A review of complementary feeding practices in South Africa

Nazeeia Sayed* and Hettie C Schönfeldt

Department of Animal & Wildlife Sciences, University of Pretoria, Pretoria, South Africa

*Corresponding author, email: nazeeia.sayed@gmail.com

**Introduction:** Infant health and nutrition in South Africa are a priority, as evidenced by the political commitment and policy development history of the last 25 years. Current efforts focus on improving breastfeeding rates, but the action plan for complementary feeding receives less attention and resourcing. A thorough analysis of the current infant feeding situation is required to assist with policy and targeted programmes associated with complementary feeding.

**Aim:** The aim of this review was to identify and collate all published research in South Africa on the complementary feeding practices of infants and young children, aged 0–24 months.

**Methodology:** Searches included English-language research published between 2006 and 2017, within PubMed, Scopus, Web of Science and Google Scholar. All papers included in the review had to meet defined eligibility criteria. Papers older than 11 years were excluded. In total 34 papers relevant to South Africa were identified and included in this review.

**Main findings:** Early introduction of foods and liquids other than breast milk is a common practice. Maize porridge is a common first food for infants, but there is also a high reliance on commercial infant cereal. Water and other liquids (e.g. tea, herbal mixtures) are commonly given to infants younger than six months. There is little information on the number of meals per day. The diets of many older infants do not meet the criteria for a minimally acceptable diet. Few animal source foods are used in complementary feeding. There are indications that processed meats, soft drinks, sweets and salty crisps are given regularly to older infants between six months and one year.

**Conclusion:** Complementary feeding practices in South Africa are suboptimal and appropriate action is needed to improve this situation. Further investigation is needed on whether older infants and young children can achieve their required dietary intakes from the food that is available to them. If a change in older infant and young child feeding behaviour is desired, then existing methods and approaches need to change.

**Keywords:** complementary feeding, IYCF, infant nutrition, weaning, South Africa

Infant and young child feeding in South Africa

Infant health and nutrition in South Africa are a priority, as evidenced by the political commitment and policy development history of the last 25 years. The 2016 South African Demographic and Health Survey indicated improved exclusive breastfeeding (EBF) to a level of 32% in infants younger than six months. However, in the same report, the rates of stunting for infants below the age of six months (32.3%) and for children younger than five years (27%) show that there is a need to improve older infant and young child nutrition through addressing complementary feeding practices in South Africa.

In 2003, Piwoz et al. suggested that, globally, complementary feeding has not received adequate attention with regard to infant and young child feeding. Often, complementary feeding was not sufficiently addressed and the main objective has been the promotion, protection and support of breastfeeding. Similarly, in South Africa, the importance of complementary feeding during older infancy and young childhood (6–36 months) has not received adequate attention amongst the various stakeholders and research institutions.

Bhutta et al. assessed various interventions and modelled how many lives could be saved if these interventions were implemented. This was done for the 34 countries in which 90% of the world’s children with reported stunting are to be found. Following management of severe acute malnutrition (SAM), preventative zinc supplementation in infants and children and promotion of breastfeeding, complementary feeding interventions (scaled up to 90% coverage), are estimated to have the fourth largest impact on deaths averted from 10 interventions that were assessed. Furthermore, a focus on Infant and Young Child Feeding (IYCF) is second to management of malnutrition in terms of numbers of lives saved. A South African assessment of lives saved attributed only 117 lives saved to appropriate complementary feeding, but this assessment only assumed coverage of complementary feeding education scaled up from 10% to 20%, and that complementary feeding education and provision of supplementation was scaled up from 5% to 15%.

Older infants from six months are most vulnerable to malnutrition and growth faltering during the transition period from a milk diet to a diet that includes complementary food. There may also be consequences to the late introduction of complementary foods; for example, the late introduction of complementary foods may also affect adult obesity and predispose the infant to obesity later on.

In 2014, the Department of Health/Department of Social Development/Department of Performance Monitoring and Evaluation (DOH/DSD/DPME) evaluation report highlighted the need to change the focus across sectors from current practices to nutrition promotion, exclusive breastfeeding, complementary...
A review of complementary feeding practices in South Africa

Table 1: Selected strategies of the South African government to improve infant and young child nutrition

| Year       | Action                                                                 |
|------------|-------------------------------------------------------------------------|
| 1990, revised 2005 | Innocenti declaration signed                                             |
| 1994, revised 2007 | BFHI (Baby Friendly Hospital Initiative)                                 |
| 2007        | Renamed MBFI (Mother Baby Friendly Initiative)                          |
| 2007, revised 2013 | IYCF (Infant and Young Child Feeding) policy                             |
| 2011        | Tshwane declaration of support for breastfeeding by Minister of Health   |
| 2012        | Regulations relating to Foodstuffs for Infants and Young Children        |
| 2012        | Maternal New-born, Child and Women’s health and Nutrition strategy       |
| 2012        | Roadmap for Nutrition in South Africa                                    |

Feeding, dietary diversity and hygiene education. In assessing high-impact nutrition interventions, complementary feeding was singled out as the only one that was not prioritised and received a low (red) implementation score of 37.5%.6

South Africa has excellent policies in place and political commitment to improve infant health and nutrition, but the action plan for complementary feeding receives less attention and resourcing when compared with breastfeeding efforts. To the authors’ knowledge, national food consumption surveys have not been conducted in South Africa on older infants between six months and one year, and there are no comprehensive literature reviews on complementary feeding practices during this critical life stage. A thorough analysis of the current complementary feeding situation is needed to facilitate policy and programme decisions.

Aim of this review
The aim of this review was to identify and collate all research that has been published in South Africa on the complementary feeding practices of infants, aged 0–24 months. Information on breastfeeding, age of introduction of other foods/liquids, the types of foods/liquids consumed, dietary diversity/adequacy and feeding frequency were investigated. It is anticipated that this review will provide more information regarding the complementary feeding practices in South Africa and encourage decision-makers to prioritise programmatic and research action on complementary feeding initiatives in South Africa.

Methodology
Electronic databases were searched using selected keywords in the following four search engines: PubMed, Scopus, Web of Science and Google Scholar.

The search terms used were:
- ‘Complementary feeding South Africa’;
- ‘Complementary food South Africa’;
- ‘Infant feeding South Africa’;
- ‘Infant food South Africa’;
- ‘Infant nutrition South Africa’;
- ‘Weaning South Africa’;
- ‘Weaning food South Africa’;
- ‘IYCF South Africa’;
- ‘Infant and young child feeding South Africa’;
- ‘Breastfeeding South Africa’;
- ‘Formula feeding South Africa’.

To ensure more recent information on complementary feeding practices, articles older than 11 years (published before 2006) were excluded. However, two older articles (from 2005) were included as they were frequently cited in other articles. Studies on breastfeeding alone were also included, as they added valuable information to create a more comprehensive picture. One study was excluded because it included a sample of preschool children. All articles included in this review were read by the first author and their inclusion was confirmed by the second author. A total of 34 articles were included in this review.

Results
The published research mainly comprised cross-sectional studies with varying sample sizes, and varying sites of data collection across South Africa. Two national surveys (2016 SADHS7 and the 2012 SANHANES9) were included. The supplementary table provides additional information pertaining to the details of each of the studies included in the review such as sample size, description, where the study was undertaken and type of study.

Data from all the articles included were collected using standardised questionnaires. There were three qualitative studies.10–12 In the articles included in the review, breastfeeding estimates were made by asking about the current situation and by recall of past behaviour, and complementary feeding practices were obtained by the food frequency,13–17 24-hour14,16–23 and 7-day recall of foods. Four studies1,13,24,25 used the WHO IYCF indicators.26

The public health implications of infant feeding during HIV, and the research funding available for HIV research has undoubtedly led to an increase in the number of studies on IYCF that have been conducted. This is evidenced by the high number of HIV/PMTCT infant and young child feeding studies included in this review (n = 14 articles).11,20,22,23,25,27–35 However, the results on breastfeeding practices found by this review need to be interpreted against the existing policy background and the changes made in HIV and infant feeding guidelines in South Africa. The practice of giving free formula might have influenced more mothers to choose to formula feed and might have made formula feeding more acceptable in communities.

Key findings of this review are given in Table 2.

Discussion
The recent South African Demographic and Health Survey1 results showed an increase in stunting in older infants and young children between 8 and 23 months. This is the time when a child is introduced to and gradually makes the transition to the family diet, clearly indicating a problem with the complementary feeding practices. While it is imperative to continue investing in breastfeeding, it is also important to realise that complementary feeding practices are also suboptimal. It is clear from this review that actions to improve complementary feeding practices are urgently needed.

Lutter et al.44 proposed 3 broad interventions to improve complementary feeding: 1) counselling of mothers and social and behaviour change communication, 2) helping families overcome barriers to feed their children appropriate complementary foods,
Table 2: Key findings of review of the complementary feeding practices in South Africa

| Criteria | Finding |
|----------|---------|
| (1) Initiation of breastfeeding | Nine studies indicated that breastfeeding initiation rates were high in South Africa, ranging from 75% to 100%[1,3,6–8,21,23,28,32,36]. One national survey indicated 83% breastfeeding initiation[9]. One study indicated 51.1% breastfeeding initiation in the first hour, which increased to 85.2% by 24 hours[28]. Another study indicated 42% breastfeeding initiation in the HIV-positive group but 97% in the HIV negative group[23]. Pre-lacteal feeds were being given and colostrum was not given by some mothers (3 studies)[19,28,32]. |
| (2) Exclusive breastfeeding | Results for exclusive breastfeeding were mixed—but overall exclusive breastfeeding practices were suboptimal. National studies reported 7.4%, and more recently 32% of children younger than six months were exclusively breastfed[1,9]. Other studies: • < 1% were exclusively breastfed up to 6 months[17]. • < 1% were exclusively breastfed at 24 weeks[22]. • 6% of < 1-month–5-month-olds were exclusively breastfed[26]. • 7.6% of < 12-month-olds were exclusively breastfed[27]. • 12% were exclusively breastfed for 6 months[21]. • 13% were exclusively breastfed for 6 months[13]. • 18% were exclusively breastfed at 14 weeks[12]. • 27% of 0–10-month-olds were exclusively breastfed[13]. • 29.5% were exclusively breastfed at 30 days[19]. • 35.6% of 3–6-month-olds were exclusively breastfed[31]. • 36.5% were exclusively breastfed > 3 months[38]. • 38.5% of < 6-month-olds were exclusively breastfed[24]. • 40% of HIV positive and 45% of HIV negative mothers exclusively breastfed for 6 months[34]. • 52% were not exclusively breastfed beyond 2 months[15]. • 61.8% were exclusively breastfed in HIV infected mothers and 72.6% were exclusively breastfed in HIV uninfected mothers at 3–4 months[29]. Three studies reported that there was no exclusive breastfeeding in the surveyed community[7,16,30]. The duration of exclusive breastfeeding reported in studies was not standardised and this makes it difficult to draw any conclusions about this aspect of IYCF. |
| (3) Continued breastfeeding | One study reported that 31% of mothers had stopped breastfeeding before 24 weeks[27]. In studies that reported breastfeeding for longer than 6 months: • 80% of 6–12-month-old infants were being breastfed[9]. • 58% were still being breastfed at 12 months[13] and • 14.4% of 6–24-month-olds were still being breastfed[14]. |
| (4) Age of introduction of complementary foods | There was significant evidence of the early introduction of foods/drinks other than breastmilk/other milk in the first months: • 2.6% had completely stopped breastfeeding[19]. • between 17%[2,12,32] had been introduced to food, and • 66.8% of HIV positive women who did not breastfed, gave water and other foods from 3 weeks[10]. Ninety-one per cent had food introduced by 3 weeks[39]. • 73% had food introduced by 14 weeks[32]. • 72.7% of mothers gave food/liquids by 12 weeks[18]. • about a third gave food/liquids before 3 months[36]. • 43.2% at 3 months, 15% before 3 months[37]. • half by 3 months[40]. • solid food or formula introduced within 3 months[41]. • 19% before 4 months[13]. • 61% before 4 months, 87% before 6 months[17] and • 84.6% had introduced food before 6 months[38]. • Age of introduction of solid foods was 3.5 months in rural and 4.2 months in urban areas[14]. |
| Criteria | Finding |
|----------|---------|
| (1) Initiation of breastfeeding | Nine studies indicated that breastfeeding initiation rates were high in South Africa, ranging from 75% to 100%.
| | One study indicated 51.1% breastfeeding initiation in the first hour, which increased to 85.2% by 24 hours.
| | Pre-lacteal feeds were being given and colostrum was not given by some mothers.
| (2) Exclusive breastfeeding | Results for exclusive breastfeeding were mixed.
| | National studies reported 7.4%, and more recently 32%, of children younger than six months were exclusively breastfed.
| | < 1% were exclusively breastfed up to 6 months.
| | 27% of 0–10-month-olds were exclusively breastfed.
| | 29.5% were exclusively breastfed at 30 days.
| | 35.6% of < 6-month-olds were exclusively breastfed.
| | 40% of HIV positive and 45% of HIV negative mothers exclusively breastfed for 6 months.
| | 52% were not exclusively breastfed beyond 2 months.
| | 61.8% were exclusively breastfed in HIV infected mothers and 72.6% were exclusively breastfed in HIV uninfected mothers.
| (3) Continued breastfeeding | One study reported that 31% of mothers had stopped breastfeeding before 24 weeks.
| | 80% of 6–24-month-olds were still being breastfed.
| (4) Introduction of solid foods | In the first month:
| | 32% had been introduced to food, and 66.8% of HIV positive women who did not breastfeed, gave water and other foods.
| | Ninety-one per cent had food introduced by 7 weeks.
| | 19% before 4 months.
| | Food was given between 2 and 6 times to infants aged 8 weeks or younger.
| | Food was introduced to infants aged 8 weeks or younger.
| | Seventy-one percent of 6–23-month-olds received food the recommended minimum number of times or more.
| (5) Types of foods used in complementary feeding | Cereal based foods were the most popular type of complementary food.
| (6) Use of water and other non-milk liquids | Water was commonly given to infants before 6 months.
| (7) Foods of concern | Processed meats, soft drinks, sweets and salty crisps were some of the foods being given to older infants and young children that are cause for concern.
| (8) Meal frequency | Only four studies reported on the total number of feeds per day:
| (9) Dietary diversity (the number of items consumed from different food groups) | The number of older infants and young children who consumed food from 4 or more food groups were:
| | 5% at 6 months, 24% at 9 months, 75% at 12 months.
| | 44% of 6–23-month-olds.
| | less than 2.9% of 6–24-month-olds.
| (10) Minimum acceptable diets | The number of older infants and young children reportedly meeting the criteria for a minimally acceptable diet varied.
| (11) Reasons for introducing solid foods | Breast milk was not enough.
| | Told by friends/relatives; babies hungry; babies not sleeping.
| | Advised by family members; to keep baby full and help baby sleep at night.
| | Solid food introduction was the mother’s own decision but grandmothers (33%) and nurses (6%) were also named as sources of advice.
| | The main reason for starting solids was that the baby was still hungry after getting milk.
| | A crying baby and one that did not sleep well at night.
| (12) Home-made versus commercial food choice | Thirty-five per cent said special baby foods are better than ordinary foods.
| (13) Knowledge relating to or about complementary feeding | Eighty-two per cent of caregivers said solid foods should be introduced at 4–6 months.
| | The majority of mothers (76%) said they had not been told about foods to give their older infants and young children.
| | Fifty-nine per cent said that 3 months was the recommended age to introduce solid foods.
and 3) making the best of promoting local foods to reduce the
dependence on aid or purchased foods. Local cultural and tra-
ditional practices in South Africa also affect complementary
feeding practices. This review did not find much information
on this topic, and more research is needed to understand how
cultural/traditional practices influence complementary feeding.

Sanghvi et al.45 shared knowledge that had been gained from
Alive & Thrive efforts to improve infant feeding in Bangladesh.
These authors emphasise that advocacy, community mobilis-
ation, mass communication and strategic use of data are necessary
for optimal complementary feeding efforts to succeed.

The causes of stunting are multi-factorial and concerted efforts
on all fronts are needed to combat stunting. Stewart et al.46 pro-
posed an expanded conceptual framework for stunted growth and
development with causes grouped as: household and family factors, inadequate complementary feeding, inadequate
breastfeeding and infection, within a context of broader commu-
nity and societal factors. The 2016 SANHANES-1 study47 showed
that at a national level only 45.6% of the population were food secure, with 28.3% at risk of hunger, and 26.0%
experienced hunger (classified as food insecure). The SAN-
HANES-1 also found the national mean Dietary Diversity Score
was 4.2 (the cut-off for dietary adequacy being 4). The comple-
mentary feeding diet is reflective of a lack of diversity present in the adult diet and the struggle of dealing with food
insecurity.

In 2015, Larney48 discussed stunting prevention in sub-Saharan
Africa, and emphasised the important role of education for
girls, improved socioeconomic situations, provision of water,
sanitation and hygiene, and integrated actions across health–
education–agriculture and social protection. Supporting
mothers to follow older infant and young child feeding guide-
lines they have learned is also important: whether this is breast-
feeding support or making nutrient dense or fortified foods
more accessible, affordable and appealing.49 Breastfeeding
support would enable mothers to breastfeed for longer and
not introduce foods too early. Making the appropriate foods
more accessible, affordable and appealing would mean that
mothers are more likely to use them for complementary feeding.

It is beyond the scope of this review to critically assess the
various interventions that could be employed to improve com-
plementary feeding in South Africa, but the findings of this review
merit discussion on possible ways forward. Consideration is war-
ranted in two specific areas: (1) the older infant and young child
feeding messages, and (2) actions beyond training and nutrition
education.

(1) The older infant and young child feeding messages:

Investing in nutrition education efforts aimed at healthcare
workers and mothers in South Africa by providing evidence-
based and best practice messages on older infant and young
child feeding is important.

• Training of healthcare workers to improve counselling of
mothers: Globally, it has been seen that healthcare
workers do not use the contact they have with mothers to convey evidence-based and best practice older infant and
young child feeding messages.44 This is also true in
South Africa, where identification of malnutrition and
appropriate older infant and young child feeding counsel-
ing implementation could still be strengthened in the

South African healthcare system.48 Current training needs
to be critically assessed and the barriers to health worker
implementation investigated and addressed.

• The message emphasis: The information that is given to
mothers about older infant and young child feeding prac-
tices needs to be reconsidered.
  - One specific problem which was highlighted is that only
the exclusivity of breastfeeding and not the duration is
emphasised in South African older infant and young
child feeding policy communication.47
  - Furthermore ‘exclusive’ breastfeeding may be interpreted
as ‘not mixing two milks’ and does not include information
about the early introduction (i.e. before six months) of
other liquids and food.43
  - Crocetti et al.49 propose that pre-emptive advice given
early and consistently may help influence behaviour and
prevent early introduction of solids. Parents also need to be
taught to understand older infant and young child
cues, e.g. sleepiness and dealing with babies who have
different characters/personalities, in addition to when
and what to feed.
  - Critical aspects of the complementary feeding messages
include how often to feed, how to prepare and make
best use of foods available to the household, nutrient
density, consistency of meal prepared, giving of water,
teas, juices and snacks, and responsive feeding.50
  - Related practices like hand washing before food prep-
aration also need to be included.44

• Receiver of the message: Although the mother is targeted
with older infant and young child feeding information,
she may not be the only one making the decisions.42
Mothers function in a broader sociocultural context and
influences from the community (their friends and family,
even the media), as well as the healthcare system, need
to be considered.43 Communication of older infant and
young child feeding messages needs to extend beyond
just the mother or caregiver if an impact on optimal
older infant and young child feeding is to be achieved.
The attitudes and advice of the father, grandmothers and
creche owners would also influence feeding.

(2) Other nutrition interventions that need consideration:

Funding and strategy play a major role in the available nutrition
interventions. Piwoz et al.3 creatively suggest a ‘Ten steps
approach to complementary feeding’—similar to the 10 steps
of the baby-friendly hospital initiative. Complementary feeding
interventions should consider linking with the Mother Baby
Friendly Initiative (MBFI) in South Africa since it is well estab-
lished and understood by many South African healthcare
workers. The use of multiple micronutrient powders for home
fortification of complementary foods is also a venture with
promising returns. Research has indicated that it is feasible
and well accepted by caregivers.41 This intervention has the
added advantage of providing an opportunity for the healthcare
worker to talk about feeding. Another opportunity that cannot
be ignored is partnership with other stakeholders: these could
be partnerships with creative marketing agencies to assist with
behaviour change campaigns or partnerships with the food
industry to provide affordable and appropriate complementary
foods that are appropriately promoted. Improving complemen-
tary feeding is not just the domain of nutrition and health
professionals.
There is an emerging discipline of conducting opinion leader research to inform strategy and evidence-based advocacy. In consideration of action to improve complementary feeding practices in South Africa, perhaps opinion leader research is one of the first actions that need to take place, as it may identify opportunities to strengthen current activities and new actions that may be considered by the government.

**Conclusion**

In summary, the key findings of this review are that:

1. Breastfeeding initiation rates range from 75% to 100%.
2. Exclusive breastfeeding up to six months is not a common practice.
3. Continued breastfeeding after six months varies.
4. Early introduction of foods and liquids other than breast milk is widespread.
5. Maize porridge is a common first food for infants, but there is also a high reliance on commercial infant cereals.
6. Water and other liquids (e.g. tea, herbal mixtures) are commonly given to infants younger than six months.
7. There are indications that processed meats, soft drinks, sweets and salty crisps are being given regularly to children between six months and one year.
8. There is little information available about the number of meals per day that older infants and young children receive.
9. Dietary diversity is poor in many older infants and young children, and the use of animal source foods appears to be low.
10. The diets of many older infants and young children do not meet the criteria for a minimally acceptable diet.
11. Mothers have varying knowledge, and there are a variety of influencers and reasons for introducing complementary foods.

From the information gathered from the 34 studies, which included two national surveys, it can be concluded that complementary feeding practices in South Africa are suboptimal and appropriate action is needed to improve this situation. Policy-makers and implementers need to be sure that it is indeed worthwhile to invest in behaviour change and education in a resource-limited setting. They need the evidence that a continued emphasis on a food-based approach is the right action to improve the complementary feeding situation. An investigation into whether older infants and young children can achieve their required dietary intakes from the food that is available to them, in an affordable manner, would be a good first step. Nutrition modelling software can be helpful to assess whether older infant and young child nutrient needs can be met with foods commonly available, and to test specific food-based recommendations.

If a change in older infant and young child feeding behaviour is desired, then existing methods and approaches need to change: a paradigm shift is required—changes in infant feeding behaviour are not just about education and information given to mothers but must also include support for the desired behaviour change. There are a host of internal and external enablers and barriers to change, but there is little information and even less understanding of the many factors that impact on a mother's complementary feeding decisions in South Africa. Whichever strategy and actions are pursued to improve complementary feeding practices, they need to be supported by research that takes into account current challenges, and ensures that the action can be scalable and sustainable.

**Disclosure statement** – No potential conflict of interest was reported by the authors.

**Funding** – The authors would like to thank the Department of Science and Technology (DST)/National Research Foundation (NRF) South African Research Chairs Initiative (SARCHi) in the National Development Plan Priority Area of Nutrition and Food Security (Unique number: SARCHi170808259212). Ms Sayed is a PhD Nutrition student supported by the DST-NRF Centre of Excellence in Food Security. The grant holders acknowledge that opinions, findings and conclusions or recommendations expressed in any publication generated by the NRF-supported research are those of the author(s), and that the NRF accepts no liability whatsoever in this regard.

**ORCID**

Nazeeia Sayed http://orcid.org/0000-0003-4629-5230

Hettie C Schönfeldt http://orcid.org/0000-0003-2388-4489

**References**

1. Department of Health SA. Protecting, promoting and supporting exclusive and continued breastfeeding: a breastfeeding course for health care providers. 2014. p. 1–237.
2. NDoH, SSA, SAMRC, et al. South Africa demographic and health survey 2016: key indicator report. Pretoria, South Africa and Rockville, Maryland, USA: National Department of Health (NDoH), Statistics South Africa (SSA), South African Medical Research Council (SAMRC) and ICF; 2017.
3. Piwoz EG, Huffman SL, Quinn VJ. Promotion and advocacy for improved complementary feeding: can we apply the lessons learned from breastfeeding? Food Nutr Bull. 2003;24(1):29–44. https://doi.org/10.3402/gha.v8.27265
4. Bhutta ZA, Das JK, Rizi A, et al. Evidence-based interventions for improvement of maternal and child nutrition: what can be done and at what cost? Lancet. 2013;382(9890):452–77. https://doi.org/10.1016/S0140-6736(13)60996-4
5. Chola L, Pillay Y, Barron P, et al. Cost and impact of scaling up interventions to save lives of mothers and children: taking South Africa closer to MDGs 4 and 5. Glob Health Action. 2015;8(1):27265. https://doi.org/10.3402/gha.v8.27265
6. Black RE, Allen LH, Bhutta ZA, et al. Maternal and child undernutrition: global and regional exposures and health consequences. Lancet. 2008;371(9608):243–60. https://doi.org/10.1016/S0140-6736(07)61690-0
7. Fall CH, Borja JB, Osmond C, et al. Infant-feeding patterns and cardiometabolic risk factors in young adulthood: data from five cohorts in low- and middle-income countries. Int J Epidemiol. 2011;40(1):47–62. https://doi.org/10.1093/ije/dyq155
8. DOH, DSD, DPME. Summary evaluation report: diagnosticimplementation evaluation of nutritional interventions for children from conception to age 5. 2014.
9. Shisana OLD, Rehle T, Simbayi L, et al. South African national health and nutrition examination survey (SANHANES-1). Cape Town: HSRC Press; 2013.
10. Chelule PK, Mokgatle MM, Zungu LI, et al. Caregivers’ knowledge and use of fermented foods for infant and young children feeding in a rural community of Odi, Gauteng Province, South Africa. Health Promot Perspect. 2014;4(1):54–60.
11. Ijumba P, Doherty T, Jackson D, et al. Social circumstances that drive early introduction of formula milk: an exploratory qualitative study in a peri-urban South African community. Matern Child Nutr. 2014;10 (1):102–11. https://doi.org/10.1111/mcn.12012

Full list of references available on request.