

Original Article

Food insecurity is associated with attitudes towards exclusive breastfeeding among women in urban Kenya

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Abstract

This study aimed to document whether food insecurity was associated with beliefs and attitudes towards exclusive breastfeeding (EBF) among urban Kenyan women. We conducted structured interviews with 75 human immunodeficiency virus (HIV)-affected and 75 HIV-status unknown, low-income women who were either pregnant or with a child ≤ 24 months and residing in Nakuru, Kenya to generate categorical and open-ended responses on knowledge, attitudes and beliefs towards EBF and food insecurity. We facilitated six focus group discussions (FGD) with HIV-affected and HIV-status unknown mothers ($n = 50$ women) to assess barriers and facilitators to EBF. Of 148 women with complete interview data, 77% were moderately or severely food insecure (FIS). Women in FIS households had significantly greater odds of believing that breast milk would be insufficient for 6 months [odds ratio (OR), 2.6; 95% confidence interval (95% CI), 1.0, 6.8], that women who EBF for 6 months would experience health or social problems (OR, 2.7; 95% CI, 1.0, 7.3), that women need adequate food to support EBF for 6 months (OR, 2.6; 95% CI, 1.0, 6.7) and that they themselves would be unable to follow a counsellor's advice to EBF for 6 months (OR, 3.2; 95% CI, 1.3, 8.3). Qualitative analysis of interview and FGD transcripts indicated that the maternal experience of hunger contributes to perceived milk insufficiency, anxiety about infant hunger and a perception that access to adequate food is necessary for successful breastfeeding. The lived experience of food insecurity among a sample of low-income, commonly FIS, urban Kenyan women reduces their capacity to implement at least one key recommended infant feeding practices, that of EBF for 6 months.

Keywords: food security, Kenya, exclusive breastfeeding, HIV/AIDS, urban.

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Introduction

Few studies have explored the possible causal links between a high prevalence of food insecurity and low prevalence of exclusive breastfeeding (EBF). This is surprising because food insecurity is prevalent in many countries, and child survival remains a major challenge with 7.7 million child

deaths predicted for 2010 (Rajaratnam *et al.* 2010). Recent estimates are that suboptimal breastfeeding, including non-EBF, contributes to 13% of deaths (Jones *et al.* 2003) and 10% of the disease burden of children <5 years (Black *et al.* 2008). Globally, less than 40% of infants younger than 6 months are EBF, and 50% are breastfed to 20–24 months (UNICEF 2008).

Household food insecurity is known to contribute to poor dietary intakes, nutrition and health outcomes among adults and children and is often common in communities in which breastfeeding rates are high but EBF rates are low (Nyaruhucha *et al.* 2006; Hackett *et al.* 2009). A recent longitudinal study in Bangladesh observed that better household food security during the antenatal period was associated with poorer infant feeding practices from 3 to 6 months, including providing cow milk, juices and other liquids, although no significant differences in duration of EBF were observed (Saha *et al.* 2009). Food insecurity was not assessed in the post-natal period, and it is unclear if longitudinal changes in food insecurity contributed to infant feeding practices; also, it is not clear how applicable these findings are to human immunodeficiency virus (HIV)-impacted regions.

We can posit at least three plausible and non-mutually exclusive hypotheses for the causal pathways through which food insecurity may undermine a mother's ability to EBF, i.e. by contributing to maternal employment outside of the home, psychological distress and/or reduced breast milk output (Fig. 1). First, food insecurity may compel women to work outside of the home and there is strong evidence of a negative impact of maternal work on breastfeeding practices in both developed and developing country settings (Moffat 2002; Mamabolo *et al.* 2004; Clifford *et al.* 2006; Otoo *et al.* 2009). Second, food insecurity may also contribute to maternal psychosocial distress and undermine maternal confidence and self-efficacy, which in turn may adversely affect initiation and duration of EBF. In countries with high prevalence of food insecurity such as Tanzania (Hadley & Patil 2006) and Ethiopia (Hadley *et al.* 2008) as well as in resource-rich settings such as the United States (Huddlestone-Casas *et al.* 2009; Lent *et al.* 2009),

household food insecurity was associated with higher rates of maternal depression and stress. Maternal depression and distress is a significant predictor of reduced breastfeeding self-efficacy, exclusivity and duration of BF in developed country settings (Galler *et al.* 2006; Dennis & McQueen 2009). Third, psychological and physiological stress associated with severe food insecurity and malnutrition may impair milk let-down, breast emptying and subsequent milk output (Jelliffe & Jelliffe 1978; Dewey 2001). In situations where food insecurity contributes to severe maternal malnutrition (van Esterik 1985; Gittelsohn *et al.* 1997), physiological mechanisms may alter breast milk output or the concentration of certain fats and micronutrients (Nommsen *et al.* 1991; Haskell & Brown 1999; Ettyang *et al.* 2005). It is also theoretically plausible that food insecurity may increase the practice of EBF if it limits access to supplemental foods for mixed feeding and attitudes to EBF are positive.

As efforts increase to develop effective interventions to support EBF, it would be helpful to test these hypotheses directly and to tease apart the relative importance of each putative underlying mechanism in programmatic settings. The primary objective of this study was therefore to assess the associations between indicators of current household food insecurity and attitudes and beliefs towards EBF among mothers using cross-sectional data collected in Nakuru, Kenya.

Materials and methods

Study site

The study was conducted between August and November 2008, in Nakuru, a multi-ethnic, urban municipality, where EBF is commonly promoted in

Key messages

- The lived experience of food insecurity and hunger was associated with negative attitudes towards exclusive breastfeeding among a sample of low-income, urban Kenyan women.
- Food insecurity differentially influenced the infant feeding choices of HIV-affected women.
- The role of food insecurity as a motivator of mixed feeding among both HIV-unaffected and HIV-affected women needs further investigation.

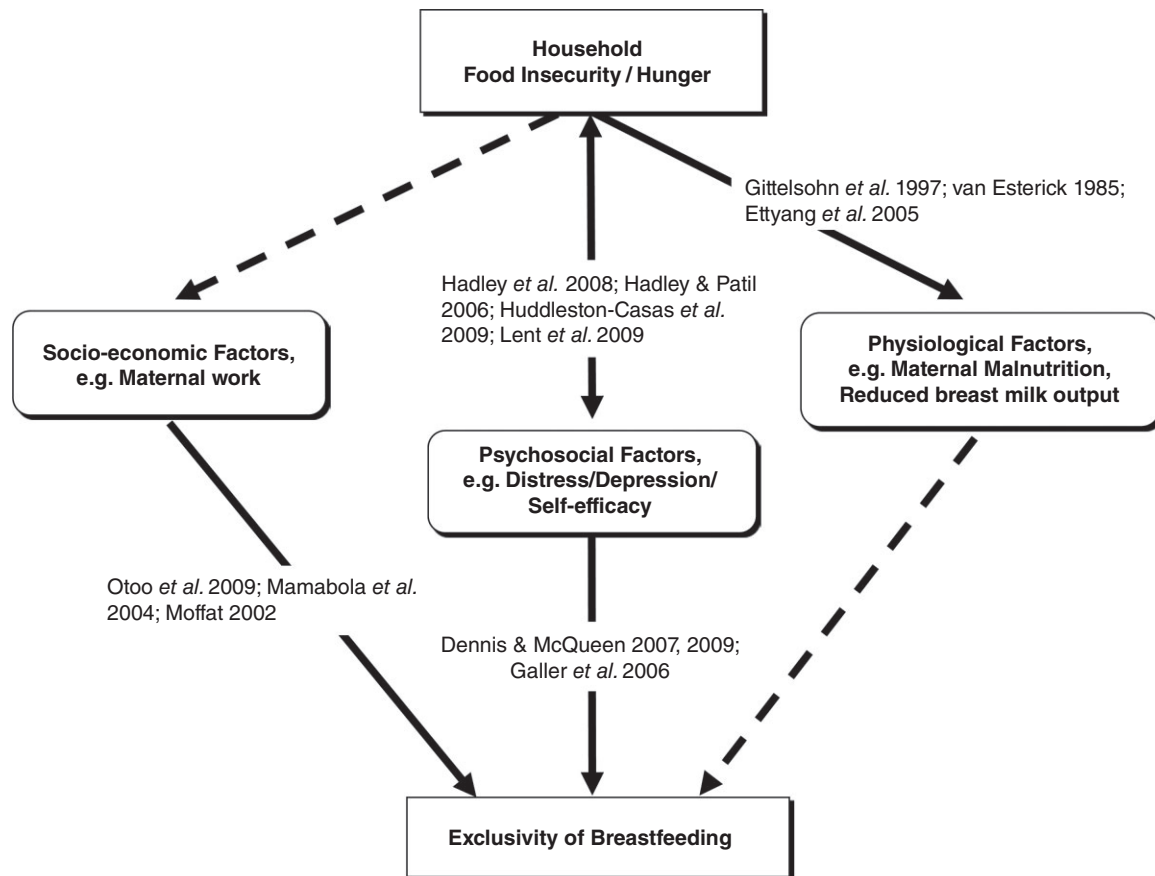


Fig. 1. Conceptual framework for potential mechanisms by which food insecurity may undermine exclusivity of breastfeeding.

antenatal clinics (ANC), maternity wards, health centres and through media. Nakuru is located approximately 160 km northwest of Nairobi in the Great Rift Valley Province and is the fourth largest city (population approximately 300 000) in the Republic of Kenya. Rates of EBF are low in Kenya – 18% and 13% at 4 and 6 months, respectively, in spite of ongoing promotion of EBF to 6 months in health centres and through the media and moderate rates of prolonged breastfeeding (57% to 20–24 months) (UNICEF 2008). In 2007, the HIV prevalence rate among adults aged 15–49 years was 7.4%, with women being disproportionately infected (8.7%) compared with men (5.6%) (NASCO 2009). The prevalence of food insecurity is also relatively high. In 2005, the Kenya National Bureau of Statistics (KNBS) estimated that 51% of Kenyans were under-

nourished (KNBS 2008)¹. This proportion has likely increased following recent events including crop failures due to drought, the post-election violence of 2008 and the global food crisis. In Nakuru, the

¹The KNBS defined undernutrition as the proportion of the population consuming less food than is needed to meet the minimum dietary energy requirement. We choose this measure as a national-level indicator for food insecurity because it provides an estimate of the potential risk of malnutrition among adults. Demographic Health Surveys and Multiple Indicator Cluster Surveys do not estimate food insecurity, and nutrition indicators for malnutrition (underweight, stunting, wasting) from several national surveys largely represent the situation among children. Although maternal underweight may also be used, it was not included in the most recent Kenyan Demographic and Health Survey (2004).

HIV prevalence in 2009 was 5.9% [females (6.6%); males (3.5%)] (http://www.aidskenya.org/public_site/webroot/cache/article/file/Official_KAIS_Report_20091.pdf), and a recent survey reported that approximately 75% of HIV-affected households in Nakuru were moderately to severely food insecure (Mbugua 2009).

Study design, population and sampling approach

This study used cross-sectional quantitative and qualitative data to investigate associations between indicators of food insecurity and attitudes and beliefs about EBF. Because the study was interested in breastfeeding attitudes and beliefs of urban women who are or would soon be breastfeeding, participants were sampled based on recent or near-future breastfeeding experience. Thus, sampling for interviews and focus group discussions (FGDs) was purposive based on the following criteria: either confirmed pregnant by a health care worker or with a child ≤ 24 months of age, resident in Nakuru municipality and expecting to reside in the municipality for at least the following year. Women were sampled equally from two groups according to HIV status as described below.

Group A ('HIV-affected')

We recruited 75 women from 'HIV-affected' households who met the eligibility criteria to participate in structured interviews. We defined women from 'HIV-affected' households as those whose households could be identified at baseline to have at least one adult member diagnosed with HIV through membership of a community-based organization for 'living positively' with assistance from a well-respected, community-based key informant (gatekeeper). We recruited the first 30 of these women by convenience from among the participants in a longitudinal follow-up assessment conducted by the authors on the effects of an urban agriculture intervention on infant and young child nutrition among HIV-affected households in Nakuru (the Sustainable Environments and Health Through Urban Agriculture, or SEHTUA project) (Karanja *et al.* 2010). We recruited the remaining 45 of these women from community-based

HIV/acquired immunodeficiency syndrome (AIDS) support/self-help groups using service-based convenience sampling. We recruited an additional convenience sample of 25 women meeting the eligibility requirements from Prevention of Mother to Child Transmission Services (PMTCT) at the government-run Provincial General Hospital (PGH) in Nakuru to participate in three FGDs. Women in this group were not required to disclose to researchers their own HIV status or that of any member of their household during data collection.

Group B ('HIV-status unknown')

We recruited 100 low-income women attending ANC or child well clinics (CWC) at the PGH (75 for interviews and 25 for FGDs). A maternal and child health nurse approached women in the ANC or CWC waiting area to inform them of the study and to invite participation. Those agreeing were referred to a trained researcher for eligibility screening, consent and administration of questionnaires. It was assumed for analysis that most women in this group lived in less HIV-affected households, i.e. most households did not contain any adult members diagnosed with HIV/AIDS. Women in this group were not required to disclose to researchers their own HIV status or that of any member of their household during data collection.

Data collection

We used 'mixed methods' to collect a combination of qualitative and quantitative data through (1) FGD and (2) interviews with structured and open-ended responses. All interviews and focus groups were conducted in Kiswahili using guides developed in English and pre-tested in Kiswahili with mothers in a town approximately 1 h away from Nakuru. All FGDs and approximately 25% of structured interviews were recorded, transcribed and translated into English and reviewed by the co-authors. A research assistant with a university degree in nutrition was trained on the interview tool and FGD guide prior to and during piloting of both instruments; training included reviewing the questions, rapport building and inter-

view skills such as probing. During training, a bilingual co-investigator with extensive training in infant and young child feeding and qualitative methods provided feedback and retraining. During the implementation of the study, rapid review of transcripts allowed for retraining as needed.

We used FGDs facilitated by a trained researcher in a private setting at the PGH to gather community-based barriers to EBF. We followed an FGD guide that asked open questions about barriers and supports to EBF in the community and perceptions on different sources of infant feeding information. Specific questions on food insecurity were not asked. However, if themes related to food insecurity were independently raised by women, the facilitator probed on this topic. All FGDs were recorded and later transcribed into English.

We conducted interviews at a location of the participant's choosing (Group A: usually the home but also in private spaces at community-based comprehensive care centres or support groups) or in a quiet and private location at the PGH (Group B). The interview guide was semi-structured and designed to collect individual knowledge, attitudes and practices towards EBF using both closed-ended questions to elicit pre-coded categorical responses and open-ended questions that allowed for follow-up and probing. In the first part of the interview, structured questions were designed to capture quantitative socio-demographic, obstetric and food insecurity indicators as follows:

- *Socio-demographic characteristics:* We adapted questions on socio-demographic and economic characteristics of the household and respondent from the Kenya Demographic and Health Survey (ORC Macro 2004).
- *Obstetric history:* For pregnant women, we also collected information on pregnancy confirmation, parity, expected date of delivery, expected location of delivery and expected assistance during delivery (trained health worker, traditional birth attendant or other). For women with children ≤ 24 months of age, we collected information on maternal parity and infant age, date of birth, location of and assistance during delivery, birthweight and sex by maternal recall. We verified these against child clinic cards when available.

- *Food insecurity:* We used the Household Food Insecurity Access Scale (HFIAS) to collect semi-quantitative data on household food access (Coates *et al.* 2007). The HFIAS was previously validated in this population and exhibited high internal consistency (Cronbach's alpha = 0.83) and construct validity (0.80) (Mbugua 2009).

In the second part of the interview, we used a modified set of open-ended responses previously used in another town in Kenya (Sellen 2006) to explore personal experiences of breastfeeding in the context of food insecurity and hunger; responses were further probed for detail and meaning using follow up questions and probes. We also used a modified set of semi-structured questions on infant feeding knowledge, attitudes and beliefs, and experiences with infant feeding counselling based on previous work conducted by team members in Voi, Kenya (Sellen *et al.* 2007).

Protection of study participants

Study protocols and instruments were approved by institutional review boards at the University of Toronto and the Kenyan National Council of Science and Technology and the Medical Director of the PGH in Nakuru. All participants provided informed consent prior to participating.

Statistical analysis

We categorized participants' households into two food insecurity categories: 'food secure/mildly food insecure' or 'moderately/severely food insecure', using HFIAS responses, coding guidelines provided by the Food and Nutrition Technical Assistance Project (Coates *et al.* 2007) and SPSS 15.0 (SPSS-IBM, Chicago, IL, USA). We tested statistical models predicting an association between food security status and beliefs and attitudes towards EBF using multivariate logistic regression specifying household food security status in the preceding month as a predictor and categorical indicators of current attitudes and beliefs towards EBF as outcomes. We adjusted models for the following variables as determined by changes in the

odds ratio (OR) (Kleinbaum & Klein 2002): maternal age, parity (nulliparous/multiparous), years of schooling, pregnancy status (yes/no), respondent contributes to household income (yes/no); household size; whether the mother received infant feeding counselling (yes/no). Significant effects were determined at $P < 0.05$. We also tested for interactions between food security status and receipt of infant counselling for attitudes and beliefs towards EBF ($P < 0.10$ cut-off for significance). Analyses were conducted using SAS v9.1 (SAS Institute, Cary, NC, USA).

We conducted subgroup analysis stratified on HIV group status to assess the extent of potential confounding. This revealed that there was insufficient variance in the HIV-affected group to examine associations because 97% of respondents were moderately to severely food insecure. Subgroup analysis of HIV-status unknown participants only yielded similar trends as when the groups were combined, although estimates did not reach statistical significance due to smaller sample sizes (available on request). Thus, we report findings for the entire sample of HIV-affected and HIV-status unknown women with group status (HIV affected or status unknown) removed from the model due to multi-collinearity with food insecurity status. Household income was also not included in the adjusted models due to multi-collinearity and because it was missing for a substantial portion of participants (30%) due to inability to estimate or uncertainty regarding monthly household income.

We conducted content analysis of open-ended responses from the interview (attitudes, beliefs towards EBF) and of FGD transcripts using post hoc thematic categorization and manual coding and labeling of open-ended response. Common themes around beliefs and attitudes towards EBF were identified and reviewed by the authors.

Results

We completed structured interviews with 148 women and excluded partial data collected on two women who did not complete the interview due to a scheduling conflict or voluntary withdrawal. Six FGDs were held with 50 women. Complete transcripts were available for 32 interviews and all FGDs. Redundancy in

thematic content of open-ended responses from interviews conducted later in the study indicated adequate 'sampling to saturation'. There were also many similarities in the content of FGDs that suggested sample size was adequate to capture the main themes of interest.

Food insecurity

Among the 148 women for whom we collected complete interview data, 36% were pregnant, 21% self-identified as the head of household and 77% lived in households classified as moderately or severely food insecure. A greater proportion of women from moderately/severely food insecure households was HIV affected or headed their household (Table 1). Moderately/severely insecure women had significantly larger median household size, lower median schooling or lower median monthly incomes (Table 1; all $P < 0.05$). Ninety-seven per cent of women in Group A (HIV affected) were from moderately/severely food insecure households compared with 48% of women in Group B.

Attitudes towards EBF

As shown in Table 2, 89% of women had heard of EBF when defined as the provision of breast milk only without any other foods or liquids. However, 77% believed that breast milk alone would be insufficient for the first 6 months, and 58% believed that women who EBF would have health or social problems. Problems cited included hunger, weight loss, ill health, fainting, lack of energy and problems with neighbours or family members who insist on mixed feeding or who 'gossip'. These beliefs were more prevalent among women living in moderately/severely food insecure households. A large minority (47%) reported that infants EBF for 6 months would have physiological and/or emotional problems including hunger, thirst, malnutrition and falling ill because breast milk 'does not provide all the nutrients a child needs' as well as crying and being 'bothersome'.

In multivariate models, mothers from moderately to severely food insecure households had approximately 2.6-fold greater odds of believing that breast milk alone would be insufficient for 6 months com-

Table 1. Descriptive statistics of urban Kenyan women participating in a study of infant feeding knowledge attitudes and practices, overall and by food insecurity status ($n = 148$). Values are presented as median (interquartile range) or proportion with differences assessed by Wilcoxon ranked sum and chi-square analysis, respectively

Descriptive statistics	Overall ($n = 148$)	Food secure/mildly food insecure (22%)	Moderately/severely food insecure (78%)
Maternal age, year	26 (21, 30)	23 (21, 27)	26 (21, 32)
Currently pregnant (%)	36	61	30
Respondent is household head (%)	21	3	27
Respondent contributes to income (%)	43	36	46
Household income, KES	4200 (2000–7000)	9600 (6000–15 000)	3500 (1900–5600)
Schooling, year	8 (7, 12)	11 (8, 12)	8 (7, 11)
Household size, n	4 (3, 6)	3 (2, 4)	5 (3, 6)
Child <6 months ($n = 97$), %	26	24	28
Lives with partner, %	59	88	50
HIV affected, %	51	6	62

HIV, human immunodeficiency virus; KES, Kenyan shilling.

Table 2. Attitudes and beliefs of 148 urban Kenyan women towards exclusive breastfeeding for 6 months according to their household food insecurity status

Indicators of knowledge, attitude and belief	Overall ($n = 148$), %	Food secure/mildly food insecure ($n = 33$), %	Moderately/severely food insecure ($n = 115$), %	Adjusted OR (95% CI)*
Knew about EBF [†]	88.6	81.8	90.4	0.8 (0.2, 2.8)
Breast milk is insufficient for EBF for 6 months	77.0	63.6	80.7	2.6 (1.0, 6.9)
Women need adequate food to EBF for 6 months	42.0	24.2	47.8	2.7 (1.0, 7.3)
Women who EBF for 6 months will have problems	58.0	32.3	65.8	2.6 (1.0, 6.7)
Infants that EBF for 6 months will have problems	51.4	48.5	52.3	1.0 (0.5, 3.0)
Respondent would be unable to EBF for 6 months if recommended to do so by a health care worker	55.7	30.3	62.6	3.2 (1.3, 8.3)
There are no/few benefits to EBF for 6 months	23.1	21.9	23.6	1.3 (0.4, 3.9)
There are disadvantages to EBF for 6 months	36.4	45.5	33.9	1.5 (0.6, 3.8)
Received counselling about infant feeding	64.2	45.5	70.2	1.8 (0.7, 4.7)

*Odds ratios (OR) and 95% confidence intervals (95% CI) are adjusted for maternal age, parity (nulliparous/multiparous), years of schooling, pregnancy status (yes/no), respondent contributes to household income (yes/no), household size and whether the mother received infant feeding counselling (yes/no). [†]When defined as the provision of breast milk only with no additional liquids, foods, supplements or water with the exception of prescribed medicines. EBF, exclusive breastfeeding.

pared with women in food secure/mildly food insecure households (Table 2). Severely/moderately food insecure women had significantly greater odds of reporting that women would have problems if they EBF for 6 months; this association remained significant in adjusted models. Food security status was not significantly associated with whether women believed children would have problems.

Sixty-four per cent of women received infant feeding counselling. Receipt of counselling was not associated with food security status or attitudes and beliefs towards EBF, with the exception that women

who had received counselling had significantly lower odds of reporting that there were no benefits of EBF [OR, 0.29; 95% confidence interval (95% CI), 0.11, 0.76; $P = 0.01$].

Motivations for mixed feeding

Maternal hunger and subsequent lack of confidence in maternal milk adequacy

A significant minority of women (43%) indicated that breast milk sufficiency depended on whether the

Table 3. Selected statements about the perception and lived experience of food insecurity and infant feeding practices for women living in Nakuru, Kenya*

A: Conceptual links between maternal hunger and breast milk sufficiency	
1.	'The mother would like to breastfeed but sometimes lacks money to buy food so that she can eat well so the baby will not be full because the mother doesn't have enough milk'. (HIV-status unknown, pregnant woman)
2.	'When I wasn't eating well because of lack of income I didn't have sufficient milk and the child cried a lot but when I had enough to eat I didn't have the problem. If one is breastfeeding one should eat well or else she would be very hungry because of the child breastfeeding' (HIV-affected, mother of young child)
3.	'If the mother is eating well the baby will not have any problems but if she is not feeding well the baby may have problems since it will not grow healthy.' (HIV-status unknown, mother of a young child)
B: Physiological demand of breastfeeding in the absence of 'adequate food' and the well-being of mothers	
1.	'The mother will become thin if she doesn't eat well yet she is breastfeeding.' (HIV-status unknown, pregnant woman)
2.	'If a child breastfeeds without being given other foods it will breastfeed a lot and the mother will lack energy.' (HIV-affected pregnant woman)
3.	'if a child breastfeeds too much the mother will lose weight and the mother won't be strong; it will require the mother to eat well and maybe she doesn't have the food.' (HIV-affected mother of a young child)
C. Food insecurity informs maternal confidence in ability to EBF	
1.	'I don't eat sufficient amounts of food currently so I don't think it (breast milk only) will be enough for all these months.' (HIV-status unknown, mother of young child)
2.	'I won't have sufficient food to produce a lot of milk.' (HIV-affected, mother of young child)
3.	'My milk is not sufficient for the child . . . because of what I eat.' (HIV-status unknown, mother of young child.)
D. Child crying, perceived as hunger, compels mothers to offer supplemental foods	
1.	'There are children who need food, even when breastfed they continue to cry, when you give other foods the child stops crying.' (HIV-affected pregnant woman)
2.	'If the baby doesn't eat well in the stomach (womb) then its born hungry and will need more food like uji at 2 weeks to satisfy it.' (HIV-status unknown pregnant woman)
3.	'Sometimes the mother's milk is not enough so the baby is hungry and becomes problematic thus one is forced to feed other foods.' (HIV-status unknown, pregnant woman)
4.	'A baby who is breastfed only will be hungry since at home other babies are fed food like porridge. I see other babies being very hungry I don't know if it is because the mother doesn't have enough milk.' (HIV-status unknown, pregnant woman)

*Recorded, transcribed structured interviews were available for 32 women. HIV, human immunodeficiency virus; EBF, exclusive breastfeeding.

mother had access to adequate food. In multivariate models, women living in moderately/severely food insecure households had significantly greater odds of reporting that mothers needed adequate food to produce sufficient breast milk to support EBF for 6 months ($P = 0.04$; Table 2). Qualitative analysis of interview and focus group transcripts also support a hypothesis that the lived experience of food insecurity, hunger and infant feeding practices are linked (Table 3).

Mothers' interview statements revealed a strong positive conceptual link between maternal well-being and the sufficiency of breast milk and a strong negative conceptual link between maternal hunger and the perception of milk insufficiency (Table 3A). These sentiments were similarly echoed by mothers in FGDs:

1. 'If you don't eat there is nothing the child will find at the breast' (FGD with HIV-affected participants).
2. 'If you are told to EBF it means that the milk has everything, its balanced as a result of what the mothers eats, if a mother doesn't eat well, where will the balance come from?' (FGD with HIV-status unknown participants).

Also evident was a concomitant negative link between the perceived physiological demands of breastfeeding effort and the health of women (Table 3B). EBF in the absence of adequate food was believed to undermine women's health largely as weight loss, fainting or no energy, although more extreme health consequences were cited by some. Given that breastfeeding can increase appetite, EBF may produce sensations of hunger that reinforce per-

ceptions of its demand on the body. In the context of food insecurity, women may thus engage in a balancing act between their infant's health needs and their own, as illustrated by the following comment from an HIV-affected mother of a child ≤ 24 months: 'If the mom isn't eating well the child will be healthy at mom's expense'.

Lack of confidence in EBF advice

More than half of women indicated that they believed they would be unable to follow a health care worker's advice to EBF for 6 months. In multivariate models, women living in moderately/severely food insecure households had significantly greater odds of reporting that they would be unable to EBF for 6 months if recommended to do so (Table 2). Qualitative analysis revealed that a lack of food for themselves undermined women's confidence in their ability to produce sufficient milk to support EBF for 6 months (Table 3C). When mothers were probed to discuss why they felt unable to follow health care workers' advice, they commonly expressed their lack of confidence as a belief that inadequate food for themselves would cause them to have insufficient milk.

Infant hunger or thirst

In both interviews and FGDs, mothers spoke of child irritability or crying as a sign of unmet hunger. For example, some described the challenge of children who were 'born hungry', or the perception that breast milk alone would not satisfy an infant. Crying or 'bothersome' babies were perceived as hungry and needing more than breast milk; supplemental food was used to quiet and soothe babies, which served to reinforce the perception that crying was related to infant hunger (Table 3D). Women also alluded to the need to give water, either plain or with salt and/or sugar, to cleanse the infant's stomach, create appetite, sate thirst or relieve stomach pain and constipation:

1. 'I think even when a baby is weeks old it is fed some water since water is life' (interview with HIV-status unknown, pregnant woman).

2. 'Not just water you put a little salt for those who have stomach ache so that it (water + salt) soothes the stomach, it "washes" the stomach' (FGD with HIV-status unknown women).

Concerns about infant and maternal hunger or thirst were often expressed together and seemed to form a nexus of concerns. A partial translation of a transcript from one interview with an HIV-status unknown pregnant woman illustrates some of the ways this nexus of concerns around infant and maternal hunger becomes integrated in caregiver discourse (Box 1).

Box 1. Partial transcript of structured interview with a HIV-status unknown pregnant woman residing in Nakuru, Kenya

Interviewer (Int). Have you heard from others about exclusive breastfeeding for the first 6 months?

Respondent (Resp). Yes

Int. In your opinion do you think the mother's milk is enough for the baby for the first 6 months?

Resp. No

Int: Why?

Resp. Because there are some babies who are very hungry and can't withstand being breastfed for those 6 months. In our ethnic group, we breastfeed up to the 4th month then start feeding the baby other foods like porridge.

Int. During the 4 months do you breastfeed only without feeding him even water?

Resp. Yes but it's a must the baby be given water with some glucose.

Int. When do you start giving the baby water with glucose?

Resp. Immediately after giving birth, I feed the baby plain water then after 2 months start to put glucose in the water.

Int. Do you think, if a woman breast fed the baby exclusively for 6 months, she will have problems?

Resp. The mother will become thin if she doesn't eat well yet she is breastfeeding.

Int. Will there be problems to the baby if breastfed exclusively for 6 months?

Resp. The baby will be hungry and thin and will not grow fast.

Int. What do you think are the benefits of breastfeeding a baby exclusively for 6 months?

Resp. There are no benefits because the baby is not eating other foods.

Int. What are the disadvantages or inconveniences of breastfeeding for the first 6 months?

Resp. I don't know.

Int. If you go to a clinic and are advised to breastfeed the baby exclusively for 6 months without giving him other foods, will you follow such advice?

Resp. No I will not be able to because the baby will die of hunger and also not grow fast. It will be hard for me to follow such advice.

Maternal separation from infant

Maternal separation from the infant, usually due to work, was also cited by women in interviews ($n = 25$ of 148) and FGDs as a reason that EBF to 6 months is not a practical option:

1. 'In some cases some women go to work and it's not possible to be with the child and it can't wait till evening so one can give cows milk then breast-feed in the evening' (FGD with HIV-affected women).

Food insecurity and EBF: difficult choices for HIV-affected mothers

The conceptual links and perspectives raised in the preceding section were discussed by both HIV-affected and HIV-status unknown women to a similar extent. However, the experience of having to choose the most appropriate infant feeding option in the context of food insecurity was especially poignant for HIV-affected women. Many who self-disclosed as HIV-infected were counselled to choose either EBF or exclusive replacement feeding (ERF) for the first 4–6 months followed by rapid weaning to reduce the risk of transmitting HIV to their infants. Qualitative responses indicated that food insecurity strongly influenced how mothers in HIV-affected households perceived the feasibility of the infant feeding options

Table 4. Selected statements about food insecurity and infant feeding decision making among self-disclosed HIV-infected women with young children residing in Nakuru Kenya

1. 'It's said if you are sick (with HIV) you should breastfeed for 6 months without giving anything (but) it will depend on how the mother eats. If there is no food you can't breastfeed; it's better to replacement feed . . . the child might be thin because of insufficient milk, might be hungry and lack weight because that's just water, milk is just water if it pees, that's it, it won't have weight.'
2. 'I don't get food myself. What happens if I can't get food for my child on consecutive days; it will not survive. That's why I did not risk not breastfeeding.'
3. 'The way one eats will determine what the child gets and if it becomes impossible one can stop breastfeeding at three months and give cows milk or commercial formula if you can, but since commercial formula is expensive you can give breast milk for three months and cows milk for the next three.'

HIV, human immunodeficiency virus.

presented to them, but in different ways. For one woman with a young child, food insecurity and concerns for her own health contributed to the belief that ERF was more feasible (Table 4, Quote 1). Conversely for another, food insecurity made EBF a more feasible option (Table 4, Quote 2), while a third discussed a strategy of switching from EBF to ERF based on transient food access for the mother and the infant (Quote 3). The response of one HIV-affected woman highlights the distress that accompanies the decision-making process in the presence of a lack of feasible infant feeding options: 'at that point you feel like running mad, the child cries for food and you wonder what to do'.

Food insecurity, infant feeding counselling and confidence in breast milk adequacy

We observed a significant interaction between food security status and receipt of infant feeding counselling for belief in breast milk adequacy ($P = 0.06$). Among women who were not severely food insecure, receipt of counselling was associated with a trend towards higher odds of reporting that breast milk alone would be adequate for 6 months (OR, 3.92; 95% CI, 0.73, 21.4; $P = 0.11$); conversely, among women from severely food insecure households, we observed an inverse trend between receipt of counselling and belief in the adequacy of breast milk for 6 months (OR, 0.18; 95% CI, 0.02, 1.78; $P = 0.14$).

Discussion

We present both quantitative and qualitative data that together suggest how the lived experience of food insecurity among a sample of low-income, largely food insecure, urban Kenyan women undermines their capacity to implement recommended infant feeding practices, specifically EBF for 6 months. First, semi-quantitative indicators of household food insecurity are associated with weaker confidence in the feasibility, safety and benefits of EBF in the first half of infancy. Second, qualitative data indicate that the maternal experience of household, caregiver and individual hunger is translated into perceived milk insufficiency and anxiety about infant

hunger. Irrespective of maternal HIV status, access to food is seen as a key determinant of the healthiness and feasibility of EBF for 6 months, and maternal food insufficiency is seen as a key determinant of maternal illness, weight loss and milk insufficiency and of infant hunger. Our interpretation is that the lived experience of maternal and infant hunger among both HIV-affected and HIV-status unknown women is a powerful motivator for mixed feeding in this setting.

The findings of the current study are important for both theoretical and practical reasons. First, they demonstrate both a quantitative, epidemiological link between household food insecurity and negative attitudes towards EBF and a qualitative, perceptual link between maternal/caregiver experience of food insecurity and hunger and the individual motivations and rationale that underlie negative attitudes towards EBF. The hunger of women drives perceptions of their body's inability to produce sufficient milk, and the perceived hunger of children reinforces a rationale for mixed feeding. Second, the quantitative finding that food insecurity is particularly common among caregivers directly affected by HIV and AIDS, and the qualitative finding that the experience of food insecurity clearly undermines confidence in EBF and ERF among such caregivers, both concord with results from a growing number of studies of the maternal burden of PMTCT recommendations (de Paoli *et al.* 2004, 2008). Third, the finding that food insecurity modifies the positive impact of counselling and attitudes towards EBF has strong programmatic implications.

From indirect lines of evidence, we hypothesized that food insecurity may adversely influence breastfeeding through multiple mechanisms as outlined in Fig. 1. In this Kenyan sample, food insecurity appeared to function through psychological mechanisms related to maternal confidence in her ability to successfully produce sufficient milk for 6 months; confidence is a key component of breastfeeding self-efficacy. Breastfeeding self-efficacy has consistently been associated with adherence to optimal infant feeding practices in multiple populations and settings (Semenic *et al.* 2008; McCarter-Spaulding & Gore 2009). Indeed, self-efficacy may deteriorate under conditions of maternal depression and distress

(Dennis & McQueen 2007), and recent studies have shown that these psychosocial states are associated with food insecurity (Hadley & Patil 2006; Hadley *et al.* 2008). In a pioneering qualitative study in Ghana, Otoo *et al.* (2009) reported that maternal hunger and a lack of money to buy food similarly contributed to psychosocial factors that interfered with EBF, specifically anger, worry and stress. It is therefore plausible to interpret our results as consistent with a hypothesis that food insecurity may contribute to reduced EBF through reduced breastfeeding self-efficacy and increased maternal depression and anxiety.

Psychosocial factors may also contribute to the perception of insufficient milk. If this perceived insufficiency results in supplemental feeding it may in turn cause mothers to reduce feeding frequency and/or time at the breast. Continuation of this cycle may result in real milk insufficiency as reductions in feeding frequency or breast emptying reduce breast milk production as part of the natural physiological feedback loop. Some evidence suggests that psychosocial stressors can directly impair lactation performance (Dewey 2001). However, it is important to note that we did not formally assess depression, anxiety or self-efficacy using validated indicators nor did we have the capacity to examine potential effects of food insecurity on breast milk quantity or quality or measure interactions between these factors.

A common theme expressed overwhelmingly by women in this study was the belief that one needs to eat sufficient and adequate food to produce sufficient milk and avoid problems for herself and/or her child. Similarly, qualitative work among HIV-infected women in Swaziland, South Africa and Namibia also reported that women believe their own insufficient diet contributed to insufficient milk (Buskens *et al.* 2007). In a randomized controlled trial in Guatemala, food supplements significantly improved rates of EBF to 4 months among malnourished breastfeeding women (Gonzalez-Cossio *et al.* 1998). Thus, across a range of cultural and economic settings, a mother's ability to succeed at EBF may be influenced by her own perceptions of the adequacy of her diet. In Nakuru, comments around maternal problems associated with EBF (e.g. Table 3) when taken together

suggest that mixed feeding may be a strategy deployed by food insecure women as a way to cope with the perceived dangers of 'excessive' breastfeeding by the infant and the resulting potential health effects on the mother. It can be argued that these perceptions derive from the process of 'embodiment' of the maternal burden of caregiving in challenging conditions.

The observation that perceived milk insufficiency is a key motivator for mixed feeding is not new (Greiner *et al.* 1981; Sellen 2002; Gatti 2008). However, we suggest that a focus on debunking the physiological validity of such 'perceptions' can divert attention away from the equally important consideration of the often-powerful contextual factors that shape them. Mixed feeding due to perceived milk insufficiency remains one of the most common factors underlying the widespread mismatch between actual and recommended infant feeding practices (Sellen 2007; Gatti 2008). The mismatch between actual practices and infant and young child feeding (IYCF) recommendations is often framed as 'cultural' by public health researchers, but this conceptualization limits our ability to identify the underlying material and political economic basis for apparently 'cultural' factors. In our study, apparently 'cultural' negative attitudes and beliefs were common and included the need to give water to the infant to sate thirst, increase appetite and soothe stomach pains; a lack of knowledge of the benefits of EBF; the potential for problems with neighbours and family if the mother did not mixed feed; and the perceived need to feed breast milk alternatives when the mother was separated from the child for an extended period of time (i.e. for non-domestic work). Nevertheless, access to adequate food for mothers was the most commonly raised theme linked to mixed feeding and negative attitudes towards EBF in the first 6 months. Therefore, applied research to understand the ultimate determinants of this mismatch remains potentially helpful, especially with the recent global rise in global food prices and the ongoing challenge of counselling for safe infant feeding for PMTCT in communities with high rates of HIV/AIDS, food insecurity and mixed feeding.

The results have three important implications for policy and programming. First, efforts to strengthen

programmes to promote and support EBF in this and similar communities may be more effective when combined with interventions to reduce food insecurity of mothers and strengthen livelihoods of households.

Second, increased attention to the unintended negative consequences of counselling interactions is warranted in populations with high prevalence of food insecurity. In many settings, the importance of a balanced and adequate diet for the mother is emphasized in antenatal care and is promoted as especially important to maintain the health of HIV-affected individuals and their adherence to drug therapies. Women who hear such messages but who have little means to access them may believe EBF to be beyond their capacity. While no studies to date have reported on the influence of food insecurity on uptake of breastfeeding education and support programmes, a recent systematic review reported that food insecurity differentially influences the effectiveness of nutrition counselling on complementary feeding practices (Dewey & Adu-Afarwaha 2008). Additional qualitative work to evaluate this potential interaction is needed, and changes in the educational strategies and content of antenatal, PMTCT and post-natal well-child programmes may be indicated, including advocacy for continued psychosocial, breastfeeding and nutritional support into the post-partum period.

Third, HIV-affected/infected women may be particularly vulnerable to the impact of food insecurity on capacity for EBF. For HIV-infected women in most resource poor settings, EBF is the optimal method of infant feeding because ERF often does not meet criteria the World Health Organization criteria of affordability, feasibility, acceptability, safety and sustainability. However, as some HIV-affected women in this study suggested, the very food insecurity that may indicate EBF as the 'better' option leads them to perceive ERF as most feasible or the safest option for themselves or their child. Food insecurity was observed to be a significant factor in HIV-affected women's decisions whether to continue breastfeeding in Malawi (Levy *et al.* 2010). Research exploring the influences of food insecurity on maternal decision making regarding uptake of EBF or ERF is needed to inform PMTCT strategies.

Study limitations

Our analysis is not without limitations. First, the findings must be interpreted with caution because we were unable to control for the effect of HIV infection in multivariate models due to significant multicollinearity with food insecurity (97% of HIV-affected women were also moderately to severely food insecure). A notable lack of variance in food insecurity status precludes subgroup analyses for the HIV-affected group, but when we restricted our analyses of the associations between food insecurity status and attitudes and beliefs towards EBF to group B only (HIV status unknown), similar trends to those seen in the complete sample were observed – although estimates did not reach statistical significance due to smaller sample sizes (data available on request). Moreover, results from the qualitative data strongly suggest that food insecurity likely influences attitudes to EBF in a manner independent of HIV status. Nevertheless, we anticipate that a newly funded follow-on study will provide an opportunity to further explore this topic in a larger sample (>900 women).

Second, the findings cannot be used to infer causality or direction in the reported association between food insecurity and negative attitudes towards EBF due to their cross-sectional nature. Third, because food security status is a dynamic state, these cross-sectional data do not allow analysis of the temporal associations between household food security status and indicators of EBF because of the possibility that these indicators precede the period of recall for food security status. For example, a woman may currently mixed feed her 5-month-old infant and is currently mildly food insecure; analyses using these two measures may not adequately capture the influence of food insecurity on EBF if the mother introduced foods at 2 months of age during a period when she was moderately or severely food insecure. To capture the influence of food insecurity on actual practices related to EBF, prospective studies or controlled trials that modify the food security status of a household are needed. Fourth, these findings cannot be used to infer the specific attitudes and beliefs of HIV-infected and uninfected women, or whether these differ, because the HIV status of the individual women was

not obtained. Our sample included both HIV-affected and HIV-status unknown women in order to obtain a more representative picture of how food insecurity impacts breastfeeding; previous studies of EBF in sub-Saharan Africa have tended to include only one group or the other. Fifth, our analysis focused on the potential intervening indicators of current attitudes towards EBF rather than on hypothetically downstream outcomes such as actual feeding practices or infant growth and morbidity. Whether the observed associations translate into reduced rates of EBF needs further research and clarification.

Conclusions

In this population of urban Kenyan women, food insecurity was associated with poorer attitudes towards EBF, including reduced belief in one's ability to EBF and perceived insufficient milk. These results suggest an urgent need to investigate whether and to what extent food insecurity is undermining optimal breastfeeding patterns because currently, infant feeding counselling and breastfeeding promotion campaigns in this and other resource-poor settings do not usually consider food insecurity. The real impact of food insecurity on actual IYCF practices, especially EBF, warrants further investigation. Randomized intervention studies using validated tools or observational repeated measures cohort studies are needed to adequately test the hypothesis of a causal relationship between food insecurity and a suite of maternal psychosocial parameters that likely influence infant feeding attitudes and practices, including milk insufficiency, depression, anxiety and low self-efficacy. If such studies were to establish a causal relationship, we anticipate that the policy and programmatic implications would likely include a need to develop and deploy interventions that link breastfeeding behaviour change to food insecurity alleviation in order to achieve gains in rates of EBF.

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Conflicts of interest

The authors declare that they have no conflicts of interest.

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