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Are Behavioral Change Interventions Needed to Make Cash Transfer Programs Work for Children? Experimental Evidence from Myanmar

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ABSTRACT

We experimentally evaluate the impact on child malnutrition of a maternal cash transfer program in Myanmar that was supplemented with Social Behavior Change Communication (SBCC) in a subset of villages. The combination of interventions significantly reduced the proportion of children stunted, while cash alone had no impact on stunting. SBCC appears to have worked in conjunction with cash to reduce stunting by encouraging mothers to increase children's total calories and protein consumed. The findings provide evidence that information constraints contribute to low income-elasticity of calorie demand among malnourished populations, and underscore the importance of adding SBCC to cash transfer programs.

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1 Introduction

Despite widescale improvements in economic wellbeing over the past few decades, child malnutrition remains a global health concern, affecting more than 150 million children annually (World Bank, 2017). When families cannot afford to provide children with sufficient nutrient-rich calories during critical windows of growth, malnutrition can lead to irreversible decreases in health and cognitive human capital that are visible in permanent differences in stature. In Myanmar, where this study takes place, an estimated 29 percent of the children under age five are stunted, a rate that can reach as high as 50 percent in poor rural areas (Demographic Health Surveys, 2015; United Nation Standing Committee on Nutrition, 2010).

The provision of adequate nutrition in early life is believed to be crucial to realizing an individual's full physical and cognitive potential throughout the life course. Evidence from both medical and social science research has contributed to the consensus that the in-utero phase and the first two years of life constitute the most critical period of development (Almond and Currie, 2011a). Inadequate nutrition during the first 1000 days of life is believed to produce higher susceptibility to illness, and impaired physical and cognitive ability later in life (Almond and Currie, 2011b; Doyle, 2019). These early life health insults have the potential to lower human capital accumulation, productivity and earnings in adult life, thereby contributing to the inter-generational transmission of poverty (Engle et al., 2007; Hoddinott et al., 2013; Richter et al., 2017).

Concern over malnutrition in utero and during the first two years of life has motivated a number of governments, NGOs, and international agencies to direct cash transfers programs to households with young children, which to date have reached between 750 million to one billion people globally (Bastagli et al., 2016; Hoddinott et al., 2017). There are two principal ways in which cash transfers may directly reduce early life malnutrition. First, households at risk of malnourishment are expected to spend a large fraction of each additional dollar of income on child nutrition (both quantity and quality of calories) simply because investing in children who are malnourished during critical windows of physical and cognitive development is one of the highest return investments a family can make. Likewise, cash transfers could also facilitate similarly high-return investments in child health production such as health care expenditures. Second, these programs are frequently directed to mothers ("maternal cash transfer programs"), and increasing women's control over income is believed to promote invest-

ment in children in and of itself.[1]

However, it is not obvious that simply giving cash to families at risk is sufficient to make a dent in early life malnourishment. Although stunting rates do indeed fall with household income in cross-sectional data, empirical research on calorie "Engel curves" suggests that even very poor households do not spend a large fraction of each additional dollar received on food consumption.[2] In fact, a number of scholars have noted a "malnutrition puzzle" in parts of the developing world whereby calorie consumption stays constant or even *declines* when income rises (Deaton and Drèze, 2009). Consistent with this, there is no consensus from evaluations of existing programs that cash transfers generate significant reductions in stunting. While cash transfer programs have been associated with a wide range of positive household outcomes, including increases in schooling and business income of vulnerable populations (Bastagli et al., 2016), the evidence on positive effects on child malnutrition is scarce and inconclusive (Baird et al., 2019; Ahmed et al., 2019). As described in evidence reviews (Ritcher, 2010; Soares et al., 2010; Cecchini and Madariaga, 2011; Manley et al., 2013; Bastagli et al., 2016; Tirivayia et al., 2016; Biscaye et al., 2017; Millan et al., 2019), while some program evaluations have shown positive impacts, several reported mixed or null results.

There are three primary explanations for why maternal cash transfer programs may fail to reduce malnutrition. First, households may lack sufficient information on child health production to understand the value of early life nutrition, reducing the marginal impact of income on child health. Second, even when cash is targeted to mothers, households may fail to direct consumption towards children because those who

[1]There is a substantial body of literature linking female income share to increases in children's expenditure. Bobonis (2009) finds that climate shocks that contribute to female bargaining power, increased household expenditures on children's goods (education, health). Similarly, Duflo and Udry (2004) find that positive rainfall shocks to women-controlled crops in Cote D' Ivoire increased shares of education expenditures for children. Lépine and Strobl (2013) find that positive rainfall shocks to women-controlled crops in Ghana increased children's nutritional status. Duflo (2003) find that providing pensions to South African grandmothers increased height-for-age of grandchildren. There are several theories explaining this bias including gender differences in old age security, preferences, and altruism.

[2]For a review of evidence suggesting very low elasticity of calorie consumption, see Colen et al. (2018). While cash transfers were shown to boost food consumption (Bailey, 2013), generally, food demand is income inelastic (Colen et al., 2018). In addition, the increase in demand for calories becomes smaller as income levels become higher, as result from reaching a saturation point in calorie consumption (Skoufias et al., 2011; Salois et al., 2012). While income has been found to have limited effects on calorie intake in more developed countries where preference for quality of food rather than calories becomes more important (Subramanian and Deaton, 1996; Robert T. Jensen, 2011; Zhou and Yu, 2014), in poor economies income elasticities remain positive, suggesting that not all poorer countries have reached the saturation point.

control income do not internalize the health benefits to young children of additional calories and hence prefer an alternative consumption bundle. Lastly, a failure to spend marginal income on calories may reflect limited local food availability, such as occurs during famines or in food deserts.

To increase their impact on child malnutrition, policymakers increasingly enhance maternal cash transfer programs with complimentary features designed to address these constraints. In many settings, programs include conditionalities such as mandatory health visits in order to incentivize households who may otherwise prefer to put cash elsewhere to invest in child health, thereby addressing one or both of the first two constraints. While a number of studies show positive effects of conditional cash transfers (CCTs) on stunting, there is ongoing concern that imposing conditionalities excludes the most vulnerable households from receiving program benefits (Cahyadi et al., 2020; Kandpal et al., 2016). In-kind transfer programs can mitigate all three constraints described above, but are costly to implement and may be difficult to tailor to households' idiosyncratic dietary needs.

An alternative strategy for promoting child health that has been implemented in a number of different settings in conjunction with maternal cash transfers are information programs delivered via Social and Behavior Change Communication (SBCC). SBCC sessions attached to maternal cash transfer programs are designed to tackle the first constraint by supplementing cash transfers with information on child health production, and their curricula typically focus on infant and child health and feeding practices. Participation in SBCC programs is voluntary (not tied to the receipt of cash benefits), and hence immune to concerns over systematic exclusion. However, it is unclear whether information frictions impose a binding constraint on the marginal propensity to invest in child health out of cash transfer income, and also whether relevant information on child health production can be effectively delivered at scale.

In empirical work to date, the efficacy of supplementing maternal cash transfers with SBCC in bolstering child health remains uncertain. A number of studies have evaluated child health impacts of maternal SBCC programs (Luo et al., 2012; Zulfiqar A Bhutta et al., 2013), but evidence is often inconclusive and limited to behavior change outcomes. For instance, several evaluations show that cash transfer programs can lead to improved infant and child feeding practices only if they are combined with SBCC (Fiszbein et al., 2009; Avula et al., 2013; Hoddinott et al., 2017), but fail to measure impacts on child health outcomes. Among those, the bulk of existing evidence on

child outcomes suggests that, even when SBCC programs are successful in promoting behavior change among transfer recipients, those changes are insufficient to reduce malnutrition in children. For example, a recent randomized experiment in Nepal found meaningful effects of supplementing cash transfers with SBCC on health knowledge and behavior, but null effects on child malnutrition (Levere et al., 2016).[3] One study that does find meaningful impacts of SBCC plus cash transfers on child stunting in Nigeria is unable to shed light on the marginal contribution of SBCC to cash transfer programs because the research does not evaluate the impact of cash alone (Carneiro et al., 2019).

In this study we seek evidence on the potential value of supplementing cash transfers with SBCC for child malnutrition. We evaluate a combination of interventions designed to reduce chronic malnutrition during the first 1000 days of life by providing cash transfers with and without SBCC to women who are pregnant or have children under age two. The program, sponsored by the Government of Myanmar and implemented by Save the Children International (SCI), was run for 30 months in 416 rural villages as a pilot for the government's national maternal transfer program.[4] The program targeted all pregnant women in intervention villages, who were provided monthly cash transfers from enrollment until their child reached age two (i.e. for 24-30 months). In a randomly chosen subset of treatment villages, program recipients also received monthly SBCC group sessions for the duration of the program that covered a range of topics relevant to child health and nutrition.

We assess the impact after 30 months of implementation of transfers alone and in combination with SBCC on child height-for-age Z-scores (HAZ scores) and stunting, a well-validated biometric measure of chronic malnutrition in children (Leroy and Frongillo, 2019). We restrict our analysis to women found to be pregnant immediately prior to program announcement, which allows us to gauge the impact of receiving the full duration of program transfers while also circumventing concerns over selective fertility or migration into treatment villages.

Our results indicate that the combination of cash transfers and SBCC leads to a 4.6 percentage point (13.5%) statistically significant reduction in the proportion of children who are stunted. The program appears to be effective for children at risk of moderate

[3]One exception is an experimental evaluation of a child nutrition SBCC program without cash transfers in Malawi, which was associated with gains in HAZ (0.27 SD) (Fitzsimons et al., 2016).

[4]The name of the program was LEGACY, which stands for "Learning, Evidence Generation, and Advocacy for Catalyzing Policy".

but not severe stunting, which indicates that more heavy-handed approaches or higher levels of transfers might be required to address malnutrition among the most vulnerable children. Meanwhile, cash alone has no detectable impact on child biomarkers relative to the control group.

Survey data on health behaviors collected at endline indicate that the cash transfers, when combined with SBCC, reduced stunting through some combination of improvements in total food consumption, dietary diversity, breastfeeding and hand-washing practices, all of which are reported to be significantly higher among those treated with the combined interventions relative to both control and cash only groups. Most notably, relative to the control group, food consumption in the combined treatment group rises by 15%, accompanied by a significant improvement in a standardized index of child dietary diversity. Both amount of calories and specific types of calories like protein can directly reduce chronic malnutrition by increasing energy availability, while higher rates of breastfeeding and hand-washing lower stunting by reducing nutrient-depleting episodes of diarrheal disease.

We evaluate these competing mechanisms by examining survey data on child illness episodes, health care expenditures and food diary reports of specific foods consumed, all of which point towards dietary diversity being the critical behavior change. First, we find no decrease in child illness episodes or health care spending among children in the cash plus SBCC group, which indicates limited roles of hand-washing and breastfeeding behaviors in reducing child stunting. Second, dietary reports reveal that transfer recipients who were also exposed to the SBCC curriculum incorporate significantly more protein-rich foods into children's diets, including meat, pulses, dairy, and eggs. While fruits and vegetables can improve child nutrition, animal proteins in particular have been shown to have a significant impact on child stunting in multiple settings.[5] In sum, the weight of evidence indicates that most of the reductions in stunting observed among children whose mothers received cash transfers alongside the SBCC program arise from improvements in dietary diversity. Our pattern of results is corroborated by contemporaneous evidence from a similar RCT that was conducted in Bangladesh at the same time as our study, which finds similar evidence in preliminary reports that cash transfers plus SBCC reduces stunting in children relative to both control and cash alone (Ahmed et al., 2019).

[5]See Laplante and Sabatini (2012) and Semba et al. (2016a,b) for meat and fish; Molgaard et al. (2011); Iannotti et al. (2013); Dyer et al. (2016) for dairy products; Semba et al. (2016c); Bekdash (2016) for eggs.

Meanwhile, cash transfers both with and without SBCC improved reported take-up of prenatal care and lead to higher levels of food consumption. However, the similar rates of stunting between the cash only and control groups indicate that these behavior modifications were insufficient to influence chronic malnutrition. While prenatal care is unlikely to have a significant effect on stunting in any setting, the absence of a stunting effect on the cash only arm even when calorie intake rises is more surprising. However, not only is the increase in food consumption among the cash only group relative to control significantly lower than that observed in SBCC villages (7%, $p < 0.01$), but there is no significant change in child dietary diversity, both of which could account for a null result on stunting.

These findings provide new evidence on the policy importance of combining maternal cash transfers with behavioral change interventions in order to generate meaningful improvements in child nutrition. The critical role that SBCC plays in realizing the child health benefits of maternal cash transfers also provides novel evidence that information constraints are an important factor contributing to the low income-elasticity of calorie demand among populations that are visibly malnourished but not living hand-to-mouth.

At a policy level, our findings offer a fundamental lesson for the design and implementation of maternal cash transfer programs in low-income countries. First and foremost, in settings such as rural Myanmar where child malnutrition remains a significant problem, policies that increase household income still have large potential to improve child malnutrition as long as mothers are also provided adequate knowledge to purchase the appropriate quantity and quality of foods. Moreover, given that the improvements in stunting appear to be driven largely by promoting changes in dietary diversity, lessons on infant and child feeding practices should be heavily emphasized in SBCC curriculum and prioritized whenever programs are streamlined for scale-up. Finally, the fact that impacts happen by way of dietary changes towards more expensive foods rather than cost-free changes in health practices, such as infant feeding and hand-washing, suggest that a similar curriculum of SBCC delivered *without* the additional benefit of cash transfers would be unlikely to achieve a comparable impact on child stunting in similar settings.

Our findings also offer an important lesson for program evaluation of both SBCC and cash transfer programs. In particular, maternal cash transfers both with and without SBCC can lead to meaningful changes in parental health behaviors *without*

generating significant reductions in child malnourishment. Hence, tracking child health outcomes and not just behavioral responses is critical for comprehensive evaluation of program effects on children.

2 Methods

2.1 Setting

In Myanmar, close to 1 out of 3 children are chronically malnourished. To address concerns over child malnutrition, in 2014 the government of Myanmar committed to rolling out a national maternal cash transfer program, which is projected to reach 2.25 million beneficiaries and 0.32% of GDP by 2024 (The Republic of The Union of Myanmar, 2014). SCI was chosen to implement a pilot version of the program as a randomized controlled trial (RCT) for 30 months prior to national scale-up in order to test the delivery model, including the inclusion of a maternal behavior change component, and measure impacts on malnutrition.[6]

The pilot was implemented between 2016 and 2019 in 416 villages in three townships of Myanmar's Dry Zone – Pakkoku, Yesagyo, and Mahlaing. All villages within two hours of an urban center were eligible for the study. Overall, study villages have reasonable access to food markets (96% have a food market located in their community), but relatively poor access to medical care: only 18% have a village health facility, and only 22% have a midwife that visits regularly. The majority of households in this area earn income from agriculture (89%) and livestock (27%), and casual labor (77%) (Appendix Table 2 presents these statistics by treatment and control groups).

Malnutrition in this area is representative of the country as a whole. Baseline data collected prior to the intervention reveal that 28.7% of children under 5 in the study villages were stunted, almost identical to the national rate of under 5 stunting of 29% in 2015 (Demographic Health Surveys, 2015). In terms of weight-for-height, 18% were wasted and 31% were underweight.[7] Meanwhile, malnutrition among mothers is relatively low. Only 6.7% of pregnant or lactating mothers were found to be malnourished at baseline, as measured by mid-and-upper arm conference (MUAC), which is

[6]Since 2018 the program has been extended at scale in several states and (in 2020-2021) to further support vulnerable households during the COVID-19 pandemic (Livelihoods and Food Security Fund, 2020).

[7]The rate at baseline is somewhat higher among children 22-35 months old, the age group used for our endline analysis. In the age group, 30% were stunted, 16% were wasted and 33% under-weight.

considerably lower than rates found in other Asian countries.[8]

In terms of parental health behaviors that contribute to child malnourishment and hence are generally included in SBCC curricula, baseline data reveal that households in this setting performed very well on some measures and relatively poorly on others. Breastfeeding is nearly universal in the study area, as is early initiation of breastfeeding: 98% of children 0-23 months were ever breastfed and 94% received colostrum. Consistent with this, at baseline, 99% of mothers were aware of the best time to initiate breastfeeding. Hence, there is little scope for program participation to influence nursing practices in this setting.

Likewise, households do fairly well at baseline in terms of WASH behaviors. Almost every women reported using soap when washing their hands (99%), and the vast majority reported doing so consistently after going to the toilet (77%), the most critical routine WASH behavior for disease control. However, there is room for improvement in terms of hand-washing practices in all other situations of heightened contamination risk. Only half of the sample reported using soap before or after eating (51% and 47%) and fewer than half reported using soap before cooking (37%), after disposing baby feces (31%), after cleaning their baby's bottom (17%), before feeding children (16%) and before or after handling children (4%).

In contrast, nutritional intake of children over 6 months is poor in this setting. Only 37% of children 6-23 months have a minimum acceptable diet in terms of food diversity. Moreover, there appears to be room for information interventions to have an impact on complementary feeding practices, which are a major focus of SBCC. In particular, only 85% of mothers are aware of the best age to introduce complementary feeding. In addition, program participation has scope to influence health-seeking behavior. Only 78% of mothers attended 4 or more antenatal care visits as recommended by WHO.

In addition to addressing information constraints on child feeding and health care practices, the cash transfer alone has the potential to lead to improvements in child diet and take-up of health care services by relaxing household budget constraints. However, it is relevant to note that consumption data gathered from our analysis sample indicate that few households in this setting are living hand-to-mouth. At baseline, households with stunted children reported spending on average only 54% of their budget on food, and reported spending their remaining income on a number of "non-essentials" including an average of 7% on gifts and donations. Given this, it is

[8]See for example Vasundhara et al. (2020).

not obvious that households in the program with infants at risk of malnourishment will exhibit a high income-elasticity of calorie demand from the infusion of cash alone, unless it is the case that directing disposable income to mothers has a large effect on child consumption shares.

2.2 Program Design

The program comprised two separate interventions: 1) monthly cash transfers to mothers beginning in pregnancy until their children turned two; and 2) monthly cash transfers supplemented with monthly SBCC that covered a range of topics relevant to child health and nutrition.

Both interventions were randomized across 102 sub-rural health care center catchment areas (the geographic unit of randomization) located within two hours of an urban center. To minimize differences across experimental arms, prior to random assignment, catchment areas were first grouped into 34 triplets (strata) based on geographic clustering. Within each stratum, individual catchment areas were randomly assigned to one of three experimental arms: (1) Treatment 1 ($Cash + SBCC$), in which cash transfers and SBCC activities were provided jointly (N = 34 catchment areas encompassing 142 villages); (2) Treatment 2 ($CashOnly$), in which only cash transfers were provided (N= 34 catchment areas encompassing 146 villages); and (3) Control, in which neither cash transfers nor SBCC were offered (N = 34 catchment areas encompassing 149 villages) (Appendix Fig 1).

Within both T1 and T2 catchment areas, all pregnant women were assigned to receive monthly cash transfers worth 10,000 MMK (about 6.5 USD) beginning in their second trimester of pregnancy until their child reached age two.[9] As a reference, the legal minimum wage in Myanmar at that time was 3,600 MMK per day, so the cash transfer amount represented about 3-4 days of work at the minimum wage. In addition to monthly cash transfers, beneficiaries in T1 were targeted with SBCC in the form of monthly information sessions on four main topics: infant and young child feeding (IYCF) practices, health-seeking behavior, hygiene practices, and household expenditures.

The program was implemented by SCI in collaboration with the Myanmar Nurse and Midwives Association (MNMA), a national non-governmental organization that

[9]In October 2017 the implementer (SCI) increased the amount to 15,000 MMK (about 10 USD) to stay in line with similar initiatives in other parts of the country.

provides prevention and community-based care, and Pact Global Microfinance (PGMF), a nonprofit international development organization that delivers microfinance in rural areas. PGMF managed monthly cash disbursements by creating an ad-hoc bank account for each program beneficiary into which transfers were deposited on a monthly basis and delivered through PGMF's network of rural loan agents. MNMA was responsible for coordinating the sensitization and enrollment of eligible women in each treatment village and organizing SBCC activities in villages assigned to the T1 group.[10]

SBCC activities were implemented in two stages. First, between May 2016 and January 2017, MNMA delivered basic SBCC programming within each village aimed at mobilizing communities to address poor nutrition. Basic programming included mother-to-mother support groups (including 12-15 pregnant women or mothers of under 5 years old children) in which mothers were brought together monthly to disseminate information and share experiences with feeding practices during pregnancy, lactation, and early childhood; and a handful of participatory community-level sessions (13-15 community members) that explored perceptions and current practices around diet and nutrition, health care, and household and food expenditures.

Based on the information gathered through the basic SBCC activities, SCI then designed a series of intensive SBCC sessions that focused on key behaviors and messaging across four topics: IYCF (including dietary diversity and breastfeeding), health-seeking behavior, hygiene practices, and household expenditures. These sessions were delivered both to the maternal support groups, and also through separate sessions targeted to fathers and elderly household members. The last cohort of mothers was enrolled in May 2018. The last monthly cash transfer and the last SBCC interventions were completed in November 2018 and May 2019, respectively (Appendix Figure 2).

SBCC participation was voluntary. While all mothers in SBCC villages were encouraged to attend the sessions, they still received the full transfer if they were unable or refused to attend. Nevertheless, administrative data indicate high participation in SBCC sessions: administrative data from SCI found that in *Cash+SBCC* villages, 99% of enrolled mothers attended at least one SBCC session and 81% attended five times or more.[11] Unsurprisingly, take-up of the cash transfer was also high and relatively

[10] One aspect of delivery the government was interested in testing in this pilot program was utilizing a NGO for distribution of cash payments versus government workers. Hence, in 40 villages, payments were delivered by government workers instead of PGMF. A description of the difference in delivery agents and findings from that evaluation are the subject of a companion paper (Field and Maffioli, 2020).

[11] Monitoring data were collected only in one township because of limited funding availability and

"clean" in terms of eligibility criteria: monitoring activities conducted independently by the research team 30 months into implementation in one of three townships revealed low exclusion and inclusion errors to the cash transfer programs (6.8% and 9.8%, respectively), and all inclusion errors were women in treatment villages who received transfers despite not meeting the eligibility criteria rather than non-compliers from outside villages, reducing concern over contamination of the control group.

2.3 Analysis Sample

We evaluate the program's impact on child nutrition among women who were pregnant at the time of enrollment. Restricting the sample to this group mitigates concern over selective fertility and migration into study areas that could confound a comparison between babies that were conceived in treatment versus control groups after program announcement. Moreover, women who were pregnant at enrollment are the only program beneficiaries to receive the full 30 months of coverage as part of the pilot.

Women in this group were identified by conducting a full listing of individuals (Appendix Figure 2) in treatment and control study villages two months prior to the start of the program (February 2016) in which community health workers recorded every woman's age and pregnancy status. All 2,338 pregnant women identified in the listing were enrolled in the study. After 30 months we successfully tracked and administered an endline survey to 91.3% of women, resulting in an analysis sample of 2,134 women. Although attrition was slightly higher in the control group (10.8%) relative to treatment groups (7.9%), as is common in program evaluations due to the greater ease of tracking individuals where administrative data is collected regularly, attrition has no measurable impact on the balance of observable characteristics of respondents across treatment arms (see Appendix Table 1). The fact that observables are almost identical pre- and post-attrition waylays concern over differential attrition that could bias our estimates (see Appendix Table 1 vs Table 3).

The endline survey gathered data on household and individual characteristics, including weight and height data of all children under age 5, socio-economic status including income and assets, food consumption including dietary diversity, health-seeking behaviors emphasized in the SBCC sessions, credit and saving, decision-making, desired and realized fertility, and program participation. Our analysis estimates the effects of

the implementing partner's (SCI) preference for the implementation of a related project (Field and Maffioli, 2020).

the interventions on the 2,154 children born to these women during the study, i.e, those covered by the LEGACY program for their first 1,000 days of life. At endline, the children that benefited from the full duration of treatment are between 22 and 35 months old.[12]

2.4 Empirical Strategy

The random assignment of interventions across villages allows us to identify the causal effect of cash transfers and the relative importance of pairing cash transfers with SBCC by comparing endline outcomes across study arms. We estimate program effects with the following ordinary least squares (OLS) model:

$$Y_{iv} = \alpha + \beta * [Cash + SBCC]_v + \gamma * [CashOnly]_v + \delta X_{iv} + t + \epsilon_{iv}$$

where Y is the primary health outcome of interest for child or mother i living in village v. To capture nutritional impacts on children, we use child height and age data from endline to construct height-for-age z-scores (HAZ), a well-validated anthropometric measure of chronic malnutrition, using the WHO child growth standards (World Health Organization, 2006). A HAZ value of -1 indicates that, given sex and age, a child's height is one standard deviation below the median child in her age/sex reference group. In addition, we construct an indicator of stunting that equals one if $HAZ < -2$; an indicator of severe stunting that equals one if $HAZ < -3$; and an indicator of moderate stunting that equals one if $-3 <= HAZ < -2$.

To better understand potential pathways of influence, we examine a number of behavioral outcomes available at endline that capture economic and health determinants of malnutrition, focusing on knowledge and behaviors emphasized in the SBCC curriculum. These include infant feeding practices (dietary diversity and breastfeeding), total expenditures on food and healthcare, illness episodes and visits to skilled health personnel, and hand-washing behavior.

[12]Several additional women, who were not classified as pregnant at the time of the initial listing, either because they were unaware of, or reluctant to report pregnancy status early on, or because they were not found in the village at the time of the initial listing, were reclassified as eligible midway through the program and received program benefits thereafter. However, significantly more of such women were found in treatment relative to control villages (unsurprisingly, given their greater incentive to reveal themselves in order to receive benefits once they became aware of the program), which could bias our estimates of program effects were we to include them in the analysis. Hence, we restrict our evaluation of program impacts to women identified as pregnant at the onset of the study, prior to the announcement of the program.

$Cash + SBCC$ is an indicator of whether the respondent's village was assigned to T1, and $CashOnly$ is an indicator of whether the village was assigned to T2. The excluded group is the control group (CG). The model also controls for a number of predetermined observables, X, which include (i) individual demographic controls, including mother's age and education, household head's age and education, and child's sex and age (child-level analysis only); and (ii) village-level controls, including distance to large and small markets, indicators for main source of livelihood (agriculture, livestock, or casual labor), availability of government provided electricity, and participation in a concurrent water, sanitation and hygiene (WASH) intervention. Village-level controls were collected prior to the start of program activity. In accordance with our randomization design, the model includes fixed effects for geographic strata (one variable for each triplet of sub-rural health catchment areas, t), which control for unobserved characteristics that may vary across clusters and influence program delivery. Standard errors are clustered at the village cluster level, the unit of randomization.

To ensure that comparability across study arms was achieved by random assignment, we test for observable differences across experimental arms based on time-invariant individual characteristics (Appendix Table 3) and village-level data collected prior to the program launch (Appendix Table 2). Overall, the randomization was successful with only 1 out of 68 comparisons unbalanced across any of the treatment arms at a 99% confidence interval, 1 out of 68 unbalanced at a 95% confidence interval and only 2 out of 68 unbalanced at a 90% confidence interval. Moreover, the mean differences that are significant are small in magnitude and work against our ability to attribute differences in stunting to treatment: for example, the head of the household's education is lower in the $Cash + SBCC$ arm, so could potentially bias downward a comparison of differences in stature at endline. We control for these unbalanced covariates in the empirical model.

It is important to note that our study design precludes non-random imbalances across treatment arms driven by selection into treatment. Although maternal cash transfers have the potential to incentivize women to become pregnant earlier than they would have otherwise or might encourage migration into treatment villages, our analysis sample is limited to women who were living in the village and pregnant *prior* to learning about the program, so is not subject to concerns over endogenous selection into the sample. However, because we run a handful of regressions on the sample of new mothers – the only group among which we are able to measure detailed infant

feeding practices –, we also test directly whether the program led to fertility responses that could bias a comparison of infant feeding outcomes across experimental arms. Relative to the control group, women in $Cash + SBCC$ and $CashOnly$ are no more likely to be currently pregnant and do not report a greater number of pregnancies since the start of the program, indicating that there is no increase in fertility in response to the program (Appendix Table 4).

3 Results

Our main outcome of interest is stunting among children 22-35 months old.[13] Table 1 reveals that, in control villages, a full 34% of children in this cohort are stunted, including 7% that are severely stunted.

3.1 Program Effects on Chronic Malnutrition

Table 1 shows that children born to mothers who received both cash and SBCC ($Cash+SBCC$, T1) from pregnancy until the child reached 24 months are an estimated 4.6 percentage points (a 13.5 percent reduction, p<0.05) less likely to be stunted at 22-35 months of age compared to children living in control group households. Meanwhile, children in $CashOnly$ (T2) villages are no less stunted than children in the control group, and we can firmly reject the equality of $Cash+SBCC$ and $CashOnly$ treatment effects on stunting (p-value<=0.02). This pattern supports the hypothesis that cash transfers – even those directed to mothers – are only able to effectively combat chronic malnutrition in children when paired with an intervention that encourages behavior change.

Column 4 of Table 1 presents the treatment indicators regressed on a continuous measure of height for age, i.e., HAZ score. Although the $Cash + SBCC$ intervention arm does not have a statistically significant effect on the continuous measure of height, the point estimate is large (0.074) and close to significance at the 90% level.[14] Moreover,

[13] In Appendix, we present results for weight measurements, such as underweight (Appendix Table 5) and wasting (Appendix Table 6). However, for most of the children in our sample (22-35 months old) the program had already ended at the time of the endline survey. For this reason we do not expect measures of non-chronic malnutrition to be affected by the program. The evidence in Appendix Tables 5 and 6 confirms this.

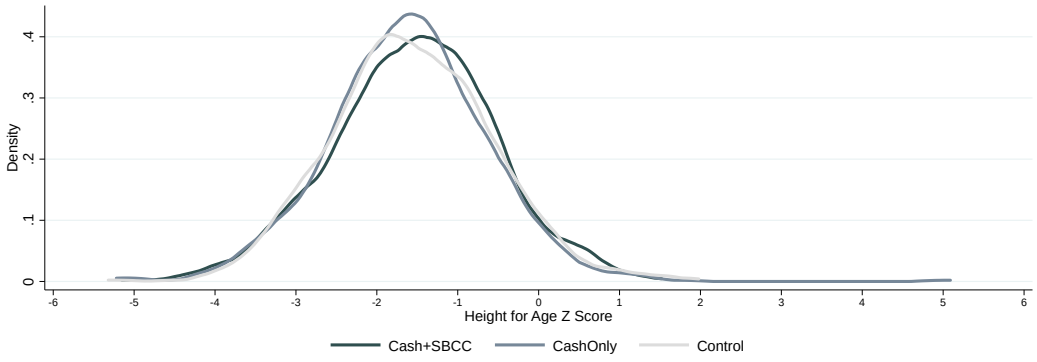
[14] As a point of comparison, the point estimate is similar in magnitude to a deworming intervention in Kenya that increased the mean HAZ by 0.09 SD, which was significant in a larger sample (Miguel and Kremer, 2004). Our estimates are also in line with the non-experimental estimates of HAZ impacts

Table 1: Child stunting

	(1)	(2)	(3)	(4)
	Prop. of children stunted	Prop. of children moderately stunted	Prop. of children severely stunted	HAZ score (WHO)
Cash+SBCC	-0.046**	-0.053***	0.007	0.074
	(0.021)	(0.018)	(0.011)	(0.047)
CashOnly	-0.004	-0.008	0.004	-0.017
	(0.021)	(0.020)	(0.011)	(0.041)
Observations	2151	2151	2151	2151
Mean Control	0.34	0.27	0.07	-1.57
Clusters	102	102	102	102
Cash+SBCC=CashOnly	0.02	0.01	0.75	0.02

Notes: The table presents OLS estimates of the effects of the maternal cash transfer program interventions on measures of stunting for children whose mothers were pregnant at enrollment, following WHO classification."Cash+SBCC" indicates T1 villages, where cash transfers and SBCC activities were provided jointly; "CashOnly" indicates T2 villages, where only cash transfers were provided; the reference group are villages in the control group where neither cash transfers nor SBCC took place. Outcomes include the proportion of children stunted as children with Height for Age Z score (HAZ) < -2 (1); the proportion of children moderately stunted as children with HAZ < -2 and >= -3 (2); the proportion of children severely stunted as children with HAZ < -3 (3); and, HAZ (4). Controls include (i) individual demographic controls, including child's sex and age, mother's age and education, and household head's age and education; (ii) village-level controls, including distance to large and small markets, main source of livelihood (agriculture, livestock, or casual labor), availability of government provided electricity, and participation in a concurrent WASH intervention. Fixed effects per geographic strata (34) are included. Standard errors are clustered at the village cluster level. P-values from t-test from the difference in means are reported. ***p<0.01, ** p<0.05, * p<0.1.

a more nuanced test of the distribution of HAZ scores reveals program effects that are consistent with the stunting results.[15] In particular, Figure 1 reveals a rightward shift in the distribution of HAZ scores among $Cash + SBCC$ beneficiaries compared to the control group. A Kolmogorov-Smirnov non-parametric test for equality of distributions indicates that the $Cash + SBCC$ intervention has a statistically significant positive effect on the distribution of HAZ score when compared to the $CashOnly$ arm (p=0.048) and the control group (p=0.098). Once again, we can reject the null hypothesis of equal distributions of HAZ scores in the $CashOnly$ arm and control group (p=0.071).



Notes: This figure describes the distribution of Height for Age Z score (HAZ) for children whose mothers were pregnant at enrollment, by treatment status. "Cash+SBCC" indicates T1 villages, where cash transfers and SBCC activities were provided jointly; "CashOnly" indicates T2 villages, where cash transfers only were provided; "Control" indicates villages in the control group where neither cash transfers nor SBCC took place.

Figure 1: Child HAZ distribution, by treatment

Consistent with these distributional patterns, columns 2 and 3 of Table 1 show that the reduction in malnutrition achieved by the program corresponds to a decrease in the proportion of children moderately stunted (5.3 percentage points, a 19.6 percent reduction, p<0.01) but no change in the proportion severely stunted. This implies that, while chronic malnutrition in early childhood fell for many children at risk, the SBCC intervention did not succeed in combating malnutrition among the most vulnerable households.

Although severe stunting is relatively low in this setting (7% in the control group),

from other conditional or unconditional cash transfer programs (Biscaye et al., 2017; IEG World Bank, 2011) or early stimulation and nutrition interventions (Attanasio et al., 2018).

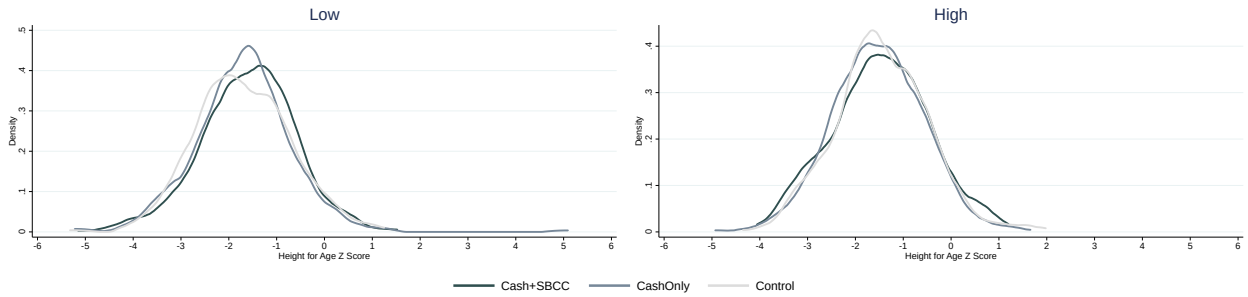
[15]Note that the distribution of HAZ is centered at zero only if the population follows the WHO standard growth curve, which is not the case in our context given the high prevalence of malnutrition.

the absence of a program effect on this tail of the HAZ distribution is somewhat counterintuitive given that severe stunting is likely to be concentrated among the poorest households, and one might anticipate that the same amount of cash makes a bigger difference for households in more dire circumstances. One possible explanation is lower SBCC participation rates of extremely poor households. However, self-reported data from endline do not indicate significantly lower participation rates among households below median income relative to those above median income. Alternatively, the SBCC curriculum or mode of delivery may be inappropriately designed to meet the needs of very poor participants. For instance, households at risk of severe stunting may lack sufficient human capital to translate information into behavior change, or might face additional financial barriers to implementing changes such as diet diversification, even with the additional liquidity provided through a cash transfer. Finally, households at risk of severe stunting may be concentrated in villages with poor infrastructure to support the adoption of certain health practices such as access to clean water or food products.

To further evaluate whether the absence of a program effect on severe stunting is related to differences in socio-economic status (SES), we examine patterns of treatment effects across villages according to village-level SES. In the absence of baseline data on wealth or income, we proxy for village SES with the average number of years of education attained by resident women.

It is first worth noting that rates of severe stunting are similar in magnitude across villages with low versus high average levels of parental education. This pattern alone suggests that some fraction of the population may face a poverty trap such as chronic reinfection that keeps them in a state of persistent malnutrition even when village resource levels rise. Interestingly, results from the subsample analysis indicate that the program effects are concentrated in low SES villages. In particular, we observe that the distribution of the HAZ scores is strongly shifted to the right in the $Cash + SBCC$ intervention arm compared to the $CashOnly$ arm or the control group only in low SES villages (Figure 2), and the difference is statistically significant. Meanwhile, in the above-median villages, HAZ score distributions are similar across experimental arms. Appendix Table 7 shows a similar heterogeneous pattern in a regression framework: the results indicate that relatively low-SES villages gain the most in terms of reductions in rates of stunting from maternal cash transfers combined with SBCC.

Moreover, households below median income *within* the low-SES village benefit dis-



Notes: This figure describes the distribution of Height-for-age Z-score (HAZ) for children whose mothers were pregnant at enrollment, by treatment status, and by low vs high socio-economic status. As a proxy, we use the average number of years of education attained by resident women in the village. "Cash+SBCC" indicates T1 villages, where cash transfers and SBCC activities were provided jointly; "CashOnly" indicates T2 villages, where cash transfers only were provided; "Control" indicates villages in the control group where neither cash transfers nor SBCC took place.

Figure 2: Child HAZ distribution by women village-level average education

proportionately in terms of reductions in moderate stunting relative to those above the village median (Appendix Table 8). That is, if we divide the sample into four groups according to both village-level SES and median household income at endline, the pattern of results indicates that reductions in moderate stunting due to exposure to cash plus SBCC are fully concentrated among the quartile of households in the lower half of the income distribution *within* the lowest SES half of villages. Still, even among this subsample, severe stunting does not improve with either version of the program, consistent with non-convexities at extremely low levels of income.

Figure 2 also reveals that, within low-SES villages, the $CashOnly$ and the $Cash + SBCC$ treatments appear to operate on the same distribution of children who are on the left-hand side of the stunting distribution, but the $Cash + SBCC$ treatment appears to push them relatively further rightward in terms of HAZ scores relative to the $CashOnly$ treatment. That is, the patterns of $HAZscore$ distributions indicates that the $CashOnly$ treatment is effective for the same number of marginal responders as the $Cash + SBCC$ treatment just to a lesser extent, rather than being equally effective for fewer kids. This implies that *all* responders are made better off by adding $SBCC$ sessions to a maternal cash transfer program.

3.2 Mechanisms

To better understand the channels through which a combination of $Cash + SBCC$ generates positive effects on child health, in this section we explore program effects on maternal health behaviors, including the amount of calories consumed, as measured by total food consumption, and health-care utilization as measured by total health expenditures. We also investigate whether assignment to $Cash + SBCC$ is associated with increases in maternal knowledge about child health production. Finally, to disentangle whether stunting impacts are driven by reductions in nutrition-depleting illnesses versus increases in the intake of nutritious food, we examine whether treatment is associated with reductions in reported episodes of child illness.

3.2.1 Program Effects on Maternal Health Behaviors

Table 2 and Table 5 describe the program impacts on behaviors and knowledge that were emphasized in the SBCC curriculum. Specifically, we focus on the following key topics covered by the education sessions: dietary diversity, breastfeeding, hand washing practices, health-seeking behavior, and food consumption. To capture dietary diversity, we take the standard approach in the literature (based on WHO guidelines) of constructing a dietary diversity score (DDS) measured as the number of food groups consumed by the child in the previous day out of the following seven: (1) cereals, roots and tubers; (2) legumes and nuts; (3) milk and milk derivatives; (4) meat products (meat, poultry, offal, and fish); (5) eggs; (6) vitamin A-rich fruits and vegetables (leafy green vegetables, yellow fruits and vegetables); and (7) other fruits and vegetables. A DDS of four is considered the minimum DDS for a healthy diet. As children in our sample are at least 22 months old, the DDS is measured excluding milk, following WHO guidelines.

Because stunting is associated with low levels of protein-rich foods in particular, we also look specifically at how treatment assignment influences food consumption in categories 2-5 aggregated. Not only are higher levels of protein-rich food consumption most likely to translate into reductions in child stunting, but – in addition to emphasizing the general importance of food diversity – SBCC health messaging focused specifically on the importance of feeding young children a higher fraction of calories from protein-rich food groups.

Hand-washing practices are measured as a cumulative score of regularly adopted practices, where each practice is counted as 1 when the respondent reports washing

hands with soap in that specific situation and 0 otherwise: after cleaning a baby's bottom, after using the toilet, before preparing and eating food, before feeding children, after disposing of baby feces, before and after handling children, and on other occasions. Total food consumption is measured as recalled household consumption in the past 7 days and is winsorized at the 99th percentile level.[16]

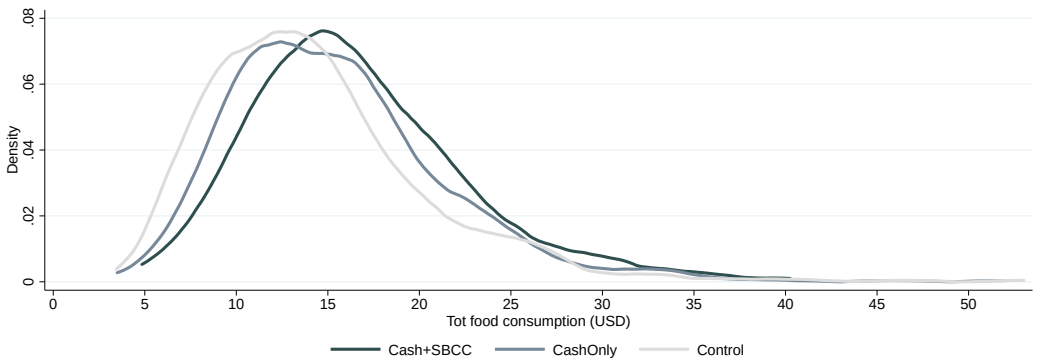
Table 2: Maternal health behaviors

	(1)	(2)	(3)	(4)	(5)	(6)
	Tot. food consumption (USD)	Child dietary diversity score (non-milk, 24 hrs recall)	Prop. of children ever breastfed	Prop. of children received colostrum	Index of hand-washing behavior	Prop. of mothers with at least 4 ANC visits to skilled health personnel
Cash+SBCC	2.168***	0.655***	0.007*	0.021**	0.651***	0.161***
	(0.373)	(0.063)	(0.003)	(0.008)	(0.128)	(0.024)
CashOnly	1.097***	0.096	0.003	0.001	0.151	0.117***
	(0.365)	(0.070)	(0.004)	(0.010)	(0.118)	(0.024)
Observations	2134	2154	2154	2151	2134	2134
Mean Control	14.33	3.39	0.99	0.96	2.60	0.67
Clusters	102	102	102	102	102	102
Cash+SBCC=CashOnly	0.00	0.26	0.06	0.00	0.05	0.00

Notes: The table presents OLS estimates of the effects of the maternal cash transfer program interventions on measures of behavior related to four topics covered by the education sessions in SBCC activities (1) IYCF -including diet diversity (column 1) and breastfeeding (columns 2-3), hand-washing practices (column 4), health-seeking behavior (column 5) and food expenditures (column 6). "Cash+SBCC" indicates T1 villages, where cash transfers and SBCC activities were provided jointly; "CashOnly" indicates T2 villages, where cash transfers only were provided; the reference group are villages in the control group where neither cash transfers nor SBCC took place. Outcomes include: total food consumption, winsorized at the 99th percentile level (in last 7 days, in USD, exchange rate at 31 December 2018, 1); child diversity score constructed following WHO standards, for children at least 22 months old (2); the proportion of children ever breastfed (3); the proportion of children who received colostrum (4); an index of hand washing practices combining whether mothers report always washing hands after cleaning a baby's bottom, after using the toilet, before preparing and eating food, before feeding children, after disposing of baby feces, before and after handling children, and on other occasions (5); the proportion of mothers receiving at least 4 Antenatal Care visits with skilled health personnel, as defined by WHO standards (6); Controls include (i) individual demographic controls, including child's sex and age, mother's age and education, and household head's age and education for child-level analysis; mother's age and education, and household head's age and education for mother-level analysis; (ii) village-level controls, including distance to large and small markets, main source of livelihood (agriculture, livestock, or casual labor), availability of government provided electricity, and participation in a concurrent WASH intervention. Fixed effects per geographic strata (34) are included. Standard errors are clustered at the village cluster level. P-values from t-test from the difference in means are reported. *** p<0.01, ** p<0.05, * p<0.1.

Consistent with the stunting results, women assigned to the $Cash + SBCC$ intervention spend significantly more money on food relative to the control group (increase of 2.2 USD, column 1). Women assigned to the $Cashonly$ intervention also exhibit a positive change, but the increase in spending is significantly less stark: food consump-

[16]Results are robust to using raw consumption data.



This figure describes the distribution of the total food consumption in the last 7 days by treatment status. "Cash+SBCC" indicates T1 villages, where cash transfers and SBCC activities were provided jointly; "CashOnly" indicates T2 villages, where cash transfers only were provided; "Control" indicates villages in the control group where neither cash transfers nor SBCC took place.

Figure 3: Food consumption distribution by treatment status

tion in the *Cashonly* arm is 7.65% higher than the control group compared with a 15.13% difference among the $Cash + SBCC$ arm (column 1). The changes in the total food consumption represents about 17% (for *Cashonly*) and 33% (for $Cash+SBCC$) of the monthly cash amount (10,000MMK), suggesting a meaningful change in household food consumption that could account for large changes in stunting. This increase in food consumption is also reflected in a statistically significant rightward shift in the distribution (Figure 3) for $Cash+SBCC$ compared to *Cashonly* and to the control group (p-value=0.00), when using a Kolmogorov-Smirnov non-parametric test for equality of distributions. Instead there is no statistically significant difference in the food consumption distribution between *Cashonly* and the control group (p-value=0.81).

We also find positive changes in behaviors related to child food diversity and breastfeeding practices (Table 2), and these results are all significantly larger for the $Cash+SBCC$ arm. In particular, we find a 0.655 unit increase in the child food diversity score (column 2) in the $Cash + SBCC$ arm that is significantly different from the *CashOnly* and the control group. We also find a change in the proportion of children ever breastfed (0.7 percentage points, column 3) and in the proportion of children who received colostrum (2.1 percentage points, column 4) in the $Cash + SBCC$ intervention arm only. Although these treatment effects are statistically significant, it is worth noting that they are small in magnitude on account of the near universality of these practices prior to the intervention, as exhibited also by the high control group means.

Essentially, SBCC participation shifts the fraction of children receiving colostrum from 96% to 98%, relative to both $CashOnly$ and the control group. Finally, we find a 0.651 unit increase in the index of hand-washing behavior (column 5) in the $Cash + SBCC$ group relative to both $CashOnly$ and the control group, as well as a significant increase in the proportion of mothers attending at least 4 antenatal care visits (column 6) that is observed in both treatment arms but is significantly higher for the $Cash + SBCC$ arm (16.1 percentage points for $Cash + SBCC$ and 11.7 percentage points for $CashOnly$).

The absence of a program effect from cash alone on WASH and breastfeeding behaviors is unsurprising given that income alone should not be expected to increase rates of early initiation, so this can be readily interpreted as an impact of information on maternal health behavior. In contrast, ANC visits among the $Cash + SBCC$ arm have the potential to be influenced by both an income effect of receiving cash transfers as well as an information effect of SBCC participation. However, the *difference* in health-seeking behavior between $CashOnly$ and $Cash + SBCC$ can be interpreted as the impact of information on health care utilization whereas the treatment effect women in the $CashOnly$ group picks up the income effect on health-seeking behavior.

The results in Table 2 column 1 highlight how cash transfers with and without SBCC increase total household food consumption. Table 3 additionally explores the shares of the household food budget (in the last 7 days) spent on specific categories of foods: (animal or vegan) protein-rich foods, fruits and vegetables, staple carbohydrates including rice, wheat, maize, soybeans, potatoes, and other food, including oil and condiments. We find that cash transfers with or without SBCC increased household consumption of animal proteins (meat, fish, eggs and dairy), while decreasing consumption of less nutritious food such as staples and other food. However, the increase is statistically significantly higher for $Cash + SBCC$ relative to $CashOnly$ (5.8 percentage points vs 3.8 percentage points, respectively, column 1). In addition, those households exposed to the SBCC curriculum spent more of their budget on vegan proteins (pulses, 1.5 percentage points) and slightly more on vegetables and fruits (0.5 percentage points).

Reassuringly, these patterns are also reflected in measures of child dietary intake reported in food diaries. In particular, Table 4 investigates food intake from various food groups among the sample of children in the endline analysis sample. Data on child diets isolate changes in child feeding practices among mothers exposed to the SBCC curriculum rather than just household-level changes in food consumption, which may

Table 3: Household budget shares of food consumption

	(1)	(2)	(3)	(4)	(5)
	Animal proteins	Vegan proteins	Vegetables and fruits	Staples	Other
Cash+SBCC	0.058***	0.015***	0.008**	-0.040***	-0.039***
	(0.006)	(0.002)	(0.004)	(0.007)	(0.003)
CashOnly	0.038***	0.005*	-0.001	-0.015**	-0.027***
	(0.007)	(0.002)	(0.004)	(0.007)	(0.004)
Observations	2134	2134	2134	2134	2134
Mean Control	0.28	0.05	0.15	0.34	0.19
Clusters	102	102	102	102	102
Cash+SBCC=CashOnly	0.00	0.00	0.00	0.00	0.00

Notes: The table presents OLS estimates of the effects of the maternal cash transfer program interventions on household budget shares of food consumption. Outcomes include the share of total household food consumption spent on animal proteins (dairy, meat and fish, eggs, 1); vegan proteins (pulses and nuts, 2); vegetables and fruits (3); staples (4) and other food, including oil and other condiments (5). "Cash+SBCC" indicates T1 villages, where cash transfers and SBCC activities were provided jointly; "CashOnly" indicates T2 villages, where cash transfers only were provided; the reference group are villages in the control group where neither cash transfers nor SBCC took place. Controls include (i) individual demographic controls, including child's sex and age, mother's age and education, and household head's age and education for child-level analysis; mother's age and education, and household head's age and education for mother-level analysis; (ii) village-level controls, including distance to large and small markets, main source of livelihood (agriculture, livestock, or casual labor), availability of government provided electricity, and participation in a concurrent WASH intervention. Fixed effects per geographic strata (34) are included. Standard errors are clustered at the village cluster level. P-values from t-test from the difference in means are reported. *** p<0.01, ** p<0.05, * p<0.1.

not be directed towards children. Table 4 shows clearly that children's (reported) food intake improved systematically in the $Cash + SBCC$ arm. Mothers in villages where cash transfers were supplemented with SBCC report that their children were 13.6 percentage points more likely to consume animal proteins than those in the control group. Households in the $CashOnly$ arm are also 7.7 percentage points more likely to eat animal proteins than households in the control group, but the difference is significantly lower that observed among children in the $Cash+SBCC$ arm (p-value=0). In addition, children in households exposed to SBCC are also 21.7 percentage points and 9.3 percentage points more likely to consume vegan proteins and vegetables and fruits, respectively, compared to children in the control group. Instead, we do not find any statistically significant changes in children's diets for the $CashOnly$ arm, and more generally observe shifts towards less nutritious food (columns 4 and 5).

Table 4: Inclusion of protein-rich food groups in children's diet

	(1)	(2)	(3)	(4)	(5)
	Animal proteins	Vegan proteins	Vegetables and fruits	Staples	Other
Cash+SBCC	0.136***	0.217***	0.093***	0.005	0.005
	(0.015)	(0.025)	(0.022)	(0.006)	(0.006)
CashOnly	0.077***	0.025	-0.012	-0.001	0.001
	(0.015)	(0.024)	(0.023)	(0.007)	(0.006)
Observations	2154	2154	2154	2154	2154
Mean Control	0.80	0.31	0.76	0.99	0.99
Clusters	102	102	102	102	102
Cash+SBCC=CashOnly	0.00	0.00	0.00	0.26	0.34

Notes: The table presents OLS estimates of the effects of the maternal cash transfer program interventions on children's diet. Outcomes include the proportion of children eating: animal proteins (dairy, meat and fish, eggs, 1); vegan proteins (pulses and nuts, 2); vitamin-rich vegetables and fruits (3); staples (4); other, including oil and other condiments (5)."Cash+SBCC" indicates T1 villages, where cash transfers and SBCC activities were provided jointly; "CashOnly" indicates T2 villages, where cash transfers only were provided; the reference group are villages in the control group where neither cash transfers nor SBCC took place. Controls include (i) individual demographic controls, including child's sex and age, mother's age and education, and household head's age and education for child-level analysis; mother's age and education, and household head's age and education for mother-level analysis; (ii) village-level controls, including distance to large and small markets, main source of livelihood (agriculture, livestock, or casual labor), availability of government provided electricity, and participation in a concurrent WASH intervention. Fixed effects per geographic strata (34) are included. Standard errors are clustered at the village cluster level. P-values from t-test from the difference in means are reported. *** p<0.01, ** p<0.05, * p<0.1.

These patterns suggest that one source of explanation for why cash transfers alone increase food expenditure but do not reduce stunting may be that the additional food

is not going towards children's diets. This implies that one key mechanism through which SBCC might enhance the malnutrition impact of cash transfers is by convincing parents to direct increases in food consumption towards young children. For instance, they may be feeding school-going children without realizing the importance of critical windows of growth.[17]

This pattern of results on program effects on specific food groups is consistent with the observed biomarker findings on child stunting, as protein-rich foods are generally needed to generate medium-run changes in chronic malnutrition through diet alone. In particular, a large literature in medicine and nutrition posits that nutrients from proteins primarily support child growth. Animal proteins from meat and fish are a source of amino acids (Laplante and Sabatini, 2012; Semba et al., 2016a,b), dairy products – and specifically cow milk – are an important source of amino acids and other micronutrients (calcium, vitamin A, zinc) (Molgaard et al., 2011; Iannotti et al., 2013; Dyer et al., 2016), and eggs are an excellent source of choline (Semba et al., 2016c; Bekdash, 2016). Similarly, vegan proteins contain essential amino-acids, although in smaller doses. Meanwhile, the key nutritional value of vegetables and fruits is the vitamins (including vitamin A) and minerals (Gilbert, 2013) they contain. While vitamin deficiencies can increase risk of infections, their impact on stunting is likely to be of second-order importance compared to the role of protein-rich foods.

The fact that cash alone increased protein-rich food consumption without information provision is also consistent with previous literature documenting a reasonably high income elasticity of demand for animal proteins relative to other food groups in many settings. Meanwhile, households are less likely to increase consumption of non-animal proteins and vitamin-rich foods without outside information and encouragement since they are less likely to be informed about the nutritional value of these food groups. The fact that SBCC is successful in promoting child consumption of vegan proteins in addition to greater consumption of animal proteins is particularly valuable given that vegan proteins are likely to be significantly more cost-effective means of increasing child protein intake.

[17]Unfortunately, our data do not allow us to test this directly by looking at program effects on weight-for-height among older children and adults in the sample as biometric data were only collected for young children.

3.2.2 Program Effects on Maternal Health Knowledge

Consistent with the changes in behavior, we find treatment effects on maternal knowledge. Table 5 shows a 3.3 percentage point increase in the proportion of mothers in the $Cash + SBCC$ intervention arm who know the importance of diversity in their child's diet (column 1), along with significant increases in the proportion of mothers who know the correct meaning of exclusive breastfeeding (3.1 percentage points, column 2), the best time to initiate breastfeeding (1.3 percentage points, column 3) and the best time to start complementary feeding (8.9 percentage points, column 4). The estimates are statistically significant for all knowledge measures. It is worth noting the levels of maternal knowledge about infant feeding practices overall: control group means indicate that most women in our sample (80-90%) already have correct information about breastfeeding and basic infant feeding practices prior to the intervention.

Overall, the analysis of treatment effects on knowledge shows a high degree of learning from the program, although there is puzzling evidence of a change in knowledge on the importance of child food diversity among women in the $CashOnly$ arm that is also statistically significant and similar in magnitude to the $Cash + SBCC$ arm. Since these women were not exposed to any training on feeding practices, this effect likely reflects reporting bias (e.g. a form of ex-post rationalization in which mothers who cannot afford to feed children a diverse diet claim that diversity is less important).[18]

3.2.3 Program Effects on Child Illness

The evidence on maternal behavior indicates that reductions in child stunting were achieved in the $Cash + SBCC$ treatment by encouraging mothers to increase total food consumption and shift children's diets towards a broader array of protein-rich foods. In addition, combining cash transfers with SBCC appears to have encouraged a higher rate of early initiation of breastfeeding, better hand-washing practices, and greater use of prenatal care. While these specific behaviors are unlikely to account for the large reduction in stunting observed in Table 1, it is possible that they correlate with a broader range of changes in infant feeding practices (e.g. longer duration of exclusive breastfeeding) and health care utilization (e.g. use of Oral Rehydration Therapy to curtail episodes of diarrheal disease) and disease control measures that could have more direct effects on stunting but are unobserved in our data. That is, some of the impact

[18] An alternative possibility is learning by doing that results from spending more on child nutrition, but this seems less likely in the absence of an obvious source of knowledge transfer.

Table 5: Maternal health knowledge

	(1)	(2)	(3)	(4)
	Prop. of mothers who know child food diversity is important	Prop. of mothers who know the meaning of exclusive breastfeeding	Prop. of mothers who know the best time to initiate breastfeeding	Prop. of mothers who know the best time to introduce complementary feeding
Cash+SBCC	0.033**	0.031*	0.013***	0.089***
	(0.015)	(0.016)	(0.005)	(0.022)
CashOnly	0.030**	-0.000	0.009*	0.033
	(0.014)	(0.019)	(0.005)	(0.025)
Observations	2134	2134	2134	2134
Mean Control	0.91	0.94	0.98	0.81
Clusters	102	102	102	102
Cash+SBCC=CashOnly	0.87	0.11	0.39	0.01

Notes: The table presents OLS estimates of the effects of the maternal cash transfer program interventions on measures of knowledge covered by the education sessions in SBCC activities. Outcomes include: the proportion of mothers who know the importance of food diversity in their children diet (1); the proportion of mothers who know the meaning of exclusive breastfeeding (2); the proportion of mothers who know the best time to initiate breastfeeding (3); the proportion of mothers who know the best time to introduce complementary feeding (4). "Cash+SBCC" indicates T1 villages, where cash transfers and SBCC activities were provided jointly; "CashOnly" indicates T2 villages, where cash transfers only were provided; the reference group are villages in the control group where neither cash transfers nor SBCC took place. Controls include (i) individual demographic controls, including child's sex and age, mother's age and education, and household head's age and education for child-level analysis; mother's age and education, and household head's age and education for mother-level analysis; (ii) village-level controls, including distance to large and small markets, main source of livelihood (agriculture, livestock, or casual labor), availability of government provided electricity, and participation in a concurrent WASH intervention. Fixed effects per geographic strata (34) are included. Standard errors are clustered at the village cluster level. P-values from t-test from the difference in means are reported. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

on stunting may have resulted from changes in health behaviors other than food intake if they led to significant reductions in diarrheal disease, which in and of itself can produce chronic undernourishment in children.

To ascertain whether this is a source of stunting impacts, it is useful to note that hand-washing, breastfeeding exclusivity and health-seeking behavior can only impact child stunting via a reduction in nutrition-depleting illness. Hence, if these behavior changes contributed to reductions in child stunting, we should see corresponding reductions in diarrheal disease in the $Cash + SBCC$ arm. Likewise, although antenatal care is unlikely to impact stunting itself, it could be correlated with an increase in expenditures on other health care services like oral rehydration therapy (ORT) that could have directly reduced nutrition-depleting illnesses.

Hence, to provide further evidence on the mechanisms through which the program reduces stunting, we examine survey data on the number of child illness episodes and health care expenditures as a proxy for severity of illness. As shown in Table 6, we do not find any evidence that the interventions led to changes in whether the child was brought in for treatment (column 4-5), or on total annual health expenditures on children under five (column 6). We find weak evidence that children were less likely to experience diarrhea in the last two weeks, but the effects are not statistically significantly different between the $CashOnly$ and $Cash + SBCC$ arms (p-value=0.39), suggesting that SBCC, along with cash, did not contribute more to reducing the risk of infections. There are also no significant effects on the likelihood that children had pneumonia or fever in the past two weeks.

Finally, we confirm that the effects on child health are not driven by disproportionate changes in women's decision-making power in the $Cash + SBCC$ arm. It is first worth noting that the pattern of results does not indicate that changes in child health are driven by an increase in female financial empowerment given that women in both treatment groups received the same amount of cash but only those in the $Cash + SBCC$ arm exhibit improvements in child health. However, it is theoretically possible that female decision-making power improved disproportionately in the combination arm due to an interaction effect on female agency of cash provision in conjunction with increased knowledge from participation in SBCC sessions. To rule out this mechanism, we use endline data on spousal decision-making over various spending categories. Appendix Table 9 shows no differential effects on female decision-making of either $CashOnly$ or $Cash + SBCC$. Endline data indicate that mothers in both

Table 6: Child Illness, seeking behavior and health expenditures

	(1)	(2)	(3)	(4)	(5)	(6)
	Diarrhea	Pneumonia	Fever	Seek treatment	Pay treatment	Health expenditures (children U5)
Cash+SBCC	-0.014*	0.003	0.008	-0.021	-0.022	0.417
	(0.008)	(0.027)	(0.026)	(0.020)	(0.021)	(2.516)
CashOnly	-0.020**	0.002	-0.017	-0.008	-0.005	-0.033
	(0.008)	(0.026)	(0.025)	(0.023)	(0.025)	(2.143)
Observations	2154	2154	2154	2154	2153	2134
Mean Control	0.03	0.20	0.72	0.89	0.86	27.75
Clusters	102	102	102	102	102	102
Cash+SBCC=CashOnly	0.39	0.93	0.31	0.56	0.46	0.85

Notes: The table presents OLS estimates of the effects of the maternal cash transfer program interventions on children outcomes. Outcomes include: the proportion of children with diarrhea in the past two weeks (1); the proportion of children with pneumonia in the past two weeks (2); the proportion of children with fever in the past two weeks (3); the proportion of children who sought treatment for that illness (4); the proportion of children who payed for the treatment (5); total health expenditures for children under 5 years old in the last year (in USD, 6). "Cash+SBCC" indicates T1 villages, where cash transfers and SBCC activities were provided jointly; "CashOnly" indicates T2 villages, where cash transfers only were provided; the reference group are villages in the control group where neither cash transfers nor SBCC took place. Controls include (i) individual demographic controls, including child's sex and age, mother's age and education, and household head's age and education for child-level analysis; mother's age and education, and household head's age and education for mother-level analysis; (ii) village-level controls, including distance to large and small markets, main source of livelihood (agriculture, livestock, or casual labor), availability of government provided electricity, and participation in a concurrent WASH intervention. Fixed effects per geographic strata (34) are included. Standard errors are clustered at the village cluster level. P-values from t-test from the difference in means are reported. *** p<0.01, ** p<0.05, * p<0.1.

$CashOnly$ and $Cash + SBCC$ are no more likely to decide on expenditures from their own or spouse's earnings, health care, major household purchases, or visiting relatives, than those in the control group.

3.3 Robustness Checks

Although administrative program data show no documented cases of cash being delivered through the program to individuals residing in control villages, two forms of contamination in the SBCC intervention may compromise the validity of some of our estimates. First, according to SCI's administrative data on the SBCC rollout, 18 villages assigned to the $CashOnly$ treatment received SBCC activities for 20 rather than 30 months because of an error in program implementation. Second, SBCC activities were expanded to all $CashOnly$ villages beginning in January 2019, although part of the endline data were collected after December 2018 at which point those respondents had already received at least one month of SBCC activities.

To address these two issues, we re-run the analysis excluding those 18 $CashOnly$ villages and all mothers interviewed after December 2018, for a total of 138 mothers or 6.5 percent of the 2,134 women in the analysis sample. As reported in Appendix Table 10, the results are robust to these exclusions.

In addition, the main results are robust to considering the full endline sample (Appendix Tables 11) identified in the 2017 listing of pregnant mothers, which includes women who may have migrated into the village or become pregnant after announcement of the program. Results are also robust to the clustering of standard errors at the level of the program delivery (village) rather than the unit of randomization (health center catchment area), as shown in Appendix Table 12. Finally, the main results are largely unchanged in a specification that excludes control variables other than the strata fixed effects (Appendix Table 13).

4 Conclusion

Our findings provide novel evidence from biomarker data that (unconditional) maternal cash transfer programs delivered for the first 1000 days of life lead to statistically significant reductions in the proportion of children (moderately) stunted, but only when they are combined with intensive Social Behavior Change Communication (SBCC). The significant effects on stunting are concentrated among below-median-income households

in low-SES villages, consistent with the notion that nutrition programs matter most where vulnerability to malnutrition is highest, yet the combination of interventions improved outcomes only among those at risk of moderate but not severe stunting. These patterns provide insight into which sub populations are most easily reached by such interventions, and indicate that greater efforts are needed to combat severe malnutrition. Tailoring SBCC programming to households with low levels of resources or facing chronic infections may be needed to address the most severe cases of malnutrition.

The program was successful in changing a number of maternal health behaviors, including total food consumption, dietary diversity, breastfeeding, hand-washing practices, and utilization of prenatal care. However, given that we do not find evidence that the combined interventions reduced child illness episodes, our pattern of results suggests that SBCC succeeded in reducing child malnutrition primarily through improvements in children's diet, including more calories and more diverse calories from a variety of protein-rich foods. In contrast, while cash alone increased child food intake and consumption of animal proteins, the changes were significantly smaller than those observed in the $Cash + SBCC$ arm, and there was no increase in consumption of the more affordable vegan proteins emphasized in the SBCC curriculum. Moreover, the changes in child diet achieved through cash alone were insufficient to improve biometric indicators of malnutrition in young children who are in a critical window of growth.

Together, these findings underscore the importance of adding information components to social safety net programs involving cash disbursement in order to successfully change investment in human capital and thereby disrupt the inter-generational cycle of poverty. Our interventions show that (unconditional) cash transfers alone are insufficient to reduce chronic malnutrition. Instead, providing mothers with knowledge on how to use the additional disposable income can be transformative in reducing stunting. More generally, our analysis reveals that SBCC was fundamental in changing mothers' knowledge and practices, which indicates that information constraints contribute to low-income elasticity of (child) calorie demand among malnourished populations.

Further research is needed to better understand which particular curricular components are key to maximizing the child health gains of maternal cash transfer programs. In addition, more research is needed to establish whether information alone would be similarly effective in improving child health outcomes. However, given that the most meaningful behavior changes in terms of child outcomes involved switching to more expensive foods rather than cost-free changes in health practices, it is likely that SBCC

delivered *without* the additional benefit of cash transfers would be unlikely to achieve a comparable impact on child stunting.

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Appendix: Additional Tables and Figures

Table 1: Balance on woman-level characteristics

	T1	T2	CG	PV (T1-CG)	PV (T2-CG)	N(T1/T2/CG)
Resp married	0.96	0.97	0.96	0.541	0.199	840 / 802 / 695
	(0.19)	(0.17)	(0.20)			
Resp age	32.16	31.42	31.26	0.013**	0.683	840 / 802 / 696
	(6.37)	(6.52)	(6.17)			
Resp educ years	5.70	5.86	6.08	0.132	0.370	840 / 802 / 696
	(3.19)	(3.38)	(3.36)			
HH size	4.95	4.99	4.81	0.224	0.103	840 / 802 / 696
	(1.71)	(1.77)	(1.64)			
Children U5	1.12	1.11	1.13	0.750	0.370	840 / 802 / 696
	(0.37)	(0.34)	(0.38)			
HH head female	0.08	0.09	0.07	0.593	0.421	840 / 802 / 696
	(0.28)	(0.28)	(0.26)			
HH head tot yrs educ	5.49	5.79	6.06	0.030**	0.292	840 / 802 / 696
	(3.19)	(3.35)	(3.35)			
HH head worked past 3m	0.89	0.83	0.86	0.650	0.386	840 / 802 / 696
	(0.66)	(0.39)	(0.58)			
HH head income	349964.00	330294.12	332720.14	0.627	0.949	839 / 799 / 695
	(478142.69)	(486734.66)	(466277.61)			
Any electricity	0.42	0.38	0.47	0.515	0.198	840 / 802 / 696
	(0.49)	(0.48)	(0.50)			
Always electricity	0.38	0.33	0.40	0.775	0.350	833 / 790 / 688
	(0.48)	(0.47)	(0.49)			
Cooking fuel electricity	0.29	0.24	0.29	0.953	0.360	840 / 802 / 696
	(0.46)	(0.43)	(0.45)			
Tot no. rooms in house	1.15	1.18	1.14	0.825	0.474	838 / 796 / 693
	(0.81)	(0.80)	(0.75)			
Improved roof material	0.87	0.85	0.87	0.991	0.681	840 / 802 / 696
	(0.34)	(0.35)	(0.34)			
Improved wall material	0.23	0.22	0.21	0.390	0.704	840 / 802 / 696
	(0.42)	(0.41)	(0.41)			
Improved floor material	0.33	0.32	0.31	0.695	0.898	840 / 802 / 696
	(0.47)	(0.47)	(0.46)			

Notes: This table presents the balance check on women characteristics by treatment arm for the sample of all mothers who were pregnant at enrollment (2,338). T1 ("Cash+SBCC") refer to villages where cash transfers and SBCC activities were provided jointly; T2 ("CashOnly") refer to villages where cash transfers only were provided; CG (control group) refer to villages where neither cash transfers nor SBCC took place. Fixed effects per geographic strata (34) are included. Standard errors are clustered at the village cluster level. P-values from t-test from the difference in means are reported. *** p<0.01, ** p<0.05, * p<0.1.

Table 2: Balance on village-level characteristics

	T1	T2	CG	PV (T1-CG)	PV (T2-CG)	N(T1/T2/CG)
Tot. population (No. HH)	182.17	175.54	160.92	0.263	0.418	133 / 135 / 139
	(128.98)	(135.99)	(106.39)			
Tot. literacy rate	85.19	85.50	83.58	0.384	0.247	133 / 135 / 139
	(13.45)	(12.50)	(12.87)			
Main livelihood: Agriculture	0.92	0.85	0.91	0.654	0.312	133 / 135 / 139
	(0.26)	(0.36)	(0.29)			
Main livelihood: Livestock	0.29	0.30	0.24	0.583	0.500	133 / 135 / 139
	(0.45)	(0.46)	(0.43)			
Main livelihood: Casual Labor	0.77	0.79	0.76	0.779	0.714	133 / 135 / 139
	(0.42)	(0.41)	(0.43)			
Type land-dry land farming	0.53	0.64	0.55	0.837	0.370	133 / 135 / 139
	(0.50)	(0.48)	(0.50)			
Type land-flood plains or irrigated	0.47	0.35	0.44	0.780	0.322	133 / 135 / 139
	(0.50)	(0.48)	(0.50)			
Accessible by car/truck in all weather	0.79	0.79	0.75	0.614	0.677	133 / 135 / 139
	(0.41)	(0.41)	(0.44)			
Village has Gov electricity	0.24	0.22	0.22	0.839	0.992	133 / 135 / 139
	(0.43)	(0.42)	(0.42)			
Village has primary school	0.63	0.58	0.59	0.544	0.832	133 / 135 / 139
	(0.48)	(0.50)	(0.49)			
Village has small markets	0.02	0.05	0.03	0.735	0.352	133 / 135 / 139
	(0.15)	(0.22)	(0.17)			
Village has home markets	0.97	0.96	0.96	0.773	0.729	133 / 135 / 139
	(0.17)	(0.21)	(0.19)			
Distance to large market	34.76	32.96	40.24	0.310	0.150	133 / 135 / 139
	(24.83)	(20.05)	(26.39)			
Distance to small markets	24.77	20.46	28.07	0.487	0.084*	133 / 135 / 139
	(18.62)	(15.49)	(23.55)			
Village has health facility	0.16	0.19	0.19	0.269	0.803	133 / 135 / 139
	(0.37)	(0.39)	(0.40)			
Village has midwife	0.21	0.21	0.24	0.358	0.269	133 / 135 / 139
	(0.41)	(0.41)	(0.43)			
Water shortage past year	0.42	0.46	0.36	0.441	0.189	133 / 135 / 139
	(0.50)	(0.50)	(0.48)			

Notes: This table presents the balance check on village characteristics by treatment arm for the sample of villages included in the analysis. T1 ("Cash+SBCC") refer to villages where cash transfers and SBCC activities were provided jointly; T2 ("CashOnly") refer to villages where cash transfers only were provided; CG (control group) refer to villages where neither cash transfers nor SBCC took place. Fixed effects per geographic strata (34) are included. Standard errors are clustered at the village cluster level. P-values from t-test from the difference in means are reported. *** p<0.01, ** p<0.05, * p<0.1.

Table 3: Balance on woman-level characteristics for women sample followed-up at endline

	T1	T2	CG	PV (T1-CG)	PV (T2-CG)	N(T1/T2/CG)
Resp married	0.96	0.97	0.96	0.581	0.189	769 / 744 / 620
	(0.19)	(0.17)	(0.20)			
Resp age	32.07	31.41	31.39	0.082*	0.964	769 / 744 / 621
	(6.38)	(6.53)	(6.18)			
Resp educ years	5.71	5.84	6.09	0.134	0.339	769 / 744 / 621
	(3.17)	(3.32)	(3.36)			
HH size	4.92	4.99	4.83	0.418	0.164	769 / 744 / 621
	(1.69)	(1.80)	(1.63)			
Tot. biological children U5	1.14	1.12	1.14	0.975	0.326	769 / 744 / 621
	(0.36)	(0.33)	(0.36)			
HH head age	40.46	39.76	39.94	0.605	0.864	769 / 744 / 621
	(13.98)	(13.37)	(14.43)			
HH head female	0.08	0.08	0.07	0.585	0.699	769 / 744 / 621
	(0.28)	(0.27)	(0.26)			
HH head tot yrs educ	5.47	5.81	6.04	0.032**	0.371	769 / 744 / 621
	(3.14)	(3.33)	(3.34)			
HH head worked past 3m	0.89	0.83	0.86	0.642	0.426	769 / 744 / 621
	(0.65)	(0.38)	(0.60)			
HH head income past 3mo	350743.23	335991.91	334404.03	0.654	0.967	768 / 742 / 620
	(466361.87)	(500633.62)	(483130.36)			
Any electricity	0.42	0.38	0.48	0.503	0.177	769 / 744 / 621
	(0.49)	(0.49)	(0.50)			
Always electricity	0.38	0.33	0.41	0.718	0.309	762 / 733 / 614
	(0.49)	(0.47)	(0.49)			
Cooking fuel electricity	0.29	0.24	0.30	0.881	0.253	769 / 744 / 621
	(0.46)	(0.43)	(0.46)			
Tot no. rooms in house	1.14	1.17	1.13	0.890	0.536	767 / 739 / 619
	(0.80)	(0.79)	(0.75)			
Improved roof material	0.86	0.85	0.87	0.866	0.698	769 / 744 / 621
	(0.34)	(0.35)	(0.34)			
Improved wall material	0.23	0.22	0.21	0.436	0.750	769 / 744 / 621
	(0.42)	(0.41)	(0.41)			
Improved floor material	0.33	0.31	0.31	0.642	0.989	769 / 744 / 621
	(0.47)	(0.46)	(0.46)			

Notes: This table presents the balance check on individual characteristics by treatment arm for the sample of mothers who were pregnant at enrollment included in the analysis as followed-up at endline (2,134). T1 ("Cash+SBCC") refer to villages where cash transfers and SBCC activities were provided jointly; T2 ("CashOnly") refer to villages where cash transfers only were provided; CG (control group) refer to villages where neither cash transfers nor SBCC took place. Fixed effects per geographic strata (34) are included. Standard errors are clustered at the village cluster level. P-values from t-test from the difference in means are reported. *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Fertility

	(1)	(2)
	Pregnant	Tot no. pregnancies since start of program
Cash+SBCC	0.010	0.002
	(0.009)	(0.018)
CashOnly	0.001	-0.028*
	(0.009)	(0.017)
Observations	2134	2134
Mean Control	.03	1.14
Clusters	102	102

Notes: The table presents OLS estimates of the effects of the maternal cash transfer program interventions on measures of fertility. "Cash+SBCC" indicates T1 villages, where cash transfers and SBCC activities were provided jointly; "CashOnly" indicates T2 villages, where cash transfers only were provided; the reference group are villages in the control group (CG) where neither cash transfers nor SBCC took place. Outcomes include whether the mother is currently pregnant at endline (1), and her total number of pregnancies between June 2016 and endline, calculated from the household roster as the sum of biological living children under 5 years old. Controls include (i) individual demographic controls, including mother's age and education, and household head's age and education; (ii) village-level controls, including distance to large and small markets, main source of livelihood (agriculture, livestock, or casual labor), availability of government provided electricity, and participation in a concurrent WASH intervention. Fixed effects per geographic strata (34) are included. Standard errors are clustered at the village cluster level. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Child underweight

	(1)	(2)	(3)	(4)
	Prop. of children underweight	Prop. of children moderately underweight	Prop. of children severely underweight	WAH score (WHO)
Cash+SBCC	-0.003	0.005	-0.008	-0.074
	(0.014)	(0.007)	(0.012)	(0.049)
CashOnly	-0.019	0.004	-0.023*	-0.050
	(0.015)	(0.008)	(0.012)	(0.055)
Observations	2142	2142	2142	2142
Mean Control	0.11	0.02	0.10	-0.83
Clusters	102	102	102	102

Notes: The table presents OLS estimates of the effects of the maternal cash transfer program interventions on measures of stunting for children whose mothers were pregnant at enrollment, following WHO classification."Cash+SBCC" indicates T1 villages, where cash transfers and SBCC activities were provided jointly; "CashOnly" indicates T2 villages, where only cash transfers were provided; the reference group are villages in the control group where neither cash transfers nor SBCC took place. Outcomes include the proportion of children underweight as children with Wight for Age Z score (WAH) < -2 (1); the proportion of children moderately underweight as children with WAH < -2 and >= -3 (2); the proportion of children severely underweight as children with WAH < -3 (3); and, WAH (4). Controls include (i) individual demographic controls, including child's sex and age, mother's age and education, and household head's age and education; (ii) village-level controls, including distance to large and small markets, main source of livelihood (agriculture, livestock, or casual labor), availability of government provided electricity, and participation in a concurrent WASH intervention. Fixed effects per geographic strata (34) are included. Standard errors are clustered at the village cluster level. P-values from t-test from the difference in means are reported. ***p<0.01, ** p<0.05, * p<0.1.

Table 6: Child wasting

	(1)	(2)	(3)	(4)
	Prop. of children wasted (GAM)	Prop. of children moderately wasted (MAM)	Prop. of children severely wasted (SAM)	WHZ score (WHO)
Cash+SBCC	-0.003	0.018	-0.021	-0.029
	(0.025)	(0.012)	(0.022)	(0.052)
CashOnly	0.004	0.019	-0.015	-0.051
	(0.027)	(0.013)	(0.023)	(0.058)
Observations	2145	2145	2145	2145
Mean Control	0.28	0.04	0.24	-1.43
Clusters	102	102	102	102

Notes: The table presents OLS estimates of the effects of the maternal cash transfer program interventions on measures of stunting for children whose mothers were pregnant at enrollment, following WHO classification."Cash+SBCC" indicates T1 villages, where cash transfers and SBCC activities were provided jointly; "CashOnly" indicates T2 villages, where only cash transfers were provided; the reference group are villages in the control group where neither cash transfers nor SBCC took place. Outcomes include the proportion of children wasted (global acute malnutrition, GAM) as children with Weight for Height Z score (WHZ) < -2 (1); the proportion of children with moderate acute malnutrition (MAM) as children with WHZ < -2 and >= -3 (2); the proportion of children with severe acute malnutrition (SAM) as children with WHZ < -3 (3); and, WHZ (4). Controls include (i) individual demographic controls, including child's sex and age, mother's age and education, and household head's age and education; (ii) village-level controls, including distance to large and small markets, main source of livelihood (agriculture, livestock, or casual labor), availability of government provided electricity, and participation in a concurrent WASH intervention. Fixed effects per geographic strata (34) are included. Standard errors are clustered at the village cluster level. P-values from t-test from the difference in means are reported. ***p<0.01, ** p<0.05, * p<0.1.

Table 7: Children stunting - by village socio-economic status (SES)

	(1)	(2)	(3)	(4)
	Prop. of children stunted	Prop. of children moderately stunted	Prop. of children severely stunted	HAZ score (WHO)
Panel A: Low SES Villages				
Cash+SBCC	-0.093**	-0.093***	0.001	0.158**
	(0.037)	(0.032)	(0.020)	(0.071)
CashOnly	-0.041	-0.055	0.014	-0.026
	(0.038)	(0.035)	(0.020)	(0.070)
Observations	1051	1051	1051	1051
Mean Control	0.34	0.27	0.07	-1.57
Clusters	92	92	92	92
Panel B: High SES Villages				
Cash+SBCC	0.044	0.020	0.024	-0.036
	(0.031)	(0.030)	(0.016)	(0.078)
CashOnly	0.057*	0.048	0.009	-0.069
	(0.033)	(0.031)	(0.014)	(0.080)
Observations	961	961	961	961
Mean Control	0.34	0.27	0.07	-1.57
Clusters	86	86	86	86

Notes: The table presents OLS estimates of the effects of the maternal cash transfer program interventions on measures of stunting for children whose mothers were pregnant at enrollment, following WHO classification."Cash+SBCC" indicates T1 villages, where cash transfers and SBCC activities were provided jointly; "CashOnly" indicates T2 villages, where only cash transfers were provided; the reference group are villages in the control group where neither cash transfers nor SBCC took place. Outcomes include the proportion of children stunted as children with Height for Age Z score (HAZ) ¡ -2 (1); the proportion of children moderately stunted as children with HAZ < -2 and >= -3 (2); the proportion of children severely stunted as children with HAZ < -3 (3); and, HAZ (4). Controls include (i) individual demographic controls, including child's sex and age, mother's age and education, and household head's age and education; (ii) village-level controls, including distance to large and small markets, main source of livelihood (agriculture, livestock, or casual labor), availability of government provided electricity, and participation in a concurrent WASH intervention. The analysis excludes the sample contaminated by the imperfect implementation (139 children). Low or high SES is proxied by the average number of years of education attained by resident women below or above the median.

Table 8: Children stunting - by village socio-economic status (SES) and household income

	(1)	(2)	(3)	(4)
	Prop. of children stunted	Prop. of children moder-ately stunted	Prop. of children severely stunted	HAZ score (WHO)
Panel A: Low SES, Low income				
Cash+SBCC	-0.140***	-0.122**	-0.017	0.210**
	(0.050)	(0.047)	(0.029)	(0.099)
CashOnly	-0.053	-0.034	-0.019	-0.010
	(0.056)	(0.052)	(0.030)	(0.104)
Observations	544	544	544	544
Mean Control	0.43	0.35	0.08	-1.72
Clusters	89	89	89	89
Panel B: Low SES, High income				
Cash+SBCC	-0.028	-0.059	0.031	0.029
	(0.047)	(0.050)	(0.030)	(0.087)
CashOnly	-0.012	-0.065	0.053*	-0.089
	(0.043)	(0.046)	(0.030)	(0.079)
Observations	507	507	507	507
Mean Control	0.42	0.35	0.07	-1.69
Clusters	86	86	86	86
Panel C: High SES, Low Income				
Cash+SBCC	0.039	0.027	0.012	0.035
	(0.045)	(0.039)	(0.024)	(0.105)
CashOnly	0.054	0.059	-0.005	-0.015
	(0.047)	(0.040)	(0.021)	(0.097)
Observations	454	454	454	454
Mean Control	0.26	0.18	0.07	-1.50
Clusters	81	81	81	81
Panel D: High SES, High Income				
Cash+SBCC	0.029	0.003	0.025	-0.084
	(0.045)	(0.044)	(0.024)	(0.111)
CashOnly	0.078	0.044	0.034	-0.178
	(0.053)	(0.053)	(0.025)	(0.132)
Observations	507	507	507	507
Mean Control	0.27	0.22	0.05	-1.39
Clusters	80	80	80	80

Notes: The table presents OLS estimates of the effects of the maternal cash transfer program interventions on measures of stunting for children whose mothers were pregnant at enrollment, following WHO classification."Cash+SBCC" indicates T1 villages, where cash transfers and SBCC activities were provided jointly; "CashOnly" indicates T2 villages, where only cash transfers were provided; the reference group are villages in the control group where neither cash transfers nor SBCC took place. Outcomes include the proportion of children stunted as children with Height for Age Z score (HAZ) ¡ -2 (1); the proportion of children moderately stunted as children with HAZ < -2 and >= -3 (2); the proportion of children severely stunted as children with HAZ < -3 (3); and, HAZ (4). Controls include (i) individual demographic controls, including child's sex and age, mother's age and education, and household head's age and education; (ii) village-level controls, including distance to large and small markets, main source of livelihood (agriculture, livestock, or casual labor), availability of government provided electricity, and participation in a concurrent WASH intervention. The analysis excludes the sample contaminated by the imperfect implementation (139 children). Low or high SES is proxied by the average number of years of education attained by resident women below or above the median. Low or high income is defined as below or above the household median income. Fixed effects per geographic strata (34) are included. Standard errors are clustered at the village cluster level. *** p<0.01, ** p<0.05, * p<0.1.

Table 9: Women's decision-making

	(1)	(2)	(3)	(4)	(5)
	Mother decides on own earnings	Mother decides on spouse earnings	Mother decides on health	Mother decides on major purchases	Mother decides on visit relatives
Cash+SBCC	0.027	-0.004	0.047	0.043*	0.022
	(0.031)	(0.024)	(0.031)	(0.024)	(0.027)
CashOnly	0.045*	0.017	0.029	0.012	-0.014
	(0.027)	(0.024)	(0.028)	(0.025)	(0.029)
Observations	1958	2088	2130	2130	2132
Mean Control	0.34	0.23	0.24	0.18	0.23
Clusters	102	102	102	102	102
Cash+SBCC=CashOnly	0.51	0.40	0.59	0.17	0.19

Notes: The table presents OLS estimates of the effects of the maternal cash transfer program interventions on measures of decision-making. Outcomes include: the proportion of mothers who decide on own (1) or spouse's earnings (2); on health (3); or on major household purchases (4) or visiting relatives (5). "Cash+SBCC" indicates T1 villages, where cash transfers and SBCC activities were provided jointly; "CashOnly" indicates T2 villages, where cash transfers only were provided; the reference group are villages in the control group where neither cash transfers nor SBCC took place. Controls include (i) individual demographic controls, including child's sex and age, mother's age and education, and household head's age and education for child-level analysis; mother's age and education, and household head's age and education for mother-level analysis; (ii) village-level controls, including distance to large and small markets, main source of livelihood (agriculture, livestock, or casual labor), availability of government provided electricity, and participation in a concurrent WASH intervention. Fixed effects per geographic strata (34) are included. Standard errors are clustered at the village cluster level. *** p<0.01, ** p<0.05, * p<0.1.

Table 10: Children stunting - addressing contamination

	(1)	(2)	(3)	(4)
	Prop. of children stunted	Prop. of children moderately stunted	Prop. of children severely stunted	HAZ score (WHO)
Cash+SBCC	-0.050**	-0.057***	0.007	0.074
	(0.022)	(0.018)	(0.011)	(0.047)
CashOnly	-0.002	-0.006	0.004	-0.031
	(0.025)	(0.022)	(0.012)	(0.044)
Observations	2012	2012	2012	2012
Mean Control	0.34	0.27	0.07	-1.57
Clusters	102	102	102	102

Notes: The table presents OLS estimates of the effects of the maternal cash transfer program interventions on measures of stunting for children whose mothers were pregnant at enrollment, following WHO classification.'Cash+SBCC" indicates T1 villages, where cash transfers and SBCC activities were provided jointly; "CashOnly" indicates T2 villages, where only cash transfers were provided; the reference group are villages in the control group where neither cash transfers nor SBCC took place. Outcomes include the proportion of children stunted as children with Height for Age Z score (HAZ) ¡ -2 (1); the proportion of children moderately stunted as children with HAZ < -2 and >= -3 (2); the proportion of children severely stunted as children with HAZ < -3 (3); and, HAZ (4). Controls include (i) individual demographic controls, including child's sex and age, mother's age and education, and household head's age and education; (ii) village-level controls, including distance to large and small markets, main source of livelihood (agriculture, livestock, or casual labor), availability of government provided electricity, and participation in a concurrent WASH intervention. The analysis excludes the sample contaminated by the imperfect implementation (139 children). Fixed effects per geographic strata (34) are included. Standard errors are clustered at the village cluster level. *** p<0.01, ** p<0.05, * p<0.1.

Table 11: Children stunting - endline full sample

	(1)	(2)	(3)	(4)
	Prop. of children stunted	Prop. of children moderately stunted	Prop. of children severely stunted	HAZ score (WHO)
Cash+SBCC	-0.038**	-0.042***	0.004	0.060*
	(0.016)	(0.015)	(0.009)	(0.035)
CashOnly	-0.006	-0.009	0.003	-0.014
	(0.017)	(0.016)	(0.009)	(0.035)
Observations	3176	3176	3176	3176
Mean Control	0.35	0.28	0.06	-1.58
Clusters	102	102	102	102

Notes: The table presents OLS estimates of the effects of the maternal cash transfer program interventions on measures of stunting for children of the full endline sample, following WHO classification."Cash+SBCC" indicates T1 villages, where cash transfers and SBCC activities were provided jointly; "CashOnly" indicates T2 villages, where only cash transfers were provided; the reference group are villages in the control group where neither cash transfers nor SBCC took place. Outcomes include the proportion of children stunted as children with Height for Age Z score (HAZ) < -2 (1); the proportion of children moderately stunted as children with HAZ < -2 and >= -3 (2); the proportion of children severely stunted as children with HAZ < -3 (3); and, HAZ (4). Controls include (i) individual demographic controls, including child's sex and age, mother's age and education, and household head's age and education; (ii) village-level controls, including distance to large and small markets, main source of livelihood (agriculture, livestock, or casual labor), availability of government provided electricity, and participation in a concurrent WASH intervention. Fixed effects per geographic strata (34) are included. Standard errors are clustered at the village cluster level. P-values from t-test from the difference in means are reported. ***p<0.01, ** p<0.05, * p<0.1.

Table 12: Children stunting - standard errors clustered at village level

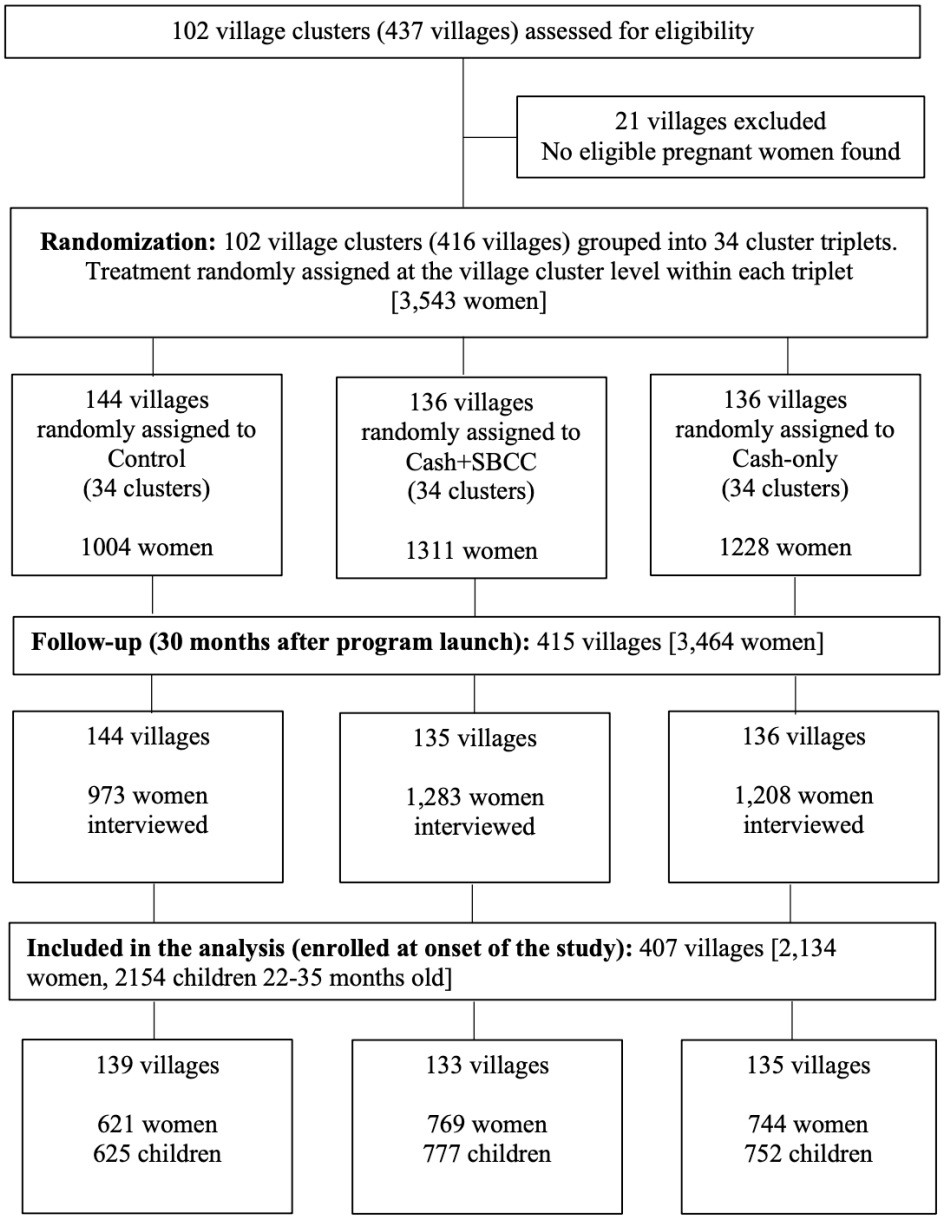
	(1)	(2)	(3)	(4)
	Prop. of children stunted	Prop. of children moderately stunted	Prop. of children severely stunted	HAZ score (WHO)
Cash+SBCC	-0.046*	-0.053**	0.007	0.074
	(0.025)	(0.023)	(0.014)	(0.054)
CashOnly	-0.004	-0.008	0.004	-0.017
	(0.026)	(0.024)	(0.014)	(0.051)
Observations	2151	2151	2151	2151
Mean Control	0.34	0.27	0.07	-1.57
Clusters	407	407	407	407

Notes: The table presents OLS estimates of the effects of the maternal cash transfer program interventions on measures of stunting for children whose mothers were pregnant at enrollment, following WHO classification.'Cash+SBCC" indicates T1 villages, where cash transfers and SBCC activities were provided jointly; "CashOnly" indicates T2 villages, where only cash transfers were provided; the reference group are villages in the control group where neither cash transfers nor SBCC took place. Outcomes include the proportion of children stunted as children with Height for Age Z score (HAZ) ¡ -2 (1); the proportion of children moderately stunted as children with HAZ < -2 and >= -3 (2); the proportion of children severely stunted as children with HAZ < -3 (3); and, HAZ (4). Controls include (i) individual demographic controls, including child's sex and age, mother's age and education, and household head's age and education; (ii) village-level controls, including distance to large and small markets, main source of livelihood (agriculture, livestock, or casual labor), availability of government provided electricity, and participation in a concurrent WASH intervention. Fixed effects per geographic strata (34) are included. Standard errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1.

Table 13: Child stunting (w/o controls)

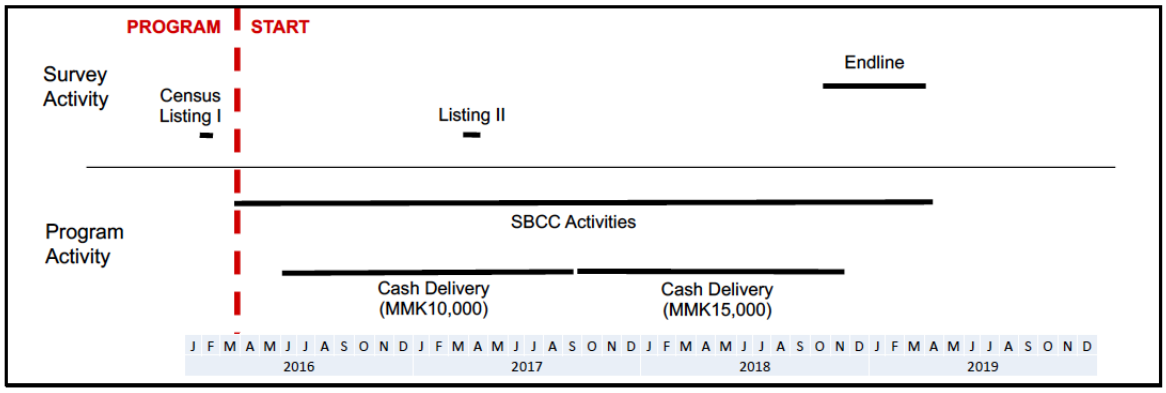
	(1)	(2)	(3)	(4)
	Prop. of children stunted	Prop. of children moderately stunted	Prop. of children severely stunted	HAZ score (WHO)
Cash+SBCC	-0.033	-0.046**	0.013	0.038
	(0.026)	(0.021)	(0.011)	(0.059)
CashOnly	-0.006	-0.010	0.004	-0.030
	(0.027)	(0.022)	(0.012)	(0.056)
Observations	2151	2151	2151	2151
Mean Control	0.34	0.27	0.07	-1.57
Clusters	102	102	102	102

Notes: The table presents OLS estimates of the effects of the maternal cash transfer program interventions on measures of stunting for children whose mothers were pregnant at enrollment, following WHO classification."Cash+SBCC" indicates T1 villages, where cash transfers and SBCC activities were provided jointly; "CashOnly" indicates T2 villages, where only cash transfers were provided; the reference group are villages in the control group where neither cash transfers nor SBCC took place. Outcomes include the proportion of children stunted as children with Height for Age Z score (HAZ) < -2 (1); the proportion of children moderately stunted as children with HAZ < -2 and >= -3 (2); the proportion of children severely stunted as children with HAZ < -3 (3); and, HAZ (4). Fixed effects per geographic strata (34) are included. Standard errors are clustered at the village cluster level. ***p<0.01, ** p<0.05, * p<0.1.



Notes: This figure presents the profile of the randomized controlled trial.

Figure 1: Profile of the Randomized Controlled Trial



Notes: This figure presents the timeline of the data collection rounds (survey activity) and the maternal cash transfer program rollout (program activity).

Figure 2: Timeline