

Exploring the impact of a maternal support grant to improve mental health and food security amongst pregnant women in South Africa during the COVID-19 pandemic

Christina A. Laurenzi¹  | Masedi Menyatsoe² |
 Mustafa Shuaib³ | Amanda Edwards²  | Kelly Gemmell¹ |
 Hayli Geffen³ | Mark Tomlinson^{1,4} | Anna-Marie Müller⁵ |
 Samuel Manda⁶ | Kopano M. Mabaso²

¹Department of Global Health, Institute for Life Course Health Research, Faculty of Medicine and Health Sciences, Stellenbosch University, Cape Town, South Africa

²Grow Great Campaign, DG Murray Trust, Midrand, South Africa

³Division of Epidemiology and Biostatistics, School of Public Health, University of Cape Town, Cape Town, South Africa

⁴School of Nursing and Midwifery, Faculty of Medicine, Health and Life Sciences, Queen's University Belfast, Belfast, Northern Ireland, UK

⁵DG Murray Trust, Claremont, South Africa

⁶Department of Statistics, University of Pretoria, Pretoria, South Africa

Correspondence

Christina A. Laurenzi, Department of Global Health, Institute for Life Course Health Research, Faculty of Medicine

Abstract

Social protection during pregnancy may support pregnant women struggling to meet basic needs to ensure a healthy pregnancy and buffer negative impacts of multiple adversities. We assessed the effect of a bimonthly digital food voucher, delivered to pregnant women during the COVID-19 pandemic in the Cape Town area, on their mental health, hunger, and dietary diversity. Pregnant women from antenatal clinics in specific high-poverty areas were invited to join the voucher program; a subset was recruited for in-depth telephone interviews. Interviews were conducted before, during, and after voucher distribution. Generalized estimating equations were fit to examine whether each outcome was associated with voucher exposure over time. Of the 205 participants, most were aged 25–34, not recently employed, with at least one child in their household. Approximately 1/3 were first-time mothers and 32% reported mental health difficulties. Voucher exposure over 12 months was associated with significant reductions in mental health symptoms at



and Health Sciences, Stellenbosch University, Cape Town, South Africa.
Email: christinalaurenzi@sun.ac.za

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midline and endline. Maternal hunger was reduced at midline and endline. High mental health scores were significantly associated with increased maternal hunger after adjusting for potential confounders. This study provides preliminary evidence for income support during pregnancy to shape positive health outcomes in South Africa.

KEYWORDS

Child Support Grant, food insecurity, maternal hunger, maternal mental health, social protection, South Africa

INTRODUCTION

Pregnancy is a time of increased physical, emotional, and economic needs. Access to healthy, nutritious food is central to these needs. Optimal physical and brain development of the fetus depends in part on sustained access to diverse and healthy foods (World Health Organization, 2013). However, many women in South Africa struggle to meet the basic nutritional requirements to ensure a healthy pregnancy and to support their infants after birth. Large-scale cohort data from the past decade shows high rates of maternal hunger and household food insecurity (Harper et al., 2023), and over 60% of mothers of young children live below the upper-bound poverty line (Hall et al., 2017). Pregnancy also places new financial pressures on a woman at a time when her income-generating potential is reduced (van den Heever et al., 2012).

These challenges significantly affect maternal and child health (Ashley-Cooper et al., 2019; Justice et al., 2019). A significant evidence base on the developmental origins of health and disease has demonstrated the long-term impacts that poor health and growth in utero can have on later ill-health and disease risk in adulthood (Gillman, 2005). Poor nutrition in pregnancy and early childhood can stunt linear growth, negatively influencing child health, educational attainment, and employment prospects across the life course (Victora et al., 2008). An estimated 21.4%–27% of South African children under age five are stunted (Development Initiatives, 2021; National Department of Health, Statistics South Africa, South African Medical Research Council, 2019; World Health Organization, 2022)—levels that have not shifted significantly since the 1990s (May et al., 2020). Food insecurity may also link to other concurrent challenges, including poor maternal mental health (Harper et al., 2022). While experiencing food insecurity may be associated with increased mental health symptoms (Horwood et al., 2021; Tsai et al., 2016)—for example, related to pressures of procuring food in constrained circumstances—maternal depression may also exacerbate household food insecurity (Garg et al., 2015; Laurenzi et al., 2020; Melchior et al., 2009). A recent South African study found that over 40% of pregnant women reported antenatal depression (Abrahams et al., 2018). Poor maternal mental health can impair a mother's ability to recognize and respond to her infant's needs adequately and appropriately at a critical time for child development (World Health Organization UNCSF, World Bank Group, 2018).

Importantly, pregnant women and mothers who are already in tenuous financial and social positions may be less resilient to shocks or crises. While South Africa has long faced rising unemployment and the uneven participation of men and women in the labor market, the



COVID-19 pandemic exacerbated an already dire situation for women, including pregnant women (Akseer et al., 2020; Connor et al., 2020). Women comprised nearly two-thirds of the three million people who lost their jobs during South Africa's early lockdown in March–May 2020 (Rogan & Skinner, 2021). Most women working in informal employment lost their livelihoods or were “locked out” of work (Rogan & Skinner, 2021). Beyond experiencing significant decreases in income with no access to a social or financial safety net—critical for the perinatal period (Rogan & Alfors, 2019; Scorgie et al., 2015)—women experienced slower economic recovery post-pandemic than men (Casale & Shepherd, 2021).

Social protection schemes provide critical support for women, especially during crises. South Africa's Child Support Grant (CSG) has been an important vehicle for transforming child outcomes in the poorest households, providing essential income support to children up until age 18 (Children's Institute, University of Cape Town, 2023). However, the means-tested CSG is only granted after infants are born; notably, only two-thirds of eligible children benefit from this grant in their first year (Hall et al., 2017). Uptake of the CSG, valued at R530 per month in July 2024 (approximately US\$29), remains the lowest among caregivers of infants under 1 year, with accessibility challenges caused by lack of birth certificates and caregiver documentation, social and cultural practices, and limited baby-friendly facilities at South African Social Security Agency (SASSA) service points (Delany & Jehoma, 2016).

Extending the CSG into pregnancy could be transformative for expectant mothers and mothers during the immediate postpartum period (van den Heever, 2016). Cash transfers during periods of vulnerability and transition—including the peripartum period—can improve child nutritional status and school grade attainment for girls (Zembe-Mkabile et al., 2012) and support improvements in psychosocial wellbeing, financial security, and household food security (Alloush et al., 2023; Davis et al., 2016). Income support provided during pregnancy has been linked with an increased number of antenatal visits; reductions in neonatal, infant, and child mortality rates; improvement in birth weight; and declines in wasting and severe malnutrition (Sambu & Delany, 2020). However, this approach has not been widely tested in South Africa. Leveraging a large grant program implemented during the COVID-19 pandemic, this study sought to explore the potential impact of a bimonthly support grant, in the form of a digital food voucher, on the food security and mental health of a cohort of pregnant women living in the Cape Town metropolitan area.

METHODS

The CoCare voucher scheme

In response to multiple crises stemming from the COVID-19 pandemic, KfW German Development Bank granted approximately R98 million (equivalent to US\$5.16 million in April 2020) to the nonprofit Violence Protection through Urban Upgrading (VPUU) to provide food and nutritional support to families living in a select set of highly disadvantaged communities in South Africa. Part of this fund was directed to pregnant women specifically, in the form of a R300 (approximately US\$16) digital food voucher received twice monthly, to a total value of R3000 (approximately US\$160). This monthly amount was 33% more than the amount of the governmental CSG at the time (valued at R450, or US\$23, monthly). With an explicit intention to support vulnerable pregnant women in the Western Cape, this initiative, known as CoCare, issued vouchers between November 2020 and April 2021; additional funding enabled a further



rollout between June and October 2021. Vouchers were redeemable at informal neighborhood convenience shops (known as spaza shops), and general dealers, with the aim of simultaneously stimulating the local economy. Through partnerships with non-profit organizations Embrace and Grow Great, VPUU developed a plan to enroll eligible women and disburse CoCare vouchers.

Design

This study used a rapid three-wave quantitative survey design, collecting data at baseline, midline, and endline in the context of the COVID-19 pandemic. Ethics approval was granted by the Health Research Ethics Committee at Stellenbosch University, South Africa (N20/09/056_COVID19).

Setting and sample

Sampling was conducted by selecting clinics operating in vulnerable communities in the Cape Town metropolitan area where the primary implementer, VPUU, had an established presence (Violence Prevention through Urban Upgrading, 2021). Participating communities were Gugulethu, Hanover Park, Harare, Kuyasa, Manenberg, Monwabisi Park, and Nyanga. These areas have high levels of unemployment, exposure to chronic stressors related to poverty and violence, and limited access to healthy nutritional options. They are representative of other high-adversity peri-urban South African settings, where the spatial and racial inequalities initiated in the apartheid era have persisted (Human Sciences Research Council, 2023; Turok et al., 2021).

All pregnant women aged 18 or older who visited the selected clinics were eligible for enrollment into the CoCare voucher scheme. Participants were first contacted via SMS text and invited to participate in a brief Unstructured Supplementary Service Data (USSD)-string survey. At the end of the USSD survey, participants were asked to indicate interest in being contacted by telephone for an in-depth survey. A list of mobile phone numbers with attached areas was generated, all of whom belonged to women who had participated in the USSD survey and who were registered to receive a voucher. Research assistants selected potential participants' mobile numbers based on geographic distribution to confirm availability, interest, and preferred language preference and to schedule a telephone interview.

Data collection

Telephone interviews, following structured questionnaires, were administered by six trained, experienced research assistants. Questionnaires were administered in either English, isiXhosa, or Afrikaans, depending on participant preference, and took approximately 30 min. At the start of the telephone interview, research assistants read a brief voluntary informed consent form over the phone in the language of the participants' choice.

Participants from the baseline survey, in October 2020, were contacted subsequently to participate in midline (April 2021) and endline surveys (October–November 2021). At the time of the endline survey, study participants had been issued vouchers to at least the value of R3000 (US\$160). All calls were audio-recorded, and all responses were recorded using an encrypted



data management software program, with responses submitted to a secure cloud-based platform.

Measures

The questionnaire included general questions about participant demographics, maternal mental health, maternal hunger, child hunger, and dietary diversity.

Demographic questions asked about participant age, highest level of education, whether they had a job or earned an income, and whether they or anyone in their household received any governmental grant in the past month (with options including CSG, older person's grant, disability grant, foster child grant, care dependency grant, war veterans grant, COVID-19 social relief of distress grant, grant in aid, and the National Student Financial Aid Scheme). Participants not reporting work were asked if they had a job to return to in the next 4 weeks. We also included questions about vouchers at midline and endline, asking participants to self-report the total amount received since the previous survey, total amount redeemed overall, and what the voucher was generally spent on. At midline and endline, participants were asked if they had given birth, along with a set of questions about infant feeding and birth weight.

Maternal hunger was assessed by a question asking if the participant had gone to bed hungry in the past week. Participants reporting “yes” were asked to indicate frequency (how many days of the past week), with options ranging from 1 to 7 days. Child hunger was assessed by asking if any child in the household had gone to bed hungry in the past week, and gauging frequency. Similar questions have been used in large-scale surveys in South Africa (van der Berg et al., 2022).

Mental health was assessed using the Patient Health Questionnaire-9 (PHQ-9), which is used to screen for symptoms of depression and measure symptom severity. The scale contains 9 items, scored on a 4-point Likert-type scale and summed (range = 0–27). Higher scores reflect more severe depressive symptomatology. This scale has been widely used (Kroenke et al., 2001); for this analysis, a high PHQ-9 score was defined as >9, a cut-off that has been validated across multiple settings, including in peri-urban South Africa (Cholera et al., 2014; Marlow et al., 2023).

Dietary diversity was assessed using the dietary diversity questionnaire, developed by the Food and Agricultural Organization as a measure of adequate nutrient intake (Kennedy et al., 2011). The measure includes nine standard and universal food groups, from which participants are asked to recall consumption over the past 24 hours. The number of food groups consumed are summed (range = 0–9). This score has been adapted for women and is known as the women's dietary diversity score (WDDS). Participants were classified as having a low WDDS (score of less than 3 food groups), medium (4 or 5 food groups), or high (more than 6 food groups) (Kennedy et al., 2011). This questionnaire has been used with pregnant women in sub-Saharan Africa and South African women (Kiboi et al., 2017; Oldewage-Theron & Kruger, 2011).

Self-report data on voucher redemption was triangulated with logs of voucher distribution and redemption data from the implementing partner, VPUU.

Statistical analysis

Descriptive characteristics of both baseline predictors and outcomes were summarized as medians with interquartile ranges and frequencies with percentages where appropriate.



Descriptive measures for baseline characteristics were compared between the full cohort of participants recruited at baseline, and the participants who also completed both midline and endline follow-up surveys, to compare the distribution of characteristics for participants who completed all surveys with those who were lost to follow-up.

Generalized estimating equations (GEEs) were fit to examine whether each outcome was associated with voucher exposure over time, and to account for correlations between the repeated measures of outcomes in each participant. Voucher exposure was considered as midline or endline relative to baseline. Univariable associations between each outcome, while still adjusting for voucher exposure, and a prespecified set of baseline predictors were explored. A single multivariable model for each outcome was fit to explore the effect of voucher exposure on each outcome adjusted for baseline predictors. We considered age, number of children in the household, employment in the last month, recipient of household grant, and level of education as a priori exposures. All models followed complete case analysis. All analysis was conducted using R (Team RC, 2023).

RESULTS

Participant characteristics

At baseline, 567 participants were recruited from an initial list of 2618 phone numbers belonging to pregnant women who had responded to the USSD survey. A total of 205 participants completed all three rounds of the survey (baseline, midline, and endline). The baseline characteristics of the full and final cohorts are summarized in Table 1. Sensitivity analysis indicated that participants who completed the full study had similar characteristics to those who were lost to follow-up after baseline.

At baseline, 118 (58%) participants were between 25 and 34 years old. The majority of participants (71%) self-reported not being employed in the last month, and over three-quarters (88%) of participants stayed with at least one child in the household. Most participants (78%) reported that their household received at least one government grant, most commonly the CSG—received by 62.4% of participants. Ten percent of participants anticipated work in the coming 4 weeks.

Voucher redemption rates

Using VPUU's voucher distribution data, we found that the majority of participants reported redeeming more than half of their voucher amount; however, at endline, only 29% of study participants had redeemed more than 90% of the full voucher value over the 12-month voucher distribution period. There was a steady drop off in redemption rates between study waves. Reasons provided for incomplete redemption included additional fees charged by spaza shops, eligible shops being too far from the participants' homes, and technical challenges with the code being accepted (e.g., error messages or incorrectly marked as previously redeemed). Vouchers were largely used for food ($n = 182$, 88.3%), followed by “other” items ($n = 21$, 10.2%), including baby items such as clothes and



TABLE 1 Comparison of baseline characteristics between participants who completed all telephone surveys and the full cohort.

Characteristic	Full cohort (n = 567)	Final cohort for analysis (n = 205)
Age (years)		
Median [IQR]	27 [24–32]	28 [24–32]
Age categories (years)		
18–24	152 (27%)	44 (21%)
25–34	317 (56%)	118 (58%)
35–63	98 (17%)	43 (21%)
Language		
isiXhosa	409 (72%)	146 (71%)
Afrikaans	158 (28%)	59 (29%)
Highest education attained		
Primary school	10 (1%)	4 (2%)
Some high school	323 (57%)	109 (53%)
Completed matric (Grade 12)	138 (24%)	50 (24%)
Tertiary	96 (17%)	42 (20%)
Employed in the last month		
Yes	150 (26%)	59 (29%)
No	416 (73%)	146 (71%)
Refuse to say	1 (0.2%)	0 (0%)
Participant expects to return to work in the next 4 weeks		
Yes	65 (11%)	21 (10%)
No	502 (89%)	184 (90%)
Neighborhood		
Nyanga	139 (25%)	48 (23%)
Gugulethu	94 (17%)	25 (12%)
Manenberg	79 (14%)	27 (13%)
Harare	78 (14%)	34 (17%)
Monwabisi Park (including Nkandla/Azania)	47 (8%)	18 (9%)
Kuyasa	42 (7%)	18 (9%)
Hanover Park	35 (6%)	16 (8%)
Bonteheuwel	22 (4%)	7 (3%)

(Continues)

**TABLE 1** (Continued)

Characteristic	Full cohort (<i>n</i> = 567)	Final cohort for analysis (<i>n</i> = 205)
Ilitha Park	8 (1%)	2 (1%)
Tambo Village	1 (0.2%)	1 (1%)
Other	22 (4%)	9 (4%)
Number of children		
0	198 (35%)	75 (37%)
1	183 (32%)	60 (29%)
2	124 (22%)	48 (23%)
>2	62 (11%)	22 (11%)
Median [IQR]	1 [0–2]	1 [0–2]
Range	0–6	0–5
Children living in the home (<i>n</i> = 369 vs. 130)		
Yes	320 (87%)	115 (88%)
No	49 (13%)	15 (12%)
Government grant in the household (any household member)		
Yes	445 (77%)	160 (78%)
No	130 (22%)	45 (22%)
Refuse to say	3 (1%)	0 (0%)
Number of grants in the household (total, to any household member)		
Median	1 [1]	1 [1]
Range	1–4	1–4
Type of grants given to any household member (<i>n</i> = 445 vs. 160)		
Child Support Grant (CSG)	356 (80%)	128 (80%)
Older person's Grant	68 (15%)	22 (14%)
Disability Grant	28 (6%)	9 (6%)
Foster Child Grant	6 (1%)	1 (1%)
Care Dependency Grant	2 (0.4%)	1 (1%)
War veterans Grant	0 (0%)	0 (0%)
COVID-19 Social Relief of Distress Grant	64 (14%)	26 (16%)
Grant in Aid	2 (0.4%)	1 (1%)



TABLE 1 (Continued)

Characteristic	Full cohort (n = 567)	Final cohort for analysis (n = 205)
National Student Financial Aid Scheme	11 (3%)	5 (3%)
Participant receiving a government grant		
Yes	241 (53%)	87 (54%)
No	204 (46%)	73 (46%)
Refuse to say	3 (1%)	0 (0%)
Missing	130 (23%)	45 (22%)
Number of government grants (participant)		
Median	1 [1]	1 [1]
Range	1–4	1–4
Type of government grants (participant; n = 241 vs. 87)		
Child Support Grant (CSG)	187 (78%)	70 (80%)
Older person's Grant	6 (2.5%)	0 (0%)
Disability Grant	0 (0%)	0 (0%)
Foster Child Grant	1 (0.4%)	0 (0%)
Care Dependency Grant	1 (0.4%)	0 (0%)
War veterans Grant	0 (0%)	0 (0%)
COVID-19 Social Relief of Distress Grant (R350)	43 (18%)	16 (18%)
Grant in Aid	1 (0.4%)	1 (1%)
National Student Financial Aid Scheme	10 (4%)	4 (5%)
Do not know	1 (0.4%)	0 (0%)
Any reported maternal hunger in past 7 days	198 (35%)	81 (40%)
Any reported child hunger in past 7 days (any child in household; n = 320 vs. 130)	66 (21%)	33 (29%)

Note: All measurements are described as percentage proportions unless mentioned otherwise.

nappies, and electricity (n = 3, 1.5%). Table 2 provides a detailed breakdown of voucher redemption rates across all three timepoints.

Outcome in participants who completed all surveys

Changes in the distribution of outcomes over time for women who completed all surveys are reflected in Table 3 and Figure 1. All women had given birth by endline, and 9.8% of women reported low birth weight (LBW) in their most recent pregnancy. Over half (56%) of women reported exclusively breastfeeding their child in the first 6 months. By endline, 77% of participants were accessing the CSG and 19% reported anticipated work in the coming 4 weeks.

TABLE 2 Summary of voucher redemption rates for participants who completed all telephone surveys.

Characteristic	Midline	Endline
Voucher value issued—ZAR ^a		
Median [IQR]	3000 [3000–3600]	2700 [2400–3000]
Range	300–3600	300–3000
Voucher value redeemed—ZAR		
Median [IQR]	3000 [2746–3300]	2400 [2100–2400]
Range	300–3300	300–2700
Voucher Redemption—%		
Median [IQR]	92 [92–100]	89 [80–100]
Range	33–100	29–100
>50% redemption (%)	198 (96%)	203 (99%)
>90% redemption (%)	161 (78%)	59 (29%)

^aSouth African rand (ZAR) to USD exchange at midline was 1 USD = 14.66 ZAR; and at endline was 1 USD = 14.85 ZAR.

Changes in PHQ-9 score

Median PHQ-9 score decreased from 8 at baseline to 6 at midline and endline, and the proportion of women with PHQ-9 scores greater than 9 at baseline was reduced from 32% to 21% and 24% at midline and endline, respectively. Voucher exposure was associated with a significant reduction in PHQ-9 score at both midline (effect = -1.6 , 95% confidence interval [CI] = -2.2 , -1.1) and endline (effect = -1.2 , 95% CI = -1.8 , -0.57) relative to baseline (see Table 4). The effect of the voucher on PHQ score was only slightly reduced (-1.4 and -0.97 for midline and endline respectively) after adjusting for age, number of children in the household, employment, recipient of household grant, education, maternal hunger, and WDDS score.

Moreover, when viewed as a categorical variable relative to baseline, the odds of a PHQ-9 score being greater than 9 was reduced with voucher exposure by 42% (95% CI = 18%–60%) at midline and 32% (95% CI = 3%–53%) at endline (see Supporting Information S1: Table S1). However, after adjusting for potential confounders, voucher exposure only significantly reduced the odds of a high PHQ-9 score at midline (adjusted odds ratio [aOR] = 0.65, $p = 0.03$) but not at endline (aOR = 0.76, $p = 0.2$) relative to baseline. In addition, having a greater number of children in the household (≥ 2 relative to none) and maternal hunger in the last 7 days were also significantly associated with both higher PHQ-9 scores on average and the odds of high relative to low PHQ-9 score.

WDDS score

WDDS scores remained constant with a median score of 4 at baseline and midline, which slightly decreased to 3 at endline. In addition, half of participants had WDDS scores that were greater than 3 throughout the three-time points. No associations were observed between voucher exposure and the odds of a high WDDS score (see Supporting Information S1:



TABLE 3 Descriptive outcomes across surveys.

Characteristic	Baseline	Midline	Endline
Delivery of infant	--	161 (79%)	205 (100%)
Low birth weight (<2500 g)	--	14/161 (8.7%)	20/205 (9.8%)
Ever breastfed	--	145/161 (90%)	182/205 (89%)
Exclusive breastfeeding in the first 6 months	--	77/145 (53%)	101/182 (56%)
Missing	--	1 (1%)	1 (0.5%)
Dietary Diversity Score			
Median [IQR]	4 [0–5]	4 [0–6]	3 [0–5]
WDDS score categories			
≤3	101 (49%)	102 (50%)	103 (50%)
>3	104 (51%)	103 (50%)	102 (50%)
PHQ-9 score			
Median [IQR]	8 [5–10]	6 [3–9]	6 [3–9]
PHQ-9 > 9	66 (32%)	44 (21%)	50 (24%)
Mother went to bed hungry in the last 7 days	81 (40%)	51 (25%)	52 (25%)
Number of nights mother went to bed hungry			
Median [IQR]	2 [2, 3]	2 [1, 2]	2 [1, 2]
Any child going to bed hungry in the last 7 days	33/130 (25%)	22/186 (12%)	19/205 (9%)
Missing	16 (8%)	46 (22%)	30 (15%)
Number of nights a child went to bed hungry			
Median [IQR]	2 [1–3]	2 [1, 2]	2 [1, 2]

Abbreviations: PHQ, Patient Health Questionnaire; WDDS, Women's Dietary Diversity Score.

Tables S2 and S3). This was probably due to the majority of participants (51%) having a high WDDS score at baseline.

Maternal and child hunger

Significant reductions in reported maternal and child hunger were observed at midline and endline when compared to baseline. The proportion of women reporting hunger in the last 7 days (40% at baseline) decreased to 25% at midline and endline (see Figure 1). In a similar trend, among women who had children living in the same household, the proportion of any child going to bed hungry in the last 7 days was reduced from 25% (33/130) at baseline, to 12% (22/186) at midline and 9% (19/205) at endline. Overall, a total reduction of 64% in child hunger between baseline and endline was seen.

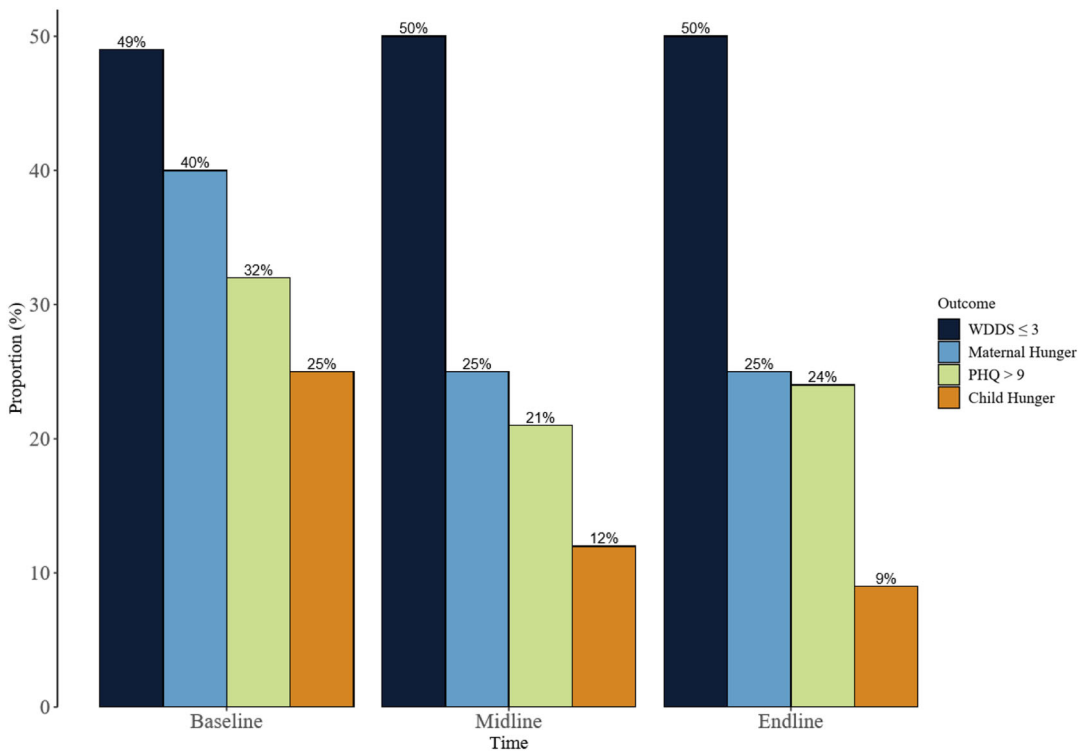


FIGURE 1 Proportion of outcomes through time for women who completed all telephonic visits ($n = 205$). Proportions of child hunger are calculated based on whether women had other children, whether any children live with them, and/or if gave birth at baseline ($n = 130$), midline ($n = 186$), and endline ($n = 205$).

Voucher exposure at both midline and endline was associated with a significant reduction in the odds of maternal hunger relative to baseline (49% reduction, 95% CI = 30%–63%, and 48% reduction, 95% CI = 33%–63%, respectively). This effect was unchanged after adjusting for potential confounders (see Table 5). High PHQ-9 scores (>9) were significantly associated with increased maternal hunger (aOR = 2.16, 95% CI = 1.51, 3.09) after adjusting for potential confounders (Table 6).

In a subgroup analysis of 161 individuals who had given birth by the time of the midline survey, voucher exposure was associated with a reduction in the odds of child hunger (Supporting Information S1: Table S3). However, this effect was not statistically significant when explored in univariable (OR = 0.76, $p = 0.4$) or multivariable models (aOR = 0.63, $p = 0.3$). Interestingly, maternal hunger was significantly associated with child hunger both in the univariable and multivariable models ($p < 0.01$). However, this effect was associated with a large amount of imprecision (95% CI = 5.75–43.2). This was due to very few participants ($n = 8$) who reported child hunger but not maternal hunger.

DISCUSSION

This study provides preliminary evidence highlighting the potential for maternal support grants during pregnancy to shape positive health outcomes. These findings align with emerging data from other settings that link the provision of social protection during pregnancy with maternal



TABLE 4 Univariable and multivariable linear estimates for continuous PHQ-9 score from generalized estimating equation (GEE) models ($n = 205$).

Characteristic	Univariable analysis ^a			Multivariable analysis		
	Estimate	95% CI	<i>p</i> Value	Estimate	95% CI	<i>p</i> Value
Time exposed to voucher						
Baseline	--	--		--	--	
Midline	−1.6	−2.2, −1.1	<0.01	−1.4	−2.0, −0.82	<0.001
Endline	−1.2	−1.8, −0.57	<0.01	−0.97	−1.6, −0.34	<0.01
Age						
18–24	--	--		--	--	
25–34	0.67	−0.65, 2.0	0.3	0.02	−1.2, 1.3	>0.9
35–64	1.5	−0.16, 3.2	0.08	−0.06	−1.9, 1.7	>0.9
Children						
0	--	--		--	--	
1	0.77	−0.46, 2.0	0.2	0.72	−0.44, 1.9	0.2
≥2	1.8	0.49, 3.0	0.01	1.5	0.07, 3.0	0.04
Employed in the last month						
No	--	--		--	--	
Yes	0.87	−0.36, 2.1	0.2	0.82	−0.27, 1.9	0.14
Any household grant						
No	--	--		--	--	
Yes	0.77	−0.44, 2.0	0.2	0.25	−0.88, 1.4	0.7
Education						
Completed matric	--	--		--	--	
Did not complete matric	0.44	−0.61, 1.5	0.4	0.11	−0.86, 1.1	0.8
Maternal hunger in the last 7 days						
No	--	--		--	--	
Yes	1.6	0.87, 2.4	<0.01	1.7	0.87, 2.4	<0.01
WDDS score	−0.05	−0.14, 0.04	0.3	−0.05	−0.15, 0.04	0.3

Abbreviations: CI, confidence interval; WDDS, Women's Dietary Diversity Score.

^aAll univariable models have been adjusted by time exposed to voucher.

and child health improvements (Falcão et al., 2023; González & Trommlerová, 2022)—a key step in bolstering advocacy efforts for social protection to at-risk pregnant women across South Africa.

Exposure to the digitally-delivered CoCare vouchers over three time points during the COVID-19 pandemic showed statistically significant improvements in maternal hunger, child

TABLE 5 Crude and adjusted odd ratios of maternal hunger from univariable and multivariable generalized estimating equation (GEE) models ($n = 205$).

Characteristic	Univariable analysis ^a			Multivariable analysis		
	OR	95% CI	p Value	OR	95% CI	p Value
Time exposed to voucher						
Baseline	--	--		--	--	
Midline	0.51	0.37, 0.70	<0.01	0.52	0.37, 0.74	<0.01
Endline	0.52	0.37, 0.73	<0.01	0.52	0.36, 0.75	<0.01
Age						
18–24	--	--		--	--	
25–34	1.30	0.69, 2.44	0.4	1.73	0.80, 3.84	0.2
35–64	1.96	0.94, 4.06	0.07	2.58	1.01, 6.61	0.05
Children						
0	--	--		--	--	
1	1.00	0.55, 1.80	>0.9	0.62	0.30, 1.32	0.2
≥2	1.44	0.80, 2.57	0.2	0.73	0.35, 1.53	0.4
Employed in the last month						
No	--	--		--	--	
Yes	0.74	0.44, 1.22	0.2	0.63	0.38, 1.06	0.08
Any household grant						
No	--	--		--	--	
Yes	1.84	1.02, 3.33	0.04	1.75	0.96, 3.19	0.07
Education						
Completed matric (Grade 12)	--	--		--	--	
Did not complete matric	1.43	0.89, 2.30	0.14	1.27	0.78, 2.08	0.3
WDDS score ≤ 3						
No	--	--		--	--	
Yes	1.05	0.75, 1.46	0.8	0.99	0.70, 1.41	>0.9
PHQ- score > 9						
No	--	--		--	--	
Yes	2.01	1.43, 2.84	<0.01	2.16	1.51, 3.09	<0.01

Abbreviations: CI, confidence interval; PHQ, Patient Health Questionnaire; WDDS, Women's Dietary Diversity Score.

^aAll univariable models have been adjusted by time exposed to voucher.



TABLE 6 Crude and adjusted odd ratios of child hunger in mothers who gave birth at midline through univariable and multivariable generalized estimating equation (GEE) models ($n = 161$).

Characteristic	Univariable analysis ^a			Multivariable analysis		
	OR	95% CI	p Value	OR	95% CI	p Value
Time exposed to voucher						
Midline	--	--		--	--	--
Endline	0.76	0.40, 1.42	0.4	0.63	0.28, 1.41	0.3
Age						
18–24	--	--		--	--	
25–34	1.27	0.45, 3.58	0.7	1.43	0.48, 4.27	0.5
35–64	1.12	0.32, 3.87	0.9	1.28	0.24, 6.69	0.8
Children						
0	--	--		--	--	
1	1.08	0.40, 2.93	0.9	0.94	0.35, 2.51	0.9
≥2	0.84	0.32, 2.24	0.7	0.77	0.21, 2.76	0.7
Employed in the last month						
No	--	--		--	--	
Yes	0.28	0.09, 0.85	0.024	0.26	0.06, 1.21	0.086
Any household grant						
No	--	--		--	--	
Yes	2.69	0.56, 12.9	0.2	1.94	0.45, 8.37	0.4
Education						
Completed matric (Grade 12)	--	--		--	--	
Did not complete matric	0.64	0.28, 1.42	0.3	0.32	0.12, 0.86	0.024
WDDS score ≤ 3						
No	--	--		--	--	
Yes	1.39	0.63, 3.03	0.4	1.22	0.50, 2.99	0.7
PHQ-9 score > 9						
No	--	--		--	--	
Yes	1.57	0.60, 4.12	0.4	1.42	0.54, 3.71	0.5
Maternal hunger						
No	--	--		--	--	
Yes	14.1	5.82, 34.4	<0.01	15.8	5.75, 43.2	<0.01

Abbreviations: CI, confidence interval; PHQ, Patient Health Questionnaire.

^aAll univariable models have been adjusted by time exposed to voucher.



hunger, and maternal mental health over time. Reductions in the PHQ-9 score differ in terms of their significance based on the severity of symptoms, and they are often also nonlinear (Peiper et al., 2023). While score reductions between 1 and 2 points are below what may be considered clinically relevant (Kroenke, 2012), these reductions may still be relevant for a broader general population sample or those with lower baseline symptomatology (Kounali et al., 2022).

The study also identified factors that diminished the potential benefit of vouchers in these domains: (1) a greater number of children in the household was linked to higher symptom scores for maternal mental health and (2) food insecurity and mental health shaped one another in expected ways. While these findings are preliminary and lack the robustness that a comparison group would offer, they suggest that providing pregnant women with a bimonthly maternal support grant at about the level of the food poverty line could contribute to improving food security and maternal mental health.

The complex interactions between maternal mental health and food security have previously been documented amongst women living in a similar setting to our study sample with food insecurity and depression being strongly associated in pregnant women (Abrahams et al., 2018), and reflect patterns in the broader literature (Laurenzi et al., 2020). Our rates of depressive symptomatology align with other recent evidence from adult women living in peri-urban South Africa (Hatcher et al., 2022), including peripartum women (van Heyningen et al., 2018). National surveys conducted over the same period show increases in maternal and child hunger in the general population linked to the COVID-19 pandemic, and an increase in job losses (van der Berg et al., 2022).

While low birth weight was not explored as a primary outcome of this study, the prevalence we identified—significantly lower than national and provincial averages (DHS STATCompiler, 2023)—may indicate a protective influence of CoCare vouchers on prenatal growth that requires further exploration. This study being situated in the Cape Town metropolitan area may have also affected these rates. Higher exclusive breastfeeding rates compared to existing data in South Africa (Vitalis et al., 2022) may also be linked to more mothers being at home with their infants during the pandemic lockdown.

Our findings emerged against a backdrop of consistently high unemployment amongst study participants. This may, in part, be linked to giving up work due to pregnancy, as well as the economic downturn caused by the COVID-19 pandemic (Daniels et al., 2021). With over 70% of women unemployed at the endline survey and only 19% reporting a paid activity in the next month, the economic security of these women and their newborn children remains a significant concern.

As expected, we saw an increase in mothers accessing the CSG at endline compared to baseline. However, considering that no participants were still pregnant by the time of the endline survey, and most women in this study would be eligible for the CSG, this increase was lower than expected. These findings align with data showing suboptimal uptake of the CSG in the first year of life, likely linked to access barriers amongst the poorest women (Delany & Jehoma, 2016). Moreover, it is important to note that social protection mechanisms, like the CSG, remain inaccessible to undocumented migrants, omitting a hidden vulnerable population of pregnant women and children residing in South Africa.

Our findings also indicate that vouchers were redeemed largely to purchase items such as food, electricity, and baby items, negating persistent myths that poor women use grants irresponsibly. These findings bolster existing evidence supporting unconditional cash transfers, and question the misconception that they will be misused by recipients (Handa et al., 2017). In evidence derived from large-scale national programs implemented by African governments,



spending on alcohol and tobacco did not increase, create dependency or reduce participation in productive work, or increase fertility (Handa et al., 2017). Study findings across Latin America, Africa, and Asia show that, on average, both conditional and unconditional cash transfers have a significant negative effect on total expenditures on temptation items (Evans & Popova, 2014). Another recent analysis of South Africa's Older Persons Grant before and during the COVID-19 pandemic shows the increasing positive impact of this widely-delivered unconditional cash transfer on household hunger and psychological distress, showing the protective impact of such grants in often multigenerational households (Alloush et al., 2023).

Interestingly, while voucher redemption rates were high, less than a third of participants (29%) redeemed the maximum value distributed to them over the course of the voucher distribution period. To ensure that voucher recipients are able to access vouchers in full, broader community and small-business engagement could help smooth access barriers, and streamline avenues for real-time technological support to troubleshoot problems with voucher redemption.

Finally, there appears to have been minimal impact of CoCare vouchers on dietary diversity across timepoints. The lack of significant improvements in participants' dietary diversity and nutritional adequacy may be attributable to several factors, including the conditionality of where vouchers could be redeemed, from spaza shops and general dealers. These stores tend to stock goods with a longer shelf life and limited fresh produce—a food group that may have been particularly negatively affected by rising food prices over the study period. While social protection programs have been shown to buffer household food security from the adverse effects of COVID-19 (Picchioni et al., 2022), social safety nets cannot be effective on their own. Broader food systems interventions and investments are needed to support and improve food and nutrition security, especially in vulnerable communities. Additionally, as the COVID-19 pandemic progressed, an increase in the cost of living, especially food prices (Okou et al., 2022) may have caused the quality of maternal diets to stagnate, and the nutritional intake of mothers and children may have been neglected (van der Berg et al., 2022).

LIMITATIONS

This study has several limitations. First, the lack of a control group limits extrapolation of the results beyond the study sample, and makes it difficult to disentangle if observed changes in the key outcome areas are attributable to the grant or other concurrent factors. Despite this study being positioned as exploring a "real-world", real-time intervention, future studies investigating the role of social protection during pregnancy should ideally incorporate comparison groups until the benefits of such grants are better established. Second, while our research measures have been used extensively and validated within the South African context, they may still be subject to reporting bias or may fail to capture some of the cultural and social complexity surrounding pregnancy, mental health (Carroll et al., 2020), and hunger in the unique context of a global pandemic. Further research should seek to understand the role of social protection during pregnancy in supporting better health outcomes outside the crisis context of COVID-19. Finally, more detailed data on voucher redemption and expenditure patterns—including how participants spent their vouchers—may serve as a useful starting point for those seeking to study the relative effectiveness of conditional versus unconditional cash transfers in supporting pregnant women in the future.



CONCLUSION

Our study findings support contemporary discourse on the importance of targeted social protection mechanisms to enhance household food security and maternal mental health for vulnerable pregnant women and new mothers in South Africa. The study makes a case for why unconditional cash transfers, and not just food parcels, may be a better option for pregnant women to meet their needs and that of their unborn children, and why we need to ensure that our social protection systems recognize, respect, and protect the dignity and agency of mothers. Policy decision-makers should consider various policy options to support vulnerable pregnant women, including, for example, the provision of digital food vouchers, and extension of the CSG into pregnancy, as potential quick wins to reduce household hunger and improve maternal mental health in South Africa. Closing the gap in social protection to include provision during pregnancy is vital to maximize investments made by the public sector throughout the course of a mother and a child's life.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ORCID

Christina A. Laurenzi  <https://orcid.org/0000-0001-9648-4473>

Amanda Edwards  <http://orcid.org/0000-0002-1837-5527>

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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