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Designing behaviorally informed health interventions: adherence to micronutrient treatment in El Salvador

Pedro Bernal, Nicolás Ajzenman, Stewart Kettle, Florencia Lopez Boo, and Emma Iriarte*

Abstract

This Technical Note describes the process of designing a behavioral intervention to help reduce the prevalence of anemia in children in El Salvador. It first describes a traditional micronutrient distribution program for rural households. The analysis shows that although implementation was relatively successful, and take-up high, adherence to the full treatment of micronutrients was much lower. To explain this gap, the analysis employs a design methodology based on the “caregiver journey.” This methodology is a sequential analysis of the decisions taken by caregivers and the factors affecting each of these decisions. The Technical Note then explores the behavioral barriers to each of these decisions by examining relevant literature and conducting semi-structured interviews in the field. Drawing on these findings, ideas and designs are proposed for interventions to overcome these barriers, prioritized based on three factors: impact, feasibility, and ability to be evaluated. The process highlights the relevance of using behavioral sciences to address issues of take-up and adherence that go beyond traditional approaches used in public health.

Keywords: anemia, behavioral, micronutrients, adherence

JEL Codes : I10, I12, I15, I18, D90

Related operations: RGT-3213, ES-G1003

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1. Introduction

Approximately 45 percent of children under 5 years of age in low- and middle-income countries have anemia (WHO 2016a). In El Salvador, one out of two children under age 2 in the poorest municipalities is affected by this condition (IHME 2011). If untreated, anemia can diminish cognitive function, increase the risk of infections, and over the long-term cause permanent losses in productive capacity (Hass and Brownlie 2001; Horton and Ross 2003). While anemia can have several underlying causes, such as infectious diseases, malaria, or genetic factors, about half of all cases worldwide are due to iron deficiency (Ezzati et al. 2014).

In a context of poverty, anemia due to iron-deficiency is very common as a result of a low intake of iron-rich foods such as those of animal origin (meat, poultry, etc.). This is particularly relevant in critical periods of growth, such as from age 6–23 months, when there is high iron demand for the physical and cognitive development of children after they transition from breastfeeding to solid foods.

In most cases, this type of anemia can be prevented or treated with iron supplements. One of the most cost-effective treatments is to supplement food with micronutrient powders (De-Regil et al. 2011; WHO 2016b). The combination of iron with other essential micronutrients can be combined with semi-solid foods such as fruit or vegetable purees. Iron in this treatment is micro-encapsulated to mask its taste, which is a common barrier for adherence to other iron supplementation treatments such as ferrous sulfate (Zlotkin et al. 2001).

In El Salvador, supplementation with micronutrient powders was introduced in 2014 as a preventive treatment for anemia in children (MINSAL 2014). The effort was part of the Salud Mesoamerica Initiative (SMI),¹ a public-private partnership whose aim is to reduce inequities in maternal and child health services in the region through a combination of results-based financing for national governments and technical assistance geared towards improving health system performance.² SMI is divided into three progressive stages in El Salvador, and targets are established for each stage in collaboration with the Ministry of Health (MoH). The targets are independently and rigorously verified by the Institute of Health Metrics and Evaluation (IHME) through household surveys and medical record reviews (Mokdad et al. 2015).

In El Salvador, the third stage of the SMI has a target to reduce the prevalence of anemia among children between 6 and 23 months old by 5 percentage points. Since the first stage of SMI in 2013, the MoH and SMI have worked to introduce micronutrient supplementation in the country's clinical guidelines, distribute them, and design and implement different strategies to increase adherence to taking them. SMI targeted 14 municipalities with high levels of poverty for the interventions, involving approximately 75 primary care units that serve close to 12,000 children ages 6 to 23 months.

The micronutrient intervention in El Salvador has an adaptive and iterative design that can be summarized in two distinct stages (see Bernal and Martinez, 2020, for a detailed description). The first stage, from 2013 to 2015, was a traditional approach that focused on the distribution of the micronutrient treatment. This is the most common approach followed by health systems. It involved providing micronutrient packets free of charge during child well-visits (at age 6, 12 and

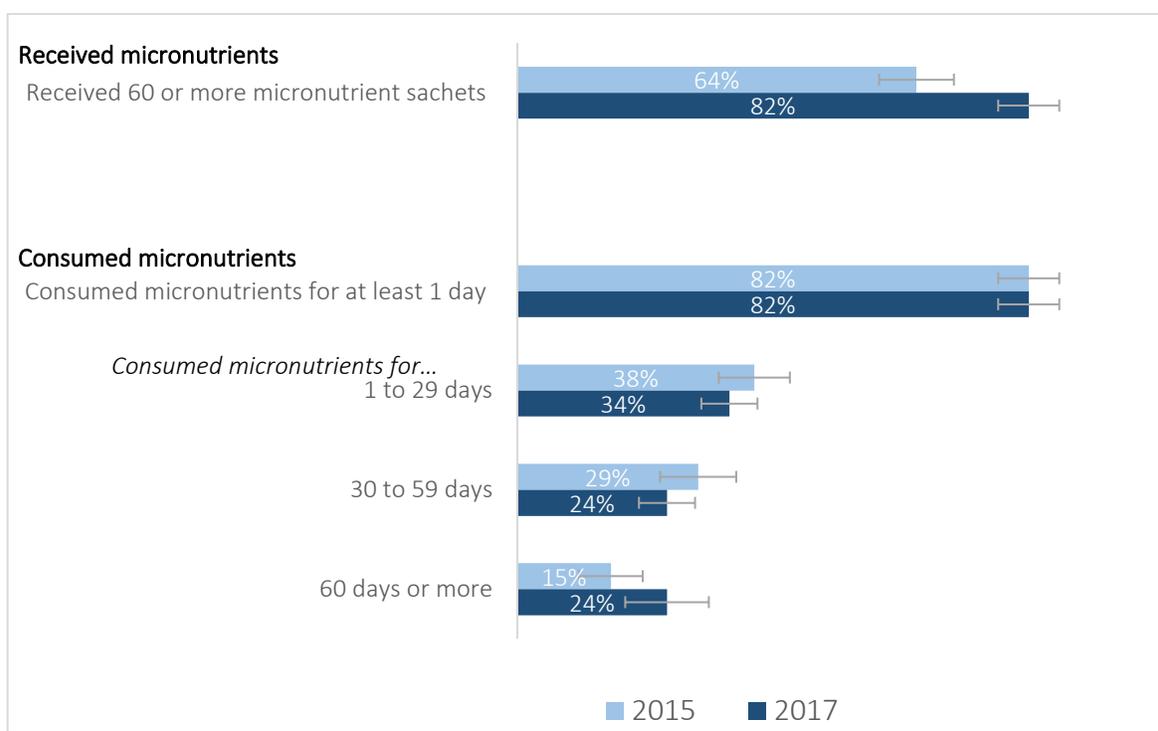
¹ <https://www.saludmesoamerica.org/es>

² The region for the purpose of the Initiative includes Belize, Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Panama, and the state of Chiapas in Mexico.

18 months) in public MoH primary care facilities.³ In addition, given that the micronutrients constituted a new product, a social marketing campaign was designed that included booklets for caregivers, posters, and even a recipe book demonstrating how to use the micronutrients. While this approach was effective in ensuring that children in the target area received the micronutrients (64 percent), only 15 percent consumed the full recommended treatment of 60 packets for 60 days every six months (Figure 1).

Following these results, the intervention was redesigned with an innovative approach and a clear focus on improving adherence to treatment. The redesigned intervention, which started in 2016, built on the previous stage and developed tools and strategies for community health workers and caregivers to track adherence to treatment. It added home visits by community health workers to caregivers to provide encouragement and counseling and to monitor adherence. In addition, it provided caregivers with a calendar to track the progress of their children in the treatment. With the redesigned intervention, the share of children receiving the full set of micronutrients increased to 82 percent and the share of those adhering to treatment increased to 24 percent (a 9 percentage point increase from baseline).

Figure 1. Reception and Consumption of Micronutrients among Children Ages 6–23 Months (percent)



Note: Authors own elaboration based on data from a household survey conducted every six months in El Salvador in the 14 municipalities targeted by the Salud Mesoamerica Initiative. All figures refer to reception and consumption of micronutrients in the last six months. The grey lines represent 95 percent confidence intervals built with clustered standard errors. For a detailed description of the data see Bernal and Martinez (2020).

Despite the substantial progress, it is clear that challenges remain toward full adherence, as 76 percent of children still fall short of completing the total treatment, which is essential to reduce

³ Child well-visits are preventive health care visits scheduled during the child's first five years. Each visit includes an overall check-up of child health as well as monitoring of child growth and development.

the prevalence of anemia. While in clinical trials adherence to micronutrients has been acceptable (De Barros and Cardoso 2016), it has proved to be much more challenging when micronutrients are distributed at scale (Rah et al. 2012; Vossenaar et al. 2017). Hence the experience of El Salvador has been similar to that of other countries that have introduced micronutrients through routine health systems.

The issue of adherence to treatment goes beyond micronutrients; it is commonly reported in the medical literature regarding treatments for a number of medical conditions, with substantial health and economic consequences (WHO 2013; Cutler et al. 2018; Fottrell et al. 2019). While a vast amount of resources, funding, and effort goes into developing effective medical treatments, research into how to influence take-up and adherence is often overlooked. Hence, when treatments are introduced and scaled up into health systems, it is common to find that they have a lower effect in the population at large than that exhibited in clinical trials or small settings, an issue known as “voltage-drop” (Al-Ubaydli et al. 2017).

While there are multiple reasons for this – including limited access to health services, ineffective supply chains, understaffed facilities, and limited quality of care at scale – even if these issues are addressed, failing to understand the drivers behind the behaviors of health workers and patients can diminish the impact of effective medical interventions on public health. For example, an experimental study by Banerjee et al. (2010) found that simply providing small incentives to parents for vaccinations had a larger effect on full immunization than having a reliable supply of vaccination services. They reasoned that parents might not be sufficiently persuaded of the benefits of vaccination to overcome the minimal costs it involves, such as the time and effort to get the vaccination, or the possible side effects. Small incentives helped overcome these minimal barriers, known as “friction costs.”

A growing literature from behavioral economics and psychology has highlighted the role that even small perceived barriers and cognitive biases can have on the take-up (or overuse) of medical interventions, and the cost-effective ways to overcome them. For instance, simple interventions that can have meaningful effects on behavior include providing by default a date for a medical appointment (Chapman et al. 2016), prompting patients to define a time and date to get a preventive procedure (Milkman et al. 2011), providing reminders for appointments or vaccinations (Busso, Cristia and Humpage 2015), sending SMS to improve adherence to anti-retroviral treatments (Pop-Eleches et al. 2011), having groups of peers provide support for adopting healthy behaviors (Fottrell et al. 2019), and providing information on how one compares relative to peers (Linder et al. 2017).

While the literature has focused more on the effects of behavioral science interventions from mostly randomized controlled trials, less is known about the process that goes into the design of such interventions. This Technical Note describes the process that was followed to design interventions informed by behavioral science to address the issue of adherence to micronutrient treatment in El Salvador. It first describes the mapping of the current intervention and the caregiver journey as well as the data available to identify bottlenecks. It then presents the process to develop and validate hypotheses for the lack of adherence, before turning to a discussion of a methodology to generate ideas to address the problem informed by the data gathered. Finally, it describes the thought process for prioritizing and selecting interventions from those generated ideas.

2. Mapping the Current Intervention and Caregiver Journey

The starting point for this analysis was to map how the intervention in El Salvador was working and the journey a caregiver of children age 6–23 months followed while going through it. The first part would allow for an understanding of the key processes of the intervention from a health service standpoint by assessing whether they are working as planned and identifying the key contact points of the health service with the patient/caregiver.

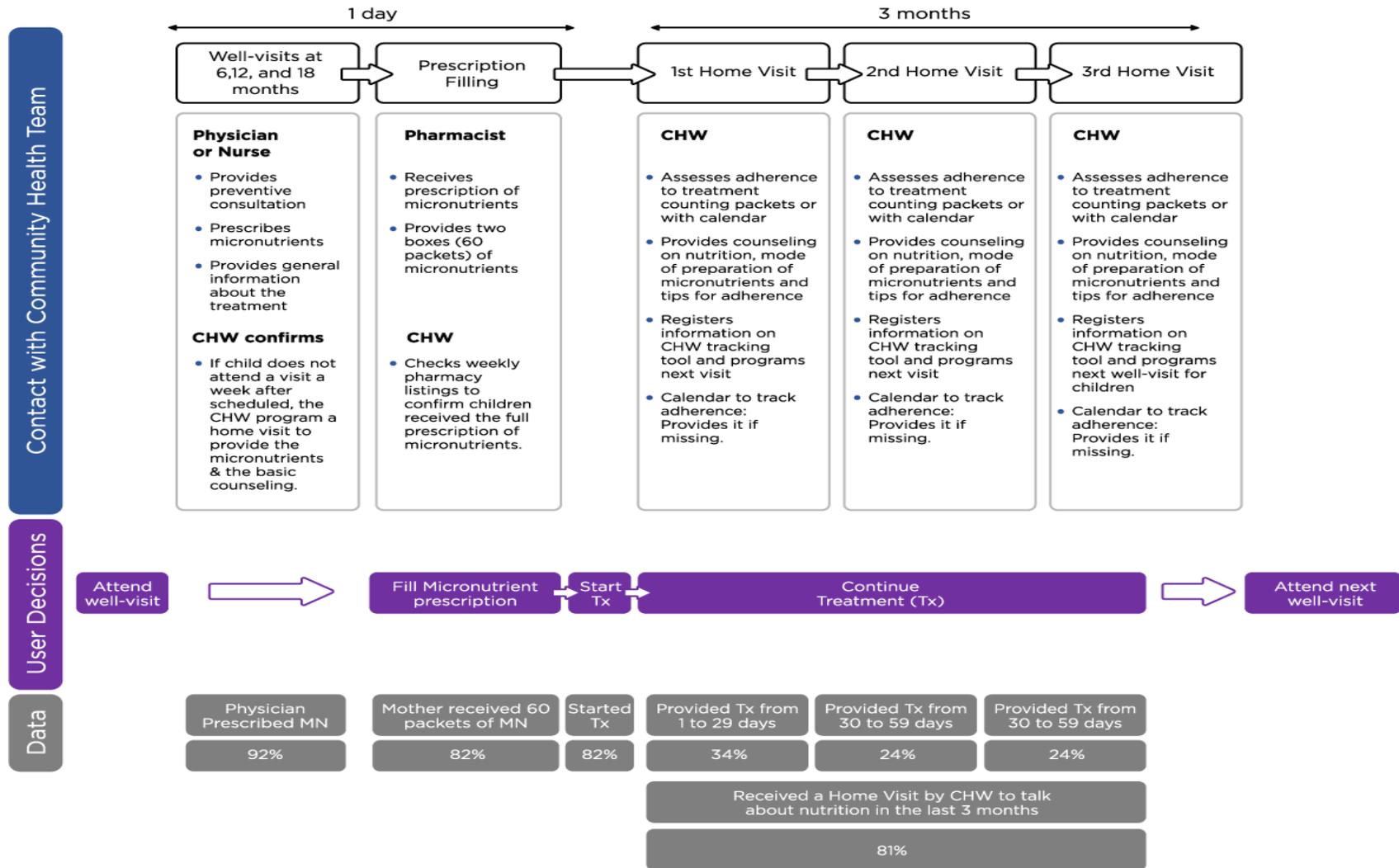
The second part of the analysis, the caregiver journey, allows for an understanding of the intervention from the caregiver's standpoint by mapping the main decisions and actions that she needs to take throughout the process and identifying the main behavioral bottlenecks. Understanding the intervention from the perspective of the user is a central part of identifying areas for improvement. This type of “user journey” tool is commonly used in service design (Følstad and Kvale 2018), including for health services (Soler et al. 2018; Mohr et al. 2018). Figure 2 summarizes the intervention map and the caregiver journey for the micronutrient intervention.

The intervention implemented starting in 2016 in El Salvador built on the free distribution of micronutrients through public health service providers managed by the MoH. The micronutrients were provided during well-visits for children ages 6, 12, and 18 months. Micronutrients were prescribed to all children in the SMI targeted municipalities as a preventive treatment for anemia by physicians or nurses who also provided basic information about their use and mode of preparation during the consultation. Prescriptions were to be filled in the pharmacy, which is part of the primary care unit where well-visits are provided. The pharmacy supplied the full treatment (60 packets) for the following six months until the next consultation. Pharmacy personnel also gave caregivers printed brochures with information on the micronutrients, as well as a calendar to track the number of doses provided.

Community health workers (CHWs), who are part of the country's primary care teams, played an essential role in following up with caregivers through home visits. Since those workers have lists of all children under age 5 in the catchment area, they used pharmacy records to keep track of which ones had received the micronutrients and which ones had not. Based on that, they programmed home visits to provide the micronutrients to children who missed the well-visit and to monitor adherence among those who had already received the treatment. Up to three home visits were made by community health workers in a three-month period following the well-visit to children who received the micronutrient treatment. During those visits, they monitored adherence by counting empty/remaining packets, provided counseling and preparation tips for caregivers, and recorded key information, including data on consumption of micronutrients for every child in their catchment area.

In terms of the SMI intervention, the caregiver journey started with the decision to attend a well-visit for the child and then fill the micronutrient prescription at the pharmacy. Once at home, she had to decide whether to start the treatment and when, and if she decided to proceed, from then on it became a daily decision on whether to continue with the treatment. Afterward the cycle repeated, with the caregiver deciding to attend the next well-visit. Overall, this set of decisions summarizes a caregiver's journey through the intervention. At each decision point, each caregiver had to deal with information, emotions, thoughts, perceptions, and actual and perceived constraints that influenced her decision. Understanding where the bottlenecks are in the caregiver journey and unpacking what goes into her decisions at those critical points is essential to understanding the problem and determining whether behaviorally informed solutions could help.

Figure 2. Intervention Map and Caregiver Journey



Note: Authors own elaboration. CHW: community health worker, MN: micronutrients; Tx: Treatment

To determine whether the intervention was being implemented as planned and to ascertain the actual behavior of caregivers at each decision point, the analysis took advantage of data from a household survey and a medical record review of primary care units. This information was collected from an impact evaluation being conducted at the same time to assess a different intervention (the effect of in-kind incentives on the performance of primary care teams).⁴

The data showed that in 2017, once the different parts of the intervention were put in place, the intervention was working relatively well. For instance, 92 percent of physicians prescribed the micronutrients during well-visits of children 6–23 months old, according to medical records. Also, the coverage of micronutrients was relatively high: 82 percent of caregivers of children in the target age group said they had received the full treatment of 60 micronutrient packets in the last six months. Moreover, community health workers were also completing the home visits: 81 percent of caregivers reported having been visited by a community health worker at home to talk about nutrition in the last three months.

The main issue was in completing the treatment. Nearly all caregivers who started providing the treatment to their children said that they had given micronutrients to their child for at least one day in the last six months, but only 24 percent had given their children the micronutrients for at least 60 days, which is the recommended dose. This information made clear that the main behavioral bottleneck to address on the side of caregivers was full adherence to treatment. In order to unpack the reasons behind this behavior, several working hypotheses were developed and then tested in field work. This process is described in the next section.

3. Developing and Validating a Hypothesis for Non-adherence

Based on the existing literature on non-adherence, data analysis corresponding to the survey described in this document, and our knowledge of the context derived from previous field visits, we explored different potential hypotheses that could explain the bottlenecks that prevent caregivers from adhering to the treatment. Considering that the micronutrients and the counseling (including the provision of relevant information) were provided without charge to caregivers, the prior was that, potentially, knowledge and cognitive biases were what primarily created the barriers that impeded caregivers from fully completing the treatment. Those barriers can in turn be heightened in a context of scarcity or poverty (Mani et al. 2013). The main hypotheses explored are presented below and then contrasted with the responses from caregiver interviews used to validate them.

Hypothesis 1: Mistaken beliefs/Lack of awareness about anemia and/or the risk of acquiring it

Caregivers might be not fully aware of the potential problems and threats related to anemia. If so, they would not know exactly what it is and what the potential consequences are for their children, and therefore might not be sufficiently concerned. This hypothesis seems plausible, considering that common symptoms of anemia such as irritability, tiring easily, or pale/gray skin can easily go unnoticed. If anemia is unnoticed or its consequences are unclear, then the benefits of taking the micronutrients might seem vague, and a very small cost could be enough to prevent caregivers

⁴ The data being collected in all of the 14 municipalities at the time for the other SMI impact evaluation included household surveys in the catchment area of each selected facility and a medical record review every six months from September 2015 to March 2017. Those data were collected for all of the 75 primary care teams that served the 14 municipalities. See Bernal and Martinez (2020).

from providing them to their children.⁵ Related to this, caregivers might have mistaken beliefs about the likelihood of acquiring the disease. This would be especially the case if they are overconfident (Weinstein 1980).

Hypothesis 2: Lack of knowledge of micronutrients as an effective treatment for anemia

Caregivers might be aware of the consequences of untreated anemia (i.e., they know its potential consequences), but might not have a clear understanding of how to avoid it. If caregivers do not see the micronutrients as the appropriate tool to prevent anemia (i.e., if they do not identify a causal link), a low level of adherence would then be expected.

Hypothesis 3: Mistaken beliefs related to the implementation of the treatment

Caregivers might not have the right information in terms of how to carry out the treatment (when, how, the importance of not missing a day, frequency, etc.) and therefore they could fall short of completing it. This problem would arise even if caregivers trusted in the causal link between adherence to treatment and anemia, and even if they were aware of the severity of the disease.⁶

Hypothesis 4: Limited bandwidth to focus on providing the daily treatment

Caregivers might just be forgetful, or they might have limited “bandwidth” to organize and plan, given the demands of their daily activities. The term bandwidth has been used in behavioral economics and experimental psychology to describe a common finding that people’s ability for effortful thought is diminished when faced with multiple tasks or “cognitive loads,” which then influences judgment and decisions. In a context of scarcity or poverty, this bandwidth tends to be diminished, since there are constant and pressing cognitive demands (Schilbach, Schofield, and Mullainathan 2016). In this setting, there could be a lack of proper attention, and thus daily events could distract caregivers or shift their focus to more immediate needs, especially if they have many children and many things to worry about. It might be the case that they would like to provide the treatment every day (for instance, if they know the severity of the disease and how to prevent it), but they just cannot manage to do it every day.⁷

Hypothesis 5: Difficulties implementing the treatment (costs of adherence or “hassle factors” are too high)

Even if caregivers remember to carry out the treatment and have a clear understating of how to do it, actually carrying it out may have small “costs” (or “hassle factors”) that could make the process harder. For example, children might not like the taste of the micronutrients or might not want to take them at all, or maybe the color of the food changes after mixing it with the powder and thus children find it strange. In such situations, it is possible that caregivers would just try a few times and then give up. Although the effect of these small costs on caregivers’ behavior might seem disproportionate (given how big the potential benefit of avoiding anemia is), many studies have shown that these hassle factors can be important barriers, especially in the context of preventive medicine (Kahn and Luce 2006).

⁵ Beliefs on the severity of a disease have been widely associated with treatment compliance rates. See Champion and Skinner (2008) for a review of the literature.

⁶ Distrust in medications or, more simply, wrong beliefs about their efficacy, could be an important deterrent to treatment compliance related to certain diseases. See AlHewiti (2014).

⁷ The literature on treatment compliance has widely explored this hypothesis in different contexts. See Pop-Eleches et al. (2013) for an example and a review of the literature.

Figure 3 summarizes the hypotheses to explain non-adherence and the barriers associated with them.

Figure 3. Main Non-adherence Hypotheses and Barriers to Adherence

	Hypothesis	Origin	Barrier
1	Underestimation: Risk of Anemia	Beliefs about general prevalence	Saliency
		Beliefs about own child's individual risk	Saliency, overconfidence
	Undervaluing "cost" of Anemia in the short-run	Mistaken or incomplete knowledge	Information
2	Lack of confidence in treatment	Mistaken beliefs on the effectiveness of treatment	Saliency, peer-influence
3	Mistaken beliefs of implementation	Lack of knowledge	Information
4	Limited bandwidth	Forgetfulness	Limited attention
		Lack of planning skills	Cognitive overload
5	Resistance to treatment	Dislike taste/side effects	Friction costs, hassle-factors, present bias

Source: Authors own elaboration.

Some of these potential barriers are likely to have a larger effect in certain contexts. For instance, the stress and anxiety brought about by scarcity in a context of poverty – common in the area of this study in El Salvador – tend to amplify these types of barriers because they reduce cognitive function, reduce mental bandwidth, and increases stress (Mani et al. 2013). In addition, personality-specific traits, such as present bias or overconfidence, could magnify the effects. A natural example is hypothesis 5: a small hassle factor in the present could represent a stubborn barrier to taking preventive measures for people who disproportionately weigh the present (to the detriment of the future).

None of these hypotheses are exclusive. For instance, caregivers might struggle to make their children eat the micronutrients mixed in their food, but the decision to give up or try harder probably depends on how beneficial they think the treatment is for them. On a similar note, it may well be the case that the giving the micronutrient itself is easy for some children who do not even realize they are taking it, but if caregivers do not see any effect and do not understand why it is useful, they might decide to stop the treatment even when the cost is very low.

In order to explore these hypotheses with the reality of caregivers, semi-structured interviews with caregivers were conducted in the catchment area of four SMI community health teams in El Salvador. Health workers from each community health team selected the women to be interviewed after being provided with a few guideline characteristics regarding caregivers' adherence to the treatment. While the sample of women was non-random and the number of interviews was neither exhaustive nor representative of the entire target area, the sample can be useful to rule out some of the potential hypotheses and to shed some light on the potential problems that caregivers faced during the intervention.

A total of 16 semi-structured interviews were conducted with women who had recently received the micronutrients. The interviews were conducted in August 2018 in the catchment area of four community health teams in San Cristóbal, San Antonio, La Virgen, and Sitio Viejo. The teams were selected to obtain a wide heterogeneity in adherence by beneficiaries to the micronutrient program according to the most recent data from the community health teams' tracking tool, and based on the teams' proximity to the team in San Cristóbal, which was the one selected by the MoH to visit during the week the interviews took place. Table A1 in the Appendix presents the lists of teams visited and their most recent data on performance. It is important to note that the data on performance were more than a year old, so the situation might have since changed, particularly because the different interventions would by then have been implemented for a longer period of time.

This step of the process was crucial to understanding the feasibility of the different hypotheses before discussing the design of the intervention. The goal was to identify the main potential behavioral biases that could have been in place at critical moments when caregivers stopped administering the micronutrients.

Based on the interviews, some common trends emerged. The general impression was that most of the problems were not related to lack of attention, limited bandwidth, or distraction. To begin with, most of the caregivers did not seem to “forget” to administer the micronutrients to their children: not doing so seemed to have been a conscious decision. They even had their own strategies – which seemed to be reasonable and effective – to remind themselves when to provide the micronutrients and keep a record of when and how many times they did it (some used a calendar, most put the packets on a visible shelf in the kitchen, and so on).

The main problem also did not seem to be a lack of information about the treatment procedure (i.e., the recommended dosage or the length of the treatment). Certainly, the provision of this information could be improved, but none of the caregivers interviewed stopped the treatment without knowing that they were indeed interrupting it before the time they were supposed to.

Most of the mothers struggled to implement the treatment because there were “physical” barriers: the children did not like the taste, or the caregivers thought that certain undesirable symptoms in their child might in some way be linked to the micronutrients (i.e., diarrhea, vomiting).⁸ These perceptions certainly implied a (small) cost that many caregivers were not willing to pay, even when they actually knew that the treatment was good for their child's development.

Who, then, were the most successful caregivers in administering the micronutrients? Analyzing the qualitative information, it seems to be the case that there were three types:

⁸ These are common side effects that have been described in the literature (De Barros and Cardoso 2016).

- Caregivers who did not struggle to administer the treatment because their children did not reject them (even if there were no apparent benefits)
- Caregivers who did struggle to administer the treatment but were very aware of the risks of not doing so (for instance, because their children were diagnosed with anemia)
- Caregivers who did struggle to administer the micronutrients, but who had seen very palpable improvements in their children in a very short amount of time (e.g., they were “chubbier,” “redder,” “more energetic,” “had increased appetite”).

These last two groups – which constituted the majority of caregivers successful in administering the micronutrients – found ways to administer them even if it was costly. Many came up with innovative strategies such as dissolving the powder when the child was not looking, mixing in different types of food until they found the “right” one, mixing the powder in a small portion of the food so that with a few spoonfuls the child took the full treatment, and so on.

Sometimes, however, even potentially successful cases ended in ambiguity. In one particular case, a caregiver who had noticed a clear improvement (and who had initially been willing to deal with her child’s resistance) stopped the treatment once the child seemed to be well and grown (i.e., already chubby, already very energetic). Apparently, with no additional short-term benefits she was not willing to exert additional effort anymore. As for caregivers who stopped the treatment, many did not seem to perceive any short-term benefit (often because the child was seemingly healthy in the first place), even though they knew the micronutrients were good for their child in the long run.

In sum, small costs sometimes prevented caregivers from providing their children with the micronutrients, but only when they could not see short-term benefits or when they did not perceive the immediate need of administering them (i.e., the child was not visibly unhealthy in the first place). If they did see improvements (in most cases, precisely because the child had initially been visibly unhealthy), they would find ways to overcome the problem.

Finally, it is worth emphasizing another potentially interesting problem, which is that most of the caregivers did not have a clear idea of what anemia is and its consequences. The prevalence of anemia in the region is close to 50 percent, and the fact that most caregivers do not see it as a pressing issue (even when they are advised by health workers) probably implies that they underestimate the likelihood of their own children eventually having it. They only seemed to show concerns when the children were diagnosed with anemia or when they perceived that their children were unhealthy.

4. Generating Intervention Ideas

A workshop in November 2018 organized jointly by the Behavioral Insights Team (BIT) and SMI aimed to generate ideas for behavioral interventions, including those that might help address the challenge of adherence to micronutrient treatment in El Salvador. The workshop included a diverse set of participants with operational and technical expertise as well as field experience in El Salvador. BIT regularly conducts these workshops with partners to build capacity in the application of behavioral science and to co-create behavioral solutions for a specific problem. With the aim of designing behavioral interventions the workshops leverage the knowledge and experience of participants on the specific public policy challenges they are facing with BIT’s expertise on behavioral science. The methodology and summary ideas from the workshop are outlined below.

4.1 Methodology

The workshop followed the Target-Explore-Solution-Trial-Scale (TESTS) methodology developed by BIT, which starts by identifying the specific behaviors to promote or discourage within larger, often complex, public policy challenges. Then it investigates potential barriers to change and motivational levers, using these findings, together with evidence from the behavioral science literature, to co-create preliminary intervention ideas. Finally, participants work to outline applicable evaluation strategies to test the interventions developed.

The five stages of BIT's TESTS were covered in the workshop to work through the challenge of adherence to micronutrient treatment in El Salvador.

1. **Target:** Participants worked to break down the public health challenge to identify the specific behavior to address: *who* needed to do *what*. To more clearly define those behaviors, decision maps were developed for the most relevant actors – caregivers, clinical staff and community health workers. Following this, participants decided which target behavior to focus on. Participants assessed potential target behaviors based on potential impact, or the extent to which a given behavior contributes to the challenge of anemia, and the likelihood of shifting that behavior through interventions.
2. **Explore:** Workshop participants shared insights from their fieldwork and previous programs with their colleagues. The combination of this information from several participants and the expertise of the group allowed for exploring the identified target behavior from the perspective of end-users.
3. **Solution:** Through structured brainstorming sessions, participants developed preliminary intervention ideas based on rigorous evidence. To provide participants with examples of how behavioral science has been applied to this and other challenges, case studies were presented based on BIT's work and the academic literature.
4. **Trial:** A session was conducted on running randomized controlled trials in public policy. Participants worked to refine intervention ideas and think about how they might be able to test them.
5. **Scale:** Throughout the brainstorming activities, attendees were prompted to think about whether their interventions were scalable, and how they could be implemented at scale.

By the end of the workshop, participants had identified several potential behavioral interventions that could positively impact the target behavior and discussed how these intervention ideas could be rigorously tested for effectiveness and scaled. The results of the workshop are discussed in the section below, focusing on the trial, explore and solution stages.

Following the workshop, an Inter-American Development Bank (IDB) and BIT working group further assessed the intervention ideas in terms of potential for impact, feasibility, and ability to be rigorously evaluated. Potential for impact was assessed using the academic literature on similar interventions and their impacts. Feasibility was evaluated by calculating the cost to implement a given intervention, and a judgement call on how difficult it would be to implement in practice in the context at hand. Evaluability was determined by assessing potential evaluation methods for each intervention, and how rigorous the results would be. The results of this process are presented in the next section.

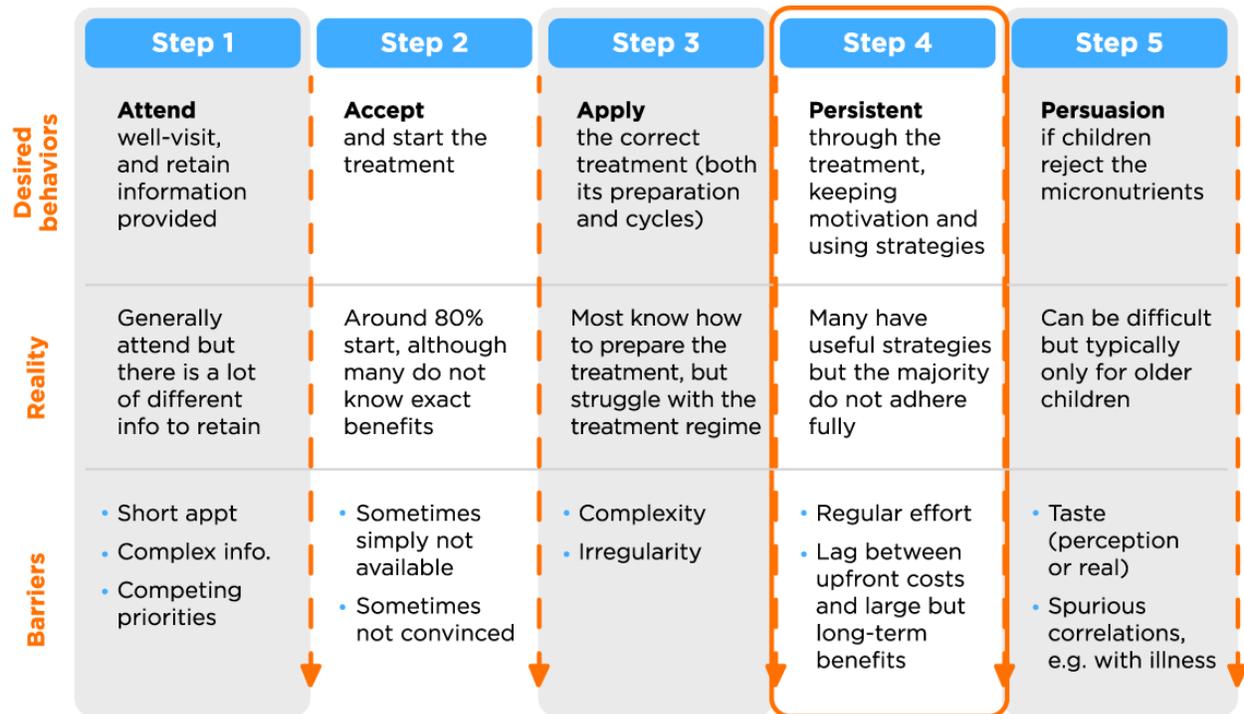
4.2 Summary of Results

Target

The policy problem that the workshop started with was the low adherence to micronutrient treatment in El Salvador. The adherence behavior could be broken down into different related

behaviors or steps. In order to identify a specific behavioral target, the behaviors relevant to adherence to treatment were separated between three key actors: caregivers, community health workers, and clinical staff. The exercise mapped the desired behaviors, the reality on the ground, and barriers for each of these three actors. Figure 3 is an example of this target map developed for caregivers.

Figure 4. Example of a Caregiver Decision Map for Adherence to Micronutrients



Source: Authors own elaboration.

In addition to this target mapping, participants also reviewed data on potential target behavior such as the survey data presented in sections 1 and 2 and the fieldwork conducted to validate hypotheses described in section 3.

In terms of feasibility, it was concluded that persistence was a behavior that could plausibly be changed through behavioral approaches because at this stage caregivers have already made the decision to start using micronutrients, and so they cannot be completely against them.

The behavioral objective defined in the workshop was therefore to “*increase the number of caregivers in El Salvador who complete the recommended 60-day cycles of micronutrients for their children ages 6 to 23 months old every six months*” (highlighted as Step 4 in Figure 4 above). This target was selected because it scored highly on potential impact, the degree to which it contributes to address the challenge of anemia, and how feasible it is to shift it with behavioral interventions.

Explore

Caregivers face many barriers to completing the 60-day cycles for administering the micronutrients. At the workshop, participants presented research and fieldwork findings relevant to understand the target behavior. Barriers to full adherence identified and discussed during the workshop included:

- **Small but daily short-term costs.** People tend to avoid things that are difficult to do, even if they are good for them in the long run. The specific characteristics of the micronutrients can make them hard to administer because they need to be given exclusively with food and must be consumed within 30 minutes of being prepared to avoid changes in taste or color of the food.⁹ Making small reductions to these barriers or “friction costs” could be the difference between caregivers persisting with the micronutrients and not.
- **Large but delayed and mostly invisible benefits.** There are physical and cognitive benefits to taking the micronutrients, but these are not clear to families, even if they know that they are there in the long term. People tend to be “present-biased” and are thus likely to heavily discount these long-term benefits.
- **Taste.** There is still an issue, or perceived issue, with the taste of the micronutrients when added to food. The micronutrients are meant to be tasteless, so this may be because they are not prepared correctly, e.g., they are left too long before consumption, or because there is lagged perception of bad taste from the previous version of micronutrients.
- **Side effects.** Families still report side effects from the micronutrients that include constipation, changing color of feces, and in some cases diarrhea. These effects may be incorrectly associated with the micronutrients, but it is the perception – and how the micronutrients are discussed in the communities – that matters, not the true side effects.
- **Salience.** Anemia is not a salient issue for many caregivers. In a context of poverty, the signs and symptoms of anemia can be perceived as normal and hence not considered a cause of concern.

Solution

In the solution phase of the workshop, BIT led structured brainstorming sessions to develop preliminary intervention ideas, supported by behavioral science findings, in order to improve target behavior. These sessions resulted in a series of innovative intervention ideas aimed at increasing caregivers’ adherence to micronutrient treatment that were informed by insights from fieldwork as well as the behavioral science literature.

While the initial ideas generated needed further exploration, data, and qualitative work, and would require discussions with the government to understand which would be appropriate to take forward, several were very promising (see Table 1 for a summary).

The next two sections outline the most promising ideas resulting from the workshop in more detail and refer to the evidence from the behavioral science literature that supports them. The ideas are divided into (1) short-term behavioral intervention ideas and (2) longer-term behavioral intervention ideas (such as those requiring new physical products or significant changes to MoH procedures). Generally, the ideas are grouped in terms of the mechanism used to implement them.

Short-term Intervention Ideas

(1) Public recognition for caregivers and community health workers

Caregivers often look for social cues as to how they should look after their children and can sometimes be naturally competitive about how they raise them. One way to harness these social influences and competition between caregivers would be to **publicize the caregivers who have**

⁹ This happens as the lipid-based encapsulation of the micronutrient dissolves after that time.

managed to complete the recommended treatment. This would serve to highlight that other caregivers are administering micronutrients, creating a descriptive social norm, and achieving their target, thus creating competition for others.

The desire to be liked and respected by others has been shown to motivate prosocial behavior among individuals as they seek to demonstrate traits that are widely considered to be “good.” In addition, the **community health workers whose caregivers complete a full micronutrient cycle could be recognized alongside them**, allowing them to see their success rates in comparison to other community health workers, also creating competition and comparison between them. Similar “intrinsic” rewards have been shown to be effective at motivating health workers in other contexts.

For example, a field experiment conducted in Lusaka, Zambia explored the effect of intrinsic rewards on the performance of hairdressers recruited by a public health organization to promote HIV prevention and sell condoms. Agents were assigned to either financial incentives or “star” displays showing the volume of sales in their shops. Those who were offered the intrinsic reward (“stars”) exerted more effort and generated higher sales than those who received a 90 percent margin on each condom sale (Ashraf, Bandiera, and Jack 2012).

(2) Small incentives or lottery rewards for completing 90 days

Alternatively (or additionally) extrinsic rewards could be given to caregivers who complete the cycles. Even small, nonmonetary incentives have been shown to increase the uptake of childhood vaccinations in resource-poor settings. In a trial in Rajasthan, India, vaccination rates were 39 percent in villages where raw lentils and metal plates were offered for a completed vaccination, compared to only 23 percent in villages where a reliable monthly vaccination camp was set up, but no incentives were offered (Banerjee et al. 2010).

People tend to overweight small probabilities, and so the **impact of incentives could be strengthened further by giving out the awards based on a lottery.** For example, parents could enter a lottery by giving empty packets of micronutrients back to clinical staff. Lotteries or prize draws can be highly cost-effective ways of improving the impact of direct incentives because people tend to focus more on the size of a prize rather than their chances of winning it. Similar experiments have shown to be effective at encouraging medication adherence (Volpp et al. 2008).

(3) Community health workers provide “implementation intentions” and social comparison feedback to caregivers

There is considerable variability in the strategies followed by caregivers to complete the treatment. A short set of strategies developed by successful caregivers could be provided to community health workers to discuss with caregivers. These strategies could incorporate “implementation intentions” that help people make concrete plans on how they will undertake a certain action. This approach has proven effective in encouraging a range of behaviors.

Table 1. Summary of Intervention Ideas

Mechanism	Intervention Idea
<i>Short-term interventions</i>	
Nonfinancial and financial rewards	1. Public recognition for caregivers and community health workers.
	2. Small incentives or lottery rewards for completing 90 days.
Clear instructions, reminders, and support for caregivers	3. Community health workers provide “implementation intentions” and social comparison feedback to caregivers.
	4. SMS information messaging campaign.
	5. Peer-mentor support by successful caregivers.
Improved feedback for caregivers and clinics	6. Increase testing of children for anemia at clinics.
	7. Send feedback to clinics on local anemia rates.
<i>Longer term interventions</i>	
Changes to the physical environment	8. Redesign to make the micronutrients easy, attractive, and fun.
	9. Create a micronutrient dispenser.
Changes to procedures	10. Increase the recommended dosage of micronutrients.

Source: Authors own elaboration.

During home visits, **community health workers could help parents create a plan detailing when, how, and at what times they will be giving micronutrients to their children.** Parents could be prompted to identify the barriers that prevent them from providing micronutrients and develop specific action plans to address them. For instance, to address forgetfulness, during home visits community health workers could help parents set up alarms on their phones to remind them to give the micronutrients to their children.

These interventions could be reinforced by **commitment contracts signed between parents and community health workers.** Commitments would be customized and flexible; during home visits community health workers could edit and add to them based on what is and is not working. In addition to providing this support, **community health workers could provide feedback (and also encouragement) to caregivers on their relative consumption levels compared to others in their village or area.** People tend to conform to social norms and do what the majority of people around them are doing. Making social norms salient can have a strong effect on behavior, and the effect is even stronger if the norm is made personal to them. For example, 35.1 percent of people recycled their towels when a sign in a hotel room asked them to save the environment. When the sign invoked social norms and said that most hotel guests recycled their towels at least once during their stay the proportion of guests recycling increased to 44.1 percent.

When the sign said that most previous occupants of the room had reused towels, 49.3 percent of guests also recycled (Goldstein, Griskevicius and Cialdini 2007).

(4) SMS information messaging campaign

The vast majority of caregivers starts the treatment but does not complete it. Text messages have been shown to be effective reminders in a number of circumstances, including prompting help-seeking behavior (Chen et al. 2008). Weekly SMS messages motivating caregivers to continue the treatment could be a cheap, feasible, and impactful solution. The messages could include any or all of the following types of messages:

- **Messages to strengthen the association between micronutrients and short-term observable benefits**, including that micronutrients have been shown to increase appetite, energy levels and the color of skin. Receiving regular feedback creates a feeling of progress by relating the performance of regular tasks to achievement of an ultimate, long-term goal. In turn, being able to see their progress motivates people to sustain their effort. For example, customers who receive a 12-stamp coffee card with the pre-existing “bonus” stamps complete the 10 required purchases faster than customers who receive a “regular” 10-stamp card (Kivetz, Urminsky, and Zheng 2006). Focusing on short-term observable solutions in this way may be more effective than abstract long-term benefits like reducing the risk of anemia. A recent meta-analysis of 94 studies found that gain frames were significantly more likely than loss frames to induce illness prevention behavior (Gallagher and Updegraff 2012).
- **Tips on how to remember to use the micronutrients** (such as by leaving them next to the stove) and **how to prepare them** (e.g., recipe tips).
- **Motivational messages from peers** who have been successful, or, if possible, caregivers could write messages to themselves at the start of the 90 days when they are motivated that would then be sent to them to encourage them to persevere.
- **Messages to increase the perception of caregivers that their children may have anemia and encourage them to do something about it.** For example, “6 out of 10 children in [local area] are found to have anemia at 2 years old: give your children micronutrients every day so your child doesn’t get anemia.”

(5) Peer-mentor support by successful caregivers

Caregivers might not always trust the advice given to them by clinical staff, so a “messenger” closer to them such as caregivers who have successfully completed micronutrient courses may be more effective at encouraging micronutrient use than clinical staff or health workers. Various studies have demonstrated that socially influential peers can affect the behavior of their peers in school settings, for example concerning use of contraception (Ali, Amialchuk, and Dwyer 2011) or smoking (Campbell et al. 2008). Similarly, people are also influenced by the feelings they have for a messenger, and so they may ignore information delivered by a person they dislike (Cialdini 2007). This idea could potentially be linked to the public recognition idea above, with the pool of successful caregivers used to recruit mentors who then are encouraged to mentor other caregivers. Peer mentors could be provided with information such as the ideas above included in the information messaging campaign idea in order to help them support other caregivers.

(6) Increase testing of children for anemia at clinics

Currently, because anemia rates are so high in El Salvador, children are not usually tested for anemia and all children are advised to take micronutrients. This means that **caregivers do not know if their child has anemia. Increasing testing could change this** and increase the motivation for caregivers to prepare micronutrients for their children. More research will be needed to assess which types of testing could be used and which children would be tested, and to design the feedback for caregivers. It will also be important that this feedback be designed so that children who according to the test are not anemic, are still encouraged to take micronutrients as a preventative measure., since they might still be at risk of anemia in a context of poverty.

(7) Send feedback to clinics on local anemia rates

One challenge is how to make anemia “top of mind” for doctors, particularly in areas where anemia is relatively prevalent or adherence relatively low. One approach would be to **send doctors or relatively worse-performing clinics feedback about the micronutrient consumption and anemia levels relative to “similar” clinics**. Data on consumption levels is apparently available, so this could be a feasible intervention to test. Performance feedback can be impactful, especially for doctors who have strong professional identities. Doctors’ clinics in England that received letters telling them they were among the top 20 percent of antibiotic prescribers in their local area prescribed 3 percent fewer doses of antibiotics in the following six months compared to clinics that did not receive feedback (Hallsworth et al. 2016).

Longer-term Intervention Ideas

(1) Redesign the micronutrient packaging to make it easy, attractive, and fun

The current micronutrient packaging is not dissimilar to something one might expect for medical products. This likely reinforces beliefs about bad taste or side effects (for caregivers and children) and may create the false perception that micronutrients should only be taken if the child is ill. It is therefore worthwhile to explore **rebranding the packets to make them more attractive to parents and children, and, if possible, “fun.”**

The idea that making a behavior simple and fun to do as the easiest way to change behavior for the better is the core theory of Richard Thaler and Cass Sunstein, authors of *Nudge: Improving Decisions About Health, Wealth, and Happiness* (2008). Examples of “fun” nudges include a staircase turned into a piano to encourage people to use it rather than the elevator, and bottle banks that reward recyclers with points and music.

In the workshop, one group provided the example of “pop-rock” type micronutrients that fizzle in the mouths of children, which could make it fun for them to take them rather than a chore. Structurally changing the type of micronutrients on offer in El Salvador would be difficult to implement, but the potential impact would be large if a product were found that children truly enjoy.

(2) Create a micronutrient dispenser

A dispenser could be designed that would stand vertically in the kitchen with packets dispensed at the bottom. **The dispenser would be convenient to use at the time caregivers are cooking and give them a clear sense of progress, while also providing community health workers with an easier way to count the packets consumed.** The dispenser would make it easy for

caregivers to remember the micronutrients at the time when they are preparing food. In a trial in Kenya, a similar type of intervention was found to be highly effective at encouraging people to add dilute chlorine to potentially unsafe water. Dispensers that automatically add the right amount of dilute chlorine to be mixed with 20 liters of water were placed next to water sources (and thus accessible at the time when people were collecting water). These dispensers were found to be the most effective way to increase the use of chlorine compared to other interventions, increasing usage by 30 percentage points, with an effect sustained for 30 months (Kremer et al. 2011).

(3) Increase the recommended dosage of micronutrients

The 2011 World Health Organization (WHO) guidelines that are followed in El Salvador (regimen of 60 days on and 120 days off, every six months) were superseded in 2016. The 2016 guidelines are that 90 packets should be taken within each six-month period by children between 6 and 23 months old (i.e., taken on 50 percent of days). Given the evidence cited in this report, it could be beneficial to **increase the recommended dosage of micronutrients to either (1) the 90 day per six-month regimen now advocated by the WHO, or (2) daily use between 6 and 23 months old.**

This recommendation is based on several reasons. First, the 90 day regimen in the WHO 2016 guidelines is recommended for countries with a 20 percent prevalence of anemia or higher, which is less than half of the prevalence in El Salvador. Second, the recommendations are made using a systematic review of studies in different contexts, with different regimens, and with varying amounts of micronutrients within the packets. Third, the guidelines therefore note that “the recommendation of providing 90 packets was based on the judgment of the members of the guideline development group...[and] the number of packets or doses may be adjusted if data on iron status or other micronutrient status of the vulnerable population is known.” Fourth, no evidence is cited of studies showing harmful impacts of micronutrients on 6-23 month olds (and only two studies showed a moderate increase in diarrhea for 2-12 year olds). Given this evidence, combined with the fact that only 24 percent of caregivers currently succeed in administering the recommended dose (of 60 days), and that anemia rates have remained high in El Salvador since this recommendation has been in place, options to increase the recommended regimen should be seriously explored with medical experts to assess the potential for impact, the potential risks, and the cost.

A daily regimen could be doubly beneficial because habits are hard to form and often easy to break. A given behavior needs to be repeated over time and in a consistent manner in order for it to develop into a habit. **With repetition, an automatic link can develop between the situation (meal time) and the behavior (preparing and administering the micronutrients),** and over time less mental effort is required to perform the action. The current regimen in El Salvador of 60 days every six months may therefore hinder habit formation due to the stop-start timetable.

5. Prioritizing Interventions

Following the workshop, the IDB and BIT formed a small working group to further discuss these intervention ideas and determine which ones to implement. Intervention ideas were assessed in terms of potential for impact, feasibility, and ability to be rigorously evaluated.

The 10 short- and longer-term intervention ideas outlined in the previous section were assessed for potential for impact using the academic literature on similar interventions and their impacts. Feasibility was evaluated by calculating the cost to implement a given intervention, and based on

a judgment call on how difficult the ideas would be to implement in practice. Trailing and scaling were also considered, that is, whether the intervention can be rigorously evaluated using a randomized controlled trial, and whether it has the potential to be scaled up if found impactful. Table 2 presents a summary of these criteria.

Table 2. Intervention Evaluation Criteria

Criterion	Key Question	Considerations
Impact	<i>How effective is this intervention likely to be on improving the primary and secondary outcomes?</i>	<ul style="list-style-type: none"> • What proportion of the population would the intervention reach? • Which population is the intervention targeting? • How important is the target population in decision-making or delivery? • What behavior is the intervention looking to target and what is the link to the objectives? • What effect might the intervention be expected to have on the target population's behavior? • What impact have similar interventions had on the primary and secondary outcomes? • Is the intervention likely to have a negative impact on some people? Can this be measured?
Feasibility	<i>How feasible would it be to implement the intervention?</i>	<ul style="list-style-type: none"> • What touchpoints can be controlled? • Would greater partnership be needed with the Ministry of Health or other institutions? • Would the intervention cause any ethical or political concerns in stakeholders? • When should the intervention be implemented and when will outcomes be captured? • Can compliance be tracked and managed?
Ability to evaluate	<i>How feasible would it be to evaluate the intervention?</i>	<ul style="list-style-type: none"> • Do the data that are currently collected capture the relevant outcomes? • Can child-level data be accessed? • How are the data currently recorded? • How easy would it be to create new data manually? • How different are the data between children? Between clinics? • How many children or clinics could be recruited?

Criterion	Key Question	Considerations
		<ul style="list-style-type: none"> • At what level is the intervention targeted? • Can the intervention be randomly assigned? • For how long would outcomes need to be tracked?

Source: Authors own elaboration.

Based on the guiding questions and criteria outlined in Table 2, the small working group reviewed and discussed all of the possible interventions produced in the workshop and came up with a smaller set of interventions to address the lack of adherence in the context of the El Salvador micronutrient intervention. Context did play an important role when answering the different considerations, so even if some ideas were not deemed feasible in the context of El Salvador, they could be pursued in a different setting. Seven out of the 10 interventions discussed were not selected due to different considerations that are outlined below.

First, the ideas regarding financial or nonfinancial rewards, while promising, were not considered for a variety of reasons. An impact evaluation was already ongoing in the same target area to assess the effect of nonfinancial incentives provided to primary care teams based on their performance on 10 indicators related to the quality and use of maternal and child health services, including one related to micronutrient supplementation for children.¹⁰ Rewards of any kind (financial or not) for caregivers completing the treatment could also be effective, but this type of intervention is very challenging to be implemented at scale for a Ministry of Health in a low- or middle-income countries.¹¹ There are issues regarding how to actually verify adherence without undesired effects, and it is unclear if effects would persist if rewards were discontinued later.

Three intervention ideas were seen as relatively simple to implement at a low cost, but the expected impact, if any, was projected to be low. This was the case for implementation intentions for users, providing feedback to clinics on local anemia rates, and a micronutrient dispenser that could easily help keep track of progress. Since only small effects were expected from any of these interventions, it would be difficult to detect any of these effects for an intervention in the target area of El Salvador.¹²

The full redesign of the micronutrient supplementation product to make it easy, attractive, and fun had promise, but it was outside the scope of the project and, to our knowledge, no other existing iron-supplementation product has all three of these characteristics. Finally, changing the recommended dosage and treatment schedule for micronutrients could have a major effect and is a question worth exploring, particularly since the evidence is not settled on the effects of distinct treatment schedules such as daily, every other day, or unstructured (Pelletier and DePee 2019).

¹⁰ The team in-kind incentives ultimately proved to be effective in improving the overall performance of primary care teams in measures of community outreach, timelines, quality, and utilization of health services. No significant effects were found specifically for the consumption of micronutrients. See Bernal and Martinez (2020) for more details.

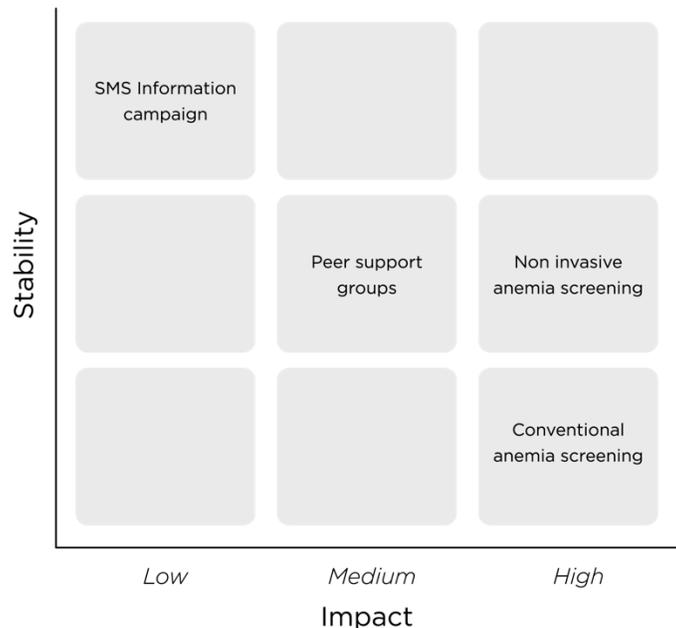
¹¹ Conditional cash transfers are a counterexample of incentives for specific behaviors, but they usually focus on easily verifiable behaviors such as school attendance and attending well-visits, since it is otherwise difficult to enforce conditionalities. In-kind rewards are challenging for ministries of health because procurement and distribution are hard to maintain for items outside the list of essential drugs and equipment.

¹² The target for implementation was the 75 primary care teams in the 14 municipalities of SMI where micronutrient supplementation was being carried out in El Salvador. Since it was not feasible to implement a randomization of any of these interventions at the individual level, doing so at the cluster level (primary care team) would only allow for detecting moderate to large effects.

However, the El Salvador project had a limited number of facilities in the target area to rigorously test this idea.

The three intervention ideas deemed feasible to implement and test were the SMS information messaging campaign, peer mentor support by successful caregivers, and increasing testing of children for anemia in primary care units during well-visits. After further discussion and exploration of costs, these three were mapped in terms of impact and scalability, as shown in Figure 5. While the mapping along these dimensions is informed by context, literature, costs, and knowledge of the setting at hand, their final classification still remains a judgment call. However, having a team with varied backgrounds and knowledge of the setting for implementation can help identify possible challenges for scalability and provide an informed decision.

Figure 5. Mapping of Selected Intervention Ideas along Impact and Scalability Lines



Source: Authors own elaboration.

SMS were deemed the most highly scalable of any of the interventions, particularly since once the message is designed and validated, reaching additional caregivers involves only the messaging costs. In addition, implementation requires at most minimal training of health workers to promote enrollment to the messaging services. However, the size of the effect of the campaign might be expected to be low, since it is a very light-touch intervention. Peer mentor support groups have the advantage of tapping into the experience and knowledge of caregivers so that they can help others. If successful, this type of intervention could have a medium to high impact because it provides a space for sharing multiple ideas and provides support for implementation. However, it was deemed by the group to be of medium scalability because it requires identifying and enrolling caregivers, promoting attendance of caregivers, and training community health workers and/or some caregivers to lead the groups.

Finally, screening for anemia in children at primary care units was considered to be the intervention with the highest expected impact, but with low to medium scalability depending on the technology used for the screening. This intervention was considered to be valuable because the clinical symptoms of mild and moderate anemia can go largely unnoticed, and screening for anemia could provide a clear signal to caregivers of an underlying health condition that requires

treatment, in turn influencing the perceived need for micronutrients. In low-income settings, screening for anemia is usually not recommended from a public health perspective because the micronutrient supplementation has to be prescribed to all children as a preventive treatment, since they are all at risk. However, this rationale underscores the effect that providing information to the caregiver can have on behavior. In terms of the scalability of this intervention being deemed to be either low to high depending on the technology used for the screening, several issues were raised. Conventional point-of-care screening is usually performed with a HemoCue, which requires a capillary sample (blood sample from a finger or toe). While the technology is tried and tested, it requires substantial training and practice to adequately collect the sample (Karakochuk et al. 2019). It also requires constant supplies for every test, including lancets, microcuvettes, etc., and while the pain is minimal it could constitute a barrier for children or caregivers. Newer noninvasive technology allows for performing the screening without the need for a blood sample by using pulse-oximetry and a small sensor that is placed on a finger or toe that can be reused about a thousand times and requires less training.¹³

6. Discussion

This Technical Note has described the pathway towards finding an impactful and cost-effective solution to a dramatic problem in El Salvador: anemia in the early years of life. Several critical questions have been investigated. What factors prevent caregivers from taking up, starting, and finishing micronutrient treatment? Is it lack of knowledge about the effects of anemia on their children? Is it a lack of knowledge about the effectiveness of micronutrients? Is it forgetfulness? Is it too difficult to add that single activity to a family routine? Is it because the benefits of the treatment are too distant in time? Is it perhaps a combination of some of these factors? The analysis conducted by the Behavioral Insight Team, the IDB and the Salud Mesoamerica Initiative of the micronutrient supplement intervention in El Salvador involved first identifying the roots of the problem and then devising possible solutions.

To identify the bottlenecks to adherence, the analysis started by mapping the current intervention and the caregiver journey. The first allows for understanding the key processes of the current intervention from a health service standpoint and the contact points with the caregiver. The second, the caregiver journey, enables an understanding of the intervention from the perspective of a user (in this case, the caregiver of the young child). This process is conducted to identify the main behavioral bottlenecks that arise in each decision needed to successfully start and finish the treatment. It was informed by in-depth interviews and survey data.

Many insights arose from this process. First, it was found that many parents abandoned the treatment because, although they understood the long-term benefits of the anemia treatment, they did not perceive improvements in the short term, and they encountered small daily difficulties in getting the children to take the micronutrients. In addition, the short- and long-term effects of anemia are almost imperceptible to caregivers, particularly in a context of poverty, where the vast majority of children have anemia or will suffer from it. Despite caregivers knowing that micronutrients are important for children's growth and development, they perceived that their children develop similarly to others in the community, and therefore they did not assign much importance to treatment.

¹³ Several devices produced by Massimo have been tested at the point-of-care. While the evidence is recent, it holds promise (Parker et al. 2018; Shamah Levy et al. 2017; Karakochuk et al. 2019).

Once the barriers were identified, the next step was to come up with actionable solutions adapted to the reality of the country. The framework was based on the BIT's TEST approach, which allowed for arriving at a diverse and rich final set of policy options to improve adherence to treatment. The prioritization was then based on the assessment of three variables: impact, cost, and feasibility.

The process outlined here for identifying bottlenecks in adherence and possible solutions to address them highlights the relevance of the insights of behavioral sciences to influence population health. The traditional approaches to public health issues for which there is a clinically proven treatment are to focus first on distributing the treatment widely in the health systems, and second on developing communications campaigns to influence the knowledge and attitudes of both health workers and the population at risk of the benefits of such treatment. Both approaches are key building blocks for a solution, but they are not enough. Behavioral sciences can complement these approaches by focusing on key micro-decisions for take-up and the choice architecture leading to those decisions. In addition, behavioral sciences make evident the outsized role that even small barriers or hassle factors can have on take-up of interventions with clear health benefits, and the importance of making those benefits salient to caregivers, especially when the benefits are mostly long-term ones. While identifying these bottlenecks can seem like a daunting task, even minimal but user-focused qualitative work and available data can shed light on how to address them. Identifying the bottlenecks can often be the most important part of this process.

Finally, since problems like those showcased here are complex, no single solution can be considered a silver bullet. Conducting a process such as that described in this Technical Note, using data to constantly identify even small barriers and then brainstorm and test solutions, can be a promising way forward. The use of this type of iterative approach for program improvement and learning has been advocated recently by a global working group to improve micronutrients programs (Vossenaar et al. 2017) and even more broadly to solve complex development problems (Andrews, Pritchett, and Woolcok, 2012).

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Appendix

Table A1. Community Health Teams Selected to Conduct Interviews of Caregivers

Department	Municipality	Community Health Team	Percentage of Children 6 to 23 Months Old with Full-Adherence Registered in Most Recent Cycle in the Community Health Worker Tracking Tool
Cuscatlán	San Cristóbal	UCSFI San Cristóbal	77.8
Cuscatlán	San Cristóbal	UCSFB San Antonio	27.8
Cuscatlán	San Cristóbal	UCSFB La Virgen	16.7
Cabañas	Ilobasco	UCSFB Sitio Viejo	4.8

Source: Authors own elaboration based on a random sample of records of children age 6 to 23 months old from a survey conducted to assess community health team performance in March 2017. The data description can be found in Bernal and Martinez (2020).