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Do Behavioral Interventions Enhance the Effects of Cash on Early Childhood Development and Its Determinants?

Evidence from a Cluster-Randomized Trial in Madagascar

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Abstract

This paper evaluates the effects of interventions based on behavioral science on measures of early childhood socio-cognitive development (and related household-level outcomes) for children from households receiving cash transfers in Madagascar, using a multi-arm cluster-randomized trial. Three behavioral interventions (a Mother Leaders group and associated activities, by itself or augmented with a self-affirmation or a plan-making nudge) are layered onto a child-focused cash transfer program targeting children from birth to age six years. Approximately 18 months into the implementation of these interventions and 20 months since baseline, the study finds evidence that households in the behaviorally enhanced arms undertake more desirable parenting behaviors, interact more with their children, prepare more (and more diverse) meals at home, and report lower food insecurity than households that received only cash. Children from households in several of the behaviorally enhanced arms also perform better than children from households in the cash-only arm on several measures of socio-cognitive development, including language learning and social skills.

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Do Behavioral Interventions Enhance the Effects of Cash on Early Childhood Development and Its Determinants? Evidence from a Cluster-Randomized Trial in Madagascar

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1: Introduction and Motivation

In recent years, the development community and researchers to begun to pay increasing attention to the potential for leveraging cash transfer programs to foster early childhood development, or ECD (World Bank 2018a; World Bank 2018b; Black et al, 2017; Currie and Almond 2011). The rationale for the interest in this nexus is driven by two parallel developments in the literature. Firstly, a growing body of research demonstrates that investing in children's health, nutrition, cognition and socio-emotional development during the 'early years' – typically defined as the period between gestation and a child's sixth birthday, when there is a high degree of plasticity in children's neurological development – has important cumulative effects for overall cognitive development, dramatically improving a range of outcomes, including labor outcomes, later in life (World Bank 2018a; Grantham-McGregor et al, 2007; Black et al, 2017; Currie and Almond 2011; WHO 2018; World Bank 2018b; Gertler et al. 2014; Cunha and Heckman 2007. Cunha, Heckman, Lochner, and Masterov 2006). At the same time, the global expansion of cash transfer programs into low-income countries means that such programs – which usually target the poorest families with young children – are among the few public-sector programs in developing countries that directly reach a large number of the very households where deprivations such as chronic malnutrition and other indicators of poor child development are concentrated (World Bank 2018a; 2018b). Taken together, these two developments have led to a renewed focus on the possibilities of using cash transfer programs to impact early childhood development among children growing up in poverty in low- and middle-income countries.

This interest is by no means novel. Pioneering "conditional" cash transfer programs in Latin America had an explicit focus on encouraging families to invest in their children's human capital, often through requirements to take children to health clinics as well as school attendance and enrollment which arose from the recognition that enhanced availability of cash may be a necessary but not always sufficient condition to ensure that the desired outcomes are achieved (Lagarde et al. 2007; Fiszbein et al., 2009). More recently, research emphasizing the importance of parental behaviors on early childhood outcomes has led to a greater emphasis on incorporating ECD programming (including programs or modules on parenting) into cash transfer programs (Vargas-Baron 2009). Indeed, evaluations of cash transfer programs have revealed that they have important, measurable effects on a variety of early-childhood outcomes beyond the well-established impacts on consumption-based poverty and access to education and health services which were their initial focus (Bastagli et al. 2016; de Walque et al. 2017). These include positive impacts on mitigating the negative impact of early life shocks (Adhvaryu et al. 2016), food consumption (Adato & Bassett, 2009), nutritional diversity (Attanasio, Gomez, Heredia, & Vera-Hernandez, 2005; Fernald, Gertler, & Neufeld 2008), food security (see survey in De Groot et al. 2015), cognitive development (Macours et al. 2012), mixed evidence on nutritional outcomes such as stunting and wasting (De Groot et al. 2015), and some effects on reducing infant mortality (Rasella et al. 2013). Pro-poor cash transfer programs targeted at households with young children can thus help to mitigate the detrimental and long-lasting effects that poverty and its associated risks have on child development, supporting human capital accumulation and reducing inequality from early in life via the provision of periodic exogenous income supplements, enabling behaviors that were not previously financially possible for households (Kabeer and Waddington 2015; Tsur 2016, and many others).

However, early-childhood-focused cash transfers present a specific set of design and programmatic challenges that mean that some tools and techniques employed by more traditional cash transfers as a means of improving impact may not be as useful when applied to such transfers. Consider the role of 'conditionality'. As discussed above, starting with early cash transfer programs in Latin America, these programs sought to buttress the effect of the cash with direct 'conditionality', where the receipt of the cash is conditional on certain actions (e.g., regular health care visits or school attendance) on the part of beneficiaries or their families, fostering the use of supply side services, notably in education and child health (Lagarde et al. 2007; Fiszbein et al., 2009). However, the use of formal or 'hard' conditionality is difficult in the case of programs focused on early childhood development, where many critical behaviors (e.g., balanced and nutritious feeding, breastfeeding, or stimulation to promote socio-cognitive growth, etc.) are private, ongoing and hard to measure, and where investments in children's

human capital often depend critically on parents' behavior and less on access to supply side services where attendance or uptake can be tracked.

As a result, as well as due to a growing literature that emphasizes difficulties with and downsides from conditionality, especially in settings with limited implementation and monitoring capacity and where there may be limited availability of the resources or facilities needed to enable households to meet conditions, there has been increasing interest in designing and evaluating alternatives to formal conditionality, including the use of "accompanying measures" ranging from nutritional supplementation, family practices training, and other modalities (Cookson, 2018; Arriagada et al., 2018). However, while there is some evidence that this 'Cash Plus' approach leads to positive impacts, at least in the short run (Berhman and Hoddinott, 2005; Macours et al., 2012), some follow-up studies have found effects to dissipate over a period of time (Attanasio et al. 2014), demonstrating the challenge *of sustainable* behavior change and investments in children's human capital needed to promote long-term welfare.

The question of how best to design ECD-focused cash transfers – in terms of program parameters, delivery mechanisms, and supplemental measures to optimize impacts on children – thus remains an open one. With conditionality difficult or impossible due to the reasons outlined above, and mixed results from straightforward informational or awareness-based programming (or "accompanying measures") alone, there is room to explore alternative techniques of encouraging the behavior change on the part of caregivers/parents that is critical for ECD-focused transfer programs to achieve their desired ends. Here, much promise attaches to the idea of leveraging insights from the emerging field of behavioral economics, which finds that human decision-making is subject to a variety of cognitive and other biases that cause behavior to diverge from the predictions of neoclassical economics, that many of these biases are activated and exacerbated by small features of decision-makers' contexts, and that while these effects operate for all populations, they are particularly marked for those living in conditions of poverty (Datta and Mullainathan 2012; Mullainathan and Shafir 2013). Applied to cash transfers, this suggests that even small features of the context in which program beneficiaries operate may impact decisions (and thereby outcomes) by exacerbating the effect of common features of human psychology such as limited self-control, limited attention, present bias, etc. in ways that could reduce the likelihood of beneficiaries taking the kinds of decisions and actions the program is set up to generate, *even when beneficiaries can afford to take these steps and are intrinsically motivated to do so.*

Behavioral economics further suggests that small tweaks – often called 'nudges' – can improve follow-through on behaviors critical for program success (see Datta and Mullainathan 2012). In particular, it suggests that subtle aspects of program design that have traditionally been overlooked, or at least not emphasized, can be adjusted or augmented in ways (such as the leveraging of social norms, the use of framing around the expected use of the cash rather than focusing on the enforcement of compliance with conditions, etc.) that can help to amplify the effects of cash by aligning program features more closely with intended beneficiaries' cognitive processes and bandwidth (World Bank 2015; Datta and Mullainathan 2012; Mullainathan and Shafir 2013).

Several recent studies test the impact of such 'behavioral interventions' or 'nudges' on cash transfer beneficiaries' decisions, actions and outcomes with promising results. For example, Moroccan cash transfer beneficiaries' resource allocation decisions are highly sensitive to how the purpose of the funds they are given is "labeled" (Benhassine et al. 2015). Similarly, a formally unconditional cash transfer accompanied by publicity around school enrollment and health checkups for beneficiaries' children led to substantial increases in school enrollment among the poorest quintile (Oosterbeek, Ponce and Schady, 2008). Sedlmayr et al. (2018) find promising impacts from a simple intervention that asks beneficiaries to articulate spending goals before receiving the transfer. Cohen et al. (2017) find that a non-binding commitment to give birth in a high-quality clinic increases the likelihood of transfer-receiving expectant mothers actually doing so. Right-timing transfer payments improves the likelihood of follow-through on intentions to send children to school, perhaps by reducing the opportunities for temptation spending between the time of receipt and the time of anticipated spending on educational expenses (Barreira-Osorio et al. 2011). Awkii et al (2018) find that peer support sessions for caregivers enrolled in a cash transfer program in Somalia increases children's participation in education parents' ability to provide some basic needs.

However, several gaps remain in the application of behavioral economics to cash transfers thus far, and especially to its application to ECD-focused transfers. First, given that parents and caregivers are the lead architects and

agents for investments in children's early years, and their behavioral choices and actions have clear impacts on children's development, the application of behavioral insights to parents' engagement in early childhood promises to "uncover approaches that could enhance and support participation and engagement of parents of children who are eligible for early interventions" (Gennetian et al. 2016). However, there is thus far little evidence of the impact of behaviorally informed interventions on outcomes in ECD-focused transfer programs. Secondly, few studies (with the exception of Sedlmayr et al. 2018) have thus far built on the idea of cognitive bandwidth and slack, developed in the work of Mullainathan and Shafir, to explore the potential to exploit the temporary 'slackening' of cognitive bandwidth constraints at the time of receipt of a transfer payment to get beneficiaries to engage in 'System-2-based' (i.e. more deliberate or reflective) decision-making that could enhance program effectiveness, and which the theory suggests may be more effective at such times than it would in general (Mullainathan and Shafir 2013; Mani et al. 2013). Further research on the effectiveness (and cost-effectiveness) of a wide range of behavioral enhancements to cash transfer programs (especially those that target parenting and ECD outcomes, and those that exploit the temporary slackening of cognitive bandwidth constraints due to the injection of cash) therefore emerges as a priority.

In this paper, we attempt to fill this gap in the literature on the intersection between cash transfer programs, early childhood development and applied behavioral economics by evaluating three variants of a package of behaviorally informed interventions ('behaviorally enhanced arms') layered onto the Human Development Cash Transfer (HDCT) child-focused cash transfer program in Madagascar using a cluster-randomized evaluation design.[4] All three intervention arms – the rationale for and details of which are described in detail in Section 3 below - involved activities for 'Mother Leader' groups, where a set of beneficiaries from a program village are organized into a group headed by a Mother Leader, a beneficiary mother elected by the membership who acts as the primary point of contact between the program and beneficiaries and helps deliver a child-development focused curriculum to a group of cash transfer program beneficiaries from her community. In addition, the second and third intervention arms each included a "behavioral nudge", either a self-affirmation activity or a plan-making activity. The three 'behaviorally augmented' arms are therefore "ML only", "ML and Self-Affirmation", or "ML and Plan-Making"(with the 'Cash Only" arm acting as the de facto control group. We focus our analysis and exposition on the key question of whether and to what extent outcomes related to early childhood developments differ at midline, or 18 months into implementation, between beneficiary households and children in these 'behaviorally augmented' groups and a 'control group' that receives only the cash and no 'enhancements.'[5] In other words, throughout, we compare the effect of receiving one or other of the 'behaviorally enhanced' arms to receiving only cash.

We find that one or more of the 'behaviorally enhanced' arms have significant positive impacts on all measured (parenting and meal preparation) behaviors compared with the corresponding behaviors for those receiving only cash. Households in one of the enhanced arms also see higher increases in the number of meals prepared as well as greater reductions in food insecurity in the past 12 months, while households in all three enhanced arms see greater reductions in past-week food insecurity, than households in the cash-only group. While the enhanced arms do not lead to significantly higher overall socio-cognitive development than for children in the 'Cash Only" group in our preferred specification, the children in some of the enhanced arms did see greater development in language learning and social skills than children in the cash-only group.

The plan of the rest of the paper is as follows. Section 2 provides background and motivation, making the case that Madagascar's economic and human development trajectory provide a compelling setting in which to explore questions around early childhood development and cash transfers, and describes the program within which the interventions we evaluate are embedded. In Section 3 we describe the interventions, the rationale behind them, and the theory of change in detail. Section 4 discusses our data sources, variables, and experimental and analytical strategy. Section 5 presents data from baseline and evidence on the validity of the random assignment. Section 6

[4] The evaluation of the behaviorally informed components was embedded into a larger, ongoing multi-level cluster-randomized evaluation of the program as a whole, which is described in the Appendix.

[5] The ML part of the behaviorally enhanced arms began at the same time as the overall program itself (i.e. about 18 months prior to midline, but the 'nudges' were introduced about 4 months later, so about 14 months prior to the midline survey).

presents the main regressions results on outcomes for households in the behaviorally enhanced treatment arms over the corresponding outcomes for households which received only cash, as well as an analysis of 'nudge dosage' and how it affects the results. Section 7 concludes by discussing the results, limitations of the study, and directions for further work.

Section 2: Background: Madagascar and the Human Development Cash Transfer

2.1: Madagascar's Economic and Human Development Trajectory

Although Madagascar has sustained consistently high rates of economic growth each year since 2013, this has yet to make a significant dent on poverty: the country remains one of the world's poorest, with, the poverty rate inching down from 77.7% in 2014 to 75.1% in 2018 (World Bank 2018b, World Bank 2019). Almost 80 percent of the population lives on less than US$1.90 per day.[6] These 20 million people make Madagascar the country with the sixth highest number of people in poverty in the world.[7] Close to 60 percent of the population is extremely poor based on the national consumption-based poverty methodology.[8]

Many of the rural poor are deprived in multiple dimensions including consumption, literacy, education, basic household assets, and access to public services such as electricity. Madagascar's Human Capital Index score of 0.37 means that Madagascar is achieving only 37 percent of its possible human capital potential, below the Sub-Saharan Africa average of 0.4. Madagascar also has the world's fourth highest rate of chronic malnutrition,[9] with one child in two under five years old suffering from stunting. About 1.4 million children were estimated to be out of primary school in 2012, the fifth largest number in the world.

2.2 Social Protection and the Human Development Cash Transfer Program

Starting in 2016, the Government of Madagascar began seeking to address these high levels of poverty and low levels of human development (especially among children) by implementing a Human Development Cash Transfer (HDCT) program in partnership with the World Bank and UNICEF. Under this program, bi-monthly payments are made to 39,000 households with children under 12, potentially reaching 97,000 children in 7 districts with particularly low levels of human development, with payments made to the children's mother, who was expected to be the primary caregiver. The HDCT program suite contains a comprehensive, multidimensional intervention package consisting of a bi-monthly cash transfer set at about 30% of average household consumption in selected areas. While a portion of the cash transfer for households with children over six years old is conditioned on regular primary school attendance, households with younger children receive an unconditional transfer coupled with encouragement to attend child nutrition and family well-being sessions.

Section 3: Interventions: Rationale and Design

Our study tests the additionality on early childhood development and antecedent behaviors and outcomes relevant to these from one of three variants of a suite of behavioral interventions layered onto the cash itself. All the variants incorporate 'Mother Leader' groups, where a set of beneficiaries from a program village are organized into a group headed by a beneficiary mother elected by the members (see Section 3.1 below for details). In addition to this, the second and third 'enhanced arms' use trained facilitators to deliver a "nudge" intervention – either 'plan-making' or 'self-affirmation' – to Mother Leader groups on cash transfer days. This "nudge" part of the second and third enhanced arms began with the fourth cash transfer tranche, or about 14 months before the midline, supplementing the ML program which had been ongoing since program implementation began approximately 18 months before the midline. For simplicity, we refer to the midline as being 18 months after

[6] The headcount measuring the percent of the population under the extreme poverty rate of US$1.90 (in PPP terms) was 76.2 percent in 2017 (http://www.worldbank.org/en/country/madagascar/overview).

[7] This is after Nigeria, India, the Democratic Republic of Congo, Ethiopia and the Republic of Yemen. https://worldpoverty.io/

[8] Osborne, Theresa Kay; Belghith, Nadia Belhaj Hassine; Bi, Chiqiao; Thiebaud, Alessia; Mcbride, Linden; Jodlowski, Margaret Christine. 2016. *Shifting fortunes and enduring poverty in Madagascar : recent findings (Vol. 2) (English)*. Washington, D.C.: World Bank Group.

[9] Chronic malnutrition affects 47.3 percent of children in Madagascar between 6-59 months (World Food Programme Country Brief, May 2018). The four highest rates are in Papua New Guinea, Burundi, Eritrea and Madagascar.

implementation while noting that some components had been implemented for a somewhat shorter period. The motivation and design of these interventions are described more fully below.

3.1: Behaviorally Enhanced Arm 1: Mother Leaders and Linked Accompanying Measures ("Mother Leaders")

The first behaviorally enhanced arm layers the 'Mother Leaders'(ML) intervention onto the cash. The 'Mother Leaders' intervention is a **norm-oriented behavioral intervention relying on peer influence, building support systems in small groups and providing positive support to others in the group**. Its introduction was motivated by experience from a Colombian cash transfer program "*Familias en Accion*", where elected, mostly female beneficiary leaders work with groups of beneficiary mothers to augment cash transfer program activities through home visits and community activities, which was found to have contributed to improved child development (Attanasio et al. 2014). Its design also draws upon the finding that mother/ peer group-based interventions are effective in improving 'minimum dietary diversity' and meal frequency when compared to 'care as usual', and reduce wasting in children under 5 when. peer groups are paired with home visits (Janmohamed et al. 2020).

In the HDCT version of this intervention, **social norms, peer influence and community dynamics are leveraged through Mother Leaders.** These women are beneficiaries of the Human Development Cash Transfer program elected by their peers to lead a group of other beneficiaries (usually 20-25 in number) in their home village to a one-year term. The Mother Leaders have three key roles. First, they have an operational role: keeping beneficiaries informed about the program's rules, responsibilities, and procedures including payment schedules and complaint mechanisms. Second, they are responsible for organizing bimonthly meetings to learn about and discuss issues of food / nutrition for pregnant and breastfeeding mothers and children, prenatal consultation, exclusive breastfeeding, children compulsory vaccination, food diversification and nutrition, hand washing (soap, ash), use of potable water, use of latrines and early childhood development (for children 2-6), etc. These meetings also serve as a place to share opinions and information among community members in the same environment and facing the same challenges, thus leveraging the power of social proof and peer influence. Mother Leaders further supplement these bimonthly meetings with home visits to follow up on the adoption of practices discussed. (In the case of the two arms with behavioral nudges, Mother Leaders also help facilitate the nudge sessions, and follow up with other beneficiaries in their group on goals and plans arising from those sessions.)

3.2: **Behaviorally Enhanced Arm 2**: **Mother Leaders and Plan-Making**

Beyond this, two variants of behavioral interventions were layered onto the ML component. The design of these 'nudges' followed from extensive field research, which led the research team to identify two major groupings of potential barriers to effective allocation decisions (and actions), and to design corresponding interventions. The first of these was that **situational impediments to forming and executing a plan for using transfer funds inhibited their use for the achievement of beneficiary goals**. While beneficiaries tended to have clear high-level goals for their participation in the program, such as seeing their children graduate from secondary school or becoming salaried professionals, they either lacked the cognitive bandwidth needed to plan realistic actions enabled by the transfer that they could take to achieve their goals, or they experienced difficulty executing these once they received the money, or both. In line with the literature on cognitive scarcity as described above (see also Shah et al. 2012; Mani et al. 2013), they were more focused on routine needs that the transfer could support than forward-thinking investments (particularly in human capital, even despite having clear knowledge of the importance of childcare and nutrition). This tendency was exacerbated by the setting of the transfer payments, which took place amongst a noisy, attention-sapping milieu crowded with social interaction and local market vendors, many of whom had sprung up precisely to take advantage of the transfer event, further reducing the ability to plan and increasing the potential for temptation spending (as in Baumeister, Heatherton, & Tice, 1994; Gollwitzer and Moskowitz, 1996; Kuhl, 1984; Loewenstein, 1996; Mischel, Cantor, & Feldman, 1996; Rachlin, 1995; Thaler, 1994; Wegner, 1994). This treatment arm therefore incorporated a "nudge" that used **plan-making to link the transfer to goals,** enabling women to better adopt a longer-term perspective with concrete goals they wish to achieve with the cash, wherein beneficiaries are supported in drawing out the intermediary steps of achieving their goals and in identifying concrete risk mitigation strategy to help them reach them. Operationally,

there were three versions of the plan-making activity, using cards, stones, and drawings, used in turn during each bi-monthly 'nudge session' so that beneficiaries experienced all three versions over three transfer periods, after which the sequence was repeated over the subsequent three transfer sessions. As discussed above, Mother Leaders helped the trained facilitator conduct these sessions and also followed up on adherence to the plans made with other group members during home visits and bi-monthly group meetings.

3.3 Behaviorally Enhanced Arm 3: Mother Leaders and Self-Affirmation

The second key finding from field research was that negative beneficiary "mindsets" also limited beneficiary aspirations, goals and actions. Holding positive mindsets have been found to be an important input in anti-poverty programs, particularly ones that hinge on the need to take uncomfortable risks with long-term future payoff (Campos et al. 2017). In fieldwork, we found that HDCT pilot beneficiaries seemed to *externalize* their own role in taking decisions and improving their circumstances, a marker of potentially negative psychological mindset factors including loss of self-efficacy, locus of control and psychological well-being,[10] making it more difficult to come up with specific action steps in the first place and, ultimately, carry these out at the right time and at the expense of more immediate needs (e.g. Ghosal et al. 2013). To address this, a second variant of the Mother Leaders' program incorporated a 'self-affirmation' intervention, which involved activities aimed at enabling women to define what they want, to make decisions about the wellbeing of the family, and reinforcing their identity as guardians and the power they have to improve the lives of their children. These sessions reinforce women's confidence that they can have a positive influence of their family's happiness. As with plan-making, there were three versions of the self-affirmation activity, with beneficiaries experiencing one version in turn during each bi-monthly transfer event, with the sequence then repeating.

3.4: Operational Details

The activities carried out on transfer day for behaviorally enhanced arms 2 and 3 consisted of group sessions lasting between 15-30 minutes, co-facilitated by the ML and an externally hired facilitator (with the aim of gradually transitioning full leadership responsibility to the ML). To reinforce the link between beneficiaries' receipt of their transfer amount and their resultant decisions and actions (for instance about engaging in child stimulation, purchasing nutritious foods and other human capital-enhancing behaviors) as directly as possible, each of the nudges occurred in the hours immediately preceding the transfer payment itself while beneficiaries waited to receive their cash. Beneficiaries were organized by their ML group while waiting for the payment and brought into an adjacent area, where (initially) a local facilitator led the group in a set of activities (either plan-making or affirmation). As discussed above, there were three versions of each activity, which beneficiaries were exposed to in turn during successive instalments of the transfer event. The activities themselves consisted of creative and highly interactive exercises[11] (such as drawing, playing games with card and stones) meant to elicit either intermediate actions to be taken, spending targets and risk mitigation steps ("plan-making") or aspirations, values and positive self-beliefs ("affirmation"). Figure 1 presents design specifications for each activity set.

3.5: Theory of Change

In our broad theory of change for the domain of early childhood, which builds on the argument laid out in Gennetian et al (2016), the interventions are hypothesized to affect beneficiary *behaviors*, which then lead to changes in intermediate outcomes or '*proximate outcomes*, which in turn are hypothesized to lead to changes in longer-term *outcomes*. Broadly, a host of parenting and nutrition-related behaviors are hypothesized to lead to proximate outcomes such as more diverse diets and lower food insecurity in the short term, and through these to longer-term outcomes such as better physical and cognitive child development. We summarize these three classes of variables in the schematic below. By and large, we should think of there being a temporal dimension to this classification: Behaviors can change quickly and are typically ongoing; proximate outcomes are likely to take

[10] For a fuller discussion of self-efficacy, locus of control and psychological well-being in resource-poor settings see Ghosal et al. (2013), Hall et al. (2013), and Houshofer & Shapiro (2013).

[11] See Figure 1 for a complete set of intervention materials and photographs.

longer to materialize; and finally, long-term outcomes take longer still to change and may not have been affected by the time of our mid-line evaluation. While the relationship between individual variables is complex and multi-dimensional, an example might help to clarify the reasoning here: higher food consumption is posited to lead to lower food insecurity, and over time to better physical development.

Behaviors	**Proximate Outcomes**	**Long-Term Outcomes**
Parenting behavior	Food diversity	Language learning
Interaction with children	Number of meals prepared	Fine motor skill
Preparing diverse meals	Food insecurity, 7 day	Social skills
	Food insecurity, 12 month	Composite development
		Stunting/wasting[12]
		Height/weight for age[10]

The definitions of key outcome variables are discussed in Section 4.3 below.

Section 4. Evaluation Design, Data and Estimation Strategy

4.1: Evaluation Design

The cluster-randomized evaluation whose results we report on here was embedded into a larger cluster-randomized evaluation of the cash transfer program itself. For that larger evaluation, 52 administrative units called communes in six rural districts containing a total of 379 villages were randomized into a "cash" condition of 39 communes and a "pure control" condition of 13 communes.[13] [14] This allowed us to estimate the effect of the cash itself (absent any other interventions).

In this paper we report the results at midline of an evaluation layered onto this broader evaluation. The goal of this 'embedded' evaluation was to estimate the additive impact of the enhanced behaviorally informed treatments relative to the receipt of cash alone. For this, all 309 villages in the "cash" communes were pooled[15] immediately after the initial randomization and then re-randomized into three groups corresponding to the three "enhanced" HDCT treatments (MLs and both behavioral variants), plus a "cash only" (i.e. non-enhanced) condition, which serves as the control group for the purposes of this evaluation.

It is worth noting that despite the fact that we survey respondents at two points in time, we do *not* have a true panel. This is because, for reasons of cost, we conducted only a limited baseline - surveying a randomly-selected 12-13 households per village, for a total of 3,883 households roughly evenly split between the four arms – for the purposes of verifying balance across experimental groups at baseline.[16] At midline, we surveyed a larger number of households from the same villages, this time targeting 16 households per village.

While the households surveyed at baseline were included in the list of eligible households for the midline survey, they were not prioritized for inclusion. However, a subset of them were sampled at midline as well, giving us 3,883 households for which we have data on at least some outcome variables at both points in time. As discussed further below, this allows us to run a specification where we control for baseline values, albeit only for the portion of this restricted sample for which all relevant variables are available. However, we will throughout emphasize the results from the full midline sample, either with or without demographic controls.

The following table summarizes the design (the bolded portion refers to the sample included in the evaluation being reported on here):

[12] We do not have measures for all relevant long-term outcomes at this stage of the study. Certain measures, such as anthropometrics, have potential to be measured at endline. We have nonetheless listed some of these in italics above.

[13] Control households were sampled from among those who had been pre-screened for inclusion in the HDCT via the same proxy means test procedure used in HDCT areas.

[14] Villages from only 38 – rather than 39 – communes are included in the cash or augmented cash arms because one cash-designated commune had to be dropped because the transfer began several months before the baseline was able to be carried out.

[15] An inherent weakness of this pooling feature is that the design ignores the potential for within-commune spillovers between "enhanced" treatment conditions. This potential was judged to be low owing to the subtle nature of the differences in intervention types at the transfer payment point.

[16] 490 households from the 'pure control' were also sampled and surveyed.

			No. of Villages (HHs sampled, baseline/midline)
All 52 communes	**Receiving HDCT cash transfers (38 communes)**	**Control Arm: Cash Only**	**77 (963/1204)**
		Behaviorally Enhanced Arm 1: Cash & Mother Leaders (ML)	**77 (945/1200)**
		Behaviorally Enhanced Arm 2: Cash & MLs & Plan-making	**77 (970/1197)**
		Behaviorally Enhanced Arm 3: Cash & MLs & Affirmation	**78 (1005/1205)**
	Pure Control (13 communes): No cash		70 (601/1200)

Note that the results in this paper compare the households in the 'Cash Only" arm (the 'control group') to the three behaviorally enhanced arms. The results of the evaluation of the cash transfer program itself – i.e., the comparison of households in the communes which received cash only to households in the communes randomized to be 'pure controls' can be found in the Appendix Tables.

4.2: Data Sources

Key baseline and outcome data come from household surveys. Data were collected in two waves, with the baseline (N = 3,883, or N=4,484 including the households in the pure control/no-cash condition) occurring about 30 days before the first payments in each district, and the midline (N = 4,806, or N=6,006 including the households in the pure control/no-cash condition) after about 20 months.[17] The survey featured modules on household consumption, assets, food security, educational attendance and parenting behaviors taken from prior national Demographic and Health Surveys[18] to facilitate comparability for policy purposes.

For child development progress, the Malawi Development Assessment Test (MDAT) pioneered by Gladstone et al. (2010) was adapted to and validated in the local context under the supervision of one of the test's original creators and a local child development expert in view of its age group applicability and the possibility of relatively close contextual adaptation. The MDAT consists of a series of progressively more difficult activities conducted by a specially trained facilitator with individual children, with separate activity streams to measure skills in the areas of speech/language, fine motor, and social interaction. The traditional Malawi Development Assessment Tool (MDAT) assesses child developmental status across four domains: gross motor skills, fine motor skills, language learning, and social skills, with a composite score that sums across all four domains. There are 136 items, 34 in each domain of development, for use with children 0-71 months of age. In the development of the original MDAT, all items were rigorously tested through an iterative process that allowed the best performing items to be selected. All items use locally sourced materials that are familiar to young Malawian children. The assessor identifies a starting point for the assessment based upon the age of the subject. Each item is then assessed in one of three ways: "pass" (the subject completes the item successfully), "fail" (the subject is unable to complete the item), or "don't know" (the child is uncooperative or unwell). The assessor stops assessment in a specific domain when the subject fails seven consecutive items. For scoring, each item is converted to a numerical score, zero for a non-pass and one for a pass. The passed items are summed within each domain, resulting in four separate scores (for gross motor, fine motor, communication, and social development).

As these items were created specific to the Malawian population, an ECD specialist spent a year adapting and testing the tool for the Malagasy population, changing items where necessary and exploring how to best set "start" and "stop" rules for the Malagasy population. During this testing period, the specialist also identified that

[17] The survey was done by direct interview of the household head and / or his spouse on the basis of a standard and pre-coded questionnaire. The survey used a tablet computer (electronic questionnaire) instead of a traditional paper questionnaire. On average the duration of the interview at a household was 52 minutes. The enumerator asked the questions on the survey, prompted oral responses from the participant, and collected those responses on the tablet.

[18] See https://www.instat.mg/ for more details.

most Malagasy children were passing the majority of the questions in the gross motor module, and so that module was cut from the version used in Madagascar for this study, which therefore assesses children for fine motor skills, language learning, and social skills.
Note that the MDAT is only used for one child per household within the age range that the MDAT is designed for. If there was more than one eligible child in the household, one of the eligible children was chosen at random. As such, the sample size for the MDAT and its component indices is smaller than the total number of households surveyed since not all households have children in the appropriate age range, resulting in a sample of 2,757 for the child development outcomes.

4.3: Key Variables

Key outcome variables are defined as below. As discussed earlier in the theory of change, we broadly classify our outcome variables into Behaviors, Proximate Outcomes, and Long-Term Outcomes. The list below reflects this classification.

Behaviors: These are variables measuring various parenting or nutrition 'actions' that caregivers may take.

Positive Parenting Behavior: This variable captures how many of three positive parenting behaviors (following up on the education of the child, checking up on the child's health, and playing with children) the parent reports engaging in over the preceding twelve months. Thus, it ranges in value between 0 and 3.

Interaction With Children: This variable captures how many of each of 6 parenting behaviors(read a book, told stories, sang songs, went for a walk, played with, taught to count or draw) the parent reports engaging in with their two youngest children over the preceding 3 months. Each of these behaviors is coded as a 0-1 binary, so that this variable ranges in value between 0 and 6.

Preparing Diverse Meals: A binary variable taking the value 1 if the household reports having usually prepared 'diverse meals' including fruit over the preceding 12 months, and 0 otherwise.

Proximate Outcomes:

Food Diversity: Defined as the sum of the number of 10 different categories of food (cereals, flours, legumes, vegetables, fruits, roots, meat, etc.) that the household reports consuming over the last 7 days; takes a maximum value of 10 if household reports consuming all the categories of food. Dietary diversity was included instead of attempting to measure nutrition directly, since it has been found to be a good predictor of micronutrient intake in Madagascar specifically (Moursi et al., 2008).

Number of Meals Prepared: Defined as number of meals the household reports preparing on the day prior to the survey; higher values are desirable.

Food insecurity, 7 day: Defined as the *mean* number of days over the preceding 7-day period that the household reportedly experienced seven types of food insecurity. (The 7 potential types include: cooked food they did not like, was not able to properly diversify food, had to reduce quantity per meal, had to reduce the number of meals, adults had to reduce amount of food eaten to give to children, had to borrow food or rely on friends and family, had nothing to eat.) For example, if the household reported that for 7 days they had to cook food they did not like, but reported 0 days for the remaining types of food insecurity, the value of this variable would be 1). A reduction in the value of this variable is desirable.

Food insecurity, 12 month: Defined as the number of months in the past 12 months the household reported experiencing not having enough food. A lower value is desirable.

Long-Term Outcomes (Child Development): The only longer-term outcomes we measure at midline are (various components of) early childhood socio-cognitive development, as measured by the Malawi Developmental Assessment Tool (MDAT) as adapted to the Malagasy context.

Language Learning/Fine Motor Skills/Social Skills: These are normalized scores over the relevant sections of the Malawi Development Assessment Tool (MDAT) as adapted to the Malagasy context.

Composite Development: This is the normalized aggregate score over all sections of the MDAT, as adapted to the Malagasy context.

4.4: Estimation Strategy

Given random assignment to treatment, we construct intent-to-treat estimates for treatment impacts from the following core OLS specification[19]:

$$y_i = \beta_0 + \beta_1 T_i + \beta_2 Pre_i + \boldsymbol{X'\beta} + \varepsilon_{it}$$

Where i indexes households and t indexes the survey round. y_i are target outcomes, T_i is treatment assignment, $\boldsymbol{X'}$ is a vector of time-invariant demographic characteristics and Pre_i denotes outcomes at baseline (20 months prior), when available (i.e. only for households who were surveyed at both baseline and midline). When considering an individual-level outcome, as in the case of child development measures, i instead indexes individuals. We report results from three specifications: a parsimonious specification (I) with no additional controls; a specification (II) with demographic controls including household size, gender of household head, age of household head, education of household head, distance of the household from the nearest school, weeks since the last payment and age of the youngest child, and finally a specification (III), which includes both demographic controls and controls for values at baseline where available. As explained earlier, we have a sub-sample of the population who were sampled at both baseline and midline of 3,883 households. However, one of the key control variables (weeks since last payment) is missing for a portion of the population, so the sample in specifications II and III are lower than the full sample (maximum sample of 4,061 in specification II, and 2,762 in specification III). As a robustness check, we have run all analyses without the inclusion of this variable and see no major effect on the results. For these purposes, we will focus results from Specifications I and II when discussing results.

Our results compare outcomes for the three 'behaviorally enhanced' arms to outcomes for the cash-only group, in order to test for additionality from the enhancements. Standard errors are clustered at the village (fokontany) level. We judged that no correction for multiple-hypothesis testing was required, despite the number of hypotheses tested, given the heterogeneity of constructs measured and our pre-specification of these analyses.[20] All standard errors are clustered at the level of the unit of randomization ('fokontany' or village).

Section 5: Baseline Results and Randomization Check

5.1: Key Metrics at Baseline

The baseline survey provided important insights into the living conditions and nutrition, dietary diversity, and parenting practices of the beneficiaries and control group before the HDCT launch. Food accounts for approximately 74% of monthly expenditure (of which rice accounted for, on average, 50% of expenditure).[21][22] Grains and starches combined comprise approximately two thirds of average household consumption of food. Less than 7% is spent on fresh fruits and vegetables. Households on average spend approximately 2,361 ariary (~0.75 USD) a day on food expenditures, or approximately 70840 ariary (~22.65 USD) a month. 41.2% responded that they were never able to "properly" diversify their food intake, while only 7.9% reported always doing so.

The data on parenting practices display a great deal of variation. Only 4.5% of the sample reported telling stories to children during the past week at baseline, and less than half took children out for a walk, though other activities such as singing (63.6%) and playing (73.1%) were more common. Overall, of 12 included activities, the households reported pursuing only 2.6 on average with their two youngest children in the past week.

5.2 Balance across Arms

Table 1a describes the sample and provides full balance statistics, while Table 1b provides balance statistics for the population sampled for the MDAT (test of socio-cognitive development). Note the generally balanced means across the evaluation groups, indicating that random assignment was successful.

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[19] We have used Ordinary Least Squares (OLS) estimates in all cases, preferring a linear probability model in the case of binary outcomes for simplicity of interpretation.

[20] Pre-analysis plan registered at the American Economic Association and available at https://www.socialscienceregistry.org/trials/957/history/6111.

[21] Rice consumption and storage is a salient feature of rural Malagasy society, one reason for the difficulty of changing nutrition practices (Michel & Randriamanampisoa 2017).

[22] In addition, in most households agricultural production is consumed by the household rather than sold. People generally tend to consume all items of production (on average 3 items) but only sell surplus for 1 item on average.

Because we do not have a true panel, it is difficult for us to accurately assess attrition. However, we can do so for the sub-sample of households that were included at both points in time. Among this sub-sample, we found that 405 households from the baseline who were also in the midline sample were not found on returning. There is no evidence of differential attrition across treatment assignment for this sub-sample, as reported in Table 2. In any case, our main results do not rely on baseline data, and virtually all the households sampled at midline were able to be interviewed. That said, individual regressions sometimes have fewer observations because of missing values for some variables.

Section 6: Results: "Cash Plus" vs Cash Only

The key goal of our study was to evaluate whether the effects of the three 'behaviorally enhanced' intervention arms on the outcomes of interest were distinguishable from the effects of cash alone. In this section, we therefore describe the results of regressions that compare outcomes for households in each of the three 'behaviorally enhanced' arms to the outcomes of households in the "cash-only" arm, with the treatment effect capturing this difference, which can be thought of as the 'additional effect' of adding the behavioral enhancements onto cash. As before, we group indicators into three categories - behaviors, proximate outcomes, and long-term outcomes - within each. We also put these findings in context by comparing the effect sizes and significance to the corresponding values for the effects from the provision of cash alone relative to the pure control group. These results can be found in Appendix Tables 1-3.

6.1: Behaviors

As the first two columns of Table 3 show, parents in two of the three behaviorally enhanced arms undertook a significantly larger number of the three targeted positive parenting practices than parents in the cash-only arm, with the difference being statistically significant both with and without demographic controls for the "Mother Leaders and Planning" arm. Looking at Appendix Table 1, we see that the effect from the addition of the behavioral enhancements is about half as large again as the effect of providing cash alone.

Parents in the behaviorally enhanced arms similarly undertook a larger number of the six kinds of parent-child interactions (read a book, told stories, sang songs, went for a walk, played with, taught to count or draw) over the preceding three months than did parents in the cash-only arm, with the difference being statistically significant for the "Mother Leaders and Planning" treatment arm. Of note, the measured size of the effect for this arm is about the same as the effect on this outcome from the provision of cash alone, as seen in Appendix Table 1. Thus, parents in the 'Mother Leaders and Planning arm' undertook about as many more of the parent-child interactions as did parents in the cash-only arm – who in turn undertook a similar number more of these activities than parents who did not receive cash.

Finally, parents in all three behaviorally enhanced arms were significantly more likely to report having prepared diverse meals over the last 12 months than parents in the cash-only arm. (It is worth noting that – as seen in Appendix Table 1 – there was no measurable effect on this outcome from the provision of cash alone.)

Overall, one or more of the behaviorally enhanced treatment arms led to greater adherence to desirable parenting- and nutrition-related behaviors than receiving cash alone did, although the size and significance of the treatment effects vary by arm and the specification used, with the additionality ranging from one-half to the same as the effect of cash alone.

6.2: Proximate Outcomes

In Table 4, we see that there are no significant effects from any of the treatments (in any specification) on the fraction of households reporting that they ate diverse meals over the past 12 months. However, cash does have a large and statistically significant effect on this variable (see Appendix Table 2). Food diversity – at least as we measure it here – does not appear to benefit from the adding on of behavioral enhancements.

However, turning to other measures of nutrition and food security, we see that households in the "Mother Leaders and Affirmation" treatment arm report having prepared a significantly larger number of meals than those in the cash-only arm (treatment effects from the other enhanced arms are positive but not statistically significant in any specification).

Households in both the "Mother Leaders" arm and the "Mother Leaders and Affirmation" arm report experiencing significantly fewer dimensions of food insecurity over the past seven days, with the effect generally being the largest for those in the Cash + Mother Leaders arm. Interestingly, as seen in Appendix Table 2, the provision of cash by itself has no statistically significant effect on this measure of short-term food insecurity.

Finally, while point estimates all suggest that households in the three behaviorally enhanced arms all reported experiencing fewer months without enough food during the preceding 12 months than households in the cash-only arm, this effect is only statistically significant for households in the arm where the cash is supplemented by "Mother Leaders and Planning". Once again (see Appendix Table 2) cash by itself does not lead to a statistically significant diminution in this measure of longer-term food insecurity (except in the specification where we are able to control for baseline values for the smaller sub-sample which was surveyed at both points in time). Overall, self-reported food insecurity is only significantly reduced when cash is supplemented by the Mother Leader groups and additional behavioral nudges.

6.3: Long-Term Outcomes

As Table 5 shows, only the treatment arm where cash is augmented with the Mother Leaders groups shows statistically significant positive differences in overall child development as measured by the MDAT, as adapted to the Malagasy context. It is worth noting that the size of this effect is approximately as large as the effect from the provision of cash alone (see Appendix Table 3). Thus, the addition of the Mother Leaders treatment roughly doubles the effect on early childhood development as the provision of cash alone – a striking finding.

When we look at the component indices that make up the overall MDAT score, we see that children in several of the enhanced arms have significantly higher social skills than children in the cash-only arm. Once again, a comparison with the corresponding section of Appendix Table 3 shows that the magnitude of the effect from the enhancements is almost as large (0.11-0.13 vs 0.14) as the effect on social skills from the provision of cash. Again, adding the behavioral enhancements leads to almost as much of a bump in social development as providing cash. Similarly, children in the arms where cash was augmented by Mother Leader groups as well as the arm where this was further augmented by the Planning tool display significantly higher language learning than children in the cash-only group. The differences engendered by the addition of the Affirmation nudge are generally positive but not large enough to be statistically significant. As seen in Appendix Table 3, the provision of cash does not make any statistically significant difference to language learning at all – so this is an area of child development where we see significant improvements only once cash is supplemented with the behavioral enhancements we test.

Finally, we see no statistically significant evidence of improved fine motor skills from any of the behaviorally enhanced arms – but, as Appendix Table 3 shows, cash also does not lead to significant effects on this component of child development.

6.4: Dosage Analysis

Although our interventions were designed to be delivered with the same intensity to all participants in the enhanced arms logistical hurdles led to a slightly delayed rollout in one district, which together with the timing of the midline survey created some (albeit not exogenously assigned) variation in intensity of treatment. This meant that while the median village in the relevant arms received 5 nudge sessions, a quarter of villages received 4.5 or less, while a quarter had received between 6 and 7 by the time of the midline survey. This variation, albeit not experimentally induced, allows for an analysis (albeit a cursory one) of the effects of intervention intensity (dosage) for the behavioral variants (Table 6). We find that the number of 'nudge' sessions carried out at the fokontany/village level is positively correlated with most of the main long-term outcome variables on which we see robust intervention impacts. Although this is very rough analysis, it does suggest, encouragingly for this study, both that the sessions themselves (rather than, say, simply being in a group setting with other beneficiaries) are a pathway through which beneficiaries are able to change their behavior and that this utility could potentially be extended through repeated exposure.

6.5 Cost Effectiveness

While we have thus far focused on the size and statistical significance of the measured effects of the three behaviorally enhanced arms interventions relative to the outcomes for households that received only cash, it is also possible and instructive to estimate the cost-effectiveness of the three behaviorally enhanced arms, which we present here. For this, we estimate how many times the cost of the behavioral interventions (in dollars) would have to be added to the transfer to achieve the impact equivalent to the nudges (without any additional transfer). To calculate this 'cost effectiveness multiplier', we estimate the following for each outcome:

$$Cost\ Effectiveness\ Multiplier = \frac{Change\ from\ behavioral\ intervention}{Change\ if\ given\ additional\ cash\ equivalent}$$

where the numerator is the estimated effect the behavioral interventions have on any given outcome, while the denominator is obtained by taking the effect on that outcome from the provision of cash, and estimating by linear extrapolation the additional effect of providing beneficiaries with the cost of the behavioral intervention in dollars. Note that this calculation assumes local linearity.

A Cost-Effectiveness Multiplier >1 implies that the behavioral interventions are a more cost-effective way of achieving a change in the outcome in question than the provision of additional cash. Put differently, the government would get more impact on the outcome of interest by spending additional resources on the behavioral intervention rather than by using the same resources to augment the transfer.

Table 7 provides the cost-effectiveness calculations for all the components of our index of child development, as well as the overall index. Note that the cost of the Mother Leaders program (per beneficiary) is about 30,000 ariary (~7.80 USD) , and that of the ML + Planning or Affirmation arms is 54,000 ariary (~14.04 USD) , while the transfer is about 120,000 ariary (~31.21 USD). Using the method above, we see that the cost-effectiveness multipliers are typically well above 1 (except for Fine Motor Skills, where the point estimates of the effect from the behaviorally enhanced arms are negative), suggesting that the behaviorally enhanced arms are a more cost-effective way of improving these ECD outcomes than supplementing the cash payments by an amount equivalent to their cost.

Section 7: Conclusion

7.1: Effectiveness

At midline, we see promising indications that "cash plus" enhancements – including the behaviorally informed variants to the Mother Leader component – can enhance the effectiveness of a cash transfer program. Results of cash transfer programs, counterintuitively, have been observed to take years to materialize (Evans et al. 2016), leading to the potential that estimated effects will be larger at endline (planned for end of 2020). Nevertheless, it is already possible to make a number of observations.

Firstly, taken together, the various enhanced arms lead to outcomes that are significant improvements on a variety of behaviors, proximate outcomes, and long-term outcomes related to child development (interactions with youngest children, adherence to key parenting practices, number of meals prepared, the preparation of more diverse meals, various measures of food security, and children's language and social skills) than corresponding outcomes for cash alone. Indeed, the effect of adding on the behavioral enhancements is typically between half as large and as large again as the effect of providing cash in the first place. Seeing effects, albeit somewhat inconsistently, on measures of child development, is particularly striking given that the existing evidence on "cash plus" interventions principally finds effects on behaviors and proximate outcomes, and relatively little on these kinds of longer-term outcomes (see de Groot 2015).

Secondly, few significant pairwise differences are present between the MLs-only condition and either "nudge-enhanced" variant, suggesting that MLs drive most of the improvements that are due to the enhanced treatments. Nevertheless, the arms augmented with behavioral 'nudges' do lead to significant effects over the cash-only condition in the case of several outcomes - namely longer-term food security, number of meals prepared, and children's social skills – where the Mother Leader program by itself does not lead to a significant improvement in outcomes.

Finally, we see that the behavioral interventions are mostly cost-effective, meaning that they produce a greater increase in the outcomes of interest than simply using the money spent on them to buttress the transfer would have.

7.2: Mechanisms

Randomized trials alone can rarely help us to explain the mechanisms behind the results that we observe. In early 2019, a consultant researcher conducted a qualitative survey to illuminate the potential pathways through which the various HDCT program elements may have produced (or failed to produce) their impacts.

The qualitative evaluation results revealed a clear difference between the "Mother Leaders only" and "behaviorally enhanced" arms. Testimonies about the impact of the program collected from among the "Mother Leaders only" arm were focused on school expenditure relief and consumption smoothing and less on future-oriented behaviors. Expectations of interviewed beneficiaries focused on the continuity of the transfer or a revision of the frequency and amount of the transfer. At the individual level, women beneficiaries claimed to have developed higher self-esteem that had been triggered not only by increased food security but also an awareness of their ability to have an influence on their future and their ability to make an informed choice that could have a positive impact on their family.

At the collective level, beneficiaries acquired information and knowledge when participating in the Mother Leaders sessions. The "well-being sessions" provided an additional platform for exchanges that engendered solidarity among beneficiaries and improved collective decision-making capacity. These findings are consistent with the qualitative evaluation of a safety net program in Southern Madagascar which uses similar benefit structures and delivery platforms, including mother leaders, led by the Institute for Development Studies (IDS). The IDS evaluation concluded that the mother leader-led groups are highly valued by program beneficiaries and have contributed to social cohesion, women's education, children's wellbeing and show promise of sustainability because of their popularity and dynamism. Mother leaders are reported to have played a role in the increased uptake of nutritional education and healthy practices, including breast-feeding, by mothers of young children. The leadership capacities of the mother leaders and group dynamics whereby women are mobilized to work collectively are recognized as central elements of the model (Huff, 2019).

Testimony collected among beneficiaries who received any forms of the "behavioral interventions" demonstrated a noticeably augmented sense of agency due to a higher degree of confidence in their ability to control their household resources. This may have led to improvements in bargaining power both within and outside the household: beneficiaries in ML groups who received the plan-making variant reported using the group action plans they developed to better negotiate collectively with producers of farm input goods to receive more favorable prices. More qualitative work may be necessary to fully understand the mechanisms through which each 'nudge' variant worked, and especially the cases in which they did not add additional value to either the cash or the mother leaders.

7.3: Limitations and Directions for Future Research

A key limitation of this study is that the time between baseline and midline is insufficient for the full effects of interventions – particularly those that relate to child development – to play out, while possibly overstating the importance of some of the proximate behavioral variables where change may be quick but not durable. Some of these issues will be sought to be addressed in the endline evaluation, which was originally planned for late 2020, or another 18 months out, although this has been delayed due to the global COVID-19 pandemic. However, a key limitation we will not be able to address is the question of whether the 'nudges' have sufficient value *absent* the Mother Leaders intervention, onto which they are layered. This is a key question for future research, but one we are unable to address in the present study where it was not possible, due to operational constraints, to deliver the 'nudges' absent mother leader groups. Future research should also seek to unpack the mechanisms through which the Mother Leaders produce impact, something that our design is not able to address.

Data Availability: The data underlying this paper will be shared on reasonable request to the corresponding author, and is currently in the process of being uploaded to the SIEF date repository.

References:

Adhvaryu, A., Molina, T., Nyshadham, A., & Tamayo, J. (2016). Helping children catch up: Early life shocks and the PROGRESA experiment. Retrieved from: file:///C:/Users/ideas42/Downloads/HelpingChildrenCatchUpEarlyLifeSh_preview.pdf

Akwii, S., Kipchumba, E., Mohamed, A.S., Sulaiman, M. 2018. "Added on Benefits of Structured Peer to Peer Support on Unconditional Cash Transfer: Short-term Evidence from a Field Experiment in Baidoa, Somalia", Save The Children. https://resourcecentre.savethechildren.net/node/14297/pdf/cash_plus_pss_final_report.pdf

Arriagada, A.M., Perry, J., Rawlings, L., Trias, J., and Zumaeta, M. (2018). Promoting early childhood development through combining cash transfers and parenting programs. *World Bank Working Paper Series*, Washington, D.C.: World Bank Group.

Attanasio, O., Fernández, C., Fitzsimons, E., Grantham-McGregor, S., Meghir, C. & Rubio-Codina, M. (2014). Using the infrastructure of a conditional cash transfer program to deliver a scalable integrated early child development program in Colombia: Cluster randomized controlled trial. BMJ 349 (September): g5785.

Baird, S.,McIntosh, C., Özler, B. (2011). "Cash or Condition? Evidence from a Cash Transfer Experiment". *The Quarterly Journal of Economics* 126(4): 1709–1753

Baird, S., Ferreira, F.H.G., Özler, B. & Woolcock, M. (2014). Conditional, unconditional and everything in between: a systematic review of the effects of cash transfer programmes on schooling outcomes. *Journal of Development Effective*ness, 6:1, 1-43, DOI: 10.1080/19439342.2014.890362

Barrera-Osorio, F., Bertrand, M., Linden, L.L., & and Perez-Calle, F. (2011). Improving the design of conditional transfer programs: Evidence from a randomized education experiment in Colombia. *American Economic Journal: Applied Economics*, 3(2):167-95.

Bastagli, F., Hagen-Zanker, J., Harman, L., Barca, V., Sturge, G., & Schmidt, T. (2016). Cash transfers: What does the evidence say? A rigorous review of programme impact and the role of design and implementation features. London: Overseas Development Institute.

Baumeister, R. F., Heatherton, T. F., & Tice, D. M. (1994). Losing control: How and why people fail at self-regulation. San Diego, CA, US: Academic Press.

Beegle, K.G.; Coudouel, A., & Monsalve, E. (2018). Realizing the Full Potential of Social Safety Nets in Africa (English). Washington, DC: World Bank Group.

Behrman, J. R., and Hoddinott, J. (2005). Program evaluation with unobserved heterogeneity and selective implementation: The Mexican Progresa impact on child nutrition. *Oxford Bulletin of Economics and Statistics* 67(2): 547–569.

Benhassine, N., Devoto, F., Duflo, E., Dupas, P., & Pouliquen, V. (2015). Turning a shove into a nudge? A labeled cash transferâĂİ for education. *American Economic Journal: Economic Policy* 7 (3), 86–125.

Benjamini, Y. and Hochberg, Y. (1995). Controlling the false discovery rate: a practical and powerful approach to multiple testing. *Journal of the Royal Statistical Society. Series B (Methodological)*, 289–300.

Black, Maureen M., Susan P. Walker, Lia C. H. Fernald, Christopher T. Andersen, Ann M. DiGirolamo, Chunling Lu, Dana C. McCoy, et al. 2017. "Early Childhood Development Coming of Age: Science through the Life Course." *The Lancet 389* (10064): 77–90.

Campos, F, Frese, M, Goldstein, M, Iacovone, L, Johnson, H, McKenzie, D. (2017). Teaching personal initiative beats traditional training in boosting small business in West Africa. *Science* 22 Sep 2017: Vol. 357, Issue 6357, pp. 1287-1290. DOI: 10.1126/science.aan5329

Cohen J., Rothschield, C., Golub, G., Omundi, G.N., Kruk, M. E., & McConnell, M. (2017). Cash on delivery: Results of a randomized experiment to promote maternal health care in Kenya. *Health Affairs*: Vol. 36 No. 11: Global Health Policy.

Cookson, T. 2018. Unjust Conditions. University of California Press

Currie, Janet, and Douglas Almond. 2011. "Chapter 15 - Human Capital Development before Age Five" In *Handbook of Labor Economics*, edited by David Card and Orley Ashenfelter, 4:1315–1486. Elsevier.

Datta, S. and Mullainathan, S. (2012). Behavioral design: A new approach to development policy. *Center for Global Development Policy Paper 016*. Washington DC: Center for Global Development.

de Walque, D., Fernald, L., Gertler, P., & Hidrobo, M. (2017). Cash transfers and child and adolescent development. In: *Disease Control Priorities* (third edition): Volume 8, Child and Adolescent Health and Development, edited by D. Bundy, N. de Silva, S. Horton, D. T. Jamison, & G. Patton. Washington, DC: World Bank Group.

Evans, D., Holtemeyer, B. & Kosec, K. (2016). Cash transfers and health: Evidence from Tanzania., *World Bank Policy Research* Working Paper 7882*,* Washington DC: World Bank Group.

Fernald, Lia C., P. J. Gertler, and M. Hidrobo. 2012. "Conditional Cash Transfer Programs: Effects on Growth, Health, and Development in Young Children" in R. King and V. Maholmes (eds) *The Oxford Handbook of Poverty and Child Development,* Oxford University Press, New York.

Fiszbein, A., Schady, N., Ferreira, F.H.G, Grosh, M., Kelleher, N., Olinto, P., and Skoufias,E. (2009). "Conditional Cash Transfers: Reducing Present and Future Poverty". World Bank, Washington, DC.

Gennetian, L., Darling, M., Aber, L,. (2016). "Behavioral Economics and Developmental Science: A New Framework to Support Early Childhood Interventions". *Journal of Applied Research on Children* 7(2).

Gertler, P., Heckman, J., Pinto, R., Vermeersch, C., Walker, S., Chang, S.M., & Grantham-McGregor, S. (2014). Labor market returns to an early childhood stimulation intervention in Jamaica. *Science*. 2014 May 30;344(6187):998-1001. doi: 10.1126/science.1251178.

Ghosal, S., Jana, S., & Mani, A. (2013). Believing in oneself: Can psychological training overcome the effects of social exclusion? *Working Paper Series*, University of Warwick, 2013, No. 152.

Gladstone, M., Lancaster, G.A., Umar, E., Nyirenda, M., Kayira, E., Van den Broek NR, et al. (2010) The Malawi Developmental Assessment Tool (MDAT): The Creation, Validation, and Reliability of a Tool to Assess Child Development in Rural African Settings. PLoS Med 7(5): e1000273.

Gollwitzer, P. and Moskowitz, G. (1996). Goal effects on action and cognition. First publ. in: *Social psychology: Handbook of basic principles*. New York: Guilford, 1996, pp. 361-399.

Grantham-McGregor, Sally, Yin Bun Cheung, Santiago Cueto, Paul Glewwe, Linda Richter, and Barbara Strupp. 2007. "Developmental Potential in the First 5 Years for Children in Developing Countries." *The Lancet* 369 (9555): 60–70.

Hall, C.C., Zhao, J., Shafir, E. (2013).Self-affirmation among the poor: cognitive and behavioral implications. *Psychological Science*, 25: 619-25. PMID 24357617 DOI: 10.1177/0956797613510949 Houshofer, J. and Shapiro, J. (2013). Policy Brief: Impacts of unconditional cash transfers. Princeton University, USA

Huff, Amber, M. Gregg Smith, Keetie Roelen, Razafiharison Andriamanantena, Hajasoa Patricia, Mianndrito Mampiray Mbola, Hadeer El Shafie (2019). Qualitative evaluation of the Social Safety Net Drought Response (SSNDR) program in Southern Madagascar: Program processes, social dynamics and impacts. Technical report from the Institute for Development Studies, World Bank.

Instat Madagascar. https://www.instat.mg/ Antananarivo, Madagascar.

Janmohamed, A., Sohani, N., Lassi, Z.N., Butta, Z.A., 2020. "The Effects of Community Home Visit and Peer Group Nutrition Intervention Delivery Platforms on Nutrition Outcomes in Low and Middle-Income Countries: A Systematic Review and Meta-Analysis. Nutrients 12(12):440

Kabeer, N., Piza, C., & Taylor, L. (2012). What are the economic impacts of conditional cash transfer programmes? A systematic review of the evidence. *Technical report. EPPI-centre, Social Science Research Unit*. Institute of Education, University of London, London.

Kabeer, N. and Waddington, H. (2015). Economic impacts of conditional cash transfer programmes: A systematic review and meta-analysis. *Journal of Development Effectiveness*, 7 (3). pp. 290-303. ISSN 1943-9342

Kahneman, D. and Tversky, A. (1979). Prospect Theory: An Analysis of Decision under Risk. *Econometrica*, 47, issue 2, p. 263-91.

Kuhl, J. (1984). Volitional aspects of achievement motivation and learned helplessness: Toward a comprehensive theory of action control. In Progress in experimental personality research (Vol. 13, pp. 99-171). Elsevier.

Lagarde, M., Haines, A., and Palmer, N. (2007). "Conditional Cash Transfers for Improving Uptake of Health Interventions in Low- and Middle-Income Countries: A Systematic Review" *Journal of the American Medical Association* 298 (16)

Loewenstein, G. (1996). Out of control: Visceral influences on behavior. *Organizational Behavior and Human Decision Processes*, 65(3), 272-292.

Macours, K., Schady, N., & Vakis, R. (2012). Cash transfers, behavioral changes, and cognitive development in early childhood: Evidence from a randomized experiment. *American Economic Journal: Applied Economics* 4 (2): 247–73.

Mani, A., Mullainathan, S., Shafir, E., & Zhao, J. (2013). Poverty impedes cognitive function. *Science* (New York, N.Y.). 341. 976-80. 10.1126/science.1238041.

Michel, S. and Randriamanampisoa, H. (2017). The capability approach as a framework for assessing the role of microcredit in resource conversion: the case of rural households in the Madagascar highlands. *Oxford Development Studies*, Taylor Francis (Routledge), pp.1 - 21.

Mischel, W., Cantor, N., & Feldman, S. (1996). Principles of self-regulation: The nature of willpower and self-control. In E. T. Higgins & A. W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 329-360). New York, NY, US: Guilford Press.

Molyneux, M. (2014). Holding Cash Transfers Accountable: Beneficiary and Community Perspectives. Overseas Development Institute Report. London.

Moursi, M.M., Arimond, M., Dewey, K.G., Trèche, S., Ruel, M.T., & Delpeuch, F. (2008). Dietary diversity is a good predictor of the micronutrient density of the diet of 6- to 23-month-old children in Madagascar. *The Journal of Nutrition*. Dec; 138(12): 2448 2453. doi: 10.3945/jn.108.09397

Mullainathan, S. and Shafir, E. (2013). Scarcity: Why Having Too Little Means so Much. First edition. New York: Times Books, Henry Holt and Company. Print.

Oosterbeek, H., Ponce, J. and Schady, N. (2008). The impact of cash transfers on school enrollment: Evidence from Ecuador. World Bank, Washington DC.

Osborne, T.K., Belghith, N. B.H., Bi, C. Thiebaud, A., Mcbride, L., & Jodlowski, M.C. (2016). Shifting fortunes and enduring poverty in Madagascar: Recent findings (Vol. 2) (English). Washington, DC: World Bank Group.

Paxson, P. and Schady, N. (2010). Does money matter? The effects of cash transfers on child development in rural Ecuador. *Economic Development and Cultural Change*, University of Chicago Press, vol. 59(1), pages 187-229, October.

Rachlin, H. (1995). Self-control: Beyond commitment. *Behavioral and Brain Sciences*, 18(1), 109-159. http://dx.doi.org/10.1017/S0140525X00037602.

Rasella D., Aquino, R., Santos, C.A.T., Paes-Sousa, R., Barreto, M.L. 2013. "Effect of a conditional cash transfer programme on childhood mortality: a nationwide analysis of Brazilian municipalities". Lancet, Published online May 15, 2013 http://dx.doi.org/10.1016/S0140-6736(13)60715-1

Sedlmayr, R., Shah, A. & Sulaiman, M. (2018). Cash-plus: Poverty impacts of transfer-based intervention alternatives. Center for the Study of African Economics Working Paper WPS/2017-15-2. Oxford, United Kingdom.

Shah, A.K., Mullainathan, S., & Shafir E. (2012). Some consequences of having too little. *Science*, Nov 2;338(6107):682-5. doi: 10.1126/ 1222426.

Thaler, R. (1994). Psychology and savings policies. *American Economic Review*, 84, (2), 186-92 Mullainathan, S. and Thaler, R.H. (2000). Behavioral Economics. *Working Paper 7948*, National Bureau of Economic Research. Cambridge, USA.

Tsur, S. (2016). Liquidity constraints and human capital: The impact of child allowances on Arab families in Israel. Bank of Israel, Israel.

United Nations Children's Fund. (2015). Unicef Annual Report Madagascar. New York, United States.

Vargas-Barón, E. (2009). Going to scale: Early childhood development in Latin America. *The RISE Institute, Washington*.

Wampfler, B., Bouquet, B., & Ralison, E. (2014). Does juggling mean struggling? Insights into the financial practices of rural households in Madagascar. In Microfinance, Debt, and Over-indebtedness – Juggling with Money. Edited Guérin, I., Morvant-Roux, S., & Villarreal, M. Routledge Studies in Development Economics.

Wegner, D. M. (1994). Ironic processes of mental control. *Psychological Review, 101*(1), 34-52. http://dx.doi.org/10.1037/0033-295X.101.1.34

World Bank. (2018a). "World Development Report 2018: Learning to Realize Education's Promise". World Bank, Washington, DC.

World Bank. (2018b). The Human Capital Project. World Bank, Washington, DC. https://openknowledge.worldbank.org/handle/10986/30498 License: CC BY 3.0 IGO

World Bank. (2018c). Economic Outlook for Madagascar. World Bank, Washington DC. https://www.worldbank.org/en/country/madagascar/publication/madagascar-economic-update-fostering-financial-inclusion

World Bank. (2017). "Early Childhood Development Topic Page" World Bank, Washington, DC. Retrieved from: https://www.worldbank.org/en/topic/earlychildhooddevelopment

World Bank Group. (2015). World Development Report: Mind, Society, and Behavior. Washington, DC: World Bank.

World Data Lab. Retrieved from: https://worldpoverty.io/

World Food Programme. (2018). WFP Madagascar Country Brief, May 2018. Rome, Italy. https://reliefweb.int/sites/reliefweb.int/files/resources/Madagascar%20Country%20Brief%20-%20May%202018.pdf

World Health Organization. (2018). Nurturing care for early childhood development: A framework for helping children survive and thrive to transform health and human potential. Geneva, Switzerland. https://apps.who.int/iris/bitstream/handle/10665/272603/9789241514064-eng.pdf

Table 1a: Sample Means and Balance

	Cash Only (mean)	Mother Leaders	Mother Leaders and Affirmation	Mother Leaders and Planning
Male (%)	0.49	0.00	0.01	0.00
	(0.01)	(0.01)	(0.01)	(0.01)
Age	18.77	0.44*	-0.17	-0.14
	(0.34)	(0.37)	(0.33)	(0.37)
School (Ever Attended)	0.63	0.06	0.03	0.01
	(0.02)	(0.02)	(0.02)	(0.02)
Ever Married (1=yes)	0.72	-0.00	-0.01	-0.01
	(0.02)	(0.02)	(0.02)	(0.02)
HH Size	6.00	-0.07**	0.16	0.19
	(0.18)	(0.16)	(0.17)	(0.17)
Total Food Consumption in the last 30 days (*ariary*)	68964	477	6864	1870
	(4043)	(3553)	(7002)	(4029)
Non-Food Consumption in the last 30 days (*ariary*)	8772	411	-302	130
	(711)	(666)	(704)	(663)
Proportion of Consumption on Food	0.74	0.01**	0.01**	0.00
	(0.01)	(0.01)	(0.01)	(0.02)
General Consumption in the last 30 days (*ariary*)	77726	888	6562	2000
	(4439)	(3891)	(7298)	(4388)
Livestock Index	0.60	-0.05*	-0.01	-0.05*
	(0.09)	(0.08)	(0.08)	(0.08)
N	1204	1200	1205	1197

Note: The coefficients for the Cash-only represent the mean for the group. The figures for all treatment groups represent the added difference from the control mean. '' denotes significance at p≤0.1; '**' at p≤0.05.*

Table 1b: Sample means and balance for MDAT participants

	Cash Only (mean)	Mother Leaders	Mother Leaders and Affirmation	Mother Leaders and Planning
Male (%)	0.48	0.00	-0.01	-0.02
	(0.50)	(0.03)	(0.03)	(0.03)
Age of child (months)	48.00	-0.79	-0.13	-0.38
	(12.23)	(0.67)	(0.66)	(0.67)
Household size	6.82	-0.05	-0.17	-0.05
	(2.41)	(0.13)	(0.13)	(0.13)
Distance to nearest school(Km)	1.00	-0.04	-0.09	-0.09
	(1.60)	(0.08)	(0.09)	(0.09)
School (ever attended) by HH head	0.64	-0.04	-0.02	-0.02
	(0.48)	(0.03)	(0.03)	(0.03)
N	695	677	680	705

Note: The coefficients for the Cash-only represent the mean for the group. The figures for all treatment groups represent the added difference from the control mean. '' denotes significance at p≤0.1; '**' at p≤0.05.*

Table 2: Sample Attrition

	Cash Only (Mean)	Mother Leaders	Mother Leaders and Affirmation	Mother Leaders and Planning
Households at baseline not found at midline (%)	0.11	0.01	-0.01	0.01
	(0.01)	(.01)	(0.01)	(0.01)
N	963	945	1005	970

Note: The coefficients for the Cash-only represent the mean for the group. The figures for all treatment groups represent the difference from the control mean. Standard errors are in parentheses. '' denotes significance at p≤0.1; '**' at p≤0.05.*

Table 3: Effects of Enhanced Treatments on Behaviors

Treatment Effects:	Parenting Behavior		Interaction with Children		Preparing Diverse Meals	
	(I)	(II)	(I)	(II)	(I)	(II)
Mother Leaders	0.04	0.08 *	0.10	0.17	0.13**	0.12**
	(0.04)	(0.04)	(0.14)	(0.12)	(0.03)	(0.04)
Mother Leaders and Affirmation	0.04	0.06	0.13	0.18	0.11**	0.11**
	(0.05)	(0.04)	(0.15)	(0.12)	(0.03)	(0.04)
Mother Leaders and Planning	0.09**	0.11**	0.32**	0.19	0.16**	0.15**
	(0.04)	(0.05)	(0.15)	(0.15)	(0.04)	(0.04)
Intercept	2.37**	2.34**	2.60**	1.24**	0.34**	0.47**
	(0.03)	(0.07)	(0.10)	(0.23)	(0.02)	(0.05)
N	4055	3521	4806	4061	4462	3801
R-squared	0.00	0.03	0.00	0.38	0.01	0.02

Note: Standard errors in parentheses. '' denotes significance at p<.1 level, '**' at p<.05. Model (I) is a simple regression with clustered standard errors, model (II) adds demographic and explanatory controls including household size, gender of household head, age of household head, education of household head, age of youngest child, weeks since last payment, and distance of the household from the nearest school, and model (III) adds additional baseline controls*

Table 4: Effects of Enhanced Treatments on Proximate Outcomes

Treatment Effects:	Food Diversity			Number of Meals Prepared			Food Insecurity, 7-Day			Food Insecurity, 12-Month		
	(I)	(II)	(III)	(I)	(II)	(III)	(I)	(II)	(III)	(I)	(II)	(III)
Mother Leaders	0.01	-0.01	-0.06	0.08	0.09	0.08	-0.37**	-0.40**	-0.38**	-0.25	-0.28	-0.20
	(0.09)	(0.09)	(0.10)	(0.06)	(0.06)	(0.05)	(0.13)	(0.13)	(0.15)	(0.19)	(0.19)	(0.20)
Mother Leaders and Affirmation	-0.08	-0.06	-0.09	0.11 *	0.11**	0.12**	-0.25 *	-0.26 *	-0.34**	-0.11	-0.20	-0.26
	(0.09)	(0.09)	(0.10)	(0.06)	(0.06)	(0.05)	(0.14)	(0.14)	(0.15)	(0.19)	(0.19)	(0.20)
Mother Leaders and Planning	-0.01	0.00	-0.06	0.04	0.07	0.07	-0.18	-0.23	-0.28 *	-0.28	-0.38**	-0.34 *
	(0.10)	(0.10)	(0.11)	(0.06)	(0.06)	(0.06)	(0.14)	(0.14)	(0.15)	(0.18)	(0.19)	(0.20)
Intercept	8.32**	8.05**	7.63**	2.65**	2.86**	2.33**	1.15**	0.12	-0.19	4.53**	3.05**	2.63**
	(0.07)	(0.12)	(0.20)	(0.04)	(0.07)	(0.10)	(0.10)	(0.17)	(0.21)	(0.14)	(0.31)	(0.34)
N	4806	4061	2762	4806	4061	2762	4652	3927	2483	4806	4061	2762
R-squared	0.00	0.01	0.02	0.01	0.05	0.10	0.01	0.05	0.08	0.00	0.02	0.03

Note: Standard errors in parentheses. '' denotes significance at p<.1 level, '**' at p<.05. Model (I) is a simple regression with clustered standard errors, model (II) adds demographic and explanatory controls including household size, gender of household head, age of household head, education of household head, age of youngest child, weeks since last payment, and distance of the household from the nearest school, and model (III) adds additional baseline controls.*

Table 5: Effects of Enhanced Treatments on Long-Term Outcomes

Treatment Effects:	Language Learning			Fine Motor Skills			Social Skills			Composite Development		
	(I)	(II)	(III)	(I)	(II)	(III)	(I)	(II)	(III)	(I)	(II)	(III)
Mother Leaders	0.14**	0.11 *	0.10	0.01	-0.01	-0.03	0.14**	0.09	0.12	0.13 *	0.09	0.08
	(0.06)	(0.06)	(0.07)	(0.07)	(0.07)	(0.08)	(0.06)	(0.07)	(0.09)	(0.07)	(0.07)	(0.08)
Mother Leaders and Affirmation	0.10	0.10	0.09	-0.05	-0.03	-0.04	0.09	0.11 *	0.18**	0.07	0.08	0.09
	(0.07)	(0.07)	(0.08)	(0.07)	(0.07)	(0.08)	(0.06)	(0.06)	(0.08)	(0.07)	(0.07)	(0.08)
Mother Leaders and Planning	0.15**	0.12 *	0.09	-0.02	-0.03	-0.05	0.12 *	0.09	0.11	0.11	0.09	0.05
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.08)	(0.07)	(0.07)	(0.09)	(0.07)	(0.07)	(0.08)
Intercept	-0.06	0.06	0.24	0.04	-0.06	0.03	-0.04	0.06	-0.01	-0.04	0.04	0.15
	(0.04)	(0.13)	(0.17)	(0.05)	(0.13)	(0.17)	(0.04)	(0.11)	(0.16)	(0.04)	(0.12)	(0.16)
N	2757	2395	1402	2757	2395	1402	2757	2395	1402	2757	2395	1402
R-squared	0.00	0.01	0.07	0.00	0.01	0.05	0.00	0.01	0.04	0.00	0.01	0.08

Note: Standard errors in parentheses. '' denotes significance at p<.1 level, '**' at p<.05. Model (I) is a simple regression with clustered standard errors, model (II) adds demographic and explanatory controls including household size, gender of household head, age of household head, education of household head, age of youngest child, weeks since last payment, and distance of the household from the nearest school, and age of the child (in months), and model (III) adds additional baseline controls to Model (II).*

Table 6: Effect of the Number of Nudges (Dosage) in Fokontany on Long-Term Outcomes with Controls

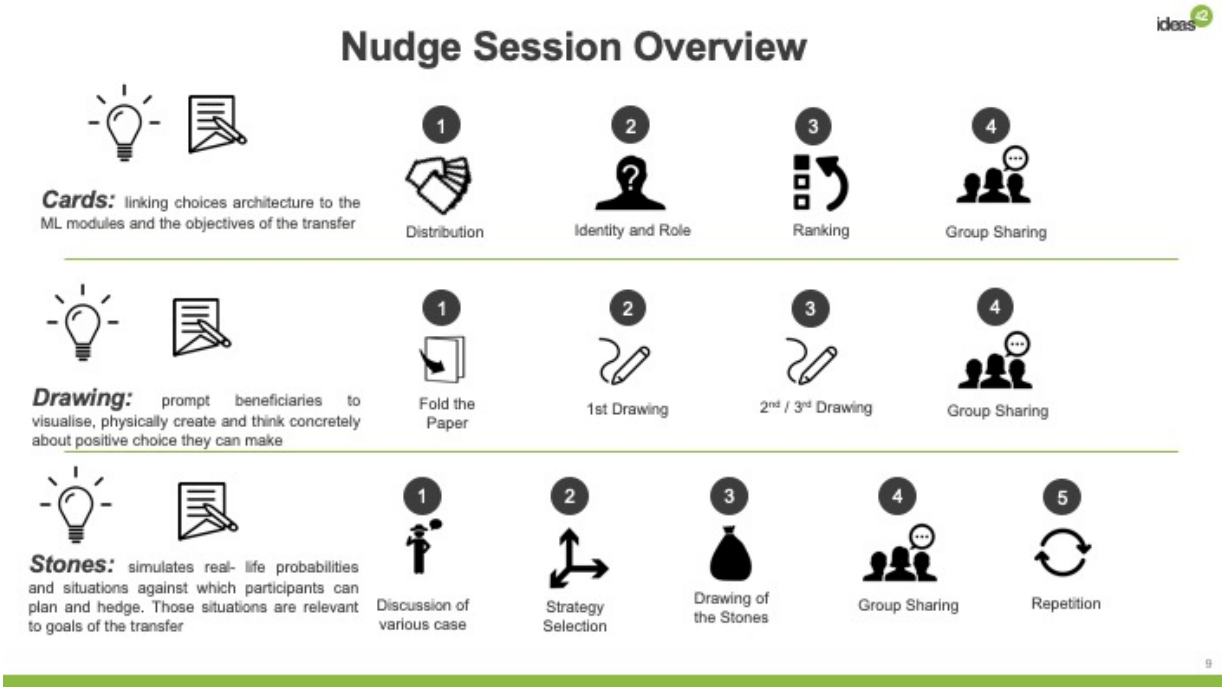
	Preparing diverse meals	Child interaction	Parenting Behavior	Language Learning	Social Skills	Fine Motor	Composite MDAT
Number of nudges	0.03**	0.11**	0.03**	0.03	0.06**	0.01	0.05*
	(0.01)	(0.04)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
HH Size	-0.00	-0.03	-0.02**	-0.02	-0.03**	-0.01	-0.03*
	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)
Child's age	-0.02	1.75**	0.09**	-0.04	-0.03	-0.02	-0.03
	(0.01)	(0.08)	(0.02)	(0.04)	(0.04)	(0.04)	(0.04)
Distance to school (KM)	0.00	-0.04	-0.02*	-0.04**	-0.02	-0.02	-0.03**
	(0.01)	(0.03)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)
Education of HH head	0.01	0.04	0.02	0.04	-0.00	0.02	0.02
	(0.01)	(0.05)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
HH head female	-0.05*	-0.07	-0.08*	0.16**	-0.01	0.08	0.10
	(0.03)	(0.11)	(0.04)	(0.07)	(0.07)	(0.07)	(0.07)
Age of HH head	0.00	-0.01**	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Constant	0.39**	0.83**	2.43**	-0.04	-0.15	-0.10	-0.11
	(0.07)	(0.34)	(0.12)	(0.20)	(0.18)	(0.18)	(0.19)
Observations	2,210	2,371	2,020	1,364	1,364	1,364	1,364
R-squared	0.01	0.37	0.03	0.02	0.01	0.01	0.02

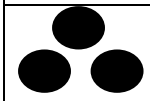
Sample including only those who received nudges (either planning or self-affirmation).
Robust standard errors in parentheses. *'*' denotes significance at p<.1 level, '**' at p<.05.*

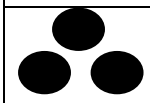
Table 7: Cost Effectiveness Multipliers for Long-Term Outcomes					
Intervention	Outcome	Effect of cash	Counterfactual	Effect of behavioral intervention	Cost-effectiveness multiplier $= \frac{Change\ from\ behavioral\ intervention}{change\ if\ given\ additional\ cash\ equivalent}$
ML groups	MDAT composite	.13*	.03	.09	3.0
	Language learning	.07	.02	.11*	5.5
	Fine motor skills	.11	.03	-.01	-.33
	Social skills	.14*	.04	.09	2.25
ML + Affirmation	MDAT composite	.13*	.06	.08	1.33
	Language learning	.07	.03	.10	3.33
	Fine motor skills	.11	.05	-.03	-.6
	Social skills	.14*	.06	.11*	1.83
ML + Plan making	MDAT composite	.13*	.06	.09	1.5
	Language learning	.07	.03	.12*	4
	Fine motor skills	.11	.05	-.03	-.6
	Social skills	.14*	.06	.09	1.5

Notes: **1.** Amount of cash transfer: 120,000 ariary per year; additional cost of mother leader intervention: 30,000 ariary per year; additional cost of additional behavioral nudges: +24,000 ariary per year (so cost of ML+ nudges = 54,000 ariary)

Figure 1: "Nudge" designs



Plan Making			
Forms	**Psychology**	**Desired outcome**	**Description**
	Commitment device, concrete plan-making, salient reminder	Women are better able to visualize the goals they want to achieve with the transfer, as well as draw out the concrete intermediate steps to reach those goals.	Beneficiaries draw: (1) Current state, (2) Future goal, and (3) Intermediate steps linking (1) and (2) (4) Volunteers share goals and plans with the group
	Choice architecture, visual reminder, concrete plan-making	Curating the choice set on how to spend the transfer sets social norms on what to do and provides women with concrete suggestions on important investments.	(1) Beneficiaries name their primary identity, (2) Beneficiaries rank purchases in order of importance, (3) Volunteers share their first choice and rationale with the group
	Locus of control, self-efficacy	Women internalize stronger sense of control over their environment and ability to prevent bad outcomes	(1) Beneficiaries discuss plans to prepare for bad but uncertain outcomes (child falling ill), (2) Beneficiaries simulate outcomes (7 bad to 3 good), (3) Beneficiaries discuss plans to *prevent* bad outcomes (4) Beneficiaries simulate outcomes (3 bad to 7 good)
Self Affirmation			
Intervention	**Psychology**	**Desired outcome**	**Description**

	Locus of control, self-efficacy, positive self-concept	Women make concrete links between their expenditure choices and their direct impact / consequence on family members. This primes their caretaker identity and provides positive feedback on the impact of their choices.	Beneficiaries draw: (1) Positive choice made with last transfer, and (2) How that choice affected their family (3) Volunteers share goals and plans with the group
	Self-affirmation, identity, priming, salient visual reminder	Identifying a specific positive value women believe to be important and thinking through how they exemplify it can affirm them to think more positively about themselves.	(1) Beneficiaries name their primary identity, (2) Beneficiaries rank values in order of personal importance, (3) Volunteers share their first choice and example of such behavior with the group
	Locus of control, self-efficacy	Women internalize stronger sense of control over their environment and ability to prevent bad outcomes	(5) Beneficiaries discuss plans to prepare for bad but uncertain outcomes (child falling ill), (6) Beneficiaries simulate outcomes (7 bad to 3 good), (7) Beneficiaries discuss plans to *prevent* bad outcomes (8) Beneficiaries simulate outcomes (3 bad to 7 good)

Appendix Table 1: Effects of Cash on Behaviors

	Parenting Behavior		Interaction with Children			Preparing Diverse Meals	
	(I)	(II)	(I)	(II)	(III)	(I)	(II)
Treatment Effect (Cash)	0.19**	0.18**	0.33*	0.25*	0.33**	0.02	0.02
	(0.09)	(0.09)	(0.17)	(0.14)	(0.16)	(0.05)	(0.04)
Intercept	2.17**	2.31**	2.27**	0.84**	0.59	0.32**	0.51**
	(0.07)	(0.11)	(0.12)	(0.27)	(0.36)	(0.04)	(0.08)
N	1840	1840	2404	2404	1268	2163	2163
R-squared	0.01	0.03	0.00	0.38	0.39	0.00	0.01

Note: Standard errors in parentheses. '' denotes significance at p<.1 level, '**' at p<.05. Model (I) is a simple regression with clustered standard errors, model (II) adds demographic and explanatory control including household size, gender of household head, age of household head, education of household head, age of youngest child, weeks since last payment, and distance of the household from the nearest school, and model (III) adds additional baseline controls*

Appendix table 2: Effects of Cash on Proximate Outcomes

	Food Diversity			Number of Meals Prepared			Food Insecurity, 7-Day			Food Insecurity, 12-Month		
	(I)	(II)	(III)	(I)	(II)	(III)	(I)	(II)	(III)	(I)	(II)	(III)
Treatment Effect (Cash)	0.30*	0.27*	0.32 *	-0.06	-0.03	0.00	0.21	0.14	0.08	-0.36	-0.4	-0.60**
	(0.15)	(0.15)	(0.17)	(0.10)	(0.10)	(0.07)	(0.24)	(0.21)	(0.23)	(0.31)	(0.29)	(0.29)
Intercept	8.03**	8.01**	6.99**	2.71**	2.72**	2.07**	0.94**	0.37	0.19	4.89**	3.79**	3.64**
	(0.11)	(0.20)	(0.34)	(0.07)	(0.11)	(0.14)	(0.14)	(0.31)	(0.39)	(0.20)	(0.39)	(0.50)
N	2404	2404	1268	2404	2404	1268	2343	2343	1155	2404	2404	1268
R-squared	0.02	0.04	0.06	0.00	0.05	0.09	0.01	0.05	0.08	0.00	0.02	0.04

Note: Standard errors in parentheses. '' denotes significance at p<.1 level, '**' at p<.05. Model (I) is a simple regression with clustered standard errors, model (II) adds demographic and explanatory controls including household size, gender of household head, age of household head, education of household head, age of youngest child, weeks since last payment, and distance of the household from the nearest school, and model (III) adds additional baseline controls*

Appendix table 3: Effects of Cash on Long-Term Outcomes

	Language Learning			Fine Motor Skills			Social Skills			Composite Development		
	(I)	(II)	(III)	(I)	(II)	(III)	(I)	(II)	(III)	(I)	(II)	(III)
Treatment Effect (Cash)	0.08	0.07	0.18**	0.14	0.11	0.09	0.14*	0.14*	0.03	0.14*	0.13*	0.14**
	(0.08)	(0.07)	(0.07)	(0.09)	(0.08)	(0.07)	(0.07)	(0.07)	(0.09)	(0.07)	(0.07)	(0.07)
Intercept	-0.15**	-0.2	-0.09	-0.1	-0.25*	-0.2	-0.18**	-0.31*	-0.18	-0.18**	-0.32**	-0.17
	(0.06)	(0.15)	(0.24)	(0.08)	(0.15)	(0.17)	(0.05)	(0.16)	(0.25)	(0.05)	(0.14)	(0.22)
N	1353	1353	624	1353	1353	625	1353	1353	625	1353	1353	624
R-squared	0.00	0.01	0.10	0.00	0.02	0.06	0.00	0.01	0.02	0.01	0.02	0.07

Note: Standard errors in parentheses. '' denotes significance at p<.1 level, '**' at p<.05. Model (I) is a simple regression with clustered standard errors, model (II) adds demographic and explanatory controls including household size, gender of household head, age of household head, education of household head, age of youngest child, weeks since last payment, and distance of the household from the nearest school, and age of the child (in months) and model (III) adds additional baseline controls*