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Effects of engaging fathers and bundling nutrition and parenting interventions on household gender equality and women's empowerment in rural Tanzania: Results from EFFECTS, a five-arm cluster-randomized controlled trial

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ABSTRACT

Advancing gender equality and women's empowerment (GE/WE) may contribute to better child nutrition and development in low-resource settings. However, few empirical studies have generated evidence on GE/WE and examined the potential of engaging men to transform gender norms and power relations in the context of nutrition and parenting programs. We tested the independent and combined effects of engaging couples and bundling nutrition and parenting interventions on GE/WE in Mara, Tanzania. EFFECTS (ClinicalTrials.gov, NCT03759821) was a cluster-randomized 2 × 2 factorial trial plus control. Eighty village clusters were randomly assigned to one of five intervention conditions: standard of care, mothers nutrition, couples nutrition, mothers bundled nutrition and parenting, or couples bundled nutrition and parenting. Between October 2018–May 2019, 960 households were enrolled with children under 18 months of age residing with their mother and father. Community health workers (CHWs) delivered a bi-weekly 24-session hybrid peer group/home visit gender-transformative behavior change program to either mothers or couples. GE/WE outcomes were analyzed as intention-to-treat and included time use, gender attitudes, social support, couples' communication frequency and quality, decision-making power, intimate partner violence (IPV), and women's dietary diversity (WDD). Data were collected from 957 and 815 mothers and 913 and 733 fathers at baseline and endline, respectively. Engaging couples compared to mothers only significantly increased paternal and maternal gender-equitable attitudes, paternal time spent on domestic chores, and maternal decision-making power. Bundling increased maternal leisure time, decreased maternal exposure to any IPV, and increased WDD over 7 days. A combination of engaging couples and bundling was most effective for paternal gender attitudes, couples communication frequency, and WDD over 24 h and 7 days. Our findings generate novel evidence that CHWs can deliver bundled nutrition and parenting interventions to couples in low-resource community settings that advance GE/WE more than nutrition interventions targeting only women.

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1. Introduction

To thrive, young children require a broad range of inputs encompassing good health, adequate nutrition, safety and security, responsive caregiving, and opportunities for learning (WHO et al., 2018). Children in low- and middle-income countries (LMICs) are disproportionally affected by undernutrition and compromised cognitive development—30% of children under five in sub-Saharan Africa are chronically malnourished (UNICEF et al., 2021) and 43% of children under five in LMICs are at risk of not reaching their developmental potential (Black et al., 2017). Broadly, empowerment is a multidimensional and context-specific process of change that centers around the concepts of resources, agency, and achievements (Kabeer, 1999) and the expansion of voice and choice through transformation of norms and power relations (van Eerdewijk et al., 2017). Women's empowerment (WE) is critical to achieving gender equality—the state of all individuals being equal in status, rights, and opportunities. Existing evidence from experimental and cross-sectional studies in sub-Saharan Africa suggest that improvements in WE (such as decision-making power over healthcare and household purchases) constitute a pathway for enhancing maternal and child health and nutrition (MCHN) and/or child development (Abreha and Zereyesus, 2021; Matare et al., 2021; Bliznashka et al., 2021; Ewerling et al., 2020). Engaging men in MCHN and/or parenting programs may facilitate better outcomes for women and children (Nguyen et al., 2018; Martin et al., 2020; Tokhi et al., 2018). However, this may not advance gender equality and women's empowerment (GE/WE) unless gender relations and norms related to masculinity and intimate relationships are explicitly addressed in the program's approach· (Barker et al., 2010; Doyle et al., 2018). Few empirical studies have generated evidence on GE/WE or examined the potential of engaging men to transform gender norms and unequal power relations in the context of MCHN and/or parenting programs in LMICs (Doyle et al., 2018; Ashburn et al., 2017; Olney et al., 2016; Quisumbing et al., 2021; Singla et al., 2015; Heckert et al., 2019).

This paper examines the effects of bundling and engaging couples in early child nutrition and parenting programs on GE/WE as secondary outcomes of the Engaging Fathers for Effective Child Nutrition and Development in Tanzania (EFFECTS) cluster-randomized trial (ClinicalTrials.gov NCT03759821) (EFFECTS Study Investigators, 2023). The primary objectives of the trial were to measure effects on child and caregiving outcomes of (1) nutrition-only and bundled nutrition and parenting interventions delivered to couples compared to interventions delivered to mothers alone, and (2) a bundled nutrition and parenting program delivered to mothers, with and without father engagement, compared to a nutrition-only program. We operationalized GE/WE as a set of intermediate variables with potential to influence the more proximate determinants of the trial's primary study outcomes of early child dietary diversity and development. To identify our variables, we developed a Theory of Change (Fig. 1) to explicate the ways in which our interventions might advance specific aspects of GE/WE, which in turn would accelerate improvements in child nutrition and development. We theorized that, even without engaging fathers, bringing women together in groups would increase peer support and enhance agency as it pertains to making meaningful choices that impact MCHN and child development (Kumar et al., 2018). The mothers' pathway is showcased at the top one in Fig. 1. We then theorized that engaging both parents in nutrition and parenting interventions that promote positive fatherhood and more equitable intimate partner relations would bestow even greater benefits to MCHN and child development compared to engaging only mothers, specifically by enhancing fathers' responsiveness to family needs and couple's relationship quality, which would promote more equitable control over income and productive assets, division of labor and time use, and bodily autonomy. This is the couples engagement pathway showcased at the bottom of Fig. 1. Except for parenting-specific skills, maternal stress and depressive symptoms (presented in Jeong et al.'s sister paper), we speculated that bundled nutrition and parenting interventions would have comparable effects on GE/WE as nutrition-only interventions (Appendix 1 illustrates the full trial Theory of Change, including how are GE/WE variables theoretically influence our nutrition and parenting pathways).

2. Methods

Study design and participants EFFECTS was a 2 × 2 factorial cluster randomized controlled trial (RCT) plus standard of care control implemented in the Butiama and Musoma districts of the predominately rural Mara region of northern Tanzania along Lake Victoria. Project Concern International—an international non-governmental organization now acquired by Global Communities (GC)—had been present in the region since 2010. GC was the overall study lead and responsible for

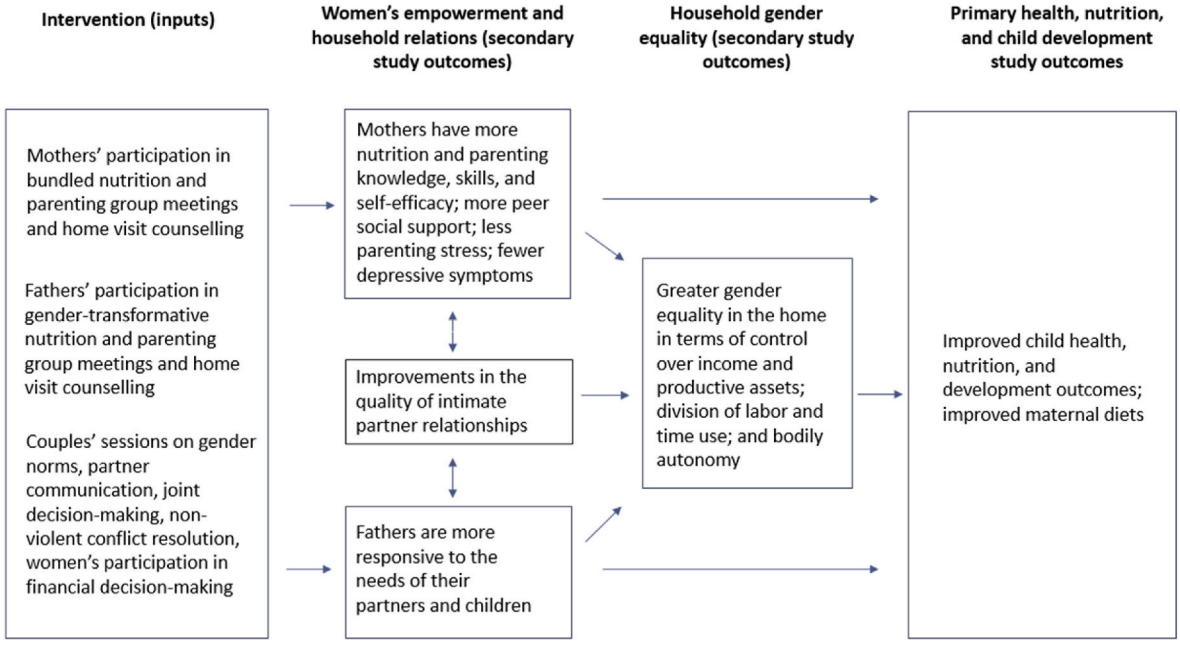


Fig. 1. EFFECTS gender equality and women's empowerment pathway.

implementing the interventions. Each of Musoma's 68 and Butiama's 59 villages typically have a market, school, and health center. Each village has approximately five sub-villages within which are 50–150 homesteads. Most homes are built with mudbricks and cow dung and lack running water. Households depend on smallholder farming and fishing as primary sources of income. Seasonal migration is common, with some men, especially fishermen, away for one to two months at a time. Roughly 85% of households keep small animals (e.g., chickens), 65% keep larger animals (e.g., cows and goats) and most—usually the male heads—own between 3 and 4 acres of arable land (baseline data). The average household size is six to seven people. A dry climate and water insecurity are major livelihood challenges that contribute to severe food insecurity (baseline data) and a 29% prevalence of stunting among children under five (Ministry of Health CD E, 2016).

In Mara, most women and men with young children have completed primary school yet few attended secondary school (baseline data). Women typically marry and give birth to their first child by 18 and 19 years of age, respectively. More than 30% of women of reproductive age have at least one co-wife (Ministry of Health CD E, 2016); the second wife is typically much younger. Co-wives usually live together on the same compound but in separate houses and lead separate lives. A rigid patrilineal system in Mara perpetrates strong patriarchal norms held by both men and women and a highly gendered and inequitable division of labor (Appendices 2a-b). Men typically take control of crops that are marketable and profitable, engage in other income-generating activities on and off farm, and control all household income. Women are responsible for much of the farm work including cash and food crops, livestock-rearing, and providing the bulk of unpaid household and childcare labor. Among our study population at baseline, mothers were spending 11 h a day on domestic and care work while fathers, in contrast, were spending less than 3 h a day (Appendix 2a). While fathers were spending 5 h a day on income-generating activities, women were spending 4 h a day (Appendix 2a). Despite heavy workloads, women are generally excluded from accessing household productive resources and participating in major household decision-making (Appendix 2b). Moreover, violence again women is pervasive—nearly 80% of women in Mara have experienced at least one form of spousal violence (physical, sexual, or emotional), the highest prevalence in the country (Ministry of Health CD E, 2016). Among our study population, between 58% and 70% of women were exposed to IPV in the past three months (Appendix 2a).

Household triads (mother, father, child) were eligible for inclusion if the child was 0–18 months of age at enrollment and both parents lived together for at least 10 months a year, intended to reside in their village for the duration of the study, and provided consent for their own and their child's participation. A cluster design was used because randomization was not possible within a village for a peer group delivery model. Ethics approvals were obtained from the National Institute for Medical Research (Tanzania) and the Harvard T.H. Chan School of Public Health Institutional Review Board. Informed written consent was obtained after screening procedures via signature or a thumbprint in the presence of a witness. Households were terminated from the study if a child died or moved away from the study area.

Randomization and masking Eighty study villages were randomly selected with stratification by district. A participatory community-based approach with district and village leadership was used to randomly assign the villages in equal numbers to one of five intervention conditions: (1) nutrition content delivered to mothers, (2) nutrition content delivered to couples, (3) bundled nutrition and parenting content delivered to mothers, (4) bundled nutrition and parenting content delivered couples, and (5) standard of care. Interventions were implemented in one randomly selected sub-village per village to minimize walking distance to group meetings. For each participating sub-village, a sampling frame of all households was randomly ordered and households were visited until 12 were enrolled in each of the 80 sub-villages for a total of 960 households. Blinding was not possible except for outcome assessors who were not made aware of village study arm assignments.

3. Procedures

Two peer groups were formed in each of the 32 intervention villages randomized to the couples arms—one for mothers and one for their spouses (fathers). These 64 peer groups received a couples intervention, either the nutrition or bundled nutrition and parenting package. In each of the 32 intervention villages randomized to the mothers-only arms, one mothers peer group was formed and received either the nutrition or bundled nutrition and parenting package; their spouses were not engaged in any intervention. Each of the 96 peer groups were comprised of 12 members and were assigned a government community health worker (CHW) from the same village and largely of the same gender to deliver the intervention packages. Most CHWs had basic reading and writing skills but had received minimal prior training in health promotion and referrals. The study provided a monthly stipend of TZS80,000/USD$35 to each CHW for the duration of intervention delivery.

Four behavior change intervention packages were developed by GC after extensive formative research and pilot testing (Fig. 2): (1) an enhanced nutrition package for mothers (mothers nutrition arms), (2) an enhanced nutrition and parenting package for mothers (mothers bundled arms), (3) an enhanced nutrition package for fathers (couples nutrition arms), and (4) an enhanced nutrition and parenting package for fathers (couples bundled arms). Each package consisted of a training manual (for CHW training), a facilitator's guide (for CHWs to use when preparing for and facilitating sessions), a flipchart (for direct use with participants), a recipe book, and a play and communication guide (for the bundled arms). The enhanced nutrition package for mothers covered infant and young child feeding (IYCF); food access; water, sanitation, and hygiene (WASH); stress management; and couples communication, decision-making, and conflict resolution. The bundled package for mothers was less nutrition- and WASH-intensive and included parenting content covering responsive caregiving, play and communication, and positive discipline. The enhanced nutrition package for mothers was adapted for fathers to ensure gender-responsive techniques and messaging and included sessions on gender norms and roles, positive masculinity, redefining fatherhood, and healthy relationships. Thereafter, the enhanced nutrition package for fathers was adapted to be less nutrition- and WASH-intensive and included sessions on responsive caregiving, play and communication, and positive discipline. When designing the packages, the study team drew on the UNICEF and Tanzania Ministry of Health's IYCF Counselling Package, the UNICEF and World Health Organization's Care for Child Development Package, and the suite of Equimundo resources on engaging men and boys for gender equality (among others). The EFFECTS packages were highly participatory and structured around critical reflection and discussion, problem-solving, practical skill-building, coaching, and commitment setting. Fig. 2 breaks down the intervention content by study arm and gender. Appendix 4 outlines session content by intervention package. The original intervention design was for CHWs to deliver 24 bi-weekly peer group sessions over 12 months beginning in July of 2019. However, activities were halted in March of 2020 for four months due to the COVID-19 pandemic. In July of 2020, the study team requested that CHWs pivot to bi-weekly home-visits for the remaining three months (6 sessions) through September of 2020 to mitigate COVID infection risks. In the couples study arms, nearly half of all sessions were delivered jointly to mothers and fathers, specifically the cooking demonstrations; sessions on couples' communication, decision-making, and conflict resolution; coached play and communication sessions with children present (in the couples bundled arm); and home-visits during the last three intervention months.

One project manager, eight supervisors, and two monitoring and evaluation specialists were recruited by the program and trained by US-based technical experts from GC and Harvard for five days in May of

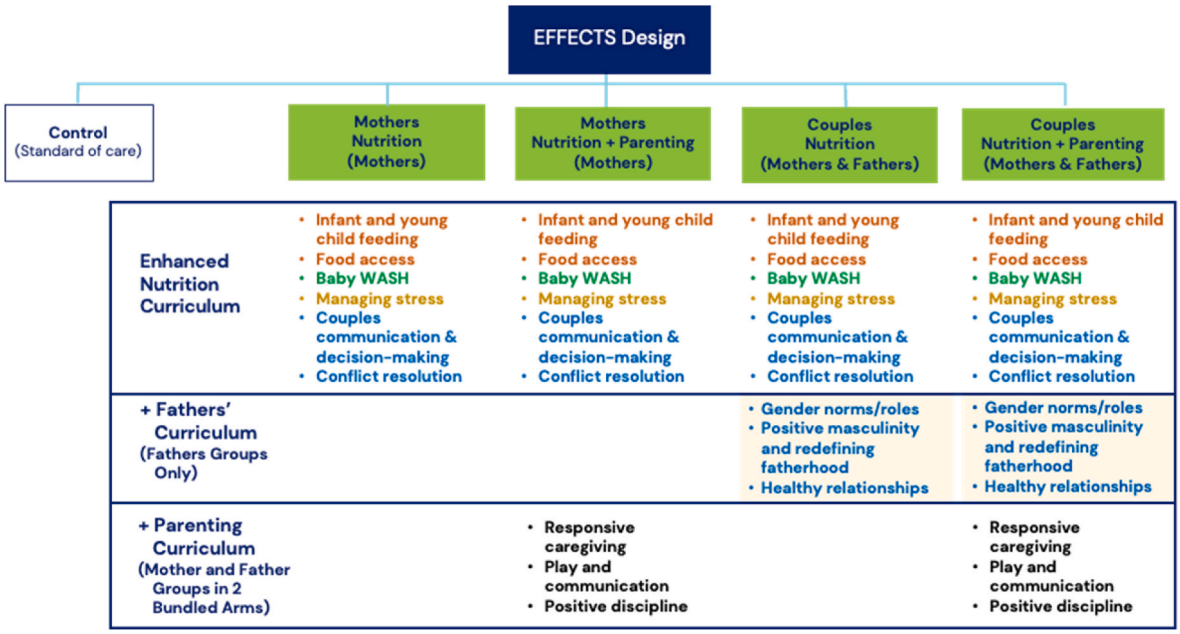


Fig. 2. Breakdown of EFFECTS intervention content by study arm.

2019. Supervisors (one for every 12 CHWs) cascaded the skills-based training down to CHWs over 10 days in June 2019. CHWs were trained using the intervention package assigned to their respective village, which included sessions on the fundamentals of behavior change and strengthening soft skills pertaining to communication, facilitation, and negotiation. Follow-up trainings were provided to the CHWs every quarter in addition to routine supervision and mentorship site visits during which challenges and support needs were addressed. Process data (e.g., attendance rates, session quality, participant satisfaction) were routinely collected, analyzed, and reviewed for tracking and improving the quality of implementation. Gunaratna et al.'s sister paper presents more detail on and the results of our program fidelity measures, and the EFFECTS study protocol provides more detail on the intervention design, delivery, and monitoring (EFFECTS Study Investigators, 2023).

Three evaluations were conducted in December 2018–May 2019 (baseline), November–December 2019 (midline), and November 2020–January 2021 (endline) (EFFECTS Study Investigators, 2023). Midline data are not discussed in this paper. Enumerators were recruited and trained by the project team at each study timepoint and collected data on tablets in Open Data Kit. Where feasible, we matched on sex of respondent. All evaluation modules were pilot tested prior to baseline. Serious adverse events were ascertained during outcome data collection and during groups sessions and promptly reported to the ethics committees (none were deemed related to the study). To ensure participant safety during data collection, questionnaires were administered to mothers and fathers separately and privately in Kiswahili. Enumerators were trained in local referral protocols for disclosures of IPV.

Outcomes Standardized scales and indices have recently been developed to measure WE across sectors and cultural contexts e.g., the project-level Women in Agriculture Empowerment Index (pro-WEAI) (Malapit et al., 2019), the Abridged Women's Empowerment in Nutrition Index (A-WENI) (Saha and Narayanan, 2022), the Women's Agency Scale 61 (Yount et al., 2020), and the Time-Use Agency Scale (Sinharoy et al., 2021). Nevertheless, standardizing and applying cross-cultural definitions and measures of WE remains a contested endeavor, especially as empowerment is a complex process of change that occurs within a particular socio-economic and cultural context where local meanings matter. To conceptualize our paper, we consulted several prominent frameworks that have been used to guide the design and measurement of empowerment programs. We were influenced by two frameworks in particular: (1) Naila Kabeer's seminal framing of WE as three interrelated dimensions of resources (pre-conditions; material, human, social), agency (processes of decision-making, negotiation, deception, manipulation), and achievements (well-being outcomes) (Kabeer, 1999), and (2) Anouka van Eerdewijk et al.'s conceptual model of women and girls' empowerment (which drew heavily on Kabeer, among others) comprised of the mutually reinforcing dimensions of agency (decision-making, collective action, leadership), resources (bodily integrity, critical consciousness, assets) and institutional structures (family, community, market, state) (van Eerdewijk et al., 2017). To analyze intervention effects on different dimensions of WE, we adopted Kabeer's broad overarching framework of resources, agency, achievements while also drawing on guidance from van Eerdewijk et al. and Malapit et al. when classifying our outcomes across these three categories.

We operationalized resources as assets or conditions (human, social, economic) that could, conceivably, enhance or inhibit a woman's ability to exercise choice, "at one remove from choice, a measure of potential rather than actualized choice" (Kabeer, 1999) (all of which are non-material in our case), namely: (1) paternal gender attitudes, (2) maternal and paternal time use, (3) maternal social support, and (4) maternal exposure to IPV (a measure of bodily integrity and physical safety). We generated an average score on a five-point scale (strongly agree to strongly disagree) of 11 statements measuring attitudes toward gender norms in intimate relationships (adapted from the Gender Equitable Men Scale [Nanda, 2011]). We developed an adapted version of the Women's Empowerment in Agriculture time use tool (Alkire et al., 2013) to measure maternal and paternal time allocated to domestic tasks and leisure and rest. We measured social support from friends, family, and significant other using the 12-item Multidimensional Scale of Perceived Social Support (Zimet et al., 1990). We measured maternal exposure to overall, physical, emotional, and sexual IPV in the past three months with ten items from the domestic violence module of the Tanzania Demographic and Health Survey (United States Agency for International Development, 2014).

We defined agency as a woman's ability to exercise voice and choice in her household. Our measures captured elements of "power within" or intrinsic agency and "power to" or instrumental agency (Jones et al., 2020). They included: (1) maternal gender attitudes, (2) maternal report

of couples' relationship quality, (3) maternal report of couples' communication frequency, (4) maternal report of couples communication quality, and (5) maternal household and reproductive decision-making power. Maternal gender attitudes (the same tool as for fathers) was conceptualized as a facet of intrinsic agency, acknowledging that agency also entails attitudes and self-concept (Kabeer, 1999; Yount et al., 2020). Relationship quality was measured with three binary items (often feeling listened to, appreciated, respected) reflecting intimate partner emotional support and trust in the household. They were adapted from the Bandebereho ("role model") trial in Rwanda, which evaluated the effects of a gender-transformative fatherhood and couples intervention on men's engagement in reproductive health, household decision-making and caregiving practices, and violence prevention. These items were originally used in the Decision-Making in Low-Income Couples (CDM) study (Doyle et al., 2018). Couples' communication frequency, quality, and women's decision-making power were each measured as a count of eight total topics or decisions related to household income, productive assets, food purchases, and animal-source food allocation that mothers reported often communicating about with their spouses, often feeling listened to by their spouses when discussing, or having a final say in (jointly or independently), respectively. Two similar items measured reproductive communication frequency and decision-making power. These tools were adapted from the Bandebereho trial (Doyle et al., 2018) and analyzed as overall scores and by sub-domain.

Achievements were operationalized as maternal well-being outcomes (Kabeer, 1999), namely women's dietary diversity (WDD) (a proxy for women's nutritional status), maternal depressive symptoms, and maternal parenting stress, all of which may influence child growth and/or development (Jones et al., 2019; Neamah et al., 2018). Results for maternal depressive symptoms and parenting stress are presented in Jeong et al.'s sister paper. WDD was measured as maternal self-report of food consumption over the past 24 h and seven days coded on a scale of 0–10 food groups. Appendix 5 summarizes in detail our GE/WE outcomes by empowerment domain. Data were collected on paternal reports of perceived social support, relationship quality, communication frequency, and women's decision-making power but are not discussed in this paper.

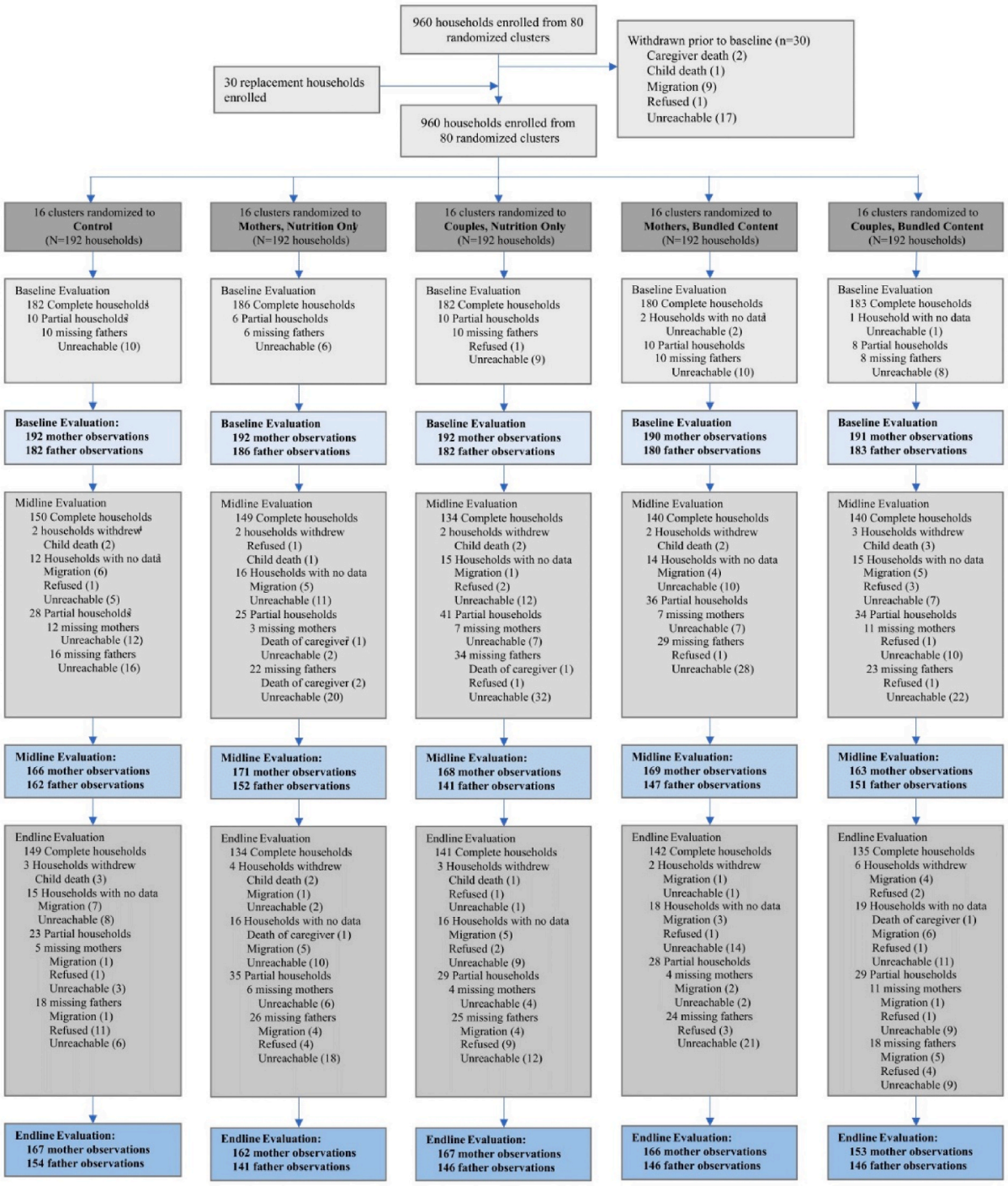
Statistical analysis Our target sample size was based on conservative statistical power calculation assuming pairwise comparison of individual study interventions for the primary outcome of child dietary diversity and allowed for 10% loss to follow-up. The design had 80% power to detect a difference of 0.43 food groups between two study arms assuming a standard deviation of one food group and an intracluster correlation coefficient of 0.1. Statistical analyses were clustered at the village level, used intention to treat, and included mixed effects linear and logistic regressions conducted in Stata/SE 16.1. Results were considered statistically significant at a p-value smaller than 0.05. All analyses included the fixed effects of district, study arm, evaluation, and an interaction term between study arm and evaluation, and the random effects of village and household. Covariance was specified as exchangeable for both random effects (villages and households). Restricted maximum likelihood was specified for continuous outcomes but not for binary or ordinal outcomes. Common covariates for adjusted analyses of all outcomes consisted of household size, wealth index, maternal and paternal age and education, marital relationship (monogamous/polygamous), and survey group (on time/delayed data collection). The adjusted analyses evaluating WDD, women's time use, and family planning outcomes also included women's physiological status (neither pregnant nor lactating/pregnant and/or lactating). Additionally, adjusted analyses evaluating gender attitudes, couple's communication frequency and quality, relationship quality, IPV, and women's decision-making power also included interviewer gender. Changes over time in trial outcomes were evaluated using four main research questions (RQ). RQ1: Was the change over time in outcomes among the four intervention arms different from the change in the control arm? RQ2: Was the change in outcomes among the father engagement (couples) arms different from the change among the mothers-only arms? RQ3: Was the change in outcomes among arms that received bundled nutrition and parenting content different from the change among arms that received nutrition-only content? RQ4: Was the impact over time of engaging fathers (vs mothers only) among arms receiving bundled content different from the impact of engaging fathers (vs mothers only) in arms receiving nutrition-only content?

Results Between October 2018 and April 2019, 960 household triads (192 per cluster) were enrolled in the study (Fig. 3). At baseline, data were collected from 913 fathers (95.1%) and 957 mothers (99.7%). At endline, data were collected from 733 fathers (76.4%) and 815 mothers (84.9%) (Fig. 2). Reasons for missingness included household withdrawal, migration, refusal, unreachability, and caregiver death. Each study arm at both time points had 16 village clusters. Baseline characteristics were similar across study arms with only minor imbalances (Table 1). Maternal and paternal age averaged 30 and 38 years, respectively, and 82% of mothers and 77% of fathers had completed primary school. Polygyny was practiced among 17.8% of households. Average land size was 3.8 acres. Only 1.1% of households reported access to running water. Nearly 50% of households were severely food insecure.

Intervention dose delivered and received were similar across intervention arms. All 24 sessions were delivered to each peer group. Peer group average attendance rates (first 18 sessions) by study arm ranged from 69% to 78%. The average attendance rate was lower among fathers (70%) than mothers (75%). Average home visit attendance rates (last 6 sessions) by study arm ranged from 70% to 93%, with lower attendance among fathers (76%) than mothers (84%). CHWs received between 12.5 (fathers nutrition arm) and 16.2 (mothers bundled arm) supportive supervision and mentorship sessions over the course of the intervention. More detailed process results are presented in the Gunaratna et al. sister paper.

Results presented below are adjusted (Table 2a, Table 2b, Table 2c) unless specified as unadjusted (Appendices 3a-c) or cross-sectional by RQ (Appendices 6a-c). Mothers in any intervention vs control (RQ1) were more likely to report (1) often feeling that their spouses respect them even when disagreeing (difference in log odds [DLO] 0.52, $p = 0.044$), (2) communicating with their spouses about a significantly greater number of topics pertaining to household resources (DLO 0.89, $p < 0.001$), specifically productive assets and food purchases, (3) often communicating with their spouses about contraceptive use (DLO 0.74, $p = 0.004$), and (4) often feeling their opinions were taken seriously by their spouses when discussing major household topics (DLO 0.66, $p = 0.003$). Fewer mothers in any intervention vs control reported exposure to emotional IPV (DLO -0.98, $p < 0.001$) and physical IPV (-0.79, $p = 0.007$) in the past 3 months. Mothers in any intervention arm also spent 0.68 h/day less on leisure and rest compared to mothers in the control arm ($p = 0.05$) although there were no significant differences between intervention arms and the control arm in time spent on domestic and paid work. Lastly, WDD among mothers in any intervention vs control was significantly higher over 24 h (0.37 food groups, $p = 0.011$) and 7 days (0.75 food groups, $p < 0.001$).

Fathers in the couples arms vs mothers-only arms (RQ2) reported greater agreement with gender-equitable norms (0.21 points, $p = 0.003$) as did mothers in couples arms vs mothers-only arms (0.23 points, $p < 0.001$). Fathers in the couples arms spent 1.06 more hours daily on domestic work vs fathers in the mothers-only arms ($p = 0.001$), with an increase from 2.64 to 3.89 h daily among fathers in the couples arms vs 2.57 to 2.74 h daily among fathers in the mothers-only arms (Appendix 6c). In couples arms, overall maternal decision-making power increased (DLO 0.46, $p = 0.016$), specifically over animal-source food allocation ($p = 0.04$) compared to the mothers-only arms. Interestingly, couples' communication frequency over animal-source food allocation marginally declined in the couples arms vs mothers-only arms ($p = 0.041$). Engaging couples had a positive effect on maternal 24-h dietary



[1]Complete households had data for father and mother at the indicated time point

[2]Partial households: either father or mother missing, but not both

[3]Households with no data: no data for either father or mother

[4]Households could withdraw at any point throughout the study. Households are included in this category if the entire household withdrew, with no further data, and/or the index child passed away.

[5]Households were considered migrated if the entire household moved away. However, the household could move back and be available for endline data collection.

[6]Unreachable may be due to travel, business, marital conflict/separation, or the household was unreachable after multiple attempts.

[7]Death of caregiver: the household could continue in the intervention, but the participants that passed away before midline were not included in the endline. No deaths were determined to be associated with the intervention.

Fig. 3. Trial profile.

Table 1
Baseline demographic characteristics by study arm.

Demographic Characteristics	Control	Mothers Nutrition	Couples Nutrition	Mothers Bundled Nutrition & Parenting	Couples Bundled Nutrition & Parenting
	N = 192	N = 192	N = 192	N = 192	N = 192
Mothers' age at baseline	29.97 [±6.76]	29.52 [±7.19]	29.39 [±6.70]	29.74 [±7.08]	29.69 [±7.33]
Fathers' age at baseline	38.22 [±10.00]	37.83 [±9.70]	38.31 [±9.90]	38.16 [±9.89]	38.46 [±11.88]
Mothers' educational categories at baseline					
No school	8	5	3.9	5.6	5.1
Some primary or less	5.7	3.3	5	4	5.1
Completed primary	79	80.6	84.9	86.4	78.1
Some secondary or more	7.4	11.1	6.1	4	11.8
Fathers' educational categories at baseline					
No school	4.4	3.8	3.9	1.7	2.2
Some primary or less	6	7.1	5	8.5	10.1
Completed primary	80.8	79.1	79	76.7	68.2
Some secondary or more	8.8	9.9	12.2	13.1	19.6
Total household size at baseline	7.23 [±2.62]	6.77 [±2.27]	6.71 [±2.42]	6.84 [±2.58]	6.96 [±2.69]
Proportion (%) of participants in a monogamous relationship	79.2	82.8	82.8	85.3	81.2
Wealth quintile					
Lowest	20.9	18.8	21.4	18.3	21.3
Second	18.1	24.2	19.8	19.4	18
Middle	20.9	16.7	24.2	19.4	19.1
Fourth	18.1	18.8	20.3	23.9	19.1
Highest	22	21.5	14.3	18.9	22.4
Total land owned from fathers form	4.43 [±7.41]	3.39 [±4.00]	3.75 [±4.94]	3.89 [±7.86]	3.74 [±6.14]
Household Food Security Status					
Food secure	9.4	13.5	12	15.3	14.1
Mildly food insecure	15.6	16.1	10.9	13.7	16.8
Moderately food insecure	27.1	19.8	18.8	24.2	25.1
Severely food insecure	47.9	50.5	58.3	46.8	44
Household has running water (%)	1.1	0.5	0.5	1.7	1.6
Household has an improved floor (%)	19.2	24.2	17	26.7	23.5
Household has an improved wall (%)	39.6	39.8	39	40.6	41
Household has an improved roof (%)	81.9	82.3	74.2	78.9	81.4

diversity in the unadjusted model (0.28 food groups, $p = 0.033$) (Appendix 3c), which became marginally significant in the adjusted model (0.24 food groups, $p = 0.069$). Engaging couples had no independent effects on maternal time use, intimate partner relationship quality, maternal exposure to IPV, maternal 7-day dietary diversity, and marginally decreased maternal social support from friends compared to mothers-only arms (DLO -0.45, $p = 0.04$).

Mothers in bundled arms compared to mothers in nutrition-only arms (RQ3) spent more time on leisure and rest (0.89 h/day, $p = 0.005$). However, pairwise comparisons show a decrease in leisure and rest time among mothers in all treatment arms compared to the control, but greater reductions were observed among mothers in the nutrition-only arms. Fewer mothers in the bundled vs nutrition-only arms reported exposure in the past three months to any form of IPV (DLO -0.58, $p = 0.02$), specifically sexual IPV (DLO -0.97, $p = 0.007$) and marginally physical IPV (DLO -0.52, $p = 0.058$) and emotional IPV (-0.42, $p = 0.087$). Exposure to any IPV reduced by 24.7% (from 66.7% to 42%) among mothers in the bundled arms vs 12.7% (from 59.8% to 47.1%) among mothers in the nutrition-only arms (Appendix 6a). While any intervention improved WDD over 7 days, bundled interventions increased WDD by 0.33 food groups more than nutrition-only interventions ($p = 0.026$). Bundling had no independent effects on maternal and paternal gender attitudes, paternal time use, maternal social support, maternal perception of intimate partner relationship quality, maternal report of couples communication frequency and quality, and maternal decision-making power.

For a few outcomes, we observed interaction effects between engaging couples and bundling, where engaging both parents was only effective or most effective when coupled with bundled content (RQ4). Fathers expressed greater acceptance of gender-equitable norms when couples (vs mothers-only) were exposed to bundled content compared to couples (vs mothers-only) exposed to nutrition-only content ($p = 0.082$), with fathers in the couples bundled arm expressing the highest acceptance of gender-equitable norms compared to all other study arms. The combination of engaging couples and bundling led also to the greatest positive effects on couples communication frequency over major household topics ($p = 0.015$) and WDD— specifically an increase by 0.72 food groups over one day and 1.16 food groups over seven days among mothers in the couples bundled arm compared to the control ($p < 0.001$).

4. Discussion

EFFECTS is the first published trial to measure the effects of (1) engaging couples (vs mothers-only) in gender-transformative nutrition and parenting behavioral interventions and (2) bundling gender-transformative nutrition and parenting interventions (vs nutrition-only) on household GE/WE. We collected robust data directly from fathers, including about their attitudes and subjective experiences, which is uncommon among most nutrition and parenting RCTs (a notable exception is the ANGeL trial that administered the pro-WEAI to both women and men). We found that, compared to a nutrition behavioral intervention engaging only mothers, both our gender-transformative approach to engaging fathers and couples (promoting positive fatherhood and equitable intimate partner relationships) and the inclusion of parenting sessions focused on responsive caregiving, positive discipline, and play and communication contributed in unique ways to the advancement of GE/WE across all three empowerment domains of resources, agency, and achievements. We observed the greatest benefits to women's agency (specifically, communication frequency) and achievements (specifically, their dietary diversity) when couple engagement and bundling were combined. Notably, our interventions neither

Table 2a
Adjusted difference in difference results (difference in log odds for ordinal and binary variables) (resources).

RESOURCES																
OUTCOMES	RQ1: Any intervention vs. control		RQ2: Father engagement vs. mothers only		RQ3: Bundling vs. nutrition only		RQ4: Engaging fathers × bundling interaction		Mothers nutrition vs. control		Couples nutrition vs. control		Mothers nutrition + parenting vs. control		Couples nutrition + parenting vs. control	
	Estimate (95% CI)	P-value	Estimate (95% CI)	P-value	Estimate (95% CI)	P-value	Estimate (95% CI)	P-value	Estimate (95% CI)	P-value	Estimate (95% CI)	P-value	Estimate (95% CI)	P-value	Estimate (95% CI)	P-value
Gender attitudes (1–5)																
Paternal gender attitudes	0.18 (0.02, 0.33)	0.024	0.21 (0.07, 0.36)	0.003	−0.01 (−0.15, 0.13)	0.922	0.25 (−0.03, 0.53)	0.082	0.13 (−0.06, 0.33)	0.178	0.23 (0.03, 0.42)	0.024	0 (−0.19, 0.2)	0.970	0.34 (0.15, 0.54)	0.001
Time use (hours)																
Maternal, work overall	0.3 (−1.1, 1.69)	0.676	0.06 (−1.2, 1.32)	0.930	−0.04 (−1.3, 1.22)	0.948	0.31 (−2.21, 2.83)	0.809	0.37 (−1.4, 2.14)	0.684	0.27 (−1.5, 2.03)	0.765	0.17 (−1.6, 1.94)	0.850	0.38 (−1.4, 2.17)	0.674
Maternal, domestic work activities	0 (−1.13, 1.13)	0.998	−0.07 (−1.1, 0.95)	0.886	−0.09 (−1.11, 0.93)	0.862	−0.49 (−2.53, 1.55)	0.640	−0.04 (−1.47, 1.4)	0.959	0.13 (−1.3, 1.56)	0.857	0.12 (−1.32, 1.55)	0.874	−0.2 (−1.65, 1.24)	0.783
Maternal, income-generating activities	0.3 (−0.28, 0.88)	0.307	0.12 (−0.41, 0.64)	0.657	0.05 (−0.47, 0.58)	0.844	0.81 (−0.24, 1.86)	0.131	0.42 (−0.32, 1.16)	0.265	0.13 (−0.6, 0.87)	0.721	0.07 (−0.67, 0.8)	0.857	0.59 (−0.15, 1.33)	0.119
Maternal, leisure and rest	−0.68 (−1.36, 0)	0.050	0.23 (−0.39, 0.84)	0.469	0.89 (0.27, 1.5)	0.005	−0.45 (−1.68, 0.78)	0.470	−1.35 (−2.22, −0.49)	0.002	−0.9 (−1.76, −0.04)	0.041	−0.24 (−1.1, 0.62)	0.588	−0.24 (−1.11, 0.63)	0.593
Paternal, work overall	0.91 (−0.14, 1.95)	0.089	1.13 (0.19, 2.08)	0.019	−0.21 (−1.16, 0.74)	0.664	−1.32 (−3.21, 0.57)	0.172	0.11 (−1.22, 1.44)	0.868	1.91 (0.58, 3.23)	0.005	0.56 (−0.76, 1.89)	0.406	1.04 (−0.29, 2.36)	0.124
Paternal, domestic work activities	0.82 (0.17, 1.48)	0.014	1.06 (0.46, 1.66)	0.001	0.17 (−0.42, 0.77)	0.570	−0.83 (−2.02, 0.36)	0.173	0 (−0.84, 0.84)	1.000	1.48 (0.64, 2.31)	0.001	0.59 (−0.25, 1.42)	0.168	1.23 (0.4, 2.07)	0.004
Paternal, income-generating activities	0.08 (−0.69, 0.85)	0.840	0.06 (−0.64, 0.76)	0.869	−0.38 (−1.08, 0.31)	0.281	−0.49 (−1.88, 0.9)	0.492	0.12 (−0.86, 1.1)	0.812	0.42 (−0.55, 1.4)	0.397	−0.02 (−1, 0.96)	0.969	−0.21 (−1.18, 0.77)	0.679
Paternal, leisure and rest	0.75 (0.01, 1.5)	0.047	−0.48 (−1.16, 0.19)	0.162	0.62 (−0.05, 1.29)	0.072	−0.62 (−1.97, 0.72)	0.364	0.53 (−0.42, 1.47)	0.273	0.36 (−0.59, 1.3)	0.457	1.46 (0.52, 2.4)	0.002	0.67 (−0.28, 1.61)	0.166
Social support (% with average score of 4-5)																
Overall	0.1 (−0.37, 0.58)	0.668	−0.48 (−0.92, −0.05)	0.027	0.3 (−0.13, 0.72)	0.176	0.35 (−0.51, 1.2)	0.428	0.28 (−0.32, 0.89)	0.355	−0.37 (−0.97, 0.22)	0.221	0.41 (−0.2, 1.01)	0.186	0.1 (−0.51, 0.7)	0.756
Peers	0.27 (−0.21, 0.74)	0.271	−0.45 (−0.88, −0.02)	0.040	0.34 (−0.09, 0.77)	0.122	0.4 (−0.46, 1.26)	0.357	0.42 (−0.18, 1.02)	0.169	−0.23 (−0.83, 0.37)	0.450	0.56 (−0.04, 1.16)	0.069	0.31 (−0.29, 0.92)	0.314
Family	−0.51 (−1.18, 0.16)	0.134	−0.03 (−0.63, 0.58)	0.932	0.14 (−0.46, 0.74)	0.651	−0.46 (−1.67, 0.74)	0.450	−0.68 (−1.54, 0.17)	0.117	−0.48 (−1.31, 0.35)	0.259	−0.31 (−1.18, 0.55)	0.478	−0.57 (−1.41, 0.27)	0.181
Any special person	−0.39 (−1.03, 0.25)	0.236	−0.33 (−0.89, 0.22)	0.239	−0.24 (−0.8, 0.31)	0.393	−0.01 (−1.12, 1.1)	0.989	−0.1 (−0.93, 0.72)	0.806	−0.43 (−1.22, 0.35)	0.279	−0.34 (−1.14, 0.46)	0.403	−0.68 (−1.48, 0.12)	0.096
Intimate partner violence over past 3 months (%)																
Any IPV	−0.89 (−1.43, −0.36)	0.001	−0.2 (−0.69, 0.29)	0.421	−0.58 (−1.07, −0.09)	0.020	0.46 (−0.52, 1.44)	0.356	−0.39 (−1.07, 0.29)	0.261	−0.82 (−1.5, −0.14)	0.017	−1.2 (−1.89, −0.51)	0.001	−1.17 (−1.86, −0.48)	0.001
Physical IPV	−0.79 (−1.37, −0.22)	0.007	0.03 (−0.5, 0.57)	0.899	−0.52 (−1.05, 0.02)	0.058	−0.09 (−1.16, 0.98)	0.867	−0.58 (−1.31, 0.16)	0.126	−0.5 (−1.23, 0.24)	0.184	−1.05 (−1.78, −0.32)	0.005	−1.06 (−1.81, −0.3)	0.006
Emotional IPV	−0.98 (−1.5, −0.45)	0.000	−0.32 (−0.8, 0.17)	0.202	−0.42 (−0.91, 0.06)	0.087	0.59 (−0.38, 1.56)	0.230	−0.46 (−1.12, 0.21)	0.178	−1.07 (−1.74, −0.4)	0.002	−1.18 (−1.85, −0.51)	0.001	−1.2 (−1.88, −0.51)	0.001
Sexual IPV	−0.3 (−1.04, 0.43)	0.416	−0.05 (−0.75, 0.65)	0.884	−0.97 (−1.67, −0.27)	0.007	−0.26 (−1.65, 1.14)	0.718	0.14 (−0.79, 1.07)	0.767	0.22 (−0.68, 1.12)	0.636	−0.7 (−1.64, 0.24)	0.145	−0.88 (−1.91, 0.15)	0.096

directly intervened in women's ownership of productive assets nor supported them as food producers as in most previously evaluated nutrition-sensitive agricultural programs that demonstrated empowerment outcomes.

Engaging fathers and couples had positive effects on some but not all aspects of GE/WE, namely paternal and maternal gender attitudes (resources and agency), paternal time spent on domestic chores (resources), and maternal decision-making power (agency). These results give credence to our overarching hypothesis that, even in a relatively short period of time, engaging fathers in nutrition and parenting interventions that simultaneously work with couples to identify common goals, define healthy relationships, and challenge restrictive gender norms has gender-transformative potential. Our results align with other empirical studies that found men's engagement strategies modelling positive fatherhood and promoting equitable gender norms can have a transformative impact on multiple interrelated wellbeing outcomes for children, parents, and couples (Doyle et al., 2018; Singla et al., 2015; Jensen et al., 2021).

Gender attitudes: An important strategy for promoting gender equality and improving child well-being is addressing internalized sociocultural norms and beliefs that perpetuate expectations about women's and men's roles and capacities, especially in contexts such as Mara where women and girls experience high levels of bias (Matare et al., 2021; Ewerling et al., 2020; Barker et al., 2010; Bhagowalia et al., 2012; Amugsi et al., 2016). A 2021 paper from the Sanitation Hygiene Infant Nutrition Efficacy (SHINE) trial in Zimbabwe found predictive associations between more egalitarian gender norm attitudes and optimal maternal health and childcare practices (Matare et al., 2021), lending further evidence to the narrative that interventions challenging inequitable gender norms benefit not only women and their health but child wellbeing as well. We found that participation of fathers in any intervention, coupled with exposure to gender content, shifted paternal and maternal attitudes toward greater acceptance of gender-equitable norms and practices. While further investigation is warranted, this suggests that changes in men's attitudes and/or behaviors may be critical for addressing women's internalized sense of their own inferior status, especially if women on average hold more gender inequitable attitudes than men (which was the case in our study context at both baseline and endline).

Paternal time use: Time is a crucial resource for women with potential trade-offs between heavier workloads and nutrition and development outcomes (Quisumbing et al., 2020). Critical reflection on gendered division of labor and opportunities for more engagement of fathers in family wellbeing were core intervention foci. An encouraging finding was the increase by more than an hour a day in fathers' time spent on domestic tasks resulting from intervention participation. We did not find a corresponding reduction in women's time spent on domestic (including care) work, which is considerable at more than 9 h per day at endline. This aligns with Doyle et al.'s finding that increasing men's involvement in childcare and household tasks does not necessarily impact women's time spent on these tasks (Doyle et al., 2018).

Maternal decision-making power: Acquiring or expanding the ability to make strategic life choices among those who have been previously denied such as ability is at the heart of the empowerment process (Kabeer, 1999). When women have greater control over income and assets, they have greater household bargaining power which may improve MCHN (Heckert et al., 2019; Amugsi et al., 2016; Carlson et al., 2015) and child development (Ewerling et al., 2020). We found that when couples (compared to mothers only) engaged in gender-transformative interventions, women reported greater overall household decision-making power driven largely by greater decision-making power over household animal-source food allocation. Doyle et al. also found that a couples-focused gender-transformative reproductive and maternal health and violence prevention program can reduce men's household decision-making dominance (Doyle et al., 2018). Although effect sizes were modest with no impact on other decision-making sub-domains, our results suggest that nutrition and parenting behavior change interventions have potential to address household power dynamics and promote more gender-equitable influence over household resources.

Bundling of nutrition and parenting interventions had a buffer effect on women's daily time spent on leisure and rest (*resources*) and a positive effect on reducing maternal IPV exposure (*resources*) and increasing WDD over 7 days (*achievements*). *Maternal time use:* It's possible that mothers in the bundled arms, who received coaching on promotion of early learning through play, were more likely to perceive (and thus report) playtime as leisure rather than work. It is not surprising that mothers' participation in any intervention took away from their time spent on leisure and rest. Van den Bold et al. found that a nutrition-sensitive agriculture program led to greater time spent by women on agriculture activities, but this did not negatively impact maternal and child nutrition (van den Bold et al., 2021). It is important nonetheless to understand how interventions like ours may bring both benefits and disadvantages to mothers and children.

IPV: Measuring women's exposure to physical and sexual IPV in the context of nutrition and parenting programs is important given their associations with child growth and development (Neamah et al., 2018). Surprisingly, in our case, bundling as opposed to engaging fathers contributed to reductions in maternal exposure to sexual IPV, and marginally physical and emotional IPV (pair-wise comparisons of each intervention arm against the control show the greatest reduction in all forms of IPV to be among mothers in the bundled couples arm, Table 2a). These results mirror the reductions in maternal and paternal use of harsh discipline observed in the bundled vs nutrition-only arms presented in Jeong et al.'s sister paper and align with Jensen et al.'s evaluation of Sugira Muryango—a home-visiting parenting intervention linked to Rwanda's social protection system—which had positive effects on reductions in IPV and use of harsh discipline (Jensen et al., 2021). In our case, it is possible that responsive caregiving and positive discipline sessions in the bundled packages had broader impacts on family violence. Levtov et al. highlight the multiple mechanisms through which men's engagement in maternal and child health programs reduces IPV, specifically by advancing positive couple dynamics and men's gender-equitable attitudes (Levtov et al., 2022). Similarly in our case, further analysis is warranted on the mechanisms by which hypothesized parenting mediating variables link our bundled nutrition and parenting interventions to reduced risk of IPV.

When mothers *and* fathers participated in sessions that moved beyond nutrition to coach parents on provision of nurturing care to their children, we observed the greatest positive effects on several outcomes spanning all three empowerment domains: paternal gender attitudes (*resources*), couples communication frequency (*agency*), and WDD over 24 h and 7 days (*achievements*). *Paternal gender attitudes:* The largest shift in paternal attitudes toward greater acceptance of gender-equitable norms occurred in the couples bundled arm. This suggests that interactive parenting sessions that bring fathers together with their children and spouses to reinforce positive father-child relationships may have greater impact on gender norms change than gender-responsive nutrition-only programs. *Couples communication:* Spousal communication frequency may mediate a nutrition program's impact on child nutritional status (Heckert et al., 2019). We observed the greatest increase in couples communication frequency for the overall score and the sub-domains of household income, productive assets, and food among couples engaged in a bundled intervention.

WDD: Generally, we found that maternal diets improved across all intervention arms compared to the control, especially over seven days. We found marginally greater benefit of engaging both parents vs mothers only for WDD over 24 h, and significant but still relatively modest effects of bundling on WDD over seven days. When these two intervention conditions of engaging couples and bundling were combined, we observed the greatest benefit to maternal diets. This suggests that interventions that engage both parents and bundle parenting with nutrition messages can have synergistic benefits to women's health. In

Table 2b
Adjusted difference in difference results (difference in log odds for ordinal and binary variables) (agency).

AGENCY																
OUTCOMES	RQ1: Any intervention vs. control		RQ2: Father engagement vs. mothers only		RQ3: Bundling vs. nutrition only		RQ4: Engaging fathers × bundling interaction		Mothers nutrition vs. control		Couples nutrition vs. control		Mothers nutrition + parenting vs. control		Couples nutrition + parenting vs. control	
	Estimate (95% CI)	P-value	Estimate (95% CI)	P-value	Estimate (95% CI)	P-value	Estimate (95% CI)	P-value	Estimate (95% CI)	P-value	Estimate (95% CI)	P-value	Estimate (95% CI)	P-value	Estimate (95% CI)	P-value
Gender attitudes (1-5)																
Maternal gender attitudes	0.01 (−0.13, 0.14)	0.928	0.23 (0.11, 0.35)	0.000	−0.02 (−0.14, 0.1)	0.753	−0.15 (−0.4, 0.09)	0.219	−0.14 (−0.31, 0.04)	0.121	0.17 (0, 0.34)	0.054	−0.08 (−0.25, 0.09)	0.367	0.07 (−0.1, 0.25)	0.417
Couples' relationship quality																
Often feel listened to by partner	0.44 (−0.19, 1.08)	0.174	0.4 (−0.23, 1.03)	0.216	−0.46 (−1.1, 0.17)	0.153	0.91 (−0.36, 2.18)	0.159	0.7 (−0.19, 1.59)	0.124	0.65 (−0.2, 1.49)	0.136	−0.22 (−1, 0.56)	0.586	0.64 (−0.2, 1.48)	0.135
Often feel appreciated by partner	0.33 (−0.24, 0.91)	0.255	0.03 (−0.52, 0.59)	0.911	0.24 (−0.31, 0.8)	0.388	0.08 (−1.03, 1.19)	0.886	0.21 (−0.53, 0.96)	0.570	0.21 (−0.55, 0.96)	0.591	0.42 (−0.32, 1.16)	0.266	0.49 (−0.27, 1.26)	0.208
Often feel respected by partner even during disagreement	0.52 (0.01, 1.03)	0.044	−0.11 (−0.59, 0.37)	0.648	0.3 (−0.18, 0.78)	0.218	0.46 (−0.5, 1.41)	0.350	0.54 (−0.13, 1.21)	0.115	0.2 (−0.44, 0.84)	0.540	0.61 (−0.03, 1.25)	0.060	0.73 (0.06, 1.39)	0.031
Couples' communication frequency																
Overall	0.89 (0.46, 1.32)	0.000	−0.09 (−0.47, 0.3)	0.663	0.29 (−0.09, 0.68)	0.136	0.97 (0.19, 1.74)	0.015	1.03 (0.48, 1.57)	0.000	0.46 (−0.08, 0.99)	0.094	0.84 (0.29, 1.38)	0.003	1.24 (0.68, 1.79)	0.000
Household income (% often)	0.61 (−0.06, 1.27)	0.073	0.55 (−0.11, 1.21)	0.100	0.41 (−0.25, 1.06)	0.223	0.93 (−0.38, 2.24)	0.165	0.36 (−0.5, 1.22)	0.414	0.45 (−0.4, 1.29)	0.301	0.3 (−0.52, 1.13)	0.473	1.32 (0.37, 2.26)	0.006
Productive assets (% often)	0.64 (0.03, 1.25)	0.039	0.12 (−0.46, 0.71)	0.676	0.33 (−0.25, 0.91)	0.270	0.9 (−0.26, 2.07)	0.128	0.64 (−0.14, 1.42)	0.107	0.31 (−0.48, 1.1)	0.438	0.52 (−0.25, 1.28)	0.186	1.09 (0.27, 1.91)	0.009
Food purchases (% often)	0.61 (0.04, 1.18)	0.035	0.41 (−0.14, 0.96)	0.145	0.25 (−0.3, 0.8)	0.378	1.28 (0.18, 2.38)	0.023	0.6 (−0.15, 1.35)	0.115	0.37 (−0.35, 1.1)	0.312	0.21 (−0.51, 0.93)	0.564	1.26 (0.48, 2.04)	0.002
Animal source food allocation (% often)	0.48 (−0.07, 1.02)	0.086	−0.52 (−1.03, −0.02)	0.041	0.36 (−0.14, 0.87)	0.155	0.81 (−0.2, 1.81)	0.116	0.76 (0.05, 1.47)	0.036	−0.17 (−0.84, 0.5)	0.622	0.72 (0.01, 1.43)	0.046	0.6 (−0.1, 1.3)	0.094
Whether or when to use contraception (% often)	0.74 (0.24, 1.25)	0.004	−0.11 (−0.57, 0.35)	0.626	0.19 (−0.27, 0.65)	0.408	0.09 (−0.83, 1.01)	0.846	0.72 (0.08, 1.37)	0.027	0.57 (−0.07, 1.2)	0.083	0.87 (0.23, 1.52)	0.008	0.8 (0.16, 1.45)	0.015
Couples' communication quality																
Overall	0.66 (0.23, 1.09)	0.003	−0.23 (−0.62, 0.16)	0.255	0.18 (−0.2, 0.57)	0.354	0.59 (−0.19, 1.37)	0.137	0.83 (0.28, 1.38)	0.003	0.31 (−0.23, 0.85)	0.263	0.72 (0.17, 1.27)	0.011	0.79 (0.24, 1.34)	0.005
Household income (% often if often to at least one of the items)	−0.05 (−0.76, 0.65)	0.882	0.33 (−0.34, 1)	0.339	−0.28 (−0.95, 0.4)	0.421	0.86 (−0.49, 2.21)	0.210	0.14 (−0.82, 1.09)	0.780	0.03 (−0.85, 0.92)	0.941	−0.57 (−1.43, 0.29)	0.195	0.19 (−0.76, 1.14)	0.698
Productive assets (% often if often to at least one of the items)	0.36 (−0.32, 1.03)	0.299	0.13 (−0.54, 0.8)	0.698	0.08 (−0.59, 0.74)	0.821	0.46 (−0.87, 1.8)	0.499	0.37 (−0.52, 1.25)	0.417	0.27 (−0.6, 1.14)	0.546	0.21 (−0.63, 1.06)	0.620	0.58 (−0.37, 1.52)	0.231
Food purchases (% often)	0.38 (−0.2, 0.95)	0.200	−0.33 (−0.89, 0.22)	0.242	0.16 (−0.4, 0.72)	0.570	0.87 (−0.24, 1.99)	0.125	0.68 (−0.09, 1.45)	0.083	−0.09 (−0.81, 0.63)	0.807	0.4 (−0.33, 1.13)	0.278	0.51 (−0.27, 1.28)	0.201
Animal source food allocation (% often)	0.31 (−0.31, 0.92)	0.328	−0.47 (−1.03, 0.1)	0.105	0.16 (−0.41, 0.72)	0.588	0.83 (−0.3, 1.97)	0.150	0.67 (−0.15, 1.49)	0.110	−0.21 (−0.96, 0.53)	0.575	0.41 (−0.38, 1.2)	0.308	0.36 (−0.43, 1.15)	0.374
Household decision-making																
Overall	−0.09 (−0.5, 0.33)	0.678	0.46 (0.08, 0.84)	0.016	0.06 (−0.32, 0.43)	0.758	0 (−0.75, 0.75)	0.993	−0.35 (−0.87, 0.18)	0.194	0.11 (−0.42, 0.65)	0.674	−0.29 (−0.81, 0.23)	0.279	0.17 (−0.36, 0.7)	0.526
Household income	−0.29 (−0.79, 0.21)	0.251	0.17 (−0.28, 0.62)	0.463	0.13 (−0.32, 0.58)	0.567	0.04 (−0.86, 0.94)	0.928	−0.43 (−1.06, 0.2)	0.183	−0.28 (−0.9, 0.34)	0.373	−0.32 (−0.95, 0.31)	0.317	−0.13 (−0.77, 0.51)	0.691
Household productive assets	−0.19 (−0.69, 0.31)	0.450	0.34 (−0.11, 0.79)	0.141	0.18 (−0.27, 0.63)	0.444	−0.26 (−1.16, 0.64)	0.573	−0.51 (−1.15, 0.12)	0.110	−0.05 (−0.68, 0.58)	0.884	−0.21 (−0.84, 0.42)	0.516	0 (−0.64, 0.64)	0.998
Household food purchases	−0.13 (−0.72, 0.47)	0.675	0.35 (−0.16, 0.86)	0.180	−0.02 (−0.53, 0.48)	0.924	−0.01 (−1.03, 1.01)	0.988	−0.29 (−1.03, 0.45)	0.440	0.06 (−0.68, 0.8)	0.871	−0.31 (−1.06, 0.44)	0.412	0.03 (−0.71, 0.77)	0.931
Household animal-source food allocation	−0.38 (−0.89, 0.13)	0.147	0.48 (0.02, 0.95)	0.040	0.08 (−0.38, 0.54)	0.719	0.06 (−0.86, 0.98)	0.903	−0.65 (−1.3, 0.01)	0.052	−0.19 (−0.83, 0.44)	0.553	−0.59 (−1.24, 0.05)	0.071	−0.08 (−0.74, 0.58)	0.813
Use of a family planning method	−0.33 (−1.18, 0.53)	0.455	0.02 (−0.78, 0.81)	0.967	−0.14 (−0.94, 0.65)	0.723	−0.3 (−1.89, 1.29)	0.711	−0.34 (−1.46, 0.78)	0.556	−0.17 (−1.23, 0.9)	0.755	−0.33 (−1.4, 0.74)	0.545	−0.46 (−1.59, 0.67)	0.421

Table 2c
Adjusted difference in difference results (difference in log odds for ordinal and binary variables) (achievements).

ACHIEVEMENTS																		
OUTCOMES	RQ1: Any intervention vs. control		RQ2: Father engagement vs. mothers only		RQ3: Bundling vs. nutrition only		RQ4: Engaging fathers × bundling interaction		Mothers nutrition vs. control		Couples nutrition vs. control		Mothers nutrition + parenting vs. control		Couples nutrition + parenting vs. control	
	Estimate (95% CI)	P-value	Estimate (95% CI)	P-value	Estimate (95% CI)	P-value	Estimate (95% CI)	P-value	Estimate (95% CI)	P-value	Estimate (95% CI)	P-value	Estimate (95% CI)	P-value	Estimate (95% CI)	P-value
Maternal dietary diversity (out of 10 food groups)																
Over 24 h	0.37 (0.08, 0.65)	0.011	0.24 (−0.02, 0.5)	0.069	0.08 (−0.18, 0.34)	0.544	0.78 (0.27, 1.3)	0.003	0.41 (0.05, 0.77)	0.027	0.25 (−0.11, 0.61)	0.167	0.09 (−0.27, 0.45)	0.607	0.72 (0.36, 1.09)	0.000
Over 7 days	0.75 (0.42, 1.07)	0.000	0.23 (−0.06, 0.53)	0.119	0.33 (0.04, 0.62)	0.026	0.53 (−0.06, 1.11)	0.077	0.6 (0.19, 1.01)	0.004	0.57 (0.16, 0.98)	0.007	0.66 (0.26, 1.07)	0.001	1.16 (0.75, 1.58)	0.000

Gunaratna et al.'s sister paper, we report a similar pattern whereby the combination of engaging couples and bundling led to synergistic improvements in child diets. These two papers combined add new evidence (and the gender perspective) to the parenting and nutrition integration literature (Grantham-McGregor et al., 2014; Hurley et al., 2016; Black et al., 2015).

Engaging couples in nutrition and parenting behavioral interventions that promote positive fatherhood and more equitable intimate partner relationships can improve child diets (Gunaratna et al.), child development and parenting practices (Jeong et al.), IYCF and WASH practices (Ambikapathi et al.), and advance women's agency and access to resources, specifically by promoting women's household decision-making power and more gender-equitable attitudes and division of labor in the home. Moreover, the combination of nutrition and parenting sessions that focus on early learning and strengthening the parent-child relationship, especially when both parents were engaged, advanced women's agency, achievements, and access to resources in terms of greater paternal agreement with household gender equality, reductions in maternal exposure to IPV, and increases in couples communication frequency and WDD. Given the relationship between GE/WE and child nutrition and development—and the evidence presented herein that nutrition and parenting behavior change interventions can be combined, made gender-transformative, and effectively delivered by CHWs— future nutrition and parenting programs should be delivered together and address household GE/WE as a core programmatic objective to maximize positive impacts for women, children, and families.

Our study had several limitations. We excluded coastal communities that take fathers away from their families for long periods of time and prioritized households with fathers who live with their spouses and children most of the year. The COVID-19 pandemic led to a major disruption while implementing our interventions and necessitated a three-month intermission and pivot to a home delivery model. Our results are specific to the structure of our hybrid peer group-home visit program. These factors may limit generalizability of results to other contexts, family structures, and intervention delivery models. Additionally, the intervention objectives were not primarily focused on advancing GE/WE and therefore intervention designers were tasked with addressing multiple priority behaviors within the intervention packages. Our measures depended on self-report and hence may be prone to recall and/or social desirability bias. We were unable to fully mask group assignment from participants and data collectors who were not affiliated with the intervention. Some of our GE/WE measures were not standardized items or scales that had been validated in our study context and by the subjects of this research. Moreover, no significant economic strengthening elements were embedded within the intervention arms, which may have limited impact on our study outcomes given we know that, in at least some contexts, women's access to and control over resources may be instrumental both to their empowerment and to the adoption of improved health and nutrition behaviors. Lastly, 12 months is a relatively short period of time to meaningfully address household gender norms.

To strengthen the design of gender-transformative nutrition and parenting programs, future projects should not only engage men to challenge restrictive gender norms but should also employ context-specific metrics to test direct, indirect, and synergistic pathways linking specific domains of GE/WE with nutrition and parenting/development practices and outcomes. Data should be collected from both caregivers to assess empowerment impacts on both partners and the couple as a unit. Empirical research is also needed on how to optimize the engagement of fathers and bundling of nutrition and parenting interventions such that impact on GE/WE is maximized. We concur with Doyle et al. that further research should explore how tasks change or shift within the household as men take on greater caregiving roles, and how men's involvement can alleviate women's domestic and care burden and stress (Doyle et al., 2018). Further explorations are needed

on relationships between women's time use, access to resources, and child nutrition and development outcomes, and on the degree to which shifts in gender norms and attitudes affect household gender equality, especially decision-making patterns and domains most predictive of child nutrition and development outcomes. Finally, in resource-constrained settings, program designers should contemplate if desired impacts can be maximized by expanding participant access to material assets.

5. Conclusion

To the best of our knowledge, EFFECTS is the first published RCT that examines (1) the gender-transformative potential of engaging both parents (couples) to advance GE/WE in the context of bundled nutrition and parenting behavior change interventions, and (2) bundled nutrition and parenting behavior change interventions as a platform for advancing WE while also operationalizing WE as a pathway to better child nutrition and development outcomes (underscoring empowerment's intrinsic and instrumental value to both women and children). Our findings generate novel evidence that, with the right approach, materials, training, and mentorship, CHWs can deliver gender-transformative nutrition and parenting interventions to couples in low-resource community settings with potentially synergistic positive effects on household gender relations and maternal and child well-being.

Author contributions

LG conceptualized and secured funding for the trial, conceptualized this paper, guided the analysis for this paper, developed the intervention packages, oversaw intervention delivery, and wrote the original draft of the paper; CKV contributed to conceptualizing and ran the analyses for this paper; RA conceptualized the trial, oversaw data collection and management, supervised the analysis, and validated results for this paper; NSG conceptualized and helped secure funding for the trial, oversaw data collection, supervised the analysis, and validated results for this paper; PR helped conceptualize this paper and contributed to the original draft of the paper; AS helped conceptualize this paper; JJ conceptualized the trial and contributed to intervention package and evaluation tool development; EK supervised all aspects of intervention implementation; AKY conceptualized and secured funding for the trial and provided oversight to development of bundled intervention packages; SFO contributed to the trial profile and analysis of process data; DM supervised data collection; MMS administered and oversaw data collection activities; GP helped conceptualize and administer the trial; HC provided administration support to the trial and contributed to the literature review for this paper; CED provided administrative support to the trial; MPK conceptualized and secured funding for and provided oversight to all aspects of the trial. All authors critically reviewed and approved this manuscript.

Data availability

Data will be made available on request.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.socscimed.2023.115869.

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