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“It has changed my life”: unconditional cash transfers and personalized infant feeding support- a feasibility intervention trial among women living with HIV in western Kenya

Emily L. Tuthill^{1*}, Ann E. Maltby¹, Belinda C. Odhiambo², Thomas J. Hoffmann³, Maureen Nyaura², Rosemary Shikari⁴, Craig R. Cohen⁵ and Sheri D. Weiser⁶

Abstract

Background The syndemic effects of poverty, food insecurity and living with HIV are recognized as global health priorities, including through the United Nations Sustainability Goals 1, 2 and 3. Today, women and girls account for 63% of all new HIV infections in eastern and southern Africa, including Kenya. Pregnant and postpartum women living with HIV in this setting face unique challenges including increased financial insecurity as women leave the work force to care for their newborn infants. This contributes to poverty, food scarcity and stress.

Methods To address financial insecurity, improve infant feeding and reduce stress among mothers living with HIV in this setting, we developed a multilevel intervention, Supporting Healthy Mothers, consisting of 10 monthly unconditional cash transfers (10,000 KES, ~\$75 USD/month) and personalized infant feeding support from pregnancy to 7 months postpartum. We conducted a non-randomized feasibility trial of this intervention among women engaged in HIV care in Kisumu, Kenya. From February 23, 2022 to March 23, 2022, we enrolled a total of 40 women who were 20–35 weeks pregnant—20 women to the intervention group at a public clinic, and 20 women to the control group at a similar clinic. Our aim was to assess feasibility, acceptability, and the potential impact of the intervention on food security, infant feeding and maternal mental health.

Results Analyzing data from all 40 participants, we found a significant reduction in food insecurity scores from baseline for the intervention group when compared to the control group at 6 weeks and 6 months postpartum ($p = 0.0008$ and $p < 0.0001$, respectively). Qualitative exit interviews with intervention group participants confirmed women felt more financially secure and had newly acquired practical knowledge and skills related to infant feeding. Women found the two intervention components highly acceptable and described an overall positive impact on wellbeing.

Conclusions The Supporting Healthy Mothers intervention has potential to positively impact women across the perinatal period and beyond by increasing financial security and supporting women to overcome infant feeding challenges and should be assessed in larger trials.

Trial registration Supporting Healthy Mothers was registered with ClinicalTrials.gov Protocol Registration and Results System, initially published on February 1, 2022. ClinicalTrials.gov ID: NCT05219552 Protocol ID: K23MH116807.

*Correspondence:

Emily L. Tuthill

emily.g.tuthill@gmail.com

Full list of author information is available at the end of the article



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Keywords Exclusive breastfeeding, Financial insecurity, Food insecurity, Unconditional cash transfers, HIV, Kenya

Background

The United Nations Sustainable Development Goals 1, 2 and 3 prioritize ending poverty and hunger and promoting good health and wellbeing for all [1]. Despite great progress, achieving these goals remains an urgent matter for sub-Saharan Africa given a disproportionate number of people suffer from extreme poverty and severe food insecurity in this region, which simultaneously bears an unequal share of the global HIV disease burden [2, 3]. Women and girls now account for 63% of all new HIV infections in sub-Saharan Africa [4]. In addition, lower education levels and less access to paid work and property ownership make women more likely to experience poverty [2]. The combined challenges of poverty, food insecurity and living with HIV are especially difficult for pregnant and postpartum (perinatal) women, many of whom are newly infected during pregnancy or while breastfeeding [4].

During the perinatal period, women have increased dietary needs and are generally less able to perform paid work as they face physical limitations and must dedicate time to caring for their infant [5, 6]. Perinatal women living with HIV (WLWH) also worry about the possibility of transmitting HIV to their baby which can occur during pregnancy, childbirth or during breastfeeding [7]. Optimal nutrition, including breastfeeding, is of critical importance to the health of HIV exposed infants, and as such, it is a chief concern for mothers in this setting [8, 9]. Current evidence-based guidelines universally recommend exclusive breastfeeding for the first 6 months of life followed by continued breastfeeding along with safe and adequate complementary feeding until 24 months or beyond [7, 10]. Yet, in sub-Saharan Africa, including Kenya, adherence to these guidelines is threatened by many factors such as contradictory cultural norms, worries about transmitting HIV through breastmilk and limited access to food and water [11–16].

In Kisumu County, Kenya, the prevalence of HIV among women (15–49 years old) is approximately 17.4% (compared to 5.2% among women nationally), and the rate of mother to child transmission of HIV is 8.7% with 87% of perinatal WLWH engaged in care at prevention of mother to child transmission of HIV (PMTCT) clinics [17]. Longitudinal exploratory research, among WLWH engaged in HIV care in Kisumu, has revealed that financial and food insecurity negatively impact women's mental health and wellbeing and act as central barriers to optimal infant feeding for HIV exposed infants across time [18].

To address financial and food insecurity and sub-optimal infant feeding for HIV exposed infants while supporting the health and well-being of WLWH, we applied Transitions Theory [19] to develop a multilevel intervention incorporating unconditional cash transfers and personalized infant feeding support—Supporting Healthy Mothers. We conducted a feasibility trial of Supporting Healthy Mothers to assess the feasibility of implementing the intervention, the acceptability of the intervention's components and trends in our primary outcomes, including food insecurity, mental health and breastfeeding behaviors.

Methods

Design and setting

We applied mixed-methods in this non-randomized feasibility trial, which took place at two PMTCT clinics within public hospitals in Kisumu. The clinics were similar in terms of size, services offered and socioeconomic status of the population served. Twenty participants from one clinic were enrolled into the intervention group and 20 to the control group at a second clinic ($N=40$). Separate clinics were used for each group to ensure there was no social interaction between control and intervention group participants.

Sample size

Sample size was determined based on standardized feasibility procedures [20, 21].

Participants

Recruitment was carried out between February 23, 2022 and March 23, 2022. Women greater than 18-years-old, 20–35 weeks pregnant (based on last menstrual period), living with HIV and currently prescribed antiretroviral therapy (ART) were included. Women were excluded if they were having a high-risk pregnancy for reasons other than HIV status (e.g., pregnancy complications, preeclampsia, gestational diabetes, preterm labor), already participating in another ART adherence-related study, unable to understand the consent process, or planning to relocate out of the greater Kisumu area within 12 months.

Clinic staff conducted an initial screening of all pregnant WLWH being seen at the clinic. Interested women were then referred to our on-site research coordinators who met individually in a private room with women to verify their eligibility and interest to participate in the trial; women who remained willing and able to participate provided written informed consent.

Supporting Healthy Mothers intervention

The Supporting Healthy Mothers intervention consisted of two components: 1) unconditional cash transfers, and 2) personalized infant feeding support. To develop the intervention we utilized previous research and applied Transitions Theory as a theoretical framework [19, 22]. The unconditional cash transfer was delivered to women via M-PESA, a mobile phone-based money transfer system that links money to a telephone number. Each intervention group participant received 10 monthly payments of 10,000 Kenyan Shillings (KES; approx. \$75USD) beginning 1 month after enrollment until around 7 months postpartum. The number of monthly payments and targeted period of time were based on previous research which identified late pregnancy and early postpartum as the time of greatest financial insecurity for perinatal WLWH [23]. The amount to be given, frequency, and the form of payment were based the estimated range of income from informal employment in Kisumu, previously collected data about women's estimated expenses, and previous studies involving cash transfers in this setting [24–26].

The second intervention component consisted of five personalized, in-person, infant feeding support sessions. The sessions were delivered by a locally trained, experienced doula and lactation specialist who assessed women's practices, addressed challenges, and provided teaching about optimal infant feeding and care. The first infant feeding support session was delivered during pregnancy shortly after enrollment, and follow-up sessions occurred at 2, 4, 6 and 12 weeks postpartum. Detailed information about the lactation sessions is outlined in a separate publication [27].

Intervention group participants completed surveys using REDCap at enrollment, 2 weeks, 4 weeks, 6 weeks, 12 weeks, and 6 months postpartum. In addition, at each postpartum encounter, infant weights were measured [28–31]. To better understand women's experiences, and gain feedback on the acceptability and perceived impact of the intervention, we conducted qualitative, semi-structured exit interviews at 7 months postpartum. This timing was chosen in order to capture women's experiences with complementary feeding—a component of the infant feeding support sessions which most women initiated after 6 months of breastfeeding exclusively.

At each of the eight research encounters, participants received refreshments and were reimbursed 800KES (\$5.80 USD) for their transportation expenses (in addition to the cash transfer).

Control group

Women who participated in the control group received standard perinatal and PMTCT care. Upon enrollment and at 2 weeks, 4 weeks, 6 weeks, 12 weeks and 6 months postpartum, women completed electronic surveys, and at each postpartum encounter, infant weights were measured [28–31]. Women in the control group were provided refreshments and transportation reimbursement (800KES/\$5.80 USD) at the six research encounters.

Outcomes

Food insecurity

The Household Food Insecurity Access Scale (HFIAS), which has been successfully applied in similar Eastern African settings [32, 33], was used to measure food insecurity [34]. We looked at HFIAS scores as both a continuous variable (range 0 to 27 with higher scores indicating greater food insecurity) and when scores were categorized as food secure, mildly food insecure, moderately food insecure, or severely food insecure.

Mental health

We used the Patient Health Questionnaire-9 (PHQ-9) to assess for symptoms of depression, including anhedonia, depressed mood, insomnia, fatigue, appetite disturbance, guilt, diminished ability to think, psychomotor disruption, and suicidal ideation. The PHQ-9 uses a 4-point Likert Scale with scores ranging from 0 to 27 with higher scores corresponding to more depressive symptoms [35]. Women's perceived stress was measured using the Perceived Stress scale-10 (PSS-10) consisting of 10 items which are responded to using a 5-point Likert scale. Score can range from 0 to 40 with higher scores indicating greater perceived stress [36, 37].

Breastfeeding behaviors

Women self-reported their breastfeeding behaviors via electronic surveys. We posed a variety of direct questions at various timepoints and allowed for explanations to be recorded along with the multiple choice/ select all that apply survey responses.

Statistical analysis

Descriptive statistics

Frequencies, or means and standard deviations (or medians and interquartile ranges (IQR), if skewed) were calculated to describe food insecurity, depressive symptoms and perceived stress at three timepoints.

Association of group status with outcomes

To test for an association of these scores with the intervention versus control condition we utilized linear

mixed models (LMM) with the package lme4 v1.1.27.1 [38] in R v4.1.0 [39] utilizing a non-parametric bootstrap (10,000 iterations; percentile confidence intervals) with the package boot v1.3.28 [40, 41] to handle slight deviations from normality. Covariates included whether intervention (vs. control), the time-point measured, and the interaction term between them (main coefficient of interest, measures if intervention differs from controls, from baseline).

Exit interview analysis

We analyzed 20 exit interviews, using the framework approach beginning with open coding where we applied short descriptive phrases or labels to women's experiences or feedback about the intervention [42]. From the open coding, we then created an analytical framework—a set of codes (based on the labels applied during open coding) organized into categories. We then developed descriptive written summaries of the coded excerpts including outliers (comments or experiences pertaining to one/few participants). Finally, we categorized these summaries according to the following questions: 1) How was the unconditional cash transfer used? 2) What happened when financial insecurity was reduced for women? 3) What practical skills and knowledge were gained from the infant feeding support sessions that women could apply? 4) What was the perceived impact of the infant

feeding support sessions? 5) Was the intervention acceptable to women (Fig. 1)?

Results

Participant characteristics

The mean age of participants was approximately 28 years at enrollment. Most had completed primary level education (60%), and 55% lived in informal housing (i.e., not regulated by the state in terms of building codes or safety regulations and/or no legally identified owner or address). The majority of our participants were married and living with their partners with 25 and 35% of participants' partners having additional wives/partners in the intervention and control groups respectively (see Table 1).

Associations between the intervention and food security and depressive symptoms

Food insecurity decreased during the study period with median scores of 11.5 and 2.0 for the intervention group compared to 12.0 and 9.0 for the control group at baseline and 6 months postpartum, respectively (see Table 2). There was a significantly greater reduction in food insecurity scores from baseline observed in the intervention group when compared to the control group at 6 weeks and 6 months postpartum ($p=0.0008$ and $p<0.0001$, respectively, Table 2). More than half of participants in

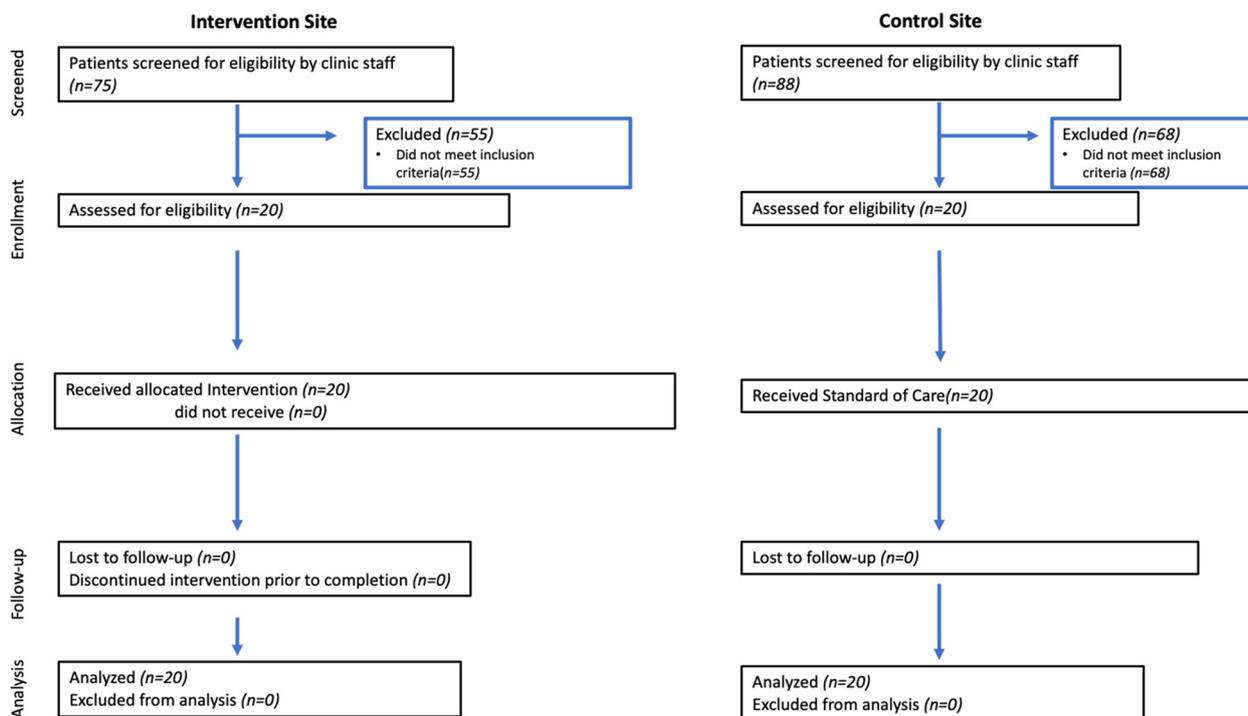


Fig. 1 Consort pilot and feasibility flow diagram modified for Supporting Healthy Mothers

Table 1 Baseline characteristics

	Intervention Group (n = 20)	Control Group (n = 20)
Mean age (years)	27.95	28.50
Level of education		
None	1 (5%)	0
Some primary	7 (35%)	7 (35%)
Primary graduate	2 (10%)	4 (20%)
Some secondary	2 (10%)	5 (25%)
Secondary graduate	5 (25%)	3 (15%)
Some college	3 (15%)	1 (5%)
Type of Housing		
Informal housing	11 (55%)	11 (55%)
Town apartment	3 (15%)	4 (20%)
Rural home	2 (10%)	3 (15%)
Town house	0	2 (10%)
Other (rural rented house)	4 (20%)	0
Relationship with the father of the baby		
Married	12 (60%)	15 (75%)
Living together as married	4 (20%)	2 (10%)
Boyfriend who lives separately	2 (10%)	2 (10%)
Divorced		1 (5%)
No relationship, single	2 (10%)	
Currently living with father of baby?		
Yes	15 (75%)	16 (80%)
No	5 (25%)	4 (20%)
Baby's father has other wives or lives with other women as if married?		
Yes	5 (25%)	7 (35%)
No	15 (75%)	10 (50%)
Unsure	0	3 (15%)
Primary Occupation		
Trading	5 (25%)	14 (70%)
Day labor	2 (10%)	4 (20%)
None	13 (65%)	2 (10%)
Average household income (KES)	10,800	13,935
Average needed per month to meet basic needs (KES)	15,035 (group mean)	17,350 KES (group mean)
Average travel time from home to the clinic	39 minutes	39.75 minutes
Was this a planned or unplanned pregnancy?		
Planned	4 (20%)	12 (60%)
Unplanned	16 (80%)	8 (40%)
First pregnancy?		
Yes	4 (20%)	3 (15%)
No	16 (80%)	17 (85%)
Number of years in HIV Care		
≤ 2 years	5 (25%)	7 (35%)
> 2 years	15 (75%)	13 (65%)

Table 2 Measured scores and linear mixed model

Measured total scores	HFIAS	PHQ-9	PSS-10
Value	Median (IQR) [n]	Median (IQR) [n]	Mean (SD) [n]
Intervention Group			
Baseline	11.5 (9.0, 16.2) [20]	8.5 (6.0, 9.2) [20]	17.9 (6.4) [20]
6 weeks postpartum	1.0 (0.0, 7.0) [20]	3.0 (2.0, 6.2) [20]	12.2 (6.0) [20]
6 months postpartum	2.0 (0.0, 3.5) [20]	3.0 (1.0, 5.2) [20]	12.6 (6.3) [20]
Control Group			
Baseline	12.0 (7.0, 15.0) [20]	6.5 (5.0, 9.8) [20]	15.8 (8.4) [20]
6 weeks postpartum	9.5 (5.8, 12.5) [20]	3.0 (0.8, 5.0) [20]	12.2 (7.1) [20]
6 months postpartum	9.0 (6.0, 11.5) [20]	5.0 (1.0, 8.0) [20]	15.1 (6.7) [20]
Linear mixed model			
Baseline, all participants	10.74 (8.51, 12.86) [<0.0001]	7.99 (6.21, 10.06) [<0.0001]	15.85 (12.40, 19.70) [<0.0001]
Intervention vs. Control	1.36 (-1.94, 4.61) [0.42]	0.06 (-2.45, 2.41) [0.94]	2.05 (-2.56, 6.54) [0.37]
All participants at 6 weeks postpartum (vs. baseline)	-1.93 (-4.43, 0.39) [0.11]	-4.41 (-6.48, -2.56) [<0.0001]	-3.54 (-8.41, 1.38) [0.15]
All participants at 6 months postpartum (vs. baseline)	-1.50 (-4.21, 1.20) [0.27]	-3.05 (-5.75, -0.39) [0.029]	-0.70 (-5.36, 3.63) [0.77]
Change from baseline (Intervention vs. Control) at 6 weeks postpartum	-6.62 (-10.14, -3.17) [0.0008]	0.21 (-2.11, 2.68) [0.88]	-2.21 (-8.24, 3.75) [0.46]
Change from baseline (Intervention vs. Control) at 6 months postpartum	-8.05 (-11.51, -4.58) [<0.0001]	-1.40 (-4.51, 1.84) [0.38]	-4.55 (-10.00, 1.28) [0.12]

each group were severely food insecure at baseline, but by 6 months postpartum, three (15%) women in the intervention group compared to 10 (50%) women in the control group were severely food insecure (see Table 2, see also Fig. 2 for categorized HFIAS scores across time).

Median PHQ-9 scores for the intervention group decreased from 8.5 at baseline to 3.0 at 6 months postpartum, and in the control group median scores decreased from 6.5 to 5.0 between baseline and 6 months postpartum.

The overall decrease in PHQ-9 scores for both groups was significant at 6 weeks and 6 months postpartum ($p < 0.0001$ and $p = 0.029$, respectively) but there was no significant difference in decrease between groups (see Table 2, see also Fig. 3 for categorized PHQ-9 scores across time).

Mean PSS scores decreased (indicating decreased stress) across the intervention period. For the intervention group, scores decrease from 17.9 at baseline to 12.6 at 6 months postpartum and for the control group scores

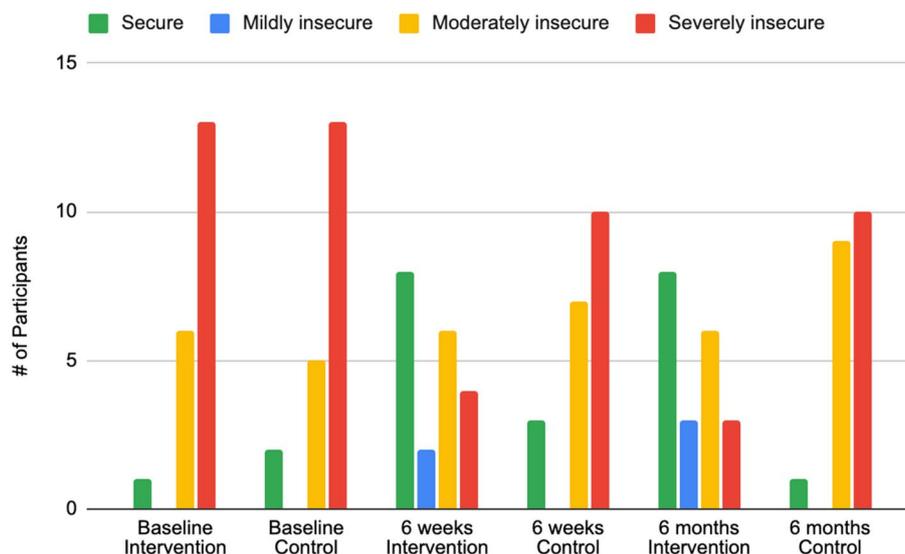


Fig. 2 HFIAS scores by categories of food security

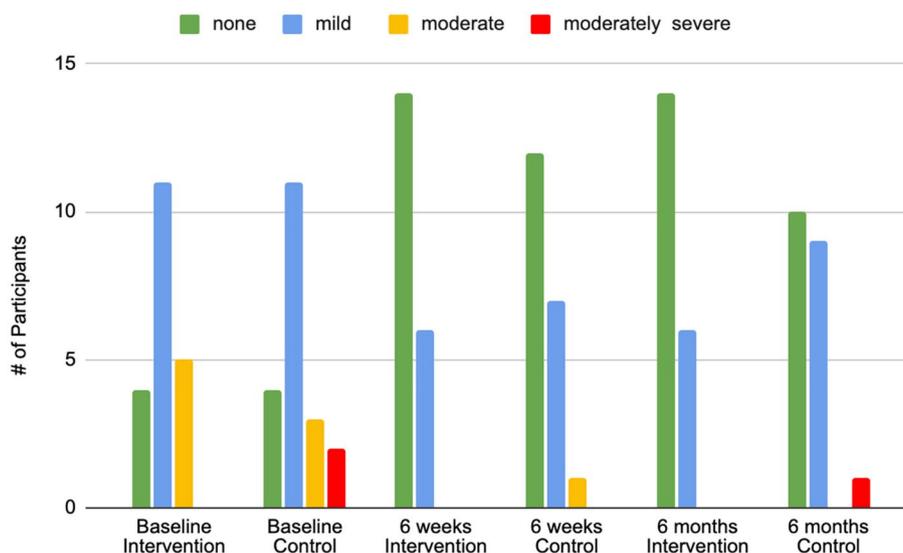


Fig. 3 PHQ-9 scores by categories of depressive symptom severity

decreased from 15.8 to 15.1 between baseline and 6 months (there was no statistically significant decrease or difference between groups, see Table 2).

Breastfeeding behaviors

Most women in both groups planned to exclusively breast-feed at baseline, but around a quarter of women overall either did not believe they would produce enough breast-milk or were unsure. Follow-up surveys revealed that all women in the intervention group consistently reported feeding their babies “breastmilk only” while three (15%) women in the control group reported already giving their baby water at 2 weeks postpartum. In terms of perceived milk insufficiency, most women in both groups reported they were producing enough milk to satisfy their baby from 2 to 12 weeks postpartum. However, when asked if anything could help them to produce more breastmilk, most women in the control group answered, “yes, more food”, whereas nearly all women in the intervention group answered “no” (i.e., they were not lacking anything needed to support breastmilk production). At around 6 months postpartum, most women in the intervention group reported introducing complementary foods or had plans to begin doing so at 6 months postpartum or shortly thereafter. Meanwhile, less than half of the women in the control group reported introducing complementary feeding at 6 months postpartum with at least three women introducing earlier than recommended and nine women planning to wait until their baby was 7-months-old (see Table 3).

Exit interview findings

1. How was the unconditional cash transfer used?

Above all and without exception, women used the money to purchase food and water. In addition to these basic needs, most women also reported buying clothes, baby items, or other household items such as mattresses for sleeping or pots for cooking. Using the money for rent, school fees, medical bills, or for transportation to the clinic was also mentioned by most. More than a quarter of women used part of the funds to revive or start-up small businesses, and around the same number of women allocated money to support the needs of their close family members or church. Women also paid off debts and/or saved some of the money.

2. What happened when financial insecurity was reduced for women?

“It has changed my life” is how most participants described their experience with Supporting Healthy Mothers. Women explained, the money transfers had spared them from desperate circumstances such as needing to beg for money or food. Financial insecurity had been a primary stressor for women—straining relationships and leaving at least two women feeling so hopeless they had thoughts of ending their life.

Table 3 Baseline and follow-up questions about breastfeeding behaviors

Baseline: (prior to first infant feeding support session)															
	EBF			mixed feeding											
	unsure			unsure											
How do you plan to feed your baby just after you give birth?	INT (n=20)			CON (n=20)											
	18	2	0	17	2	1									
Do you think you will produce enough milk to satisfy your baby?	INT (n=20)			CON (n=20)											
	15	2	3	14	2	4									
Follow up:															
What are you currently feeding your baby?	2 weeks pp			4 weeks pp			6 weeks pp			12 weeks pp					
	breastmilk only	breastmilk and water	breastmilk only	breastmilk and water	breastmilk only	breastmilk and water	breastmilk only	breastmilk and water	breastmilk only	breastmilk and water	breastmilk only	breastmilk and water	breastmilk and water and other liquids or foods		
	INT (n=19)			INT (n=19)			INT (n=20)			INT (n=20)					
	19	0	19	0	20	0	20	0	20	0	0	0			
CON (n=19)			CON (n=19)			CON (n=20)			CON (n=20)						
16	3	19	0	19	1	17	1	1	2						
Are you producing enough milk to satisfy your baby?	2 weeks pp			4 weeks pp			6 weeks pp			12 weeks pp					
	Yes	No	unsure	Yes	No	unsure	Yes	No	unsure	Yes	No	unsure			
	INT (n=19)			INT (n=19)			INT (n=20)			INT (n=20)					
	16	2	1	19	0	0	20	0	0	19	0	1			
CON (n=19)			CON (n=19)			CON (n=20)			CON (n=20)						
17	2	0	17	2	0	18	1	1	19	1	0				
Is there anything that would help you to make more breastmilk? (Select all that apply)	2 weeks pp			4 weeks pp			12 weeks pp								
	no	Yes, more water	yes, more food	yes, less stress	unsure	no	yes, more water	yes, more food	yes, less stress	no	yes, more rest	yes, more food	yes, more water	yes, less stress	unsure
	INT (n=19)			INT (n=19)			INT (n=20)			INT (n=20)					
	15	3	0	0	1	18	0	1	1	18	0	0	0	0	2
CON (n=19)			CON (n=19)			CON (n=20)			CON (n=20)						
2	10	14	1	0	2	10	13	1	2	2	15	5	4	0	
When did you introduce water, fluids or foods?	6 months postpartum														
	5 months	6 months + (1-7 days)			still practicing EBF										
	INT (n=20)			CON (n=20)											
0	12	8	3	3	14										
[For women still practicing EBF] At what age will you start giving your baby foods/porridge to eat?	6 months postpartum														
	6 months	after 6 months			7 months										
	INT (n=8)			CON (n=14)											
4	3	1	5	0	9										

PID 18- It would have been bad [without the money]. I do not think this marriage would have survived...Because (sighs) you cannot be staying together, and the children are not going to school

and you are just there and you know you also need food. The children also need food, they need clothes to put on, it would have been very tough, it would have been a tough life...(Sighs).

According to participants, the funds provided instant relief from overwhelming worries, through increased food security, improved relationships and better options for caring for their infants and other children. Women explained that this relief brought them joy, happiness and hopefulness.

PID 20: It relieved me from the stress I had in my heart. I can see the progress I have made, and it has helped me in so many ways.

Several women, also mentioned using the funds to support their engagement in HIV care.

PID 20: Yes. I am currently experiencing a lot of changes even when my VL [viral load] test is done, the levels are going down, my weight is good.

The unconditional cash transfers also decreased women's dependence on others and increased their ability to provide for their family, which together with the relief from stress led women to feel empowered, strong, motivated and courageous.

PID 04- I just felt totally empowered. It has motivated me with my baby because you know when you lack, and you have a baby, sometimes you can be angry, you can react...overreact, but as of now, I was living a comfortable life.

Naturally, women sought ways to sustain this financial security/ independence. Nearly all women were planning to engage in income generating activities or were already working by the time of the exit interview including eight of nine women who, at baseline, reported having no occupation or independent source of income even prior to pregnancy.

PID 06- I used to work in a kiosk, I have a kiosk. I used to buy soap, detergent, sugar. It collapsed, and when I began receiving this money, I began saving bit by bit, I was not using it all. I would save little by little... I began stocking...Currently I have everything, I am selling charcoal, kerosene and the likes. I have developed with the help of this money, it has helped me by the way, yes.

Most relationships between women and their partners improved during the study period. Over half of the women told their partners about the money either because they felt disclosure was unavoidable or because they wanted to tell. In contrast, many did not disclose or withheld details such as the amount being received or the number of payments because they feared their partners would stop providing or try to take control of the money. Among women who reported a lack of support or problems with partners during the intervention, all reported

the problems were preexisting and/or unrelated to the money and no women reported being worse off in their relationship. Regardless of whether or not women told their partners about the money, relationships improved for most in various ways. Some women reported feeling closer to their partners as they collaborated to decide about how to spend the money.

PID 15- Yes, very much. We became close, we could tell stories, we could do stuff together and he could even laugh whenever we were talking.

For others, having the money made them feel more respected or valued by their partners.

PID 18- He does not speak rudely to me because he knows I am everything. If a child was in need of anything, he can send the child to ask me for it because he knows I have it.

Women also reported improved infant feeding experiences related to the unconditional cash transfers. For example, several women noted that improved food security facilitated adequate breastmilk production.

PID 11- The intervention? Giving us that money helped us. I would go and buy food with that money because I know the baby had to breastfeed. So, I had to eat the food so that I can have plenty of milk for the baby to breastfeed and get satisfied.

Other women noted the money allowed them (stress free) time to stay home from work, breastfeed and care for their baby or that it allowed them to purchase adequate complementary foods.

PID 02- Since you started funding me, I have not been outside my door, I have not been leaving. So, people are like, (mentions her own name) stays at home, how has she been paying her rent? How does she feed when she is just home? You see, the stress of rent and how I feed is gone.

When asked how they felt about the money transfers ending, most women described feeling positive, prepared or grateful. That said, some believed a bit more time supported by the money would put them in a better position to sustain themselves as their baby would be older and/or their business more established and income more stable. Others wished the money transfers would be extended to sustain optimal infant care—continued breastfeeding, optimal complementary feeding and more time with their baby before starting back to work.

PID 13- [explaining why the money should continue for another year] R: Okay, sometimes someone has not organized himself/herself, how I was

eating the balanced diet will reduce and the way to feed the baby good food as recommended can also reduce. Sometimes it will reduce, and she will be unable to access the food well, and she will not be able to get sufficient milk, so I do not know.

3. What practical skills and knowledge were gained from the infant feeding support sessions that women could apply?

The majority of women were able to accurately recall what they learned about breastfeeding technique, including many technical skills such as how to position their baby, how to achieve an effective latch, how and why to burp their baby, how to understand whether or not their baby was getting enough milk and the importance of feeding on demand and giving their attention to their baby while breastfeeding. Most women also recalled key knowledge including the primary factors that impact milk production and the concepts of foremilk and hindmilk. Understanding foremilk and hindmilk provided women with a rationale for breastfeeding duration and frequency and for alternating between breasts. In addition, women explained that watery foremilk was evidence that their babies did not need water in addition to breastmilk (a commonly held belief among women locally) [43, 44].

PID 09- the more the baby breastfeeds, the more milk is produced.... It signals the brain to produce milk when there is none, and the more you breast-feed, the more milk is produced. I felt that was true, because when I was breastfeeding her, despite how hungry I felt, more milk would still be produced whenever I breastfeed her.

Women also credited the lactation specialist with teaching them about the many benefits of breastfeeding and specifically exclusively breastfeeding for the first 6 months.

PID 07 - I had thought that I would wean her at 2 months because considering that I was going to leave her with someone else while I go to work. When I received the information, I continued breastfeeding her and I did not wean her until 6 months.

Finally, nearly all women gained important (and new) information about complementary feeding including the types of food to give, how to prepare baby's food and the consistency and quantity of food their baby needs at each stage.

PID 10 - Actually before the lessons, before lessons, I didn't know how to feed the baby. After giving me that balanced diet, that chart, yes, I know what to give and what not to give.

4. What was the perceived impact of the infant feeding support sessions?

Women reported that the information and support given in the sessions about breastfeeding and their baby's progress as well as the opportunity to talk about their concerns reduced their worries and made them feel more happy, confident, informed and capable.

PID 11- You see, I normally have stress and I do not talk about it but whenever I come here, I tell you about my issues, I pour them out to you, I leave you with that burden...when I leave here, I am okay, I do not even remember those things (Laughter). But when I keep them to myself, they eat me up, it becomes a problem, and even eating is a problem because the stress affects me everywhere.

A major concern the lactation specialist addressed for women was worry about mother to child transmission of HIV.

PID 13- All along I was worried that I would infect the baby with HIV, so the information gave me courage and made me know that...it removed my worries that I previously had. It removed the worries that I had and made me courageous, and I just breastfed my baby until he was 6-months-old.

The information, support, reassurance and encouragement women received was also critical to helping women resist social/cultural pressures that impede optimal infant feeding and health, including "plastic teeth" removal (a practice that involves a traditional provider cutting an infant's gums or actually extracting the infant's primary tooth buds while claiming to have removed "plastic teeth" that are allegedly plaguing the infant) [45, 46].

PID 12- No, since you had told me about it [referring to plastic teeth removal], I am now an expert on them, I am an expert, I can tell someone else not to take the baby to the metal place [to the traditional healer who "removes plastic teeth"].

Seeing their infants' weight at the beginning of each session was additional reassurance for women that their baby was getting enough breastmilk and many women noted that this increased their confidence and contentment with their baby's progress.

PID 04- According to me, it was about weight gain, it made me so happy. I was happy with it because every month I went, I could see him grow, change, and gain weight and I became confident, and I was also happy.

For some participants, knowledge gained through the sessions led to improved complementary feeding practices, such as not forcefully feeding the baby.

PID 18- The information I got from the lactation specialist helped me big time, because with the other children, the older ones, I would begin forcefully feeding them porridge once they were 6-months-old. The lactation specialist informed us that we should not forcefully feed the baby, so I do not forcefully feed my last baby, I did not force him.

Notably, several women were experiencing challenges with complementary feeding (baby not taking food or spitting up porridge) at the time of the exit interview and wished for continued support.

5. Was the intervention acceptable to women?

All women reported that the intervention was good just the way it was delivered, reporting that it helped, it changed their life, that there was nothing negative and/or that they felt supported. All women thought the intervention should continue helping women and/ or be expanded to reach other women (who are suffering).

With regards to the infant feeding support sessions: Most women were happy with the length and timing of the sessions, though a few would have liked to meet with the lactation specialist immediately after birth and some women wished for the sessions to continue until they were done breastfeeding or until they had overcome the challenges of complementary feeding. Women liked that the sessions were private/ personalized, that the lactation specialist and research coordinator held their baby, that refreshments were given, that they were free to call with concerns and that much more than the standard information and support were provided (i.e., much more in comparison to the PMTCT clinic).

With regards to the money transfers: More than half said, the money was a major help but that they needed more to meet all the basic needs of their house, with most saying 15–20,000KES (\$110–145USD) would have been enough. Just less than half said the money was sufficient or more than sufficient for all basic needs. Most were happy with payments being delivered monthly and some specifically noted they appreciated that the money was given: without conditions, on time, at the beginning

of the month and/or via M-PESA. M-PESA proved particularly effective and secure. Even in the two cases when women lost access to their phones, they were able to recover their funds, since the money is delivered to a specific registered phone number, and not connected to a physical phone or sim card. In terms of being socially acceptable, most women did not tell anyone except for their partner about the money, and no one disclosed to more than one or two close friends/ relatives. Women did not discuss the money with others for a variety of reasons. Some felt being associated with such an intervention would reveal their HIV status, others thought people might think the money came from “evil” and some preferred not to tell simply because they believed others would ask them to share the money. Several family members who heard about the unconditional cash transfers were indeed suspicious about the source of the funds but eventually accepted or came to understand that the money came from a benign source. Overall, disclosing or not disclosing information about the money received was not problematic for women. In fact, we screened women at every visit, asking “Was there any negative thing you experienced as a result of receiving this money?” and all women at every visit responded, “no”.

Discussion

Our objective was to assess the feasibility, acceptability and potential impact of a multilevel intervention aimed at addressing financial insecurity and suboptimal infant feeding through an unconditional cash transfer and personalized, professional infant feeding support. Women found the two intervention components highly acceptable and described an overall positive impact on well-being. The intervention was feasible to implement with 100 % retention and did not require any adjustments or changes to the protocol. Our findings show a statistically significant reduction in food insecurity scores for the intervention group as compared to baseline and the control group. During exit interviews, women confirmed they felt more financially secure and confident to exclusively breastfeed because of their newly acquired practical knowledge and skills related to infant feeding. To our knowledge, this is the first multi-level intervention to address financial insecurity and suboptimal infant feeding.

Dramatic improvements in HFIAS (food insecurity) scores were directly aligned with exit interview findings that described profound relief from food and financial stress. Prior interventions using cash transfers among perinatal WLWH have been conditional, using smaller payments and mainly centered on impacting engagement

in perinatal and HIV related care. In these cases, cash transfers have positively impacted appointment attendance among perinatal women in sub-Saharan Africa [47, 48]. This intervention differs from previous cash transfer interventions in that we provided a larger and unconditional cash transfer meant to cover basic needs (10,000 KES/ \$75USD per month compared to 550–685 KES/\$4–6 USD per visit). We found that addressing this major upstream barrier (financial insecurity) without conditions positively impacted food security and maternal and infant wellbeing downstream.

Women also reported positive changes within their relationships. This was in stark contrast to previous research in this setting that indicated that many relationships were strained or broken down during the perinatal period when women leaned heavily on their support systems to make ends meet [18].

The wealth of knowledge and skills women gained throughout the five infant feeding support sessions is of particular significance given even one gap in knowledge or technique can derail a woman's breastfeeding experience. Many barriers have been identified that prevent women from maintaining breastfeeding practice in this setting such as perceived milk insufficiency [44, 49], positioning and latch [50], cultural norms or social pressures [44, 51, 52] and returning to the workforce [23, 52, 53]. In their scoping review of 59 publications investigating women's perceptions and experiences breastfeeding, Beggs et al., 2021 found women were motivated and assumed it would be easy to breastfeed and yet most experienced challenges they were unprepared to overcome [54]. In Kenya, Andare et al. [53], found similar results among WLWH showing strong knowledge and acceptance to exclusively breastfeed, but still incomplete success in practice. Setting up women for success by acknowledging breastfeeding challenges while having supportive programs in place to overcome them is clearly warranted. In this way, women in the intervention group gained skills to overcome challenges, felt more confident and able to resist social pressures to introduce foods and fluids before 6 months, and expressed satisfaction with their breastfeeding experience.

Women credited both the unconditional cash transfer and the infant feeding support sessions with making them happy and hopeful, with the majority noting marked relief from stress and worry about both finances and their infant's nutrition and health. These exit interview findings and the positive trend we observed in PHQ-9 and PSS-10 scores are consistent with findings from several previous studies in this setting which found improvements in psychological wellbeing among cash transfer recipients [25, 55, 56]. Our findings also align with several studies that point to a positive correlation between mental health and breastfeeding [57–59].

Public health implications

In effect, Supporting Healthy Mothers provided women with financial security similar to paid maternity leave. In low- and middle-income countries, longer durations of paid maternity leave have been associated with lower infant mortality [60], and in Kenya, 3 months of paid maternity leave is mandated by law [61]. Unfortunately, women working in the informal sector (this applies to many women and the vast majority of the participants in our study) are not eligible for this benefit. Supporting Healthy Mothers shows the potential benefits of financial support across the perinatal period, calling for further research to evaluate the costs associated with providing a financial safety net compared to the short- and long-term benefits to health and wellbeing.

Our findings also point to the need for improved infant feeding counseling and support. Currently, in this setting, inadequate and inaccurate counseling is a documented barrier to optimal infant feeding [52], and standard care generally offers no assessment of practices or practical solutions for overcoming challenges/barriers [62, 63]. Meanwhile, lactation specialists (also referred to as lactation consultants) are underutilized despite providing low-cost, low-risk, non-invasive, evidence-based, high-impact interventions [64–67]. A lactation specialist's support with position and latch during the early postpartum period may facilitate the development of an effective breastfeeding practice during a time that is critical to the establishment of the maternal milk supply [68]. Trusted relationships between mothers and lactation specialists, such as were developed during Supporting Healthy Mothers, may also help mothers to prioritize sound, evidence-base advice over deeply ingrained, long standing cultural practices which are often less safe (e.g., "plastic teeth" removal or force feeding) [63]. Recent efforts to improve infant feeding support, such as the Baby Friendly Community Initiative launched by the Kenyan Ministry of Health in 2016, have also shown great potential [69, 70]. However, there is little evidence of the program's sustainment in this setting since funding for the program's development and roll-out ended (December 2017) [50]. In sum, the potential impact of high-quality infant feeding support underscores the need to bolster healthcare teams including through lactation specialists and community counterparts, who are vital to sustaining and expanding such important initiatives.

Limitations

Given our multi-component intervention and study design, we are unable to assess the lactation support sessions and unconditional cash transfer separately. The two components may contribute uniquely to perinatal

women's experiences and future research may be needed to understand the extent to which desired outcomes are impacted by each component. We also acknowledge the possibility that the control group received some benefits beyond standard of care that could have positively impacted their perinatal experiences such as reimbursement for travel expenses, positive interactions with our research coordinators on site, and seeing their infants' weight at each research encounter.

Our study was limited to pregnant and postpartum women living with HIV on ART in Kisumu County, Kenya, and therefore findings may not be generalizable to other populations. That said, the potential benefits of both intervention components would likely hold true for other perinatal women in low-resource settings. Future trials, should consider offering additional infant feeding support sessions for up to 6 months and beyond to support women during the transition from exclusive breastfeeding to complementary feeding. Extended financial support and information about budgeting or small business management might also ensure more women sustain an income post intervention.

Despite these limitations, we believe our mixed-methods findings indicate that the Supporting Healthy Mothers intervention has great potential for impact and is highly acceptable to the target population.

Conclusions

The Supporting Healthy Mothers intervention consisting of unconditional cash transfers and personalized professional infant feeding support was feasible and acceptable. We observed improvements in women's food insecurity scores, and women reported the intervention positively affected their mental health and infant feeding experiences. The Supporting Healthy Mothers pilot intervention has potential to positively impact women during a vulnerable transition and beyond by increasing financial security, knowledge and skills, and should be assessed in larger trials.

Abbreviations

WLWH	Women living with HIV
PMTCT	Prevention of mother to child transmission of HIV
ART	Antiretroviral Therapy

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Authors' contributions

ET conceived of the idea; analyzed data and wrote manuscript; AM participated in intervention development, analyzed data and drafted manuscript; BO participated in intervention development, collected the data, assisted

with analysis and drafting of manuscript; MN collected the data, assisted with analysis and drafting of manuscript; RS provided lactation consultation and contributed to curriculum development; TH led the quantitative data analysis and drafted this part of the manuscript; CC contributed to the research design and review of manuscript; SW contributed to the research question, and review of manuscript.

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Availability of data and materials

The datasets from the current study are available from the corresponding author on reasonable request. The qualitative data is not available for distribution.

Declarations

Ethics approval and consent to participate

All procedures performed involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Kenya Medical Research Institute Scientific and Ethics Review Unit (KEMRI/SERU/CMR/P00093/3723) and University of California San Francisco Human Research Protection Program Institutional Review Board (IRB# 18–25134; Reference # 354239) reviewed and granted approval for all study activities described here.

Informed written consent was obtained for all individual participants included in the study.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

¹Department of Community Health Systems, School of Nursing, University of California San Francisco, San Francisco, CA, USA. ²Global Programs for Research and Training, University of California San Francisco, Kisumu, Kenya. ³Department of Epidemiology and Biostatistics, and Office of Research School of Nursing, University of California San Francisco, San Francisco, CA, USA. ⁴Ambercare Medical Centre and Mamatoto Childbirth and Breastfeeding Educative Services, Kisumu, Kenya. ⁵Department of Obstetrics, Gynecology & Reproductive Sciences, University of California San Francisco, San Francisco, CA, USA. ⁶Division of HIV, Infectious Disease, and Global Medicine, Department of Medicine, University of California San Francisco, San Francisco, CA, USA.

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