBF, to the detriment of infants and mothers. As a nation that has struggled to meet infant mortality and morbidity targets, South Africa cannot afford to ignore the arguments to promote EBF (Du Plessis et al., 2016). Infants who are exclusively breastfed have 12% less risk of dying than those who have not breastfed (Sankar et al., 2015). Beyond increased mortality, EBF also confers a number of health and development benefits, such as reducing diarrheal and respiratory illnesses in the short term and higher intelligence in the longer term (Victora et al., 2016). EBF is also associated with reduced breast cancer risk for mothers (Victora et al., 2016).

To support EBF, we recommend that communication place greater emphasis on the developmental and health benefits of EBF (Victora et al., 2016) and risks of mixed feeding for all. In particular, these messages should be emphasised to nurses and frontline health practitioners through training, given how much mothers value them, and supplemented by communication from health providers to mothers, such as MomConnect. Communities also need to be engaged with these messages through mass media. Mothers also need other sectors support and commitment, e.g. labour, for more supportive breastfeeding environments. In conclusion, we recommend multi-level responses that focus on improving the health setting, community and workplace environments to improve EBF uptake in South Africa to optimise infant growth and development (Lazarus et al., 2013, Rollins et al., 2016).

3.4 The "Good Mother" in the context of HIV and infant feeding decisions

The following case study was accepted by the editors for inclusion in their book on 18 January, 2018. The book is currently in final preparation, with publication planned for 2019. This case study responds to both the first objective of the thesis research, which was about facilitators and constraints to infant feeding as well as the fourth objective, about the people who influence infant feeding during the first six months. The use of a case study approach enabled me to delve into the complexity of decision-making. The working citation is as follows:

Nieuwoudt, S. Being a good mother: HIV and infant feeding decisions. In: *Connected Lives: Families, Households, Health and Care in Contemporary South Africa.* Edited by Manderson, L. & Mkhwanazi, N.. Pretoria, South Africa: Human Sciences Research Council ***(accepted and in production for 2019)***

The title and full body of the paper are formatted for this integrated document.

Being a good mother: HIV and infant feeding decisions

Soweto – the Southwest townships – start for me with a turn at Exit 67 off the N1 South onto the Old Potch Road, and then a right towards Chris Hani Baragwanath Hospital, better known as "Bara," where 20,000 infants are born every year. The behemoth was constructed in 1942. Soweto developed around it during the years of Apartheid (1948-94) to accommodate swelling numbers of dispossessed people. Yet a white doctor could enter the academic tertiary hospital from the leafy northern suburbs without ever driving down a township road or knowing the circumstances of how their all-Black patients were living during that period. Little has changed. To get to the three-story brick building where I work, I pass through a security entrance and a second boom gate. It was only when conducting field research that I drove down Soweto streets and entered the homes and lives of the women living there. They include the three women I introduce below, selected for the richness and diversity of their experiences, yet bound together by the challenges of feeding their babies and being 'good' mothers in a community where 30% of pregnant women test positive for HIV.

Mother 1: Martha [pseudonym] is age 25, HIV positive and unmarried, living with her mother. She is South African. Her daughter Karabo [pseudonym] was one of the few infants in our sample of 48 mothers who participated in in-depth interviews who was HIV positive.

'I just try to be a good mother'

Molebogeng, my research assistant, and I first met Martha in the postnatal ward of a bustling community health clinic. She was over 18, knew her HIV status, her infant was under six months and she lived in Soweto. Since she was eligible to participate in the study on infant

feeding influences, we invited her to do so. We did not know that Martha had learned that she and her daughter, Karabo, had seroconverted two months after her daughter's birth, despite testing HIV negative twice during antenatal visits. Karabo was four months old when she first answered an interview questionnaire with us about her infant feeding practice. At the time she was exclusively breastfeeding Karabo eight times a day. Karabo was six-months old when Martha was interviewed for a second time. Martha explained that she just tried "to be a good mother, I take care of her and I feed her well." However, she was no longer breastfeeding:

> I feel good, but the problem is that I do not breastfeed her. I cannot mix-feed. When I used to express, I could only produce very little milk. I so badly wanted to breastfeed her, but I have inevitably had to settle for the formula. I am happy with having to give her the formula, but the problem is that I really wanted to breastfeed her.

The emotional desire Martha expressed towards breastfeeding has been highlighted by several researchers as a striving towards a social idea of good mothering, one reinforced by a biomedical narrative that extolls the intrinsic value of breastmilk (Mahon-Daly and Andrews, 2002, Marshall et al., 2007), and Martha's inability to produce milk was a way for her to legitimate not breastfeeding. She explained her physical inability to produce milk to stress over learning of Karabo's HIV status: "I was very stressed out beyond words, and hence I couldn't even produce any breastmilk." Martha's inability to breastfeed and its links to HIV, in this case emotionally, was interwoven with her story of trying to be a good mother. Her decision to shift to exclusive formula feeding at six months was in her mind the best option, given that breastmilk was not possible.

Martha's stress of being HIV positive was closely related to her experience of disclosure. When she told her boyfriend about her status and that of their daughter, he got very emotional, but according to her, "He honestly is ignorant about this HIV issue. He also doesn't want to get tested. He doesn't want to have anything to do with the HIV." Beyond providing

her with money for buying infant formula, he distanced himself from them. She told his sister, but she did not respond positively either, and his family have not been supportive. Her disclosure to her mother and sister was better, and she has some support from them to raise Karabo. Martha leaves Karabo with her sister when she goes to school, which is part-time.

Contradictory understandings of what constituted "good feeding." in Martha's case, changed how she understood good mothering during the early months with her daughter. With many mothers, including Martha, this arose with the issue of mixed feeding. During the interview, Martha declared, "I cannot mix-feed," in relation to feeding Karabo "well." However, she had not always thought this. In her interview at four months, Martha explained that when she gave birth she had started breastfeeding immediately, as do most women in South Africa (Du Plessis et al., 2016). However, when she went home, she succumbed to her mother's pressure to mix feed and started adding porridge to Karabo's diet at one month old, and by four months had given her daughter gripe water, rooibos tea and semi-solid foods as well as breastmilk. Martha highlighted the importance of being a good daughter and adhering to family feeding norms: "My mother did try to encourage me to feed her solids so that Karabo could pick up weight, but I decided to stick with the dietician's plan." Her mother persisted however, that Martha give her baby porridge, and as Martha explained, she finally did "succumb" and give her solid foods until Karabo was admitted to Bara with chronic diarrhoea.

Martha's reliance on the hospital dietician's advice shifted after her daughter's diagnosis with HIV. Her mother, as well, came to trust the dietician's exclusive feeding advice, including that breastmilk was sufficient and the "baby's tummy was still too tiny for solid food." The rapid shifts in Martha's infant feeding beliefs and practices during the first six months, all in the context of coming to grips with her HIV status, left me feeling that she was still uncertain, relying on outsiders to confirm she was as "good" a mother as she was trying to be. When we asked about how she was feeding Karabo compared with other babies in her family, she

explained that Karabo was "tiny and perhaps I am not feeding her well, but they [the nurses] have stated that she is picking up weight." Now that Karabo was six months old, Martha was about to enter the next phase of complementary feeding, which would have its own set of challenges.

Mother 2: Naledi [pseudonym] is HIV positive and unmarried, though living with her boyfriend and two children. She is Zimbabwean, unlike most of the Soweto mothers interviewed, who are South African citizens. Her son Tonderai [pseudonym] was one of many infants who was reported to have been exclusively breastfed.

The concept that a baby's growth is a reflection of a mother's ability was strongly embedded in interviews with mothers, health care workers and family members. Naledi , another of the 30 HIV positive mother we interviewed, also saw her infant's growth as a reflection of her feeding decisions: **"**I feel happy, his body is developing well and it shows that he is growing." Naledi had exclusively breastfed her son, Tonderai , for six months. An immigrant from Zimbabwe who had lived in Soweto for over five years, she was currently living with her boyfriend, their older child and Tonderai. Like Martha, Naledi had to actively resist pressures to mix feed as the norm, both in the family and in the surrounding community. However, she took courage from the way Tonderai was developing to show that she was being a good mother and used this as evidence that her feeding choices were right. For her, the clinic advice about milk sufficiency was critical: "I was happy with the decision. I felt that it was the right decision to make and if I didn't know any better, I would have thought that my baby would starve from the breastmilk alone, I would have thought the breastmilk alone would never be enough."

Family and community concepts of womanhood influenced women's infant feeding practices. Though Naledi's boyfriend supported her with Tonderai, she described how her immediate family members had called her lazy not to mix feed her first infant. She accepted this label with humour as a way of coping: "I am very lazy to cook and my family would also ask me why I wasn't making food for the baby. I was very lazy." Accepting this derogatory label was part of her strategy to breastfed her firstborn child, which she did for 18 months. Exclusively breastfeeding Tonderai was easier, as she knew her HIV status before becoming pregnant, as did her boyfriend, and he supported her decision to breastfeed for up to one year. He also supported giving their baby Nevirapine syrup to reduce the risk of transmission. With this immediate support, it was easier for her to manage questions from neighbours. She explained that babies in the community are typically introduced to solids in the first month:

> At about 2-3 weeks they'd start making porridge for them but sometimes you look at the baby and you can see that they are not healthy and they'd ask me whether or not I have started feeding porridge to my baby and I'd tell them no, my baby is fine. They'd also say that my baby looks like I am feeding him solid food already, and I would add that my baby is fine.

Neighbours would challenge her, but Naledi persisted: "I would say that my baby gets his fill from my breastmilk alone and all I have to do is to make sure that I have a balanced diet such that I can produce enough milk to his satisfaction."

Mother 3: Busi [pseudonym] is a health worker, age 56, and married. She is South African. Like many of the 11 health workers we interviewed, she introduced complementary foods to her children before six months.

Unlike Naledi, many of the other 48 mothers we interviewed did not have supportive partners or an easy time dealing with accusations of being lazy. Busi [pseudonym], a healthcare worker we interviewed, described how her husband accused her of being lazy to cook as the reason for her refusing to mix-feed her children. She explained, "I was not lazy. It was (too) early for them to eat food and I was at home because my maternity leave was four months. So [my milk] was enough." Despite her protestations, her husband bullied her into mixed feeding all three of their children at five months, when she had to return to work. In addition to accusing her of being lazy, he used his personal experience of helping to raise his sibling because his mother was working. He had been responsible for feeding his younger brothers and sisters, and he believed their own children should be raised the same way. Gill Seidel (2004) has noted how descriptions of 'lazy' mothers have even extended into South Africa's healthcare setting, in what she calls a professional socialisation process that divorces care providers from the lives of patients. This socialisation of infant feeding as a form of a mother's expected reproductive division of labour in both household and clinical environments constrains the feeding choices that some women perceive they have.

As Martha and Naledi explain, the idea of good feeding originates from family traditions and community norms, which are then policed by gender expectations of what it means to be a good mother. Busi's husband actively denigrated the knowledge she brought from the clinic. Particularly when her children were crying, he would say, "He is hungry. Hey, you are coming with this stuff for the clinic every time – clinic says this, clinic says that." He accused her of following the clinic advice over the hunger of her own child. While she was unable to completely follow clinic advice, Busi described how she attempted to circumvent her husband to apply her understanding of best feeding practices from the clinic. She left her children with another woman when she returned to work, until at the age of three, they were able to go to crèche, and during this time, she provided expressed breast milk: "Ja, it was very

nice because the husband didn't see what's what. See what was happening. I expressed and the old lady just gave porridge. That food and then it was milk."

The practice of cooperative caregiving for working mothers, whereby infants were left with family members, neighbours or at a crèche was often described in interviews, beyond those presented here. Depending on the relationship mothers had with caregivers, this could become a way to sustain desired feeding decisions, such as Busi being able to continue giving her children breastmilk or Martha's sister helping to give her daughter formula and medication while she was studying. Placing infants in the care of others has been noted as a reason some HIV positive mothers opt for formula, because they do not trust that the caregiver will abide by their decisions (Zulliger et al., 2013). However, the cases here pointed to positive features of women helping women, outside of the male gaze, particularly in Busi's case. A common feature of cooperative caregiving was that it was a realm dominated by female relationships.

Unlike Martha and Naledi, Busi did not have to personally navigate decisions about the HIV risks of breastfeeding. However, she observed the challenges of making infant feeding choices in a community that was hyper-sensitive about HIV, even for HIV negative women:

> …most of the people visit, they want to see whether they are HIV positive or not. Because they know, those who are not breastfeeding are HIV positive. They don't know every mother can breastfeed, HIV positive or HIV negative. You can breastfeed. And they don't know that. ... Ja those people like to talk about HIV with the community. She wants to sit alone in the house and tell stories.

The fear of being stigmatised by the community was not just about infant feeding (mixed or exclusive), but what this choice signified. As Busi explained, exclusive feeding, particularly using formula, was understood within the community as unique to HIV positive people. Other HIV-negative mothers interviewed echoed this sentiment. The idea that HIV positive people can breastfeed is not understood fully in this community, it would seem.

Discussion

In South Africa, the ideal of exclusive breastfeeding for six months for all has problems. Early in my research I interviewed a prominent paediatrician who has worked in the field of child malnutrition for over 20 years, many spent in Bara. He reflected on the advice many pregnant woman receive in the public health setting: "The message has always been about breastfeeding is best and for me that's as a hollow as saying eating food is good for you. It's exactly the equivalent, because what does breastfeeding is best mean?" The idea of "best" was taken up by some women, like Busi, Naledi and Martha, as a marker of the kind of mothers they would like to be. Naledi succeeded, Martha did her best, until she was no longer able, and Busi also did her best, but was unable to fully avert social pressures once she returned to work.

All three women attached infant feeding to a sense of their value as mothers. While some scholars have argued that the public health narrative of "breast is best" has made breastfeeding a moral imperative (Marshall et al., 2007), all three women's narratives highlighted that which feeding practices are considered best remain highly contested. In Soweto, mixed feeding remains a strong norm and the advice they receive from antenatal clinics to feed exclusively has not been widely accepted. Furthermore, practices of exclusive feeding were associated with HIV by community members. Depending on how mothers felt about HIV, whether they had disclosed (if positive), and the support they received from immediate family, strongly influenced their ability to maintain exclusive feeding. This strongly echoes the findings of another longitudinal study with HIV positive women published by Doherty and colleagues (2006b) who found family support, a strong belief in the benefits of breastfeeding (supported by facts) and an innate ability to resist peer pressure were all associated with longer exclusive feeding. Fears of actual HIV transmission, the fear of being identified as HIV positive (fear of stigma), as well as mixed feeding norms continue to act as barriers to exclusive feeding a full decade later.

While all three women exerted agency, women like Busi were not able to fully enact their desired feeding decisions. Martha's initial decision to mix feed is another example of how family influenced her concept of what was good. The lengths to which family members went to change mother's decisions, invoking history, tradition and gender roles, speaks to the social meanings of infant feeding, well beyond meeting the nutritional needs of an infant (see Marshall et al, 2007). Soweto, as described by Martha, Naledi and Busi, remains a place where HIV is a cause for gossip and exclusion. Infant feeding choices are being interpreted as signifiers of one's status; they become an involuntary disclosure to the community.

Across these three mothers, and the larger sample interviewed, common themes were identified. The first was that all mothers wanted to be described as "good." While they were all attentive to their infants, to varying degrees, their sources of affirmation tended to be family, friends, health workers or a combination thereof. While individual agency was described in relation to infant feeding decisions, in the face of strong resistance in their immediate environment, many mothers are willing to compromise their beliefs. Other elements of identity, including womanhood and being seen as HIV-free, were often inconsistent with EBF. The critical take-home message from these mothers is that unless practices like exclusive breastfeeding are normalised for all women, a certain degree of individual resilience and family support, such as experienced by Naledi, will be needed for mothers in Soweto to meet the standards of what public health defines as a "good mother."

4 Integrated Discussion

In seeking to address this multi-layered issue, the intersecting 'knowledges' and practices need to be identified and analysed. These include not only the medical 'management' of' motherhood', indifferent health settings, but also, and more fundamentally, the social construction of 'motherhood' over time and space.

~Gill Seidel

In this chapter, I revisit the overall aim and objectives of the overall thesis against what was found. This begins with a brief summary of how each publication answered the thesis research objectives. I then update the theoretical framework based on empirical evidence which, as the integrating heart of the thesis, to discuss key findings. This is done by highlighting cross-cutting themes, and filling in gaps that were not overtly addressed in the individual publications. These include the importance of measurement, including the politics of framing "optimal" feeding, the ubiquity of mixed-feeding, and the place of policy. Study limitations are also discussed in this chapter.

4.1 Achieving objectives

The overarching aim of this thesis research was to explore factors influencing infant feeding in Soweto, South Africa, in the context of policy shifts in relation to HIV. As shown in Table 4.1.1, the three research objectives were addressed through the following manuscripts.

Table 4.1.1. PhD manuscript alignment with objectives

Objectives	Article references	Summary of high level findings
Identify factors that have supported or constrained breastfeeding in South Africa in the context of changes in infant feeding guidelines from 1980 (pre-HIV) to present.	See 3.1 & See 3.4	Factors across all three levels (individual, settings & structural) were identified. For individuals, HIV status strongly influences how mothers feed, driven largely by fears around transmission. Health concerns, infant-driven cues, and a desire to be 'good mothers' motivate feeding perceived to be optimal. Hospital/clinic-based and postnatal supports also are important. In the health setting, application of MBFI standards and compassionate evidence-based counselling need more attention. The removal of free formula led to more breastfeeding; other practices, such as elective c-sections require attention. Postnatal support from existing CHWs increases EBF, while expanded civil-society efforts, e.e. support groups, are needed. Some sub-groups require tailored programs, such as school-going mothers. Long-standing barriers, such as mixed-feeding norms and milk insufficiency beliefs, need to consider the role of culture as they are addressed.

Describe infant feeding patterns and their correlates using both standard and novel quantitative indicators for a Soweto-based sample of mothers with infants below six months.	See 3.2	Across all measures, breastfeeding practices are increasing post-Tshwane, but they differ by HIV-status. Exclusive feeding practices are associated with being HIV positive. Mixed feeding remains a norm that needs to be addressed.
Describe what health workers and other key actors believe are "the best" feeding practices for infants, in the context of HIV in Soweto.	See 3.3	While supportive of breastfeeding, HWs need further training on EBF and support with counselling skills. They have been influenced by PMTCT and community norms to distrust EBF in the HIV context.

In this discussion, the individual manuscript findings are not repeated, but rather built upon in line with the broader literature through the presentation of the adapted ecological framework and two key cross-cutting themes: Measurement matters and Mixed feeding cultural norms.

4.2 A (revised) ecology of factors

The conceptual framework for how infant feeding decision-making is influenced was adapted over the course of this thesis (from Figures 1.1, 1.2 to 3.1.1). The three levels depicted in the framework proposed by Rollins et al. (2016) were maintained as helpful for exploring the ecology of breastfeeding. The individual and settings levels were retained as per the original framework. At the structural level, the Policy Context was added to reflect how policies influence the broader social environment. As an intervention, policy was kept with legislation at the settings level.

By including Rollins and colleagues interventions, I applied intervention mapping (Eldredge et al., 2016), to identify which approaches/interventions should be used to address factors influencing EBF. As the factors on all three levels interact in a dynamic way; that

dynamism is captured well by behavioural theorist Bandura's construct of reciprocal determinism, whereby a change in one factor (individual, the environment or behaviour) alters what happens at another level (Baranowski et al., 2002). For example, a mother's feeding behaviour (initiating breastfeeding) and her individual beliefs (formula being too expensive) may change if free infant formula were removed from health facilities (environment). For this reason, interventions that simultaneously address factors at all levels are more effective at promoting breastfeeding (Rollins et al., 2016); this follows core principles of social and behaviour change communication (Leslie et al., 2016, Schiavo, 2016).

In the final version (See Figure 3.1.1), Bronfenbrenner's time dimension, the chronosystem (1993), was visually represented at two levels. At the individual level, it was represented by a series of measureable variables related to caregiver behaviour (at the bottom of the image). At the top, the conceptual framework also reflected the frequent infant feeding guideline changes that South Africa underwent from 1980 until 2018 with regards to exclusive breastfeeding, given this thesis' focus on policy change. This emphasis on historicity and subjectivities is often be lost in cross-sectional work. If this framework were developed for another country, adaptations would need to be made for its own policy context.

4.3 Measurement Matters: Whose optimal counts?

Biomedical versus social constructions of optimal

At the individual level, infant feeding practices were the critical outcome of interest for this study. Within the primary study, the two practices I sought to track were initiation of breastfeeding within the first hour (early initiation) and exclusive breastfeeding to six months, following WHO definitions of each (World Health Organization Secretariat, 2002, World Health Organization and United Nations Children's Fund, 2016). In doing so I accepted a bio-medical perspective, while remaining aware that the public health framing of "optimal" may not be perceived as "optimal" by mothers (Seidel, 2000). A reason for differing interpretations

of optimal, as highlighted in the literature review, is that different people (including scientists) link behaviours to different outcomes. To discuss mothers' definitions of optimal, e.g. quality of life, as a side-bar to a public health perspective is not to say that one is more valuable than the other. Insight into the motivations of mothers and other stakeholders is critical to promoting behaviours that support health and development.

Quantifying optimal practices

Leaving aside the question of "whose optimal?" for a moment, there was a fundamental question of which feeding measures to use and trust. While different measures of infant feeding have been used in South Africa, the EBF measurements used in this thesis research, showing increases, appear reliable for discussing trends. My key point of comparison was the DHS statistics, which showed a three-fold rise in EBF rates (National Department of Health et al., 2017). Critics point out that this was based on a sample of the 2000 children in the DHS, which did not reflect population-level data (Martin-Wiesner, 2018). The systematic review EBF data also showed an upward trend in EBF (see 3.1). The DHS used the preferred 24-hour maternal recall indicators from the WHO (World Health Organization et al., 2010), as I did in this research.

Within the infant feeding literature, maternal recall has been accepted as reliable. Zyl et al. (2016) found that breastfeeding and formula feeding were reliable over a ten year period and Li et al. (2005) found that maternal recall were valid and reliable within a short (three year) period for measures of both breastfeeding initiation and duration. In my case, mothers were still feeding, so there was not a concern of time lag. That my findings reflected an upward trend in Soweto's EBF is a positive indicator of real improvements. The trends have been variable; there were more modest increases shown in the four province study by Siziba et al. (2015), with only 12% EBF at six months. A more recent KZN study by Horwood et al. (2018) showed 48.9% EBF at 14 weeks, which was similar to the rates Siziba and colleagues found at the same

time point (Siziba et al., 2015). As discussed in my quantitative article (see 3.3), the Mnyani et al. (2016) study in Soweto found higher EBF rates could be due to how they sampled (convenience vs. quota), their smaller sample size (100 vs. 298), or how infant feeding was measured (not using the WHO 24-hour recall method).

A greater concern for quantitative measurement is a recent study comparing maternal recall against an objective gold standard for breastfeeding: stable isotope measures. These can be used to test the reliability of breastfeeding recall rates. A recent study reported by Mulol and Coutsoudis (2018), conducted in South Africa, found that self-reported 24-hour breastfeeding rates were significantly higher than the rates detected using a stable isotope measures at three different time points (6 weeks, 3 and 5.5 months). They reported kappa scores as having "slight or fair agreement" and concluded that maternal recall has limited accuracy and should be restricted only to large epidemiological studies (Mulol and Coutsoudis, 2018). Similar studies could not be identified to see if this trend of maternal recall over-reporting EBF is particular to a region of South Africa or if it is a common characteristic globally. Though not at the scale reported in the Mulol and Coutsoudis study, there were mothers like Martha (see 3.4) who admitted to us that they misreported their infant feeding in questionnaires during their in-depth-interviews, illustrating prestige bias. Nurses also talked about mothers "lying" about their feeding practices at clinics (see 3.2). All of this suggests that relying on quantitative maternal recall findings on infant feeding as real numbers needs to be done with caution.

For comparison purposes, I applied standard infant feeding recall measures to estimate infant feeding in Soweto and applied them to four distinct groups segmented by HIV status and main feeding practice. As recommended by Abdel-Hady and El-Gilany (2016), I reported both 24-hour and since birth recall measures. Consistent with their article, the 24-hour measurements over-estimated recall of exclusive feeding compared with the since birth estimates, while current measures had the advantage of providing estimates of mixed feeding

practices at the time. This richness of detail highlighted important feeding trends and patterns. The most important of these were that although breastfeeding may have improved in Soweto since the Tshwane Declaration of 2011, exclusive feeding (whether breastmilk or formula) is still strongly associated with having an HIV-infected status. From a health communication perspective, displaying data by potential audience segments is valuable for message development (Maibach and Parrott, 1995, Baker et al., 2013). Aggregating infant feeding patterns to all mothers may miss certain patterns unique to groups, required for designing strategic communication (Baker et al., 2013, Sanghvi et al., 2013).

In addition, responding to the concerns raised by Noel-Weiss et al. (2012) about combining content with modality, we reported bottle-feeding as a distinct feeding variable in our quantitative paper (see 3.3). By doing so, we substantiated the argument that mothers who report feeding their babies breastmilk are using bottles, particularly in later months. Shifting mothers to expressed breastmilk is more likely to happen when a mother has to return to work or school, which was reflected in higher rates of older infants receiving breastmilk in bottles (Nieuwoudt et al., 2018). As we did not test health outcomes, we were unable to verify whether bottle versus breastfeeding were resulting in different outcomes for those infants, which was the concern raised by Noel-Weiss and colleagues (2012). Nevertheless, this highlights another area in feeding communication that could be targeted.

Qualitative considerations of optimal

Qualitative measurement of the meaning of different types of feeding provided key insights into how future communication needs to shift to change norms, particularly around exclusivity. Both mothers and health workers associated exclusivity with HIV, as was highlighted in all four PhD manuscripts. According to both types of respondents, community members also perceive mothers who exclusively feed as HIV positive. The mixed-methods approach of this PhD enabled me to link feeding patterns to motivations. While I observed

exclusive breastfeeding among HIV-negative mothers, it was of shorter duration. The fear of HIV transmission, documented in many studies of HIV-positive mothers (see 3.1), provides a discernible extra motivation for maintaining EBF. Exclusive formula feeding was almost non-existent among mothers who were not HIV-infected, supporting that EFF is still perceived to be a HIV prevention method based on more than a decade of guidelines that promoted it as such.

Whose optimal?

To return to the question of "whose optimal," the results from this thesis research underlined a hierarchy in which mothers' interests were given low status. Despite the rhetoric of rights observed by Seidel (2004), "good" mothers in South Africa are expected to sublimate their own interests to those of their children (as if such interests were separate). This was evident in my case study (see 3.4) and has been noted by postmodern (Mahon-Daly and Andrews, 2002) and feminist scholars (Seidel, 1998, Marshall et al., 2007). Furthermore, the decision of what is optimal has been handed to health professionals, with instructions to apply standards like AFASS prior to supporting a mothers' choice, albeit often incorrectly (Doherty et al., 2007). This approach has a rational basis, but also undermines the notion that mothers are experts of their own contexts, a key element of having healthy conversations (Black et al., 2014). Rather than health workers being partners in counselling, they become arbiters of optimal (Desclaux and Alfieri, 2009), without necessarily appreciating the social, emotional or economic import of their advice. The infant feeding discourse of optimal is guided by biomedical perspectives, where mothers' quality of life is often devalued or completely ignored.

4.4 Mixed feeding as cultural norm

As highlighted in all four PhD publications, mixed feeding before six months is a social norm, reflected in practices and social patterns. The practice predated commercial formula (Hunter, 1961) and has persisted despite multiple infant feeding guideline changes and socio-

political upheavals. Though EBF may be increasing, the 24.7% of infants mixed feeding before three months in Soweto who we observed (excluding the 25.3% EFF) and the 39.9% mixed feeding reported nationally by the DHS for 0-3 month olds, also excluding EFF, points to a deep societal and cultural embeddedness of the practice (National Department of Health et al., 2017).

Infant cues

The practice of introducing foods prior to six months is often related to cues from an infant, such as reaching for foods or expressing lack of satisfaction with breastmilk (Nor et al., 2012b). The rigid WHO definition of EBF is experienced as unnatural for some mothers, going against their own understandings of what their infants need and how they should feed their infants. Some developed countries, such as Sweden, have refused to adopt the six month advice, with many paediatricians supporting the introduction of water and semi-solids prior to six months (International Baby Food Action Network, 2014). South African paediatricians and nurses have reported to do the same with mothers (Nor et al., 2012b, Jama et al., 2017a). Here we find mixed feeding being driven by behavioural cues. Studies have found that mothering confidence can be damaged if she is told she has failed by introducing foods or liquids before six months (Marshall et al., 2007, Locke, 2015, Knaak, 2010).

Cultural considerations

In addition to being a social norm, both the interviewees who contributed data to this thesis and the systematic review highlighted that mixed feeding is a cultural norm for multiple ethnic groups in South Africa. Not participating in particular cultural practices has the potential to alienate a mother from her direct support base, as was argued by Buskens and colleagues over a decade ago (2007). Some cultural practices are contextual, such as *ipupho*, where a mother's milk is considered unclean because she has been bewitched through a sexual dream (Seidel, 2004). Other practices cut across certain ethnic groups, such as traditional Zulu

medicine of *umfula* for 'cleansing' the infant's bowels of perceived impurities, which some mothers are unwilling to abandon (Nor et al., 2012b, Buskens et al., 2007). One health worker I interviewed described how she tried to discourage mothers from using traditional medicines until six months as opposed to discouraging the practice itself (not reported in 3.3).

By rejecting cultural practices, the mother may be seen as disrespecting her culture or the elders who are requesting the practice (Buskens et al., 2007). The public health community in its communication has not engaged reflectively on what we are actually asking of mothers in this instance when we insist on exclusivity. Fear of alienation may outweigh health considerations in these instances. Unless the cultural practices themselves can be discussed and shifted, this dynamic is likely to remain a barrier for those women who wish to align themselves with their cultural identity. Post-colonial and post-apartheid discussions of when and how cultural practices should be reviewed and revised, let alone *by whom,* are poorly reflected in the infant feeding literature. As researchers, we must reflect on why this may be, particularly in the racialized context of South Africa (Erwin, 2012)

HIV stigma towards exclusive practices

Most recently, HIV stigma has reinforced mixed feeding, by associating exclusive feeding practices with HIV. We found HIV negative mothers rejecting health advice to exclusively breastfeed because of a fear they would be identified as HIV positive. This fear (and belief within communities) reinforces mixed feeding practices. During interviews some HIV-positive mothers reported that they pretended to mixed feed in order to survive socially and avoid inadvertent HIV disclosure. Buskens and colleagues (2007), among others, recorded the same phenomena. Their reflection on what the public health community is actually asking HIV-positive mothers to do, both culturally and from a disclosure perspective, remains as true now as it did a decade ago:

> Are we not asking them to challenge both their own and traditional systems of belief and influence, including challenging those in authority over them; to challenge both patriarchy and their own internalised feelings of dependence, deficiency and disempowerment; asking them to risk being the first to be seen to bring HIV into their family by disclosing their status despite their own feelings of shame or guilt; to disclose also in the face of still-pervasive social stigma with known risks both for themselves and their dependants, including rejection, physical ejection or violence and loss of financial or social support? (Buskens et al., 2007: 1107)

The authors' observation that the public health community ask this of the most vulnerable and burdened people in society directly speaks to concerns that mothers end up getting blamed for a societal challenge. The identity struggles linked to infant feeding, whether it is being a good mother, a good Zulu or keeping ones HIV status private to avoid stigma, all relate to societal pressures needing to be acknowledged more overtly.

4.5 Limitations

The limitations of this study have been identified in each article, but are summarised here at a higher level. Given the complexity of infant feeding, a cohort design to capture influences over the first six months would have been preferable to the collection of cross-sectional data. Drawing on maternal recall data rather than biological markers of feeding may mean that the amount of EBF was overestimated, as suggested by Mulol and Coutsoudis (2018). Both the study design and measures of recall were informed by budget restrictions and standards of the day. As discussed in the quantitative paper (see. 3.3), quota sampling limited some claims to generalisability. The quantitative tool also excluded some key variables, such as education and infant feeding knowledge, which had to be addressed in discussions. The fact that I could not speak many of the local languages also meant that I had to rely on RAs for interviews with

mothers, which I believe resulted in less rich data in some cases. All of these limitations were in part addressed by using mixed methods, which enabled triangulation.

A broader limitation was retaining a limited focus on Black women in a township setting, which reinforces a misperception that infant feeding is a concern only for poor or historically marginalised populations. However, infant feeding is a decision that cuts across socioeconomic and racial divisions with regards to impacting on the health and wellbeing of both infants and mothers (Victora et al., 2016). A publication bias for HIV-positive and Black mothers unintentionally draws the public health community's away from other important populations. For instance, within South Africa's Indian Muslim population, feeding infants another person's breastmilk has familial implications, as there is a belief that the milk donor becomes a family member (Coutsoudis et al., 2011). The selection of Soweto as a study site limits transferability to non-urban populations. Mothers is Soweto are assumed to have higher levels of exposure to the media, more infant care options and experience less family pressure than their rural counterparts.

5 Recommendations and Conclusion

If people have moral courage to stand up to the smallest injustice – their own and other's – it's kind of like practice for when the big ones come around.

~Colleen Kelly

In the field of SBCC, there is a preference for multi-level interventions driven by evidence (Van Liere et al., 2014). In terms of child nutrition, particularly infant feeding, there is empirical support for multi-level approaches (Farnsworth et al., 2014, Rollins et al., 2016). This is the "way forward" chapter. In it, I present applications of the thesis findings that disrupt the idea of mothers being solely responsible for infant feeding decision-making. Instead, I address a range of stakeholders, particularly policy makers, those who develop and implement programmes (government, civil society and grassroots) and researchers. The chapter ends with a conclusion statement about the place of mothers (and others) in the discourse of infant feeding.

5.1 Implications of policy change

Frequent policy changes impact on the social ecology of infant feeding. My central focus was on changes to infant feeding guidelines, with particular interest in the removal of the free formula programme. However, my systematic review and study findings forced me to look into other sectors as well, including labour law, education, trade and industry, and water and sanitation. Regarding infant feeding guidelines, the rapid changes to guidelines without accompanying training for frontline health workers has caused problems. Confusing and/or conflicting messages have been strong themes of research relating to EBF barriers (see 3.1). Policies that would reinforce EBF, such as providing six months of paid maternity leave, have not materialised (Martin-Wiesner, 2018). Related to this, the assumed desire of mothers to remain home for six months to breastfeed has not been assessed, nor has the practical ability of workplaces to accommodate lactation been reviewed in any systematic way. This highlights the necessity of multi-sectoral coordination between government departments to align policies.

Another aspect of changing guidelines that emerged from this research was the limited participation of key stakeholders, particularly frontline health workers, in shaping how guidelines were going to be implemented. The proclivity for the government to adopt WHO guidelines without reflection and adaptation has resulted in guidelines being context-blind at both the health systems and individual level. Guidelines are intended to be flexible, but they can be taken on as dictates within health systems, shaping interactions between health professionals and community members (Desclaux and Alfieri, 2009). This was suggested by how health workers felt they had to "preach" whatever the government was saying (see 3.2). The dictate-from-above practice, beginning with the adoption of international guidelines without amendment, is mirrored in health system instructions, and translates finally into counsellor-client interactions. A top-down communication pattern becomes the norm, when

what mothers really need is for someone to listen to them and to help them, as individuals, to comprehend advice and adapt it to their own circumstances.

Given the number of changes to guidelines, I propose that researchers and health communicators need to show humility when engaging with the public and particularly mothers. We should not express surprise or disdain if health advice is discarded when conflicting with age-old family practices. With so many changes, who would not be suspicious of infant feeding guidelines? Though guidelines are changed based on increasing levels of certainty about the evidence, that evidence base continues to shift and force us to rethink what we knew. The point that EFF is credited with the end of MTCT in Cuba (World Health Organization, 2015) but is now discouraged in the South African context (Department of Health, 2011) is a case and point. The possibility that mothers and communities have something to teach us about child survival needs to be embraced, disrupting the expert-patient dynamic that prevails.

5.2 Develop a Communication Strategy

A national communication strategy that sets out clear communication objectives to increase early initiation of breastfeeding and exclusive breastfeeding would greatly enhance the focus of the current breastfeeding campaign. The existing mass communication campaign led by the NDOH and UNICEF (United Nation's Childrens Fund (Unicef), 2016) has positive elements, targeting families and communities, but to my knowledge did not do enough formative research with target audiences prior to its launch. A communication strategy needs objectives that are framed around reducing barriers or increasing supports to the desired behaviour(s) (O'Sullivan et al., 2003). Each communication objective should address a specific audience and suggest channels and approaches through which objectives could be met, which ideally should be generated through a participatory process grounded in the country of interest (Sanghvi et al., 2013). Based on the success of the Alive and Thrive (A&T) in supporting infant feeding and positive health outcomes (Rawat et al., 2013, FHI 360, 2012), I recommend

that the NDOH leads the way in constructing a communication strategy that pinpoints interventions at all of the levels indicated in their SBCC framework, as illustrated in Figure 5.2.

The policy recommendations from 5.3 should be integrated as advocacy objectives, targeting the appropriate departments, while the programmatic recommendations in 5.4 will highlight mass communication, interpersonal communication and community mobilisation opportunities specific to South Africa. Research recommendations in 5.5 will highlight strategic data. Of course, any true national communication plan should be developed through an inclusive and consultative process with community and other key stakeholders. These recommendations provide a starting point.

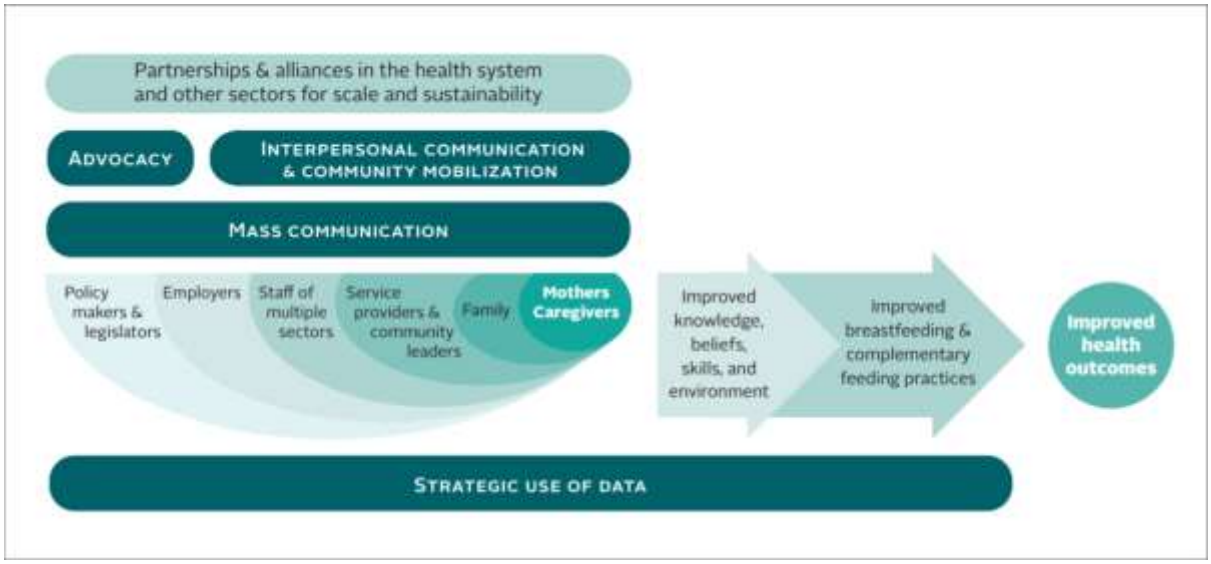

Figure 5.1 Alive and Thrive's SBCC Framework

5.3 Policy recommendations

The South African government has expressed political intent to support breastfeeding through multi-sectoral action through the Tshwane Declaration (Department of Health, 2011). A recent policy review has also identified a number of labour and health -related policies requiring attention (Martin-Wiesner, 2018). This included protection of breastfeeding in the workplace, a focus on Resolution 911, which supports enforcement of the Code, and

implementation of the Mother-Baby Friendly Initiative (MBFI). In addition to these policy areas, I have identified in the course of undertaking this research education, social development and water and sanitation policy actions. Policy recommendations are presented by sector, focusing on breastfeeding promotion but also on supporting mothers to make informed choices within their contexts.

5.3.1 Department of Labour

Returning to work was identified as one of the key barriers to EBF through my empirical research and in the systematic review. This related to the desire to earn, lack of childcare near work and lack of support for expressing milk (see Systematic Review, 3.1). Three policy recommendations for the Ministry of Labour have been supported through findings of this thesis research.

Legislated paid maternity leave and breastfeeding breaks

At present, mothers in South Africa are guaranteed neither paid maternity leave or breastfeeding breaks to facilitate EBF for six months (World Policy Analysis Center, 2018). Currently, the Basic Conditions of Employment Act enables mothers employed in the formal (vs. informal) sector to get four months of unpaid leave, which can begin from one month before delivery (Department of Labour, 1997, Department of Labour, 2014); with those working in the informal sector only being covered through a voluntary Code of Good Practice on the protection of employees during pregnancy and after the birth of a child (Department of Labour, 1998). Maternity benefits can be covered by applying to the Unemployment Insurance Fund (UIF) during this time (see next section). A review of 38 LMIC countries who have changed legislated paid maternity leave noted that for every one month of paid maternity leave there was a 5.9% increase (95% CI 2.0 to 9.8) in EBF prevalence and a 2.2- month increase (95% CI 1.1 to 3.4) in breastfeeding duration (Chai et al., 2018). Such evidence suggests that providing six months paid maternity leave would increase EBF for working mothers in South

Africa. Civil-society led initiatives to promote this type of legislative change in other countries have been successful, such as Alive and Thrive (Fhi 360, 2012).

Speeding up Unemployment Insurance Fund (UIF) payments

Excluding students (secondary and below) and non-citizens, mothers who take maternity leave are entitled to UIF payments (Department of Labour, 2013). While mothers are able to apply as soon as they take maternity leave, in practice the payments are often only released a few months after birth (Jaga, 2018). Economic concerns related to returning to work were a frequent refrain in thesis interviews as well. Slow UIF payments increase pressure on mothers to return to work earlier than the four unpaid months of maternity leave to which they are entitled. Financial dependence on families while they are not working can reduce mothers' confidence to insist on their preferred feeding method. Investing in improving the efficiency of the UIF registration and payment system would ease these pressures.

5.3.2 Health Sector

There are several structural barriers to breastfeeding initiation within the health system that remain to be addressed, most notably around enforcing adherence to the Mother-Baby Friendly Initiative (MBFI), addressing high levels of caesarean sections, extending health services into the postnatal period, and improving health worker counselling content and practices.

MBFI enforcement and expansion

There is nothing wrong with the initiative recommendations. However, while hospitals are being accredited as Mother-Baby Friendly, evidence shows that key elements, such as promoting breastfeeding, providing rooming in facilities, and avoiding prelacteal feeds are not always adhered to (Jama et al., 2017b). This may be due to the HIV epidemic, which has made health workers understandably nervous about limiting information about formula altogether, as highlighted our interviews (Nieuwoudt and Manderson, 2018). While specific

recommendations made in the recent policy review (Martin-Wiesner, 2018) to focus on monitoring and enforcement of MBFI facility standards and extend into services for community support are supported by the thesis research, more nuanced discussions with health workers to understand their concerns about enforcing all elements are recommended.

Reduction of elective (not medically necessary) caesareans

The quantitative data collected during the thesis research highlighted that caesarean sections were associated with delayed breastfeeding initiation, as supported by the broader literature (Hobbs et al., 2016). While there has been a recent upsurge in media coverage about the politics of elective caesareans and potential risks to mother and baby (Smith, 2014, Pilane, 2016), the presentation of risks have not necessarily made the breastfeeding link (Gebhardt et al., 2015). Allegations that doctors are pressuring mothers to have caesarean sections (Pilane, 2016) need to be investigated by their professional governing bodies (in both public and private practices). With caesarean sections making up over a quarter of public sector deliveries (Gebhardt et al., 2015) and nearly two-thirds of private sector deliveries (Smith, 2014, Council for Medical Schemes, 2016), reducing this practice could have a positive impact on breastfeeding. Apart from reducing the practice, ensuring that skin-to-skin contact and other MBFI-supported practices are targeted particularly to mothers who have had caesarean sections may mitigate the differences in breastfeeding due to delivery type (Chaplin et al., 2016, Beake et al., 2016).

Centralizing quality control of breastfeeding promotion content

Mixed messages from health workers is one of the primary reasons mothers do not adhere to EBF (see 3.1.1). Currently, provincial departments of health have control over the materials used to support infant feeding counselling, and consequently, quality and content may vary. Given the frequency of guideline changes, I recommend an audit to remove outdated materials and a centralised push to ensure that all provinces are consistent with the core

messages they are communicating. The current mass communication strategy will then have better reinforcement at provincial and district levels.

5.3.3 Education

Support continued education and breastfeeding among school-going mothers

Mothers interviewed for this research highlighted that returning to secondary school, or in a few cases, post-secondary education, was a barrier to EBF; this was also identified in the systematic review (see 3.1). Given the high rate of young women (age 15-19) giving birth (71 births per 1000 women) (National Department of Health et al., 2017), the DoH needs to engage with the Department of Education (DoE) to explore strategies to support young mothers to continue their education while breastfeeding. Concrete suggestions relate to nearby childcare options and lactation spaces, much as I have proposed for working mothers.

"Teenage pregnancy" is a sensitive topic in South Africa, with very punitive attitudes towards pregnant adolescents in various ministries. For instance, learners are not eligible to apply for paid maternity benefits through the UIF (Department of Labour, 2013). There are legal protections in the Basic Education Act, tested in court cases, which enable pregnant girls and new mothers to remain in school (National Department of Education, 2011, Davids and Waghid, 2013). However, these protections are not supported by many school governing bodies and principals, who express a desire for these young women to be excluded as they are perceived to be setting a bad example for their peers (Bhana et al., 2010). Appealing to this sentiment, former President Zuma repeatedly proposed that school-going mothers be separated from their babies and sent to Robben Island (a major site of long-term incarceration under apartheid) until they finish their schooling (Sapa, 2015). Although this did not happen, this stigmatising context, alongside lack of support for childcare facilities, translates into a context whereby school-aged mothers are given an option of either breastfeeding or continuing their schooling (Pillay, 2018). This disadvantages both mother and infant, as dropping out of school

reduces their future prospects, resulting in poor employment prospects, lower income and exposure to social risks.

5.3.4 Trade and Industry

R911 monitoring and enforcement

The promotion and normalisation of commercial formula in South Africa was often a backdrop rather than the focus of this thesis research. Since the signing of the Tshwane Declaration in 2011, South Africa took steps to enforce the International Code of Marketing of Breastmilk Substitutes (herein Code), which coincided with the dismantling of its free formula programme for HIV positive mothers. In 2012 the government passed Resolution 911 – The Regulations Relating to Foodstuffs for Infants and Young Children (National Department of Health, 2012b, National Department of Health, 2012a) to formalise the Code in South Africa. In response, 14 corporations involved in the manufacture, marketing and/or sale of formula voluntarily set up the Infant Feeding Association (IFA) to police their industry, with Nestle even hiring a dedicated R911 compliance officer (Martin-Wiesner, 2018). In terms of government, according to Martin-Wisner's policy review, "No government agency appears to collect data or have a system in place to measure the size and changes in the formula market or in the rate of use of formula or other breastmilk substitutes" (2018: 47). While the South African Civil Society for Women's Adolescent's and Children's Health (SACSoWACH) has played an ad hoc role in documenting and reporting violations (Jones, 2018), the same is not true of DTI. The DTI should be tasked by the Presidency with playing a more proactive role in monitoring the formula market in line with R911.

5.3.5 Water and Sanitation

This thesis research highlighted the extent to which access to clean water and sanitation remain a challenge for many South Africans, with 57.4% of the study sample in Soweto still

relying on communal taps (Nieuwoudt et al., 2018). Given links between poor sanitation and child mortality (Obi et al., 2006, Vanderslice et al., 1994), those working in the area of infant feeding should be working more closely with Department of Water and Sanitation to accelerate access, particularly for communities with high fertility rates. Even if more working mothers express breastmilk, the low uptake of spoon or cup feeding we measured suggests that clean water and sanitary ways to clean bottles will remain critically important (Andresen et al., 2007b, Veldman and Brink, 2004).

5.4 Programming

At the programmatic level, there are several interventions that can be built upon or introduced to support mothers, their families, health workers, employers and communities in South Africa to achieve optimal feeding for their infants (and themselves).

5.4.1 Making the business and development case for breastfeeding

Given the economic benefits of breastfeeding, more needs to be done to convince the private sector of the benefits of promoting breastfeeding (Rollins et al., 2016). This means shifting messages away from health to looking at outcomes like worker productivity, staff satisfaction, talent retention and similar metrics. While this thesis research did not engage with the private sector in the course of undertaking this research, the vulnerability of working mothers was clear. Changing the attitudes of employers so that they voluntarily support breastfeeding (or paid lactation breaks) in the workplace is more likely to benefit working women than asking each individual working woman to come up with her own strategy to navigate challenges like childcare or expressing breastmilk. An example of this is evidence that the provision of low-cost lactation rooms and nursing breaks decrease absenteeism and increase retention and workplace performance (International Labor Organization, 2014). Ideally, government should work hand in hand with civil society groups, like SACSoWACH, to engage with the private sector about this perspective in a blend of advocacy and social mobilization.

Review trade mechanisms for commercial formula and complementary foods

Trade interventions are another way that the promotion of breastfeeding can be protected. An insightful article about the link between trade and food environments was published in 2013, highlighting a number of mechanisms by which government can change the food environment (Friel et al., 2013). Although commercial formula and complementary foods specifically marketed to infants were not specified, there is no reason that the same principles could not be applied in a review of how trade is influencing infant feeding. While regulation was noted as one trade mechanism, numerous others are put forward for consideration (Friel et al., 2013), which may be worth exploring.

5.4.2 Improve health worker skills in supporting mothers

Health worker training in healthy conversations and risk counselling

More investment is needed from the NDoH to engage with frontline health workers, who are an extremely important source of advice for expectant and new mothers. HWs who interact with expectant and new mothers need to be retrained. They require updated information on the science behind infant feeding, highlighted by the misguided understandings of risk recorded in this thesis, which included overstating HIV transmission risks and underplaying the risks of mixed feeding (Nieuwoudt and Manderson, 2018). Moreover, given the lack of supportive environments for many women, health workers also need strategies on how to advise mothers about the additional social, economic and emotional risks they experience (Nieuwoudt and Manderson, 2018). For instance, if a mother believes she would have to disclose her HIV in order to get support for exclusive breastfeeding, but fears violence, HWs should be able to listen and advise.

An evaluated approach called Healthy Conversations (Black et al., 2014) is one way the NDoH could retrain HWs on their counselling roles, moving away from the status quo dissemination of health messages. This has been embraced by the Ministry of Health in New

Zealand, including a ready-made set of training tools (Healthy Start Workforce Project, 2018), with accredited professional training hours provided to midwives, nurses and GPs. To build self-efficacy to breastfeed, mothers need HW reassurances about risk (Bennett et al., 2010), which could be integrated into this approach.

Integration and expansion of NurseConnect

Evidence-based messages from MomConnect should be fed into NurseConnect, an mHealth platform for government nurses, to support the consistency and reinforcement of messages (Health-E, 2016). The platform should be expanded to ward-based outreach team members, who are not currently included in the audience, but are involved in infant feeding counselling. This should be evaluated, as reviews of the use of mHealth interventions with frontline health workers remain inconclusive (Agarwal et al., 2015).

5.4.3 Increasing mother and caregiver self-efficacy to breastfeed

Emerging from the thesis research is the importance of targeting mothers' self-efficacy to breastfeed. Shifting the supportive environment, though policy changes (see 5.2), mass media campaigns targeting norms (see 5.3.1) and HW training (see 5.3.2) may all indirectly contribute to increasing self-efficacy. Direct messaging that addresses knowledge, fears and access is another individual-level approach. In addition to HW counselling (addressed in 5.3.2), this can be done through reinforcing messages across multiple communication channels.

Mobile technologies or mHealth

mHealth technologies are useful to integrate into the communication strategy, as they are already in use and can provide platforms for reinforcement. mHealth is a channel that can reach individuals directly, in our case mothers, caregivers and health workers. In addition to MomConnect (Seebregts et al., 2016), Gateway Health Institute (GHI) is also piloting a mHealth initiative in the Northwest and Guateng provinces targeting HIV positive mothers and

elected “buddies” called SmartParent, which I am supporting in terms of theory-based messaging (Gateway Health Institute, 2018).

MomConnect is an evaluated mHealth initiative led by government that sends stage-based messages directly to pregnant women and mothers for the first year of life (Barron et al., 2016). In this doctoral study, MomConnect was the most commonly cited source of breastfeeding information on mobile phones, but was not listed as influential when it came to making decisions (Nieuwoudt et al., 2018). Although a recent study in Malawi found the mHealth messages did not influence PTMCT practices (Mwapasa et al., 2017), an evaluation of MomConnect found improved breastfeeding self-efficacy among those who had been exposed to messages (Skinner et al., 2018). The following are recommended for MomConnect:

Design theory- and evidence-based messages: While Skinner and colleagues (2018) found some evidence of MomConnect messages improving breastfeeding self-efficacy, the DoH is using Gates funding to research how to use behavioural theory to improve breastfeeding messages. I am part of the team conducting this research. Similar processes have been conducted in Myanmar (Hmone et al., 2016), which are guiding us. I am applying the same principles to support SmartParent’s more focused target audience. Lessons will be fed back into the MomConnect network.

Address structural barriers to access. Another study on MomConnect (Wolff-Piggott and Rivett, 2016) suggests that the DoH should simplify enrolment processes and the network infrastructure to improve MomConnect’s impact. A recent pilot of enabling mothers to receive MomConnect messages on WhatsApp also has shown great promise in terms of engagement, with the one percent who used this service generating 50% of the Help Desk queries (Praekelt Foundation, 2018). Such endeavours should be encouraged to increase the base of mothers (and potentially others) accessing these messages.

Expand audience to infant caregivers and support network in the postnatal period: Initiatives to replicate MomConnect in Nigeria and Kenya have resulted in caregivers receiving messages (Praekelt Foundation, 2017b, Praekelt Foundation, 2017a). Given the high level of cooperative caregiving in South Africa, this should be considered in our context, particularly for infant feeding. This idea is being piloted with SmartParent.

Support groups

Having some sort of support in the postnatal period was important for maintaining infant feeding decisions. As noted in the Literature Review, interventions that have provided mothers with support in the postnatal period showed increased EBF rates. While some groups exist in South Africa, such as La Leche League, they are not everywhere. The development of support groups is probably better managed through civil society than government, given the ever-changing composition of such groups. Furthermore, given the practice of cooperative caregiving in South Africa, it would make sense to open support options to additional caregivers as well, such as MomConnect did in Nigeria and Uganda by opening up access to partners and family members (Praekelt Foundation, 2017b, Praekelt Foundation, 2017a).

5.5 Research

A large amount of research has already been conducted in terms of understanding the determinants of infant feeding, as set out in the systematic review. Future research should feed directly into formative processes for interventions, such as mass media campaign message design, support systems, social mobilisation, and/or policy advocacy. Among caregivers, more research is merited on how infant cues, such as crying, are interpreted to identify hunger. Researchers also need to open up a space to discuss ways, beyond nutrition, that breasts are used, e.g. comforting infants. Key stakeholders who have been under-researched include employers, labour unions, as well as policy-makers from the non-health departments. The role

of the formula industry in shaping norms is another research area which could add insight into the South African context.

Emerging from my thesis, additional analysis of data and further research is being planned in the near-term as follows:

1. A commentary of infant feeding guideline changes over time to bring out key lessons related to health promotion is being discussed with Ann Behr from the National DoH. This will complement the review conducted on the current policy environment conducted by (Martin-Wiesner, 2018).

2. A network mapping analysis will be conducted based on the 46 IDIs with mothers to strengthen our understanding of the nature and power of kinship and external relationships in the context of infant feeding.

3. A comparative paper is being planned with a MPH student, under my supervision, who is studying infant feeding among affluent mothers in Johannesburg. She used the same IDI guides as this thesis with an understudied population. Our comparison paper will assist implementers in determining the extent to which infant feeding decisions are cross-cutting or particular to sub-populations of mothers.

4. In collaboration with researchers from the University of Cape Town (UCT) and Johns Hopkins, I am supporting the analysis and write-up of qualitative transcripts about breastfeeding barriers and facilitators among users of MomConnect.

5. I am in discussion with an urban geographer from Queens University in Canada to collaborate on a project on "milk economies" that will explore the phenomena of the milk banking industry in South Africa.

In addition to this upcoming work, investment in more rigorous mixed-methods designs is justified. RCTs are difficult and expensive to conduct given the call for multi-level interventions. This is particularly true if mass media campaigns to address norms are going to be conducted (Bicchieri, 2016) as setting up controls is virtually impossible. The place for small quantitative studies is rapidly being replaced by the need for qualitative insights and larger statistically powered cross-section and cohort designs. Longitudinal studies, both qualitative and quantitative, which can capture decision-making over time, are still valuable. I am looking for opportunities to design or collaborate on such endeavours moving forward.

5.6 Conclusion

Mothers remain overrepresented as targets of behaviour change communication and underrepresented in terms of being involved in co-creating solutions. Multi-level and multi-sectoral action to support optimal feeding is the ideal way to improve child survival in South Africa. In writing up this recommendation chapter, I became keenly aware that mothers could easily remain acted upon, in this case by focusing on the social ecology around them, instead of directly involving them in proposing solutions. This highlights a challenge in the discipline of public health, which often seeks to help others as beneficiaries instead of partners. By listening to mothers and frontline health workers, and including their families, I propose that we can also improve mothers' quality of life while safeguarding infant health. Without a commitment to inclusion based on values, the danger of excluding mothers is a potential in all of the proposed recommendations. As South Africans say, borrowing from Mozambicans, "A luta continua" (the struggle continues) in our efforts to bring about equity, justice and well-being for all.

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Appendix A. Co-Author Agreement

Declaration: Student's contribution to article(s) and agreement of co-author(s)

I, **Sara Jewett Nieuwoudt, student number [586626]**, declare that this Thesis is my own work and that I contributed adequately towards research findings published in the article(s) stated below which are included in my Thesis.

Signature of Student ..... **Date** 15/11/18

Name of Primary Supervisor: Prof Lenore Manderson

Signature of Primary Supervisor **Date** 01/12/18

Agreement by co-authors: By signing this declaration, the co-authors listed below agree to the use of the article(s) by the student as part of her Thesis. In cases where the student is not the 1st author of a published article, the primary supervisor must explain (under comments) why the student is entitled to use the paper for his/her degree purposes.

Article 1: Title: Factors associated with optimal breastfeeding in South Africa between 1980 to 2018: A mixed-methods systematic review
Journal name, year: South African Health Review 2019 (abstract submitted)

Authors	Name	Signature	Date
1st author	Sara Jewett Nieuwoudt		15/11/18
2nd author	Lenore Manderson		11/12/18
3rd author	Shane Norris		11/12/18

Article 2: Title: Frontline health workers and exclusive breastfeeding guidelines in an HIV endemic South African Community: a qualitative exploration of policy translation.
Journal name, year, volume and page numbers: *International Breastfeeding Journal.* 2018; 13:20 doi:10.1186/s13006-018-0164-y

Authors	Name	Signature	Date
1st author	Sara Jewett Nieuwoudt		15/11/18
2nd author	Lenore Manderson		

Appendix B. Quantitative and Qualitative Data Extraction guides

Quantatitative extraction	Qualitative
Author: First name + year of publication	**Author:** First name + year of publication
Year of data collection: When the data collection actually took place	**Year of data collection:** When the data collection actually took place
Setting: Include type (urban, rural, peri-urban) and specific towns/provinces	**Setting:** Include type (urban, rural, peri-urban) and specific towns/provinces
Design: As described by the authors; may be missing	**Design:** As described by the authors; may be missing
Outcome(s) of interest: The form(s) of infant feeding measured (be specific)	**Outcome(s) of interest:** The form(s) of infant feeding explored (if specified)
Sample(s): Try to link to outcomes and check whether HIV status is mentioned	**Sample(s):** Try to link to outcomes and check whether HIV status is mentioned
***EBF %:** Best measure of EBF, meaning most strict definition in line with WHO and longest duration reported	**Data Collection:** The method(s) used to collect data, e.g. IDI, FGD, observation
Findings: For the outcome, be specific about outcome (definition and duration if known) and any factors adjusted for	**Analysis Approach:** How data were analysed, e.g. thematic, content, grounded theory, etc.
****This may require recalculation for comparison purposes***	*****Findings/Themes:*** Code directly in NVivo for meta-synthesis (**not captured in Excel)

Excel data extraction instructions

For each article, collect data on each of the above labels as it is presented by the authors, with the exception of EBF measures, which may need to be recalculated to have the entire sampled population in the denominator. For qualitative, themes do not need to be extracted into Excel, as they will be coded directly in NVivo.

Example of qualitative spreadsheet

Author, Year	Year data collect	Setting	Study Aim	Design	Outcome of interest	Sample	Data collect	Analytic
Blah, 2020	2015	*PU/T (Soweto, GP)*	*To explore infant feeding*	*Longitudinal*	*Any feeding practice*	*Indian mothers*	*IDIs*	*Thematic analysis*

NB : See Appendix Q for article quality guides and scoring.

Appendix C. Questionnaire

WHO-SIFO

University of the Witwatersrand, Johannesburg
Developmental Pathways for Health Research Unit
Department of Paediatrics and Child Health
& School of Public Health

WHO Soweto Infant Feeding Questionnaire

INFANT FEEDING QUESTIONNAIRE

Participant ID: _____

- **Eligibility confirmed** ☐
- **Consent form signed** ☐
- **Interest in qualitative study** ☐

Recruitment Site Code: _____

Interviewer's name: _____

Interview date: _____

SECTION 0– SOCIODEMOGRAPHIC INFORMATION

I: To begin with, we want to know a little bit more about your background.

N0.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
S1	Date of birth –YY-MM-DD	|___|___||___|___|- |___|___|- |___|___|	**➔ GO TO S2**
S2	How long have you lived in Soweto?	Doesn't live in Soweto……..…1 Less than six months…….……2 6 months to < 1 year…….……..3 1-4 years…….……4 Five or more years…….…….5	**➔ IF 1 GO TO S3** **➔ IF 2-5 GO TO S4**
S3	Where do you currently live?	Johannesburg…….……1 Other…….……2 a. Specify :_____	**➔ GO TO S4**
S4	What is your primary language?	IsiZulu…….……...1 SeSotho…….…….2 Setswana…….....3 isiXhosa…….……4 Sitsonga…….….5 Other……...…6 a. Specify: _____	**➔ GO TO S5**
S5	Are you a South African citizen?	NO …….…….……..... 0 YES …… 1	**➔ GO TO S6**
S6	What is your current employment?	Employed – part-time (paid)…..…….…….1 Employed – full-time (paid)…..……...2 Unemployed…….…….…..3 Student…….…….…....4 Home duties (unpaid)……...5 Other…….……6 a. Specify: _____	**➔ IF 1-2 GO TO S7** **➔ ELSE GO TO S8**
S7	Does your current employer offer maternity leave?	NO …….…….……..... 0 YES …….…… 1 Do not know…….……. 99	**➔ GO TO S8**
S8	What is your current relationship status?	Single……..1 Relationship – Not living with partner……...2 Relationship – Living with partner…….3 Other……...4 a. Specify: _____	**➔ GO TO S9**

S9	Including you, how many people live in your home?	*Ensure person counts herself* |___|___|	➔ **GO TO S10**
S10	How do you currently access water for washing your hands?	Communal tap ……..……...1 Tap in house …..……..……....2 Other……..…...3 a. Specify: _____	➔ **GO TO S11**
S11	How do you currently access water for drinking?	Communal tap……..……..……....1 Tap in house…..……2 Purchase bottled water…...…….…..3 Other……..……4 a. Specify: _____	➔ **GO TO S12**
S12	Do you have reliable access to a freezer or refrigeration?	NO …….…….. 0 YES …….……..…….. 1	➔ **GO TO S13**
S13	Which government grants, if any, do you access? *Multiple responses possible*	0. None……0 1. Child grant……..…1 2. Social grant…….2 3. Other……...3 a. Specify: _____	➔ **GO TO S14**
S14	On what date was your baby born?	|___|___||___|___|- |___|___|- |___|___|	➔ **GO TO S15**
S15	What is the baby's sex?	Boy……..1 Girl……...2 Other……...….3 a. Specify: _____	➔ **GO TO S16**
S16	What name would you like us to call your baby for the rest of interview?	_____	➔ **GO TO S17**
S17	In addition to ***(NAME)***, have you given birth to any other children?	NO …….. 0 YES ……..…….. 1	➔ **IF YES, GO TO S18, ELSE GO TO NEXT SECTION**
S18	How many were stillborn?	|___|___|	**GO TO S19**
S19	How many were born alive?	|___|___|	**GO TO S20**
S20	Of those, how many are still alive?	|___|___|	**GO TO S21**

S21	How many of your children currently live with you, including ***(NAME)***?	|___|___|	**THANK YOU GO TO NEXT SECTION**

SECTION I – INITIATION OF INFANT FEEDING

I: Now we would like to know a little bit more about how you have fed ***(NAME)*** since he/she was born.

N0.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
1	Did you ever give ***(NAME)*** your own breastmilk?	NO ……. 0 YES …….…… 1	**➔ IF NO, GO TO Q2** **➔ IF YES, GO TO Q3**
2	State the main reason or reasons why you did not breastfeed ***(NAME)***? *DO NOT READ OUT THE LIST.* *MULTIPLE ANSWERS ARE POSSIBLE* *a) Ask her to select the MAIN reason and underline it*	1. Mother ill/Weak ……..…… 1 2. Child ill/Weak ……..... 2 3. Nipple/Breast Problem ……..... 3 4. Insufficient Milk ……..…..…… 4 5. Milk not good ……...…….. 5 6. Mother Working/at School (Or Planning to) ……. 6 7. Child Refused …...…….…….... 7 8. Worried About HIV and AIDS ……..... 8 9. Chose to formula feed ……..... 9 10. Doctor/health provider's advice …..... 10 11. Advice of Family Member/Friend ……. 11 12. Other ……..……..……. 12 Other, specify_____ Do not know/ remember…….…… 99	**➔ GO TO Q8 (WHATEVER THE ANSWER GIVEN)**
3	How long after birth did you first put ***(NAME)*** to the breast? *If respondent reports she put the infant to the breast immediately after birth, circle '000' for 'Immediately'.* *If less than 1 hour, circle '2' for hours and record '00' of hours.* *If less than 24 hours, circle '2' and record number of completed hours, from 01 to 23. Otherwise, circle '3' and record number of completed days.*	1. Immediately …..... 000 ***OR*** 2. Number of hours ……..…..…… |___|___| ***OR*** 3. Number of days ….....|___|___|__| ***OR*** 4. Number of months ……... |___|___| ***OR*** 5. Was never breastfeed (used another feeding modality, e.g. bottle, tube or cup)	**➔ IF 1 GO TO Q5** **➔ ELSE GO TO Q4**
N0.	**QUESTIONS AND**	**CODING CATEGORIES**	**SKIP**

	FILTERS		
4	Why was breastfeeding not initiated immediately? *DO NOT READ OUT THE LIST. Multiple responses possible.* *Circle '1' for those mentioned* *Circle '2'* *for those not mentioned* *Probe for further responses. When the respondent stop listing, ASK, "Anything else?"*	1. Mother ill …… 1 or 2 2. Baby premature ..…… 1 or 2 3. Traditional reasons …… 1 or 2 Traditional, specify_____ 4. Not given the baby immediately …….. 1 or 2 5. Mother had made an informed choice not to breastfeed …… 1 or 2 6. Hospital or clinic provided with a breast milk substitute …… 1 or 2 7. Other …… 1 or 2 Other, Specify_____ Do not know …… 99	**➔ GO TO Q5** **(WHATEVER THE ANSWER GIVEN)**
5	Did you ever receive support to start breastfeeding (***NAME)***?	NO …… 0 YES …… 1	**➔ IF YES, GO TO Q6** **➔ IF NO, GO TO Q8**
6	Who gave you support to start breastfeeding ***(NAME)***? ***Multiple responses possible.***	1. Spouse/boyfriend…… 1 2. Mother/mother-in-law/grand-mother …… 2 3. Sister or my husband's sister …… 3 4. Friend/neighbour …… 4 5. Health workers at the Health Centre …… 5 6. Community Health Workers …… 6 7. Other …… 7 Other, specify_____	**➔ GO TO Q7** **(WHATEVER THE ANSWER GIVEN)**
7	Of those, who **was the most** important person to support you?	My spouse/boyfriend…….. …… 1 My mother/mother-in-law/grand-mother …… 2 My sister or my husband's sister …… 3 My friend/neighbour …… 4 Health workers at the Health Centre …….. 5 Community Health Workers …… 6 Other …… 7 Specify other: _____	**➔ GO TO Q8** **(WHATEVER THE ANSWER GIVEN)**
8	What was used to feed ***(NAME)*** since his/her birth? *Multiple responses possible.*	0. Own breast……..0 1. Infant formula milk ……1 2. Another woman's breastmilk……2 3. Cow's (or other animal) milk …… 3 4. Juice/fruit juice …….. 4 5. Water and sugar mixture …….. 5 6. Fluid from traditional mixture …….. 6 7. Rooibos tea …… 7 8. Semi-solid food (mashed or pureed) like thin porridge, bread in milk, banana etc…….. 8 9. Other: _____ …….9	**➔ IF FORMULA, GO TO Q9** **➔ ELSE, GO TO Q12**

N0.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
9	Do you still feed ***(NAME)*** formula?	NO …….……..... 0 YES ……..… 1	**➔IF YES, GO TO Q10** **➔ELSE, GO TO Q12**
10	We are going to talk about the preparation of ***(NAME'S)*** formula: *For these questions, standard bottle and scoop sizes will be available to assist the interviewee in identifying quantities.*		
10a	In which form is the formula?	Liquid – ready to use …….……...… 1 Powder form ....…….……..... 2 Concentrated form ...……...…...…...….... 3 Other…….…….....…….... 4 Other specify _____	**➔IF 1-3 GO TO 10B** **➔ IF 4, GO TO 10L**
10b	What is the size of the container of the formula are currently using? *Write the number* *Circle whether it is grams (g), kilograms (kg), litre (l), millilitres (ml). Show samples.*	|___|___|___|___| gram(s)/ kilogram(s)/ litre(s)/ milliliter(s)	**➔ GO to 10C**
10c	For how long does the formula container last? *Write the number* *Circle whether it is day(s), week(s) or month(s)*	|___|___| Day(s) /Week(s) /Month(s)	**➔ GO to 10D**
10d	Do you <u>mainly</u> feed ***(NAME)*** with: *Only one possible response* *Circle the response given*	Bottle …….……...….... 1 Cup ……....……....….... 2 Spoon …….…….....….... 3	**➔IF *1* GO TO 10E** **➔IF ELSE and the infant has formula in liquid form, GO TO Q10L** **➔ IF ELSE and the infant has formula in powder or concentrated form, GO TO Q10G**
10e	How many bottles do you own?	|___|___|	**➔ GO TO 10F**

10f	What is the size of the bottle that you mainly use CURRENTLY? *Include volume of the bottle used in ml.*	|___|___|___| ml	**Please look at response in Q10D** ➔ **IF the infant has *Liquid formula,* GO TO 10L** ➔ **IF the infant has *Powder or Concentrated formula* GO TO 10G**
10g	In which order do you usually incorporate the formula and the water?	Water then formula …..…… 1 Formula then water …….……..... 2	➔ **GO TO Q10H**
10h	What type of water do you **mainly** use? *Only one possible answer* *Circle the answer given*	Tap water not boiled …...…….. 1 Tap water boiled …...……..…….. 2 Mineral water (bottled water) not boiled ... 3 Mineral water (bottled water) boiled ……... 4 Other…….……...…….….. 5 Other, specify _____	➔ **GO TO Q10I**
10i	How much water do you put in the mix? *(include unit, e.g. ml)* *Circle whether the unit is liter (l) milliliters (ml), cups etc…*	|___|___|___|___| litre(s)/ milliliter(s)/ cups	➔ **GO TO Q10J**
10j	How much powder/concentrated formula do you put in the mix? *Circle whether the unit is scoops, liter (l) milliliters (ml), cups etc…*	|___|___|___|___| scoops/ cups/ litre(s)/ milliliter(s)	➔ **IF the respondent uses powder, GO TO Q10K** ➔ **IF the respondent use concentrated formula, GO TO Q10L**
10k	Are the scoops/cups usually: *Only one possible answer*	Rounded (Heaped) …...……..... 1 Flat (Level) ...……....……... 2 Other……3 Other, specify_____	➔ **GO TO Q10L**
10l	Do you add anything else in the formula milk?	NO ....…….…..... 0 YES ……..……... 1	➔ **IF YES, GO TO Q10M** ➔ **IF NO, GO TO Q11**

10 m	Please describe what is (are) the ingredient(s) you add to the formula. *Multiple responses possible*	_____ _____ _____	➔ **GO TO Q10N**
10n	How many times a day do you add this (these) ingredient(s) to the formula?	Every time ..... 000 *OR* Number of times ……..…… |___|___| *OR* Every number of feeds ..…… |___|___|	➔ **GO TO Q11 (For any response given)**
11	What is the name (brand) of the formula you are currently using? *Brand is the name on package, not the company*	_____	➔ **GO TO Q13a**
12	Do you mainly feed *(NAME)* with: *Only one possible response* *Circle the response given*	Breast……..……0 Bottle …….……..…... 1 Cup ……....…….....…..... 2 Spoon …….…….....…..... 3	➔ **IF 0, GO TO Q18** ➔ **ELSE, GO TO Q13a**
13a	Before preparing to feed ***(NAME)***, do you wash your hands?	NO ....…….…..... 0 YES ……..…….... 1	➔ **GO TO Q13b**
13b	How often do you wash your hands before feeding?	Always ……...……... 1 Sometimes ……. 2 Seldom ……...……...…… 3	➔ **GO TO Q14 (For any response given)**
14	How are the utensils used for feeding ***(NAME)*** usually cleaned? *Including bottles, cups, spoons etc…*	1. with cold water……1 2. with cold water and soap…….2 3. with boiled water…….3 4. with boiled water and soap…….4 5. With sterilization solution……..5 6. Other……6 Other, specify _____ 7. Don't know, because s/o else cleans…..…7	**GO TO Q15** **(WHATEVER THE ANSWER GIVEN)**
15	Did you ever get support on how to feed (***NAME)***? *Food other than breast milk*	NO …….……..….....0 YES ……..……..……1	➔ **IF YES, GO TO Q16** ➔ **IF NO,GO TO Q19**

16	Who gave you support on how to feed ***(NAME)***? *Multiple responses possible* *Food other than breast milk*	My spouse/boyfriend ……. …….. 1 My mother, mother-in-law, grandmother ..... 2 My sister or my husband's sister ……..… 3 My friend/neighbour ……..…….....…….... 4 Health workers at the health centre …...….. 5 Community Health Workers…….……. 6 Other ……..… 7 Other, Specify_____	➔ **GO TO Q17 (WHATEVER THE ANSWER GIVEN)**
17	Of those, who was the most important person to support you?	My spouse/boyfriend ……. …….. 1 My mother, mother-in-law, grandmother ..... 2 My sister or my husband's sister ……...… 3 My friend/neighbor ……..…….....…….... 4 Health workers at the Health Centre …...….. 5 Community Health Workers…….……. 6 Other ……..… 7 Other, Specify_____	**GO TO Q18 if answer to Q1 was YES** **ELSE, GO TO Q19**
18	Is ***(NAME)*** still consuming breast milk?	NO ...…….…..... 0 YES ……..…..…... 1	➔ **IF NO, Q18A** ➔ **IF YES, Q18C**
18a	How old was ***(NAME)*** when you stopped giving breast milk?	|___|___| day(s) / weeks	➔ **GO TO Q18B**
18b	State the main reason why you stopped giving breast milk to *(NAME)*? *DO NOT READ OUT THE LIST*	Mother ill/Weak ……...……... 1 Child ill/Weak …….**.....** 2 Nipple/Breast Problem ……..…..... 3 Insufficient Milk ……..……. 4 Milk not good ……..…… ……..…. .5 Mother Working/at School (Or Planning to) 6 Child Refused …….……..……..…….. 7 Worried About HIV and AIDS **.....** 8 Chose to formula feed ……..... 9 Doctor/health provider's Advice ……..... 10 Advice of Family Member/Friend …….. 11 Other ……..……..….. 12 Other, specify_____ Do not know/Do not remember ……..... 99	➔ **GO TO Q18D (For any response given)**
18c	Up to what age do you intend to give ***(NAME)*** breast milk?	Number of months……. |___|___| Don't know …… 99	➔ **GO TO Q19**
18d	Is *(NAME)* drinking infant formula milk?	NO ...…….…..... 0 YES ……..…..…... 1	➔ **IF *Yes*, GO TO Q18e** ➔ **IF No, GO TO Q19**

18e	How old was *(NAME)* when you start giving infant formula milk?	|___|___| day(s) |___|___| week(s)	➔ **GO TO Q19 (For any response given)**

SECTION II – CURRENT INFANT FEEDING

Now I would like us to talk about how ***(NAME)*** ate and drank yesterday.

N0.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
19	Do you feed ***(NAME)*** *Food includes breast milk, formula milk, solid food…*	Whenever hungry (on demand)……...…. 1 On a schedule ……..……...… 2	➔ **GO TO Q20**
20	Is ***(NAME)*** currently following any special diet? *Multiple responses possible.*	No…….…….……1 Vegetarian ……..…… 2 Gluten-free ……..…… 3 Low-lactose ……..……... 4 Low-phenylalanine ……...…….. ...5 Other ……..…. 6 Other, specify _____ Don't know…..…..…..……..….. 99	➔ **GO TO Q21**
21	Where are **most** of ***(NAME)***'s feeds prepared? *Only one response.*	No preparation – breastfeeding…….….1 At home ……..2 Family/friend's home.…...…… 3 Restaurant ……..……... 4 Shop ……...…….... 5 Crèche……..…6 DON'T KNOW…..…..…….... 99	**GO TO Q22**
22	**Were you with *(NAME)* yesterday?**	NO ....…….…..... 0 YES ……..…….…..... 1	➔ **GO TO 22A**
22a	How many times did ***(NAME)*** feed yesterday. *Food includes formula milk, solid or semi solid food…* *Note N/A when not applicable*	|___|___| times for solid and semi solid food |___|___| times for infant formula DON'T KNOW ……...……... 99	➔ **IF 0 times or IF the infant is not having any breast milk (see Q18) GO TO 23** ➔ **IF the infant still has breast milk (see Q18) GO TO 22B**

22b	**How many times did *(NAME)* have breast milk yesterday?**	|___|___| times DON'T KNOW ……...…….. 99	**➔ IF 0 times GO TO 23** **➔ IF ELSE GO TO 22C**
22c	Sometimes babies are breastfed by another woman or given your expressed breast milk by spoon, cup or bottle or some other way. This can happen if a mother cannot breastfeed her own baby or cannot be with her baby. Which way(s) was ***(NAME)*** fed breast milk yesterday? *Multiple responses possible.*	Breast (own)……..……..1 Breast (another woman) ..……...……..... 2 Spoon ……...…..… 3 Cup ……..…..……...…….. 4 Bottle ……..... 5 Other……...……...…….. 6 Other, specify _____ Don't know…...…….……..….... 99	**➔ GO TO Q23 (whatever the answer given)**

N0.	QUESTIONS AND FILTERS	CODING CATEGORIES				QUESTIONS AND CODING CATEGORIES	QUESTIONS AND CODING CATEGORIES
23	Next I would like to ask you about some liquids that ***(NAME)*** may have yesterday during the day or at night. Did ***(NAME)*** have any (*ITEM FROM LIST*)? *Read the list of liquids starting with 'Breast milk' when applicable.*		**YES**	**NO**	**DK**	**24** How many times yesterday during the day or at night did ***(NAME)*** consume (*ITEM FROM LIST)*? *Record '99' for Don't Know.*	**25** During the past 7 days, did ***(NAME)*** consume any *READ **ONLY** ITEMS THAT WERE NOT EATEN YESTERDAY*?
A.1	Breast milk (own, when applicable)?	**A.1**	**1**	**2**	**99**	A.1 TIMES |___|___|	YES …… 1 NO ……..... 2 DON'T KNOW 99
A.2	Breast milk (other woman's)?	**A.2**	**1**	**2**	**99**	A.2 TIMES |___|___|	YES …… 1 NO ……..... 2 DON'T KNOW 99
B	Plain water?	**B**	**1**	**2**	**99**	B. TIMES |___|___|	YES …… 1 NO ……..... 2 DON'T KNOW 99
C	Water with sugar?	**C**	**1**	**2**	**99**	C. TIMES |___|___|	YES …… 1 NO ……..... 2 DON'T KNOW 99
D	ORS (Oral Rehydration Solution)?	**D**	**1**	**2**	**99**	D. TIMES |___|___|	YES …… 1 NO ……..... 2 DON'T KNOW 99
E	Infant formula or Soya milk such as Nan, Infacare, Isomil, Cremora …?	**E**	**1**	**2**	**99**	E. TIMES |___|___|	YES …… 1 NO ……..... 2 DON'T KNOW 99
F	Infant cereals such as Nestum, Purity, Cerelac, Cremora …?	**F**	**1**	**2**	**99**	F. TIMES |___|___|	YES …… 1 NO ……..... 2 DON'T KNOW 99
G	Fruit or vegetable juice?	**G**	**1**	**2**	**99**	G. TIMES |___|___|	YES …… 1 NO ……..... 2 DON'T KNOW 99
H	Clear broth (clear salty soup)?	**H**	**1**	**2**	**99**	H. TIMES |___|___|	YES …… 1 NO ……..... 2 DON'T KNOW 99
I	Cow's milk (including powdered milk for adults, liquid milk from shops, fresh milk from cows, long life milk)?	**I**	**1**	**2**	**99**	I. TIMES |___|___|	YES …… 1 NO ……..... 2 DON'T KNOW 99
J	Yogurt (Danone…) or AMASI?	**J**	**1**	**2**	**99**	J. TIMES |___|___|	YES …… 1 NO ……..... 2 DON'T KNOW 99

N0.	QUESTIONS AND FILTERS	CODING CATEGORIES				QUESTIONS AND CODING CATEGORIES	QUESTIONS AND CODING CATEGORIES
23	Next I would like to ask you about some liquids that ***(NAME)*** may have yesterday during the day or at night. Did ***(NAME)*** have any (*ITEM FROM LIST*)? *Read the list of liquids starting with 'Breast milk' when applicable.*		**YES**	**NO**	**DK**	**24** How many times yesterday during the day or at night did ***(NAME)*** consume any (*ITEM FROM LIST)*? *Record '99' for Don't Know.*	**25** During the past 7 days, did ***(NAME)*** consume any *READ **ONLY** ITEM THAT WERE NOT EATEN YESTERDAY*?
L	Cold drinks or cordials (coke, crème-soda, OROS…)	**L**	**1**	**2**	**99**	L. TIMES |___|___|	YES …… 1 NO ……..... 2 DON'T KNOW 99
M	Any other water-based liquids such as tea/coffee without milk, traditional herbal drinks, rooibos tea…? Specify _____ _____	**M**	**1**	**2**	**99**	M. TIMES |___|___|	YES …… 1 NO ……..... 2 DON'T KNOW 99
N	Any other liquids Specify _____ _____	**N**	**1**	**2**	**99**	N. TIMES |___|___|	YES …… 1 NO ……..... 2 DON'T KNOW 99

GO TO NEXT PAGE TO ASSESS FOOD INTAKE

N0.	QUESTIONS AND FILTERS	CODING CATEGORIES				QUESTIONS AND CODING CATEGORIES	QUESTIONS AND CODING CATEGORIES
26	Next I would like to ask you about any foods that ***(NAME)*** may have had yesterday during the day or at night. This food could have been consumed either at home or outside of home. If the answer to 26.0 is No, you do not need to go through the list. Just mark No for all. Otherwise, read through the list, asking Did ***(NAME)*** have any (*ITEM FROM LIST*)?		YES	NO	DK	**27** How many times yesterday during the day or at night did ***(NAME)*** consume any (*ITEM FROM LIST*)? *Record '99' for Don't Know.*	**28** During the past 7 days, did ***(NAME)*** consume any (*READ **ONLY** ITEM THAT WERE NOT EATEN YESTERDAY*)?
0	Has ***(NAME)*** had any form of food yesterday?		**Ask**	↓	**Ask**	N/A	Yes ……...…1 No ……..... 2 Don't know... 99
A	Porridge, bread, rice, noodles, or other foods made from grains	A	1	2	99	A. TIMES |___|___|	Yes ……...…1 No ……..... 2 Don't know... 99
B	Pumpkin, carrots, butternut squash, or sweet potatoes that are yellow or orange inside	B	1	2	99	B. TIMES |___|___|	Yes ……...…1 No ……..... 2 Don't know... 99
C	White potatoes, white yams, cassava, or any other foods made from roots	C	1	2	99	C. TIMES |___|___|	Yes ……...…1 No ……..... 2 Don't know... 99
D	Any dark green leafy vegetables (spinach, cabbage, broccoli, maroggo…)	D	1	2	99	D. TIMES |___|___|	Yes ……...…1 No ……..... 2 Don't know... 99
E	Ripe mangoes, ripe papayas, pineapples, peach, (or other local vitamin A-rich fruits)	E	1	2	99	E. TIMES |___|___|	Yes ……...…1 No ……..... 2 Don't know... 99
F	Any other fruits or vegetables (Bananas, apples, Avocado, Grape fruit, Grape, cucumbers, tomato red, Garlic, Lettuce light green, zucchini…)	F	1	2	99	F. TIMES |___|___|	Yes ……...…1 No ……..... 2 Don't know... 99
G	Liver, kidney, heart, or other organ meats	G	1	2	99	G. TIMES |___|___|	Yes ……...…1 No ……..... 2 Don't know... 99
H	Any meat, such as beef, pork, lamb, or goat	H	1	2	99	H. TIMES |___|___|	Yes ……...…1 No ……..... 2 Don't know... 99
I	Eggs	I	1	2	99	I. TIMES |___|___|	Yes ……...…1 No ……..... 2 Don't know... 99
J	Poultry (chicken, duck, etc..)	J	1	2	99	J. TIMES |___|___|	Yes ……...…1 No ……..... 2 Don't know... 99

N0.	QUESTIONS AND FILTERS	CODING CATEGORIES				QUESTIONS AND CODING CATEGORIES	QUESTIONS AND CODING CATEGORIES
26	Continued		YES	NO	DK	**27** How many times yesterday during the day or at night did ***(NAME)*** consume (*ITEM FROM LIST*)? *Record '99' for Don't Know.*	**28** During the past 7 days, did ***(NAME)*** consume any (*READ **ONLY** ITEM THAT WERE NOT EATEN YESTERDAY*)?
K	Fresh or dried fish, shellfish, or seafood	K	1	2	99	K. TIMES |___|___|	Yes ……...…1 No ……..... 2 Don't know... 99
L	Any foods made from beans, peas, lentils, nuts, or seeds	L	1	2	99	L. TIMES |___|___|	Yes ……...…1 No ……..... 2 Don't know... 99
M	Cheese, yogurt, or other milk products	M	1	2	99	M. TIMES |___|___|	Yes ……...…1 No ……..... 2 Don't know... 99
N	Any oil, fats, or butter, or foods made with any of these (margarine/Rama, peanut butter, fish oil, ghee, mayonnaise, sour cream, avocado, olive, coconut…)	N	1	2	99	N. TIMES |___|___|	Yes ……...…1 No ……..... 2 Don't know... 99
O	High-sugar foods (Biscuits, cakes, sweets, chocolates, honey, jam, marmalade, condensed milk added to tea…)	O	1	2	99	O. TIMES |___|___|	Yes ……...…1 No ……..... 2 Don't know... 99
P	Crisps, savoury snacks	P	1	2	99	P. TIMES |___|___|	Yes ……...…1 No ……..... 2 Don't know... 99
Q	Condiments for flavor, such as chillies, spices, herbs, or fish powder	Q	1	2	99	Q. TIMES |___|___|	Yes ……...…1 No ……..... 2 Don't know... 99
R	Insects (Mopani worms, termites, locust, grasshopper…)	R	1	2	99	R. TIMES |___|___|	Yes ……...…1 No ……..... 2 Don't know... 99
	Others items cited: **S.**_____ **T.** _____ **U.** _____	 S T U	 1 1 1			 S. TIMES |___|___| T. TIMES |___|___| U. TIMES |___|___|	*****Or eaten the past 7 days? S. YES T. YES U. YES

SECTION III. CURRENT HEALTH STATUS OF MOTHER AND CHILD

Now, I would like to ask about your and ***(NAME)*** health status yesterday and the past seven days.

N0.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
29	Were you sick yesterday or the past 7 days?	NO …….0 YES …….……. 1	➔ **IF YES, GO TO Q30** ➔ **IF NO, GO TO Q33**
30	Can you describe the symptoms you had?	_____ _____ _____ _____	➔ **GO TO Q31**
31	Did you take some medicines?	NO ….……...…… 0 YES …….……. 1	➔ **IF YES GO TO Q32** ➔ **IF NO GO TO Q33**
32	Can you name the medicines that you took?	_____ _____ _____ DON'T KNOW……...……99	➔ **GO TO Q33**
33	Was ***(NAME)*** sick yesterday or the past 7 days during the day or at night?	NO …….……...…… 0 YES …….……. 1	➔ **YES, GO TO Q34** ➔ **NO, GO TO Q37**
34	Can you describe the symptoms ***(NAME)*** had?	_____ _____ _____ DON'T KNOW..……99	➔ **GO TO Q35**
35	Did ***(NAME)*** take some medicines?	NO …….……...…… 0 YES …….……. 1	➔ **IF YES GO TO Q36** ➔ **IF NO GO TO Q37**
36	Can you name the medicines ***(NAME)*** took?	_____ _____ _____ DON'T KNOW……99	➔ **GO TO Q37**
37	Was ***(NAME)*** given any vitamin yesterday or the past 7 days during the day or at night?	NO …….……...…… 0 YES …….……. 1	➔ **If YES, GO TO Q38** ➔ **If NO GO TO Q39**

N0.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
38	Can you please name the vitamin(s) that ***(NAME)*** took?	_____ _____ _____ DON'T KNOW……..……99	➔ **GO TO Q39**
39	Do you know your HIV status?	NO ……..……...…… 0 YES ……..……. 1 DON'T KNOW……99	➔ **IF YES/NO, GO TO Q40** ➔ **IF DK, GO TO Q41**
40	Are you HIV positive?	NO ……..……...…… 0 YES ……..……. 1 REFUSE TO ANSWER……..98	➔ **IF YES GO TO Q39** ➔ **IF NO, GO TO Q41**
41	Are you currently using antiretroviral (ARV) medication?	NO ……...…… 0 YES ……..……. 1 REFUSE TO ANSWER……..98	➔ **IF YES GO TO Q42** ➔ **IF NO, GO TO Q43**
42	Can you please name the medication that you are taking?	_____ _____ _____ DON'T KNOW……99	➔ **GO TO Q43**
43	Has ***(NAME)*** ever been given antiretroviral medication?	NO ……...…… 0 YES ……. 1 REFUSE TO ANSWER……..98	➔ **IF YES GO TO Q44** ➔ **IF NO, GO TO Q46**
44	Can you please name the medication that ***(NAME)*** was taking?	_____ _____ _____ DON'T KNOW……99	➔ **GO TO Q45**
45	Is ***(NAME)*** still taking antiretroviral medication?	NO ……..……...…… 0 YES ……..……. 1 DON'T KNOW……....99 REFUSE TO ANSWER……..…..98	➔ **GO TO Q46**
46	Are you currently taking any other medication?	NO ……...…… 0 YES ……..……. 1 REFUSE TO ANSWER……..98	➔ **IF YES, GO TO Q47** ➔ **ELSE, Q48**
47	Can you please name the medication that you are taking?	_____ _____ _____ DON'T KNOW……99	➔ **GO TO Q48**

SECTION IV. INFORMATION SOURCES

I: Finally, we would like to know where you get information about infant feeding, beyond the people in your life.

N0.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
48	Do you own a mobile phone?	NO ……..... 0 YES ……...……..…1	**➔IF YES, GO TO Q49** **➔ELSE, Q55**
49	Which network(s) do you use? *Multiple responses possible*	1. MTN……..1 2. Cell-C……2 3. Vodacom……...3 4. Other…….4 a. Specify: _____	**➔GO TO Q50**
50	How do you use your mobile? *Multiple responses possible*	1. Calling……1 2. Please call me……2 3. SMS……3 4. WhatsApp……..4 5. Social networks (Facebook, Twitter)…5 6. Internet Access……..6 7. Other……..7 a. Specify: _____	**➔GO TO Q51**
51	Have you ever gotten information about breastfeeding on your mobile phone?	NO ……..... 0 YES ……...……..…1	**➔IF YES GO TO Q52** **➔ELSE, Q53**
52	Can you remember the source(s) of that information?	_____ _____ _____ DON'T KNOW……99	**➔GO TO Q53**
53	Have you ever gotten information about infant formula on your mobile phone?	NO ……..... 0 YES ……...……..…1	**➔IF YES GO TO Q54** **➔ELSE, Q55**
54	Can you remember the source(s) of that information?	_____ _____ _____ DON'T KNOW……99	**➔GO TO Q55**
55	Do you have access to the Internet?	NO ……..... 0 YES ……...……..…1	**➔IF YES GO TO Q56** **➔ELSE, Q60**
56	Have you ever gotten information about breastfeeding on the Internet?	NO ……..... 0 YES ……...……..…1	**➔IF YES GO TO Q57** **➔ELSE, Q58**

N0.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
57	Can you remember the source(s) of that information? *Try to get organization/campaign names or websites*	_____ _____ _____ DON'T KNOW……99	**➔GO TO Q58**
58	Have you ever gotten information about infant formula on the Internet?	NO …….……..... 0 YES ……...……..…1	**➔IF YES GO TO Q59** **➔ELSE, Q60**
59	Can you remember the source(s) of that information?	_____ _____ _____ DON'T KNOW……99	**➔GO TO Q60**
60	Where else have you read or heard about breastfeeding? *Multiple responses possible.* *For each selection, try to get specifics about the channel/station or location of mass media*	1. Radio……...1 a. Specify:_____ 2. Television…….2 a. Specify: _____ 3. Pamphlets…….3 a. Specify: _____ 4. Billboards……..4 a. Specify: _____ 5. Posters……5 a. Specify: _____ 6. Other……..6 a. Specify:_____	**➔GO TO Q61**
61	Of all of the sources of information you've mentioned about breastfeeding, which do you trust **the most**? *One response possible.*	1. Mobile phone……...1 2. Internet…….2 3. Radio……....3 4. Television…….4 5. Pamphlets…….5 6. Billboards……..6 7. Posters……7 8. Other……..8 a. Specify:_____	**➔GO TO Q62**
62	Where else have you read or heard about formula feeding? *For each selection, try to get specifics about the channel/station or location of mass media*	1. Radio……...1 a. Specify:_____ 2. Television…….2 a. Specify: _____ 3. Pamphlets…….3 a. Specify: _____ 4. Billboards……..4 a. Specify: _____ 5. Posters……5 a. Specify: _____ 6. Other……..6 a. Specify:_____	**➔GO TO Q63**

63.	Of all of the sources of information you've mentioned about formula feeding, which do you trust **the most**?	0. None……0 1. Mobile phone……...1 2. Internet……2 3. Radio……....3 4. Television……4 5. Pamphlets……5 6. Billboards……..6 7. Posters……7 8. Other……..8 Specify:_____	**DONE!**

WE ARE DONE WITH THE QUESTIONNAIRE.

BEFORE WE END, DO YOU HAVE ANY ADDITIONAL QUESTIONS OR COMMENTS? [Note them here]

Thank you!!!

IF THE PARTICIPANT HAS BEEN PURPOSIVELY RECRUITED TO TAKE PART IN THE IDI, PROVIDE FOOD AND A DRINK WHILE THE INVESTIGATORS PREPARE THE RECORDER.

Appendix D. HCW In-depth Interview Guide (unformatted)

I: Thank you for agreeing to this interview. Before we begin our interview, I would like know a little bit more about your background how long you have been working at [NAME FACILITY].

BIOGRAPHIC DETAILS	
1. Sex:	***M F***
2. Age:	***__ __***
3. Highest degree/qualification:	***_____***
4. Time working at facility:	***_____ (weeks / months / years)***
4. Any children of own?	***No Yes***

We are now going to discuss more about infant feeding, based on your experiences up until now. As we discussed earlier, this will be audio recorded. Do you have any questions before we begin?

Note: Ensure that the following are in place before beginning interview:

__ : Audio Consent form signed

__ : Audio recorder sound checked

__ : IDI Reference Code: _____

- What kind of professional training or support have you received around infant feeding?
- Personally, what do you think is the best feeding practice or practices for babies below six months?
    - *Probe for what or who informed that belief*

- How do you ***currently*** counsel expectant mothers about their feeding options?
    - *What advice do you give HIV-positive mothers? HIV-negative mothers?*
    - *What materials, if any, do you provide?*

- *Probe for changes over time if they have worked for over one year*

- How do expectant mothers respond to your advice?
  - *How important is it that they follow your advice?*
- Once babies are born, what are the actual infant feeding practices that you have observed with patients who use this facility?
  - *Probe for changes over time*
- What challenges do you observe mothers or infants having with feeding?
  - *How do you counsel them? (for each challenge)*
- What do you think about the decision to stop providing free formula to HIV-positive mothers?
- How does the infant feeding advice you provide compare with the way infants were or are fed in your own family?
- Is there anything else you would like to share?

THANK YOU

Appendix E. Mother In-depth Interview Guide (unformatted)

I: Thank you for completing our questionnaire, which asked for a lot of information about what and how you feed your baby. We are now going to discuss more about how you feel about infant feeding, based on your experiences up until now. As we discussed earlier, this will be audio recorded. Do you have any questions before we begin?

Note: Ensure that the following are in place before beginning interview:
__ : Audio Consent form signed
__ : Mother given opportunity to take break to feed infant, use restroom and get snack
__ : Audio recorder sound checked
__ : IDI Reference Code: _____

- How do you feel about **what** your baby is currently eating for his/her age?

  [Note: Ensure that the content is specified in response.]

  - *How can you tell that he/she is satisfied?*
  - *What concerns do you have, if any?*

- How do you feel about **the way** your baby is fed?

  [Note: Ensure that the method is specified in response.]

  - *How do you [or the caregiver] decide when to feed?*

- What is **your role** in feeding [baby] on a daily basis?
  - *How do you feel about that role?*
  - *How has the role changed since birth?*

- How does your baby's feeding compare with **what** and **how** other babies in your family or community are fed?
  - *How were you/siblings fed?*
  - *How was your partner fed in his family?*
  - *How are other children in the community being fed?*

- How were decisions made about how and what to feed your baby, from pregnancy until now? ***[Note: Use questionnaire information as a reference.]***
    - *Who or what influenced feeding decisions or practices?*
    - ***If HIV positive:*** *How has HIV influenced how your infant is fed, if at all?*
- What challenges have you faced in feeding your baby the way you would like?
    - *What physical or health challenges have you or your baby faced?*
    - *What opposition from other people have you faced?*
    - *What logistical challenges have you faced?*
    - *What financial challenges have you faced?*
    - *Other…*
- What strategies have you used to feed your baby the way you would like?

  [Note: Encourage strategies that have worked as well as those that have not.]

- Is there anything else you would like to share?

THANK YOU

Appendix F. Key Informant Guide

I: Thank you for agreeing to this interview. Before we begin our interview, I would like know a little bit more about your background and how long you have been involved in research or policy related to infant feeding.

BIOGRAPHIC DETAILS (Based on responses – not recorded)	
1. Sex:	***M F***
2. Age:	___
3. Highest degree/qualification:	_____
4. Time working on infant feeding:	_____
4. Any children of own?	***No Yes***

We are now going to discuss more about infant feeding guidelines and policy, based on your area of expertise. As we discussed earlier, this will be audio recorded. Do you have any questions before we begin?

Note: Ensure that the following are in place before beginning interview:

__ : Audio Consent form signed

__ : Audio recorder sound checked

__ : KII Reference Code: _____

- What are your thoughts on South Africa's current infant feeding guidelines and related legislation?
  - *Probe for thoughts on stopping infant formula provision*
- How has the health system, particularly staff, responded to the new guidelines (if relevant to the KI)?
- What do you believe should be the key information that guides the adoption of infant feeding policies or guidelines for South Africa?
- How do current infant feeding guidelines and legislation account for the different contexts faced by vulnerable communities?

- How does the “single message” approach account for context?

- How have past policies contributed (or not) to child survival in South Africa?
- What areas of policy or legislation do you feel still need to be addressed to achieve South Africa’s infant feeding goals?
- On a more personal note, how does the current infant feeding guidance compare with the way infants were or are fed in your own family?
- Is there anything else you would like to share?

THANK YOU

Appendix G. Human Research Ethics Committee Certificate

R14/49 Ms Sarah Jewett Nieuwoudt

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M150336

NAME: (Principal Investigator)	Ms Sarah Jewett Nieuwoudt
DEPARTMENT:	School of Public Health Chris Hani Baragwanath Academic Hospital Lilian Ngoyi,Zola,Chiawelo,Itereleng and Mofolo CHCs DPHRU
PROJECT TITLE:	Starting Well: Infant Feeding in the First Six Months, Soweto, South Africa
DATE CONSIDERED:	27/03/2015
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Lenore Manderson and Shane Norris

APPROVED BY: Professor P Cleaton-Jones, Chairperson, HREC (Medical)

DATE OF APPROVAL: 02/09/2015

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Secretary in Room 10004, 10th floor, Senate House, University.
I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a yearly progress report.**

Appendix H. City of Johannesburg Permission

Form 2

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

Joburg
a world class African city

JOHANNESBURG HEALTH DISTRICT

Enquiries:
Johannesburg.research@gmail.com
coralF@joburg.org.za

27 March 2015

Sara Jewett Nieuwoudt
University of the Witwatersrand
E-mail: sara.nieuwoudt@wits.ac.za

Reference no: 2014-15/068

Dear Ms Sara Jewett Nieuwoudt,

Re: Study protocol title: Infant feeding in the context of HIV: Soweto, South African.

Your application dated for the above approval project refers. The District Research Committee has reviewed your application. This letter serves as an in-principle approval to access the Districts Health facilities (mentioned below) for the above project, subject to following conditions:

- The facilities to be visited: Sub-district D: Chiawelo CHC, Zola CHC, Itereleng CHC, Mofolo CHC and Lilian Ngoyi CHC.
- This facility will be visited from 01 April to 31 December 2015.
- You will report to the Facility managers of the CHC before initiating the study.
- Participants' rights and confidentiality will be maintained all the time.
- No resources (Financial, material and human resources) from the above facilities will be used for the study. Neither the District nor the facility will incur any additional cost for this study.
- The study will comply with Publicly Financed Research and Development Act, 2008 (Act 51 of 2008) and its related Regulations.
- You will submit a copy (electronic and hard copy) of your final report. In addition, you will submit a six-monthly progress report to the District Research Committee. Your supervisor and University of the Witwatersrand will ensure that these reports are being submitted timeously to the District Research Committee.
- The District must be acknowledged in all the reports/publications generated from the research and a copy of these reports/publications must be submitted to the District Research Committee.

We reserve our right to withdraw our approval, if you breach any of the conditions mentioned above.

Please feel free to contact us, if you have any further queries. On behalf of the District Research Committee, we would like to thank you for choosing our District to conduct such an important study.

Regards,

30/03/2015

Chief Director
Johannesburg Health District

Appendix I. City of Johannesburg Extension

Form 2

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

Joburg
a world class African city

JOHANNESBURG HEALTH DISTRICT

Enquiries:
Johannesburg.research@gmail.com
coralF@joburg.org.za

05/02/2016

Sara Jewett Nieuwoudt
University of the Witwatersrand
E-mail: sara.nieuwoudt@wits.ac.za

Reference no: 2014-15/068

Dear Ms Sara Jewett Nieuwoudt,

Re: *Study protocol title: Infant feeding in the context of HIV: Soweto, South Africa*

Your letter for extension of the above project refers. The District Research Committee has reviewed your request and agreed to extension of the above project. This letter serves as an in-principle approval for extension of the study till 31/03/2017, subject to all conditions stipulated in the letter dated 30/04/2015.

In addition, the DRC noted that you have not submitted six-monthly progress reports to the District Research Committee as advised in the letter dated 30/04/2015. You are hereby advised to submit an updated reports in the prescribed form (see attached) by 19/02/2016.

We reserve our right to withdraw our approval, if you breach any of the conditions mentioned above.

Please feel free to contact us, if you have any further queries. On behalf of the District Research Committee, we would like to thank you for choosing our District to conduct such an important study and continue with it.

Regards,

District Research Committee
Johannesburg Health District

Appendix J. Information Sheet – Questionnaire for mothers

INFORMATION SHEET

Hello, my name is Sara Nieuwoudt. I am a Lecturer at the School of Public Health at the University of Witwatersrand. Together, with colleagues from the Department of Paediatrics, we are doing research to explore how infants are fed during their first six months. Research is a process to learn the answer to a question. Our question is what influences decisions about how and what a baby is fed.

We are inviting you to take part in this research study. Before you decide whether to participate, we would like you to understand why the research is being done and what it involves.

What is involved in the study?

The study will be conducted either at your home or at our offices in Chris Hani Baragwanath Hospital (MRC/Wits Developmental Pathways for Health Research Unit), depending on your preference. We will only need to meet with you one time, at a date and time we agree upon with you. If you agree to take part in the study, we will ask you a series of questions related to yourself and your baby. The content of these questions are described in the next section.

Study Procedures

Interviewer-completed questionnaire

During the visit, we will fill in a questionnaire with your help about your background, like your age, household situation and employment. We will also ask you questions about feeding your baby and where you get information and support for feeding your baby. Finally, we'll ask a few questions about your health and your baby's health. This will include a question about your HIV status. You do not need to answer any questions that you feel uncomfortable about answering. The questionnaire will take between 30-45 minutes to complete, depending on your answers. You may be asked to participate in an in-depth-interview immediately after the questionnaire. If so, you will go through a separate consent process.

Possible risks

There is a chance that some of the questions in the questionnaire might trigger some emotional distress. If this happens, we can refer you to the Psychology Unit at Chris Hani Baragwanath Hospital where you will be given an appointment with a psychologist.

Possible benefits

You will not benefit directly from participation in this study. However, the information you provide may assist us in identifying strategies to make it easier for women to feed their babies in the best ways possible.

Costs to you:

Participating in the research will involve no cost to you. Either way, you will be given R50 to compensate you for your time and any transport costs.

Voluntary participation in research:

You have the right to agree or refuse to participate in this research. If you decide to participate and later change your mind, you are free to stop at any time. Your refusal to participate will not result in any penalty or loss of benefits to which you are otherwise entitled.

Records of your participation in this research:

You have the right to privacy. I will keep information about your participation in locked files. The questionnaire will be labelled with a code to ensure your privacy.

- Ethical approval: This study protocol has been submitted to the University of the Witwatersrand's, Human Research Ethics Committee (HREC), and written approval has been granted by that committee. Ethics Clearance number: *M140803.*

- Publication of the results of the research: The results of this research may appear in scientific publications without identifying you in any way.

- As per HPCSA guidelines, we will preserve the questionnaires for a minimum of two years after the study results have been published or six years if there is no publication.

Your questions:

The investigator listed on the first page of this form, Sara Nieuwoudt, is available to answer your questions about this research. You may contact the investigator at any time on the following number (011) 717-2173.

If you have any questions or concerns about your rights as a participant, you may contact Prof Peter Cleaton-Jones at the University of the Witwatersrand, Human Research Ethics Committee: Secretariat (011 717 2301).

YOU WILL HAVE A COPY OF THIS INFORMATION SHEET TO KEEP

If you are happy to take part in the study, you will be asked to read and sign the attached consent form on the day of your appointment. This form will confirm your agreement to participate.

Your signature on the consent form will certify the following:

· You have read the information provided in this consent form

· You have received answers to all of your questions.

· You have freely decided to participate in this research.

· You understand that you are not giving up any of your legal rights.

Appendix K. Information Sheet – Mothers IDI (Unformatted)

INFORMATION SHEET

Hello, my name is Sara Nieuwoudt. I am a Lecturer at the School of Public Health at the University of Witwatersrand. Together with colleagues from the Department of Paediatrics, we are doing research to explore how infants are fed during their first six months. Research is a process to learn the answer to a question. Our question is what influences decisions about how and what a baby is fed.

Thank you for already taking part in the study questionnaire. We are now inviting you to take part in an additional interview. Before you decide whether to participate, we would like to remind you about why the research is being done and what it involves.

What is involved in the study?

The study is being conducted in Soweto, both in people's homes as well as at our offices in Chris Hani Baragwanath Hospital (MRC/Wits Developmental Pathways for Health Research Unit). For the interview, we are asking that you stay for an additional hour to take part in an interview. If you agree to take part in the study, we will ask you a series of questions related to yourself and your baby. The content of these questions are described in the next section.

Study Procedures

Interview

You have already answered many questions in the questionnaire. During this interview we will explore a little bit more about infant feeding, including:

- what you believe to be the best feeding practice your baby
- how decisions were made about how and what to feed your baby, from pregnancy until now
- people who influence infant feeding decisions or practices
- infant feeding traditions from your family or community
- challenges you may have faced in feeding your infant
- strategies you use to feed your baby the way you would like

This interview will take place in a private room with an interviewer in your local language or English, depending on your preference. With your permission, this will be audio-recorded to ensure that we do not missing anything that you say. The interview is expected to take approximately one hour.

Possible risks

There is a chance that some of the questions might trigger some emotional distress. If this happens, we can refer you to the Psychology Unit at Chris Hani Baragwanath Hospital where you will be given an appointment with a psychologist.

Possible benefits:

You will not benefit directly from participation in this study. However, the information you provide may assist us in identifying strategies to make it easier for women to feed their babies in the best ways possible.

Costs to you:

Participating in the research will involve no cost to you. For your participation in the interview, you will be given R50 to compensate you for your time.

Voluntary participation in research:

You have the right to agree or refuse to participate in this research. If you decide to participate and later change your mind, you are free to stop the interview at any time. Your refusal to participate will not result in any penalty or loss of benefits to which you are otherwise entitled.

Records of your participation in this research:

You have the right to privacy. The principal investigator will keep information about your participation in locked files. Any notes or recordings from the interview will also be kept securely and any information that may identify you from the interview will be anonymised before we analyse it. That means that your name and any identifying information will be removed.

- Ethical approval: This study protocol has been submitted to the University of the Witwatersrand's, Human Research Ethics Committee (HREC), and written approval has been granted by that committee. Ethics Clearance number: *M140803.*

- Publication of the results of the research: The results of this research may appear in scientific publications without identifying you in any way.

- As per HPCSA guidelines, we will preserve the audio tapes for a minimum of two years after the study results have been published or six years if there is no publication.

Your questions:
The investigator listed on the first page of this form is available to answer your questions about this research. You may contact the investigator at any time on the following number (011) 717-2173.

If you have any questions or concerns about your rights as a participant, you may contact Prof Peter Cleaton-Jones at the University of the Witwatersrand, Human Research Ethics Committee: Secretariat (011 717 2301).

YOU WILL HAVE A COPY OF THIS INFORMATION SHEET TO KEEP

If you are happy to take part in the study, you will be asked to read and sign the attached consent form on the day of your appointment. This form will confirm your agreement to participate.

Your signature on the consent form will certify the following:
· You have read the information provided in this consent form
· You have received answers to all of your questions.
· You have freely decided to participate in this research.
· You understand that you are not giving up any of your legal rights.

Appendix L. Information Sheet – Health Workers

INFORMATION SHEET

Hello, my name is Sara Nieuwoudt. I am a Lecturer at the School of Public Health at the University of Witwatersrand and the Primary Investigator of this study. Together with colleagues from the Department of Paediatrics, we are doing research to explore how infants are fed during their first six months. Research is a process to learn the answer to a question. Our question is what influences decisions about how and what a baby is fed.

We are inviting you to take part in this research study as a healthcare worker who provides direct antenatal and postnatal care to woman in your clinic. Before you decide whether to participate, we would like you to understand why the research is being done and what it involves.

What is involved in the study?

The study is being conducted in Soweto sub-district D. We will only need to meet with you one time, at a time and place convenient to you. The interview that you are being invited to participate in will be done either near the clinic where you are employed or at our offices in Chris Hani Baragwanath Hospital (MRC/Wits Developmental Pathways for Health Research Unit), depending on your preference. We will only need to meet with you one time. If you agree to take part in the study, we will interview you about infant feeding and the advice you provide at the clinic. The content of these questions are described in the next section.

Study Procedures

This study involves one interview. During this interview we will explore your thoughts and experiences related to infant feeding, including:

- What you believe to be the best feeding practice for women in different situations, including HIV positive mothers
- How you advise expectant or new mothers
- Infant feeding practices that you have observed with patients or in the community
- Your sources of information about infant feeding
- Your thoughts on infant feeding guidelines

The interview will take place in English in a private room with the interviewer. With your permission, this will be audio-recorded to ensure that we do not missing anything that you say. The interview is expected to take between 45 to 60 minutes.

Possible risks

There is a chance that some of the questions in the interview might trigger some emotional distress. If this happens, we can refer you to the Psychology Unit at Chris Hani Baragwanath Hospital where you will be given an appointment with a psychologist.

Possible benefits:

You will not benefit directly from participation in this study. However, the information you provide may assist us in identifying strategies to improve child health and development in this community.

Costs to you:

Participating in the research will involve no cost to you. You will be given R50 to cover your time and any transport costs.

Voluntary participation in research:

You have the right to agree or refuse to participate in this research. If you decide to participate and later change your mind, you are free to stop at any time. Your refusal to participate will not result in any penalty or loss of benefits to which you are otherwise entitled.

Records of your participation in this research:

You have the right to privacy. The principal investigator will keep information about your participation in locked files. The recordings will be kept securely and any information that may identify you from the interview will be anonymised before we analyse it.

- Ethical approval: This study protocol has been submitted to the University of the Witwatersrand's, Human Research Ethics Committee (HREC), and written approval has been granted by that committee. Ethics Clearance number: *M140803.*

- Publication of the results of the research: The results of this research may appear in scientific publications without identifying you in any way.

- As per HPCSA guidelines, we will preserve the audio tapes for a minimum of two years after the study results have been published or six years if there is no publication.

Your questions:

The investigator listed on the first page of this form is available to answer your questions about this research. You may contact the investigator at any time on the following number (011) 717-2173.

If you have any questions or concerns about your rights as a participant, you may contact Prof Peter Cleaton-Jones at the University of the Witwatersrand, Human Research Ethics Committee: Secretariat (011 717 2301).

YOU WILL HAVE A COPY OF THIS INFORMATION SHEET TO KEEP

If you are happy to take part in the study, you will be asked to read and sign the attached consent form on the day of your appointment. This form will confirm your agreement to participate.

Your signature on the consent form certifies the following:

· You have read the information provided in this consent form
· You have received answers to all of your questions.
· You have freely decided to participate in this research.
· You understand that you are not giving up any of your legal rights.

Appendix M. Information Sheet – Key Informants

INFORMATION SHEET

Hello, my name is Sara Nieuwoudt. I am a Lecturer at the School of Public Health at the University of Witwatersrand and the Primary Investigator of this study. Together with colleagues from the Department of Paediatrics, we are doing research to explore how infants are fed during their first six months. Our question is what influences decisions about how and what a baby is fed.

We are inviting you to take part in this research study given your expertise in the area of infant feeding research and guidelines. Before you decide whether to participate, we would like you to understand why the research is being done and what it involves.

What is involved in the study?

The overall study is being conducted in Soweto from our offices in Chris Hani Baragwanath Hospital (MRC/Wits Developmental Pathways for Health Research Unit). If you agree to take part in the study, you will be asked to participate in a single interview at a mutually agreed upon location or by telephone.

Study Procedures

We are inviting five people to take part in key informant interviews, including you. If you consent to participating in the study, I will schedule an interview with you, which can be either in person or telephonically. The interview will be in English and is expected to take no more than an hour. I will be asking you about your area of expertise associated with infant feeding. With your permission, the interview will be audio-recorded to ensure that I do not miss anything that is said.

Possible risks

There is a chance that some of the questions might trigger some emotional distress. If this happens, we can refer you to the Psychology Unit at Chris Hani Baragwanath Hospital where you will be given an appointment with a psychologist.

Possible benefits:

You will not benefit directly from participation in this study. However, the information you provide may assist us in identifying strategies to support the health and development of babies.

Costs to you:
Participating in the research will involve no cost to you.

Voluntary participation in research:
You have the right to agree or refuse to participate in this research. If you decide to participate and later change your mind, you are free to stop at any time. Your refusal to participate will not result in any penalty or loss of benefits to which you are otherwise entitled.

Records of your participation in this research:
You have the right to privacy. The principal investigator will keep information about your participation in locked files. The will be kept securely and any information that may identify you will be anonymised before we analyse it.

Ethical approval: This study protocol has been submitted to the University of the Witwatersrand's, Human Research Ethics Committee (HREC), and written approval has been granted by that committee. Ethics Clearance number: *M140803.*

Publication of the results of the research: The results of this research may appear in scientific publications without identifying you in any way.

As per HPCSA guidelines, we will preserve the audio tapes for a minimum of two years after the study results have been published or six years if there is no publication.

Your questions:
The investigator listed on the first page of this form is available to answer your questions about this research. You may contact the investigator at any time on the following number (011) 717-2173.

If you have any questions or concerns about your rights as a participant, you may contact Prof Peter Cleaton-Jones at the University of the Witwatersrand, Human Research Ethics Committee: Secretariat (011 717 2301).

YOU WILL HAVE A COPY OF THIS INFORMATION SHEET TO KEEP
If you are happy to take part in the study please read and sign the attached consent form and contact us to confirm your participation.
Your signature on the consent form certifies the following:

- You have read the information provided in this consent form
- You have received answers to all of your questions.
- You have freely decided to participate in this research.
- You understand that you are not giving up any of your legal rights.

N. Example of consent form

STARTING WELL STUDY: Consent Form

I agree to participate in the study. The goals and methods of the study are clear to me. I understand that the study involves one in-depth interview. All the details and purposes of this study have been explained to me. I understand that I have the right to refuse to participate in the study.

I agree to participation in the study on the condition that:

1. I can withdraw voluntarily from the study at any time and that no adverse consequences will follow on withdrawal from the study.

2. I have the right not to answer any or all questions in the interview.

3. The University of the Witwatersrand's Human Research Ethics committee has approved the study protocol and procedures.

4. All results will be treated with the strictest confidentiality.

5. Only group results, and not my individual results, will be published in scientific journals and in the media.

6. The study scientific team are committed to treating participants with respect and privacy through interviews conducted in private and follow-up counselling available on request.

7. I will receive a referral note to psychological services if I experience any psychological distress during the study.

STUDY PARTICIPANT

Printed Name	Signature	Date and Time

RESEARCH ASSISTANT

Printed Name	Signature	Date and Time

O. Example of audio recording form

STARTING WELL STUDY: AUDIO CONSENT SHEET

The reason for audio-recording this interview has been explained to me.

I am aware that I may choose whether to participate or not to participate in the interview and to be recorded or not.

I am aware that I may stop the interview at any point.

The researcher will take measures to make sure that the recording is kept confidential and safe

The researcher will destroy the recording two years after the study results have been published or after six years if there are no publication.

I consent to having the interview audio recorded.

STUDY PARTICIPANT

Printed Name	Signature	Date and Time

RESEARCH ASSISTANT

Printed Name	Signature	Date and Time

P. Systemic review search strategies

1&2. PubMed & PsychInfo*(with date restrictions from 1980)*

1. (infant feed* or (bottle adj3 feed*) or (breast adj3 (milk or fed or feed*)) or breastfeed* or breastfed or breast-feed* or breast-fed).ti,ab.
2. infant feeding/ or bottle feeding/ or breast feeding/ or solid feeding/
3. 2 or 3
4. South Africa/ or "South Africa*".ti,ab.
5. 3 and 4

3. Global Health (CAB)

1. South Africa/ or "South Africa*".ti,ab.
2. infant feeding/ or bottle feeding/ or breast feeding/ or solid feeding/ or infant formulae/
3. (infant feed* or (bottle adj3 feed*) or (breast adj3 (milk or fed or feed*)) or breastfeed* or breastfed or breast-feed* or breast-fed).ti,ab.
4. 2 or 3
5. 1 and 4
6. limit 5 to yr="1980 -Current"

4. Popline

All Fields: ((infant AND (formula OR fee*)) OR (bottle AND fee*) OR (breast AND (milk OR fed OR fee*)) OR breastfee* OR breastfed) **AND**
Region/Country: South Africa

5 & 6. Cinahl & Africa-Wide

S1 TI("South Africa*") OR AB("South Africa*") OR SU("South Africa*") Limiters - Published Date: 19800101-20140631 [Database - CINAHL Plus with Full Text]
S2 TI((infant N3 (formula or feed*)) or (bottle N3 feed*) or (breast N3 (milk or fed or feed*)) or breastfeed* or breastfed or breast-feed* or breast-fed) OR AB((infant N3 (formula or feed*)) or (bottle N3 feed*) or (breast N3 (milk or fed or feed*)) or breastfeed* or breastfed or breast-feed* or breast-fed) OR SU((infant N3(formula or feed*)) or (bottle N3 feed*) or (breast N3 (milk or fed or feed*)) or breastfeed* or breastfed or breast-feed* or breast-fed) [Database - CINAHL Plus with Full Text]
S3 S1 AND S2 [Database - CINAHL Plus with Full Text]

7. Central Register of Trials

1. ("infant feed" or "infant feeds" or "infant feeding" or (bottle near feed*) or (breast near (milk or fed or feed*)) or breastfeed* or breastfed or breast-feed* or breast-fed):ti,ab
2. [mh ^"infant feeding"] or [mh ^"bottle feeding"] or [mh ^"breast feeding"] or [mh ^"solid feeding"]
3. [mh ^"South Africa"] or ("South Africa" or "South African" or "South Africans" or "South Africa's"):ti,ab 4. (#1 or #2) and #3 – Limited by date 1980-Present

Q. Article quality scoring standards and results

Quality Assessments for Systematic Review
Adapted Newcastle-Ottawa Scale (NOS) for
Cross-sectional and Cohort studies
and GRADE for RCTs

We downloaded the following scale from: http://www.ohri.ca/programs/ clinical_ epidemiology /oxford.asp, to evaluate the quality of included studies. These were then adapted to better reflect nuances of study design.

1. Adapted Newcastle-Ottawa Quality (aNOS) Assessment Scale: Cross- Sectional Studies (Low=0-2; Medium=3-4; High=5-7)
Note: A study can be awarded a maximum of one star for each numbered item within the Selection and Exposure categories.

Selection
1) Is the outcome definition adequate? (max. 2)
   a) yes, with independent validation ✸✸
   b) yes, eg based on WHO measure or validated self report✸
   b) yes, eg record linkage or based on non-validated self report
   c) no description
2) Representativeness of the sample (max. 2)
   a) consecutive or obviously representative series of cases ✸✸
   b) potential for selection biases or not stated
3) Selection of Sample (max. 1)
   a) community-based ✸
   b) hospital-based
   c) no description

Exposure
1) Ascertainment of exposure (max. 1)
   a) secure record (eg surgical records) ✸
   b) structured interview ✸
   c) written self report or medical record only
   d) no description

Analysis
1) Analysis of findings (max. 2)
   a) Regression at 95% confidence ✸✸
   b) Bi-variate tests of associations ✸
   c) Descriptive only

Table S1. Detailed Assessment of Cross-sectional Studies

	Selection 1) Outcome	Selection 2) Representative	Selection 3) Sample	Exposure	Analysis	Score
Chalmers, 1986	Self-report low	Not stated	Hospital	Questionnaire	Association	2 - Low
				✸	✸	✸✸
Chalmers, 1987	Self-report low	Not stated	Homes	Questionnaire	Descriptive	2 - Low
			✸	✸		✸✸
Delport et al, 1988	Self-report low	Selection bias	Hospital	Questionnaire	Descriptive	1 - Low
				✸		✸
Ellison et al, 1997	Self-report low	Not stated	Hospital	Questionnaire	Association	2 - Low
				✸	✸	✸✸
Hoffman et al, 1984a	Self-report low	Selection bias	Clinic	Questionnaire	Descriptive	1 - Low
				✸		✸
Hoffman et al, 1984a	Self-report low	Selection bias	Clinic	Questionnaire	Association	2 - Low
				✸	✸	✸✸
MacIntyre et al, 2005	Self-report	Selection bias	Hospital	Questionnaire	Association	3 - Medium
	✸			✸	✸	✸✸✸
Van der Elst et al, 1989	Self-report low	Selection bias	Hospital	Questionnaire	Association	2 - Low
				✸	✸	✸✸
Kassier et al, 2003	Self-report	Representative	Health centre	Questionnaire	Association	4 - Medium
	✸	✸		✸	✸	✸✸✸✸
Petrie et al, 2007	Self-report	Not stated	Health centre	Questionnaire	Association	1 - Low
				✸	*p<0.1*	✸
Sibeko et al, 2005	Self-report	Representative	Clinic	Questionnaire	Association	4 - Medium
	✸	✸		✸	✸	✸✸✸✸
Goosen et al, 2014	Self-report	Representative	Community	Questionnaire	Association	5 - High
	✸	✸	✸	✸	✸	✸✸✸✸✸
Ladzani et al, 2011	Self-report	Representative	Clinic	Questionnaire	Regression	5 - High
	✸	✸		✸	✸✸	✸✸✸✸✸
Swarts et al, 2010	Self-report	Sampling bias	Clinic	Questionnaire	Association	3 - Medium
	✸			✸	✸	✸✸✸
Mnyani et al, 2017	Self-report low	Representative	Clinic	Questionnaire	Regression	4 - Medium
		✸		✸	✸✸	✸✸✸✸
Pillay et al, 2018	Self-report low	Selection bias	Clinic	Questionnaire	Regression	3 - Medium
				✸	✸✸	✸✸✸
Siziba et al, 2016	Self-report	Representative	Health facilities	Questionnaire	Association	4 - Medium
	✸	✸		✸	✸	✸✸✸✸
Steyn et al., 2017	Self-report low	Selection bias	Private practices	Questionnaire	Association	2 - Low
				✸	✸	✸✸
Yako & Nzama, 2013	Self-report	Selection bias	Health centre	Questionnaire	Association	3 - Medium
	✸			✸	✸	✸✸✸
Du Plessis,	Self-report	Selection bias	Private practice	Questionnaire	Descriptive	2 - Low

2009	✸			✸		✸✸
Baek et al, 2007	Self-report	Selection bias	Health facilities	Questionnaire	Regression	4 - Medium
	✸			✸	✸✸	✸✸✸✸

2. Adapted Newcastle-Ottawa Quality Assessment Scale: Cohort Studies

Note: The maximum number of stars is indicated for each numbered item within the Selection and Outcome categories. A maximum of two stars can be given for Comparability. Nine star maximum for non-interventions and 11 for interventions. Non-intervention cohorts: 0-3=Low, 4-6=Medium, 7-9=High; Intervention: 0-4=Low, 5-7=Medium, 8-11=High

Selection

1) Representativeness of the exposed cohort
   a) truly representative of the average _____(describe) in the community✷✷
   b) somewhat representative of the average _____in the community✷
   c) selected group of users eg nurses, volunteers
   d) no description of the derivation of the cohort

2a) Selection of the sample for interventions
   a) control drawn from the same community as the exposed cohort ✷
   b) control drawn from a different source
   c) no description of the derivation of the non-exposed cohort

2b) Selection of sample for descriptive
   a) community-based ✷
   b) hospital-based
   c) no description

3) Ascertainment of outcome
   a) structured interview, either WHO or validated tool ✷
   b) self report, (validation not reported)
   c) no description

4) Demonstration that outcome of interest was not present at start of study
   a) yes ✷
   b) no

Comparability (intervention only)

1) Comparability of cohorts on the basis of the design or analysis (max 2)
   a) study controls for exposure to intervention✷
   b) study controls for any additional factors, e.g. HIV status ✷

Outcome

1a) Analysis of outcome
   a) independent blind assessment ✷✷
   b) record linkage ✷
   c) self report
   d) no description

1b) Analysis of outcome (descriptive)
   a) Regression at 95% confidence ✷✷
   b) Bi-variate tests of associations ✷
   c) Descriptive only

2) Was follow-up long enough for *'meaningful'* outcomes to occur

a) yes, 12+ weeks ✸

b) yes, <12 weeks

c) no

3) <u>Adequacy of follow up of cohorts</u>

a) complete follow up - all subjects accounted for ✸

b) subjects lost to follow up unlikely to introduce bias - small number lost - > 75% follow up, or description provided of those lost) ✸

c) evaluation of subjects lost to follow indicate biases that are not controlled for in analysis

d) follow up rate < 75% and no description of those lost

e) no statement

Table S2 Detailed Assessment of Cohort Studies

	Selection Representa-Tive	Selection Sample	Selection Exposure	Selection Outcome-w/o	Comparability (intervention only)	Outcome Analysis	Outcome FU length	Outcome FU rate	Score
Bland et al, 2007	Biased	Hospital	Self-report	Yes	N/A	1b Reg.	1 week	Examined	Med
			✵	✵	-	✵✵		✵	5
Bork et al, 2013	Not stated	Hospital	Self-report	Yes	N/A	1b Reg.	>12 week	Biased	Med
			✵	✵	-	✵✵	✵		5
Bland et al., 2008	Biased	Hospital	Self-report	Yes	Visits + HIV	1a Blinded	>12 week	Not discussed	Med
			✵	✵	✵✵	✵✵	✵		7
Goga et al, 2012	Yes - consecutive	PMTCT sites	Self-report	Yes	N/A	1b. Assoc.	>12 week	Biased	Med
	✵		✵	✵	-	✵	✵		5
Ghuman et al, 2009	Not stated	Hospital	Unclear	Yes	N/A	1b. Assoc.	>12 week	Biased	Low
				✵	-	✵	✵		3
Budree et al, 2017	Not stated	Clinics	Self-report (FFQ)	Yes	N/A	1b Reg.	>12 week	Not discussed	Med
			✵	✵		✵✵	✵		5
Thomas et al., 2017	Not stated	Clinics	Self-report	Yes	N/A	1b Reg.	>12 week	Not discussed	Med
			✵	✵		✵✵	✵		5
Tuthill et al, 2017	Biased	Clinics	Self-report - low	Yes	N/A	1b Reg.	6 weeks	Not discussed	Low
				✵		✵✵			3
Sepeng & Ballot, 2016	Yes	Neonatal ward	Records	Yes	N/A	1b Reg.	<12 weeks	N/A	Med
	✵		✵	✵		✵✵			5

Table S3 Detailed Assessment of RCTs using GRADE criteria

Study	Quality						Effect				
	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	Size - Trial	Size- Control	Relative Effect	Quality summary	Importance
Nicodem et al,	RCT	Moderate	Low	Low	Moderate	Low	36.1%	29.1%	1.38 (ns)	Moderate	Important
	Video	Random allocation & blinding; only mothers who breastfeeding & follow-up low (47.6%)	All plausible	Clear links	No regression analysis		30/83	23/79	6 weeks		
Ijumba et al, 2015	Cluster RCT	Low	Low	Low	Low	Low			2.29	High	Critical
	CHW	Blinded, allocated	Sub-group analysis by HIV	Clear links	Clear measures		d-1629	d-1865	12 weeks		
Rotheram-Borus et al., 2014	Cluster RCT	Moderate	Low	Low	Low	Low	71.3%	52.1%	2.38	Moderate	Important
	EI vs. SC	Selection effects; No blinding; Not allocated	All plausible	Clear links	Clear measures		n-57 d-	n-50 d-	6 month		
Some et al, 2017	Clinical trial	Moderate	Low	Moderate	Moderate	Low	1.0	3.0	Missing	Low	Low
	ART types	Only mothers planning to breastfeed; blinding???	All plausible	ART regime & EBF links unclear	EPBF vs EBF measured		HR for lam. (short EPBR)	HR for Lop/rit (short EPBR)	1 week		
Tomlinson et al, 2014	Cluster RCT	Low	Low	Low	Low	Low	28.6%	14.9%	1.92	High	Critical
	CHWs	Blinding; random allocation; low attrition	Sub-group analysis by HIV	Clear links	Clear measures		430/ 1373	252/ 1693	12 weeks		

Tylleskar et al, 2011	Cluster RCT	Moderate	Low	Low	Low	Low	2.0%	<1.0%	5.70	Moderate	Important
	CHW	Only mothers intending to breastfeed; random allocation; mod attrition (>15%) in 1 arm	All plausible	Clear links	Clear measures		12/ 535	2/ 485	24 weeks		
Horwood et al, 2017	Cluster RCT	Low	Low	Low	Low	Low	76.7%	65.1%	1.7	High	Critical
	QI for CHWs	Random allocation; no blinding; mod attrition in both arms	All plausible	Clear links	Not WHO standards		194/ 253	181/ 278	6 weeks		
Myer et al, 2018	RCT	Moderate	Low	Low	Low	Low	31.8%	11.9%	Missing	Moderate	Important
	Integrated care	Mothers breastfeeding before 6w	Plausible & sub-groups tested	Clear links	Clear measures		67/ 211	26/ 219	6 months		
Reimers et al., 2017	Cluster RCT	Moderate	Low	Low	Moderate	Low	42.8	44.7	Missing	Moderate	Important
	Feeding Buddies (FB)	Mothers planning EBF; moderate attrition	All plausible	Clear links	FBs were not standard in terms of delivery		109/ 255	105/ 235			
Tuthill et al, 2017	RCT	Low	Low	Low	Moderate	Low	81.5%	81.5%	1.0	Moderate	Important
	Theory-based counseling vs. SOC	Blinding and random allocation; low attrition	All plausible	Clear links	Sample not powered adequately		N=29	N=29	N=58		

Appendix R. Plagiarism Declaration and TurnItIn Cover Page

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

FACULTY OF HEALTH SCIENCES

PLAGIARISM DECLARATION TO BE SIGNED BY ALL HIGHER DEGREE STUDENTS

SENATE PLAGIARISM POLICY: APPENDIX ONE

I Sara Jewett Nieuwoudt (Student number: 586626) am a student registered for the degree of PhD in Public Health in the academic year 2018.

I hereby declare the following:

- I am aware that plagiarism (the use of someone else's work without their permission and/or without acknowledging the original source) is wrong.
- I confirm that the work submitted for assessment for the above degree is my own unaided work except where I have explicitly indicated otherwise.
- I have followed the required conventions in referencing the thoughts and ideas of others.
- I understand that the University of the Witwatersrand may take disciplinary action against me if there is a belief that this is not my own unaided work or that I have failed to acknowledge the source of the ideas or words in my writing.
- I have included as an appendix a report from "Turnitin" (or other approved plagiarism detection) software indicating the level of plagiarism in my research document.

Signature: _____ Date: 11/12/2018

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SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	apps.who.int Internet Source	<1%
2	Sara Nieuwoudt, Lenore Manderson. "Frontline health workers and exclusive breastfeeding guidelines in an HIV endemic South African community: a qualitative exploration of policy translation", International Breastfeeding Journal, 2018 Publication	<1%
3	Petrida Ijumba, Tanya Doherty, Debra Jackson, Mark Tomlinson, David Sanders, Sonja Swanevelder, Lars-Åke Persson. "Effect of an integrated community-based package for maternal and newborn care on feeding patterns during the first 12 weeks of life: a cluster-randomized trial in a South African township", Public Health Nutrition, 2015 Publication	<1%