Pre-Analysis Plan: Working With Community Health Workers to Increase Use of ORS and Zinc to Treat Child Diarrhea In Uganda

Zachary Wagner, John Bosco Asiimwe, David I. Levine, and William H. Dow

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1 Abstract

Oral rehydration salts (ORS) and zinc are highly effective at preventing child mortality from diarrhea, yet they are widely underused throughout sub-Saharan Africa. As a result, diarrhea remains the second leading cause of death for children in the region. There is little evidence that can be used to understand the mechanisms that lead to under-use of ORS and zinc making the design of programs aimed at increasing use difficult. This research aims to assess the role of two potentially important barriers to ORS and zinc use: price and convenience of access.

Using a four-armed cluster randomized factorial design, our interventions will create exogenous variation in price and convenience of ORS and zinc that can used to estimate the importance of each barrier. Variation in price will be created by having some of BRAC's community health promoters (CHPs) distribute the products for free as opposed to the status quo of subsidized prices. Variation in convenience will be created by having some CHPs make "preemptive home-deliveries" of ORS and zinc for household storage as opposed to retrieval after a diarrhea episode initiates. We will measure the impact of each of these mechanisms separately (i.e. preemptive delivery but not free and free but not preemptive delivery) as well as the combined effect (i.e. free and preemptive delivery). Our primary outcome will be self-reported ORS use to treat a case of child diarrhea in the past 4 weeks. We will also measure the role of price and convenience in targeting those most in need, overinclusion (giving ORS to people that do not use it), and overexclusion (not giving ORS to people that would use it). The results of the study will be used to inform how best to implement this type of CHP program at scale-up and to provide insight into the remaining barriers to ORS and zinc use.

2 Introduction

Diarrheal diseases are the second leading cause of death globally for children under five years old with roughly 700,000 deaths annually (Liu et al., 2012). In Uganda, 90 in every 1000 live births die before their 5th birthday (UDHS 2011) and diarrheal illnesses account for about 13% of these deaths (Liu et al., 2012). Diarrheal mortality is particularly tragic since roughly 93% of deaths due to diarrheal illness could be prevented through the use of oral rehydration salts (ORS) (Cash et al., 1970; Pierce et al., 1969; Santosham, 1982; Spandorfer et al., 2005; Munos et al., 2010). ORS treats diarrhea induced dehydration, which is the underlying cause of most diarrheal mortalities. In 1978, ORS was lauded as one of the most important medical advances of the 20th century by the medical journal The Lancet (Lancet, 1978) and since 1980, when ORS became widely available, there has been more than a two-thirds reduction in global diarrheal mortality for children under five-years-old (Victora et al., 2000; Liu et al., 2012). Due to its low cost and high effectiveness, ORS is recommended by the WHO for all cases of child diarrhea regardless of illness severity (USAID, 2005). More recently, zinc was introduced as a recommended treatment for child diarrhea to compliment ORS after it was demonstrated to reduce illness severity and provide short term preventive benefits (Bhutta et al., 2000).

Despite the effectiveness of ORS and zinc in preventing diarrheal mortality, usage rates remain dangerously low, particularly in sub-Saharan Africa (SSA) (Forsberg et al., 2007; Pantenburg et al., 2012; Ram et al., 2008; Santosham et al., 2010; Liu et al., 2012; Sood and Wagner, 2013). In Uganda, the location of the proposed study, only about 46% of diarrhea cases are treated with ORS (UDHS, 2011). Therefore, finding ways of increasing use of ORS is an essential step towards reducing child mortality in Uganda and throughout the region.

There are several potential explanations for why ORS use remains low. First, it is possible that people are unaware of the life-saving benefits of ORS (the *information barrier*). However, this is unlikely to be an important barrier since ORS has been widely available and socially marketed for over 3 decades and awareness in Uganda is nearly universal (UDHS, 2011). Second, although ORS is free at public health clinics, over half of caretakers seek care for diarrhea in the private sector where they are required to pay for ORS (UDHS, 2011). Moreover, many community health workers in Uganda sell ORS at a subsidized but positive price. Since ORS does not provide an *observable* benefit to the child (no effect on volume or duration of diarrhea), caregivers might undervalue ORS and might not be willing to pay the small price (USD

$0.30 per treatment course) (the *price barrier*).

Third, it can be an inconvenience to visit health facilities or drug shops to retrieve ORS, particularly since most children have diarrhea many times throughout the year and caretakers are often required to walk long distances to retrieve ORS. This could result in avoiding or delaying ORS retrieval (the *convenience barrier*).

Fourth, even conditional on arriving at a clinic for care, many providers still fail to provide ORS and zinc to caretakers to treat their child's diarrhea (Sood and Wagner, 2013). In Uganda, only 50% of children who visit a health provider receive ORS and under 10% receive zinc (UDHS, 2011). Providers, particularly in the private sector, often distribute antibiotics as substitutes for ORS and zinc. However, antibiotics do not treat dehydration, the reason for nearly all deaths. Moreover, most cases of child diarrhea in Sub-Saharan Africa are viral, which means antibiotic provision often contributes to resistance without providing any benefits.

In this study, we aim to assess the role of price and convenience as barriers to ORS and zinc use. We designed a series of interventions that vary in their level of price of and convenience of access to these products. We will use a four-armed cluster randomized factorial design to assess the relative and combined impact of each mechanism on ORS us (primary outcome) and zinc use. We will work with Community Health Promoters (CHPs), a program supported by BRAC Uganda, to carry out the interventions. Variation in price will be created by having some CHPs distribute the products for free as opposed to the status quo of subsidized prices. Variation in convenience will be created by having some CHPs make "preemptive home-deliveries" of ORS and zinc for household storage as opposed to retrieval after a diarrhea episode initiates. We will measure the impact of each of these mechanisms separately (i.e. preemptive delivery but not free and free but not preemptive delivery) as well as the combined effect (i.e. free and preemptive delivery). We will also measure the role of price and convenience in targeting those most in need, overinclusion (subsidizing products for people that do not use them), and overexclusion (not getting products to people that would use them).

This work contributes to a limited body of literature assessing the barriers to ORS use and potential interventions to increase use (Lenters et al., 2013). Although there is an extensive body of medical literature assessing the health gains from ORS (Cash et al., 1970; Pierce et al., 1969; Santosham, 1982; Spandorfer et al., 2005; Munos et al., 2010) and identifying the problem of underuse (Forsberg et al., 2007; Pantenburg et al., 2012; Ram et al., 2008; Santosham et al., 2010; Liu et al., 2012; Sood and Wagner, 2013) there is little evidence on *why* ORS use remains low, what the key barriers are, and what potential interventions could be used to increase use. A recent systematic review by (Lenters et al., 2013) found only 19 studies that assessed interventions to increase ORS use, and only 3 RCTs. Nearly all interventions were some form of social marketing and studies were skewed geographically towards South Asia. The authors concluded that most of the studies reviewed were of low quality and as a result much more evidence is needed on potential strategies for increasing ORS use, particularly in SSA. Although diarrhea is one of the biggest threats to children in the developing world, the issue of low ORS use has so far been ignored by the field of development economics.

This work also contributes to the literature on how pricing and hassle costs associated with health products in developing countries affect overexclusion and overinclusion. Although several studies have shown that charging for health products increases overexclusion through dampened demand, there is mixed evidence on how price affects overinclusion or wastage (Cohen and Dupas, 2010; Ashraf et al., 2010; Kremer et al., 2011a). Moreover, a recent paper by Dupas et al. (2016) demonstrates that the small hassle cost of having to retrieve a free product reduces overinclusion without compromising coverage, implying greater efficiency. This work

will be the first to assess the role of pricing and hassle costs in efficient resource allocation in the context of diarrhea treatment.

The rest of this paper proceeds as follows. Section 3 discusses the background on ORS use and the recent evidence on what works to increase ORS use, sections 4 and 5 provide a conceptual framework that highlights the mechanisms through which our interventions can be expected to increase ORS use, section 6 outlines our research questions, section 7 describes our research design and strategy, section 8 describes our empirical analysis, section 9 describes robustness checks and validity tests to compliment our main analysis, section 10 discusses how our findings will contribute to the existing literature, and section 11 concludes.

3 Background

Although most developing country governments and international aid organizations include expansion of ORS use as a stated goal, there is little evidence on what interventions are effective at do so. There were substantial efforts to increase ORS use in the 1980s and 1990s and over 100 countries had ORS promotion programs in place by 1988 (Organization et al., 1990). These programs appear to have been successful, increasing use of ORS or other forms of oral rehydration therapy (ORT) from close to 0 in 1980 to around 40% in 1990 (Forsberg et al., 2007). Moreover, awareness of ORS was nearly universal. However, most programs aimed at increasing ORS use were comprised of many different interventions (e.g. provider training, social marketing, supply chain management, etc.) making isolation for the impact of each intervention difficult. Moreover, after the big push to increase ORS use during the 1980s and 1990s that share of diarrhea cases that are treated with ORT has leveled off at around 40%, suggesting that novel interventions are needed to overcome this "last mile" problem.

In Uganda, the ministry of health (MoH) and other international organizations recognize the need for intervention and have programs in place aimed at increasing ORS use. In 2001, the MoH started the Village Health Team project, where community members are assigned to act as a liaison between rural areas and the health system by providing basic health care needs including ORS distribution and education. The Clinton Health Access Initiative (CHAI) focuses on reducing the price of ORS and zinc in the private sector, where many people seek treatment. USAID funds the Strengthening Health Outcomes through the Private Sector (SHOPS) project, which focuses on increasing provision of ORS and zinc in the private sector. Living Goods and BRAC both have Community Health Promoter (CHP) programs which focus on increasing knowledge of and access to ORS by having community members sell the products at a subsidized price. Plan International focuses on ensuring sufficient supply of ORS and zinc in rural areas. Although there is an immense amount of effort being put towards many different interventions aimed at increasing ORS use, it is not clear what the remaining barriers to ORS are and which interventions are likely be effective. Below, I outline the evidence in the 3 areas where most of the recent empirical research has focused.

3.1 Provider Interventions

There is substantial evidence demonstrating that health providers, particularly in the private sector, fail to provide ORS when presented with a case of diarrhea (Sood and Wagner, 2013; Wagner et al., 2014; Mohanan et al., 2015). However, there is little evidence demonstrating why such under-provision in the private sector occurs. Wagner et al. (2014) find that private providers in India are less likely to directly distribute ORS and suggest that making ORS more

convenient to private sector patients could increase take-up. Friedman et al. (2015) randomly assigned drug shop sellers in Ghana to receive text messages encouraging ORS provision. Although drug sellers who received the messages reported increased ORS provision, their actual ORS provision practices did not change. Clearly, much more work is needed in order to understand why private providers underprovide ORS and how to increase provision. However, many caretakers (potentially the most vulnerable) do not seek care from a provider at all and therefore would not benefit from provider focused interventions.

3.2 Community Interventions

Several community interventions have shown to be successful at increasing ORS use. In a recent cluster RCT in Myanmar, Aung et al. (2014) find that a social franchising intervention that provided community education and community supply of ORS and zinc increased ORS and zinc use from 1.8% to 13.7%. Awor et al. (2014) use a quasi-experimental design to evaluation an integrated community case management (ICCM) intervention in Uganda that trained private drug shops, provided supply of ORS, and provided education to community members. They found that distribution of ORS and zinc increased 12 fold as a result of the intervention. An unpublished study that experimentally evaluated the impact of the Living Goods/BRAC CHP program found that ORS use increased from 33% to 39% as a result of the CHP program.

There is also evidence that introduction and promotion of zinc in a community as a compliment to ORS results in increased ORS use (Lenters et al., 2013). Baqui et al. (2004) randomly assigned introduction of zinc to communities in Bangladesh and found that access to zinc increased use of ORS. Bhandari et al. (2008) find similar results in India.

3.3 Social Marketing Interventions

There are several observational studies that assess the impact of social marketing and mass media campaigns on ORS use. Kassegne et al. (2011) find that ORS use increased from 20% to 30% after a PSI sponsored social marketing campaign in Berundi. Rao et al. (1998) find that ORS use in India during a time when the government promoted ORS through mass media increased more for mothers that had exposure to a radio, television, or cinema. Lenters et al. (2013) review several studies in a meta-analysis assessing the impact of social marketing and mass media campaigns on ORS use and find a pooled risk ratio of 2.05, although this estimate was not statistically significant.

3.4 Summary

Increasing ORS use appears to be an important part of many national health agendas, yet we know very little about what effectively achieves this goal. Provider interventions appear to have potential although the evidence is lacking. Community and social marketing interventions have shown to be effective, but neither appear to achieve the desired coverage rates, which suggest they alone are not sufficient. This work will provide evidence on novel approaches to ORS delivery that will highly potentially important mechanisms and help guide future ORS promotion. Next, we provide a conceptual framework for these mechanisms and highlight the specific channels through which each interventions is expected to work.

4 Conceptual Framework: The Decision to Use ORS and Intervention Mechanisms

Each of our interventions are likely to affect ORS use through different channels. Figure 1 displays a diagram of the caretakers choice to use ORS to treat their childs diarrhea. The child starts off healthy and during this time, caretakers can either acquire ORS for later use or not acquire ORS. The decision to acquire ORS for later use has many potential barriers including but not limited to low perceived probability of child diarrhea, poor knowledge of best practice, high price or low willingness to pay, distance to provider or hassle costs, value of time, liquidity constraints, mental bandwidth, and present bias. If the caretaker decides to take-up ORS pre-emptively and the child becomes ill with diarrhea, then most caretakers will have ORS stored at home upon diarrhea initiation (although some could lose or give away the product). With ORS stored at home, then the choice to use ORS is fairly easy only impeded by barriers unrelated to price and convenience (e.g. low perceived severity of illness, culture beliefs, poor flavor).

On the other hand, if caretakers do not preemptively acquire ORS and the child comes down with diarrhea, then they have to make a series of complex choices and face an array of potential barriers before arriving at ORS take-up and eventual ORS use. First, they choose whether/where to seek treatment for the child. For simplicity, we assume that caretakers can either seek treatment from a CHP, another provider, or choose not to seek treatment. There are several factors that affect the decision to seek treatment and where to go for treatment including illness severity, knowledge of best practice, distance to provider, expected price of treatment, value of time, and mental bandwidth. Many of these predictors could function as barriers that result in delayed or forgone treatment. If the caretaker decides to seek treatment, receipt of ORS is not guaranteed and is a function of provider characteristics (knowledge, supply, and treatment preferences), as well as caretaker knowledge, ORS price, and illness severity. As mentioned above, many providers in Uganda do not provide ORS at least some of the time. If the caretaker does received ORS from the provider, she then has the choice of using the ORS to treat the child.

This diagrams highlights an important point. Pre-emptive take-up of ORS makes the decision to use ORS when the child comes down with diarrhea much less complicated with fewer potential barriers than if ORS is acquired after diarrhea initiation. Caretakers that do not take-up ORS pre-emptively have to make several complex decisions and face many barriers to ORS take-up and use after the becomes vulnerable to diarrheal mortalitye.g. the caretaker could avoid treatment because the provider is too far away or they are busy with other activities, the provider could recommend an antibiotic instead of ORS or they could have a stock out. By pre-emptively acquiring ORS, the caretaker bypasses barriers to seeking treatment once the child becomes ill and barriers to receiving ORS from a provider.

Each of our interventions will alter the likely pathway taken by the caretaker in different ways by addressing a different set of barriers.

Group 2: Free preemptive home-delivery with information
Free-preemptive delivery will increase the likelihood of pre-emptive ORS take-up to nearly 100%. Knowledge, price, distance to provider, value of time, mental bandwidth and liquidity constraints are no longer barriers to preemptive take-up (indicated by * in figure 1). Since nearly all households will have ORS stored at home when the child comes down with diarrhea, ORS becomes the default option only hindered by barriers unrelated to price and convenience.

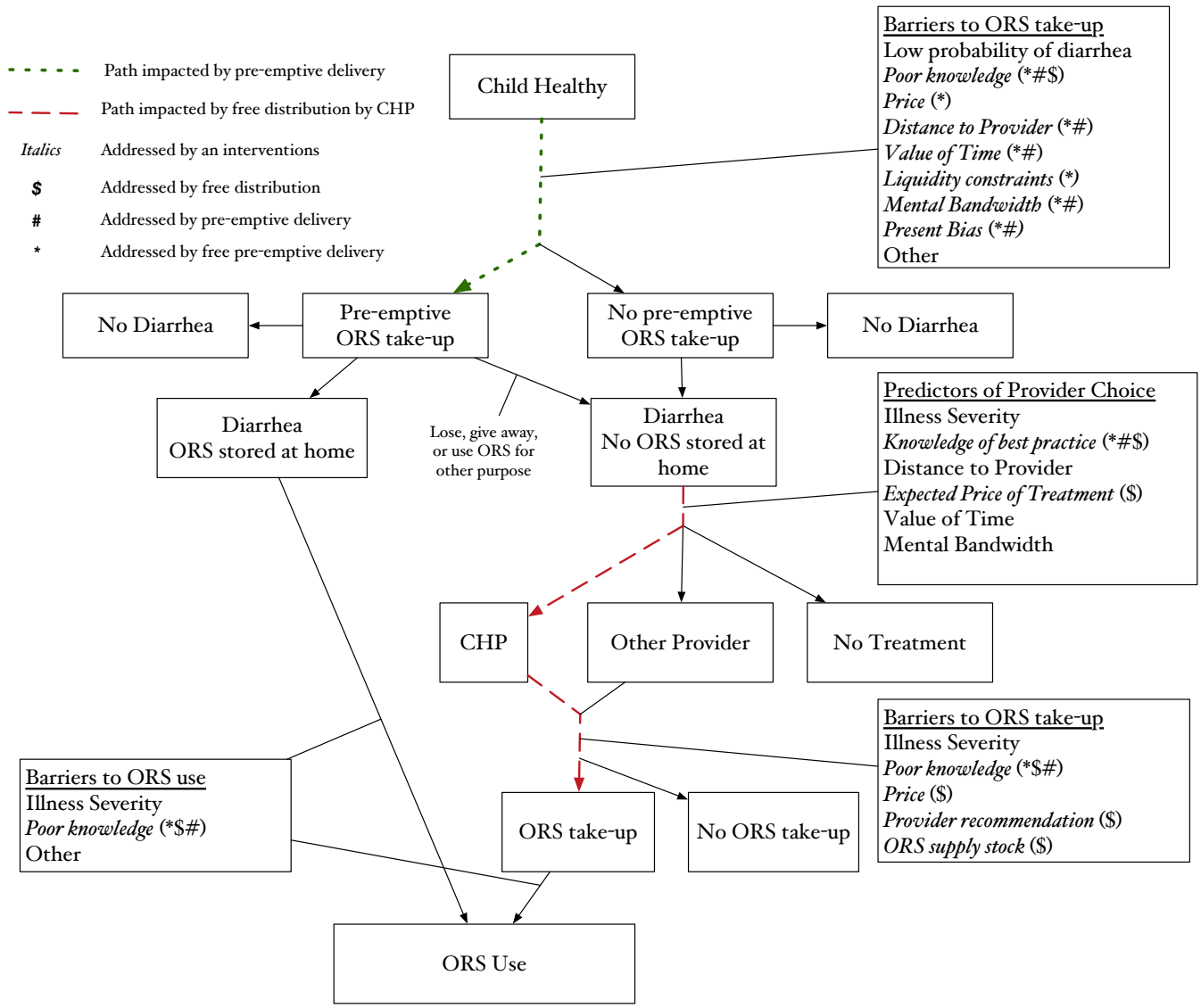

Figure 1: Flow diagram of ORS take-up and use

Group 3: preemptive home-delivery at subsidized price with information
Preemptive home delivery of ORS with cost-sharing will alter the average caretaker's preferred path in a similar way as free delivery, however it will not overcome all of the same barriers (indicated by # in figure 1). Price of ORS and liquidity constraints will remain barriers for this group. Therefore, the extent to which price and liquidity constraints impact pre-emptive ORS take-up can be measured by taking the difference between Group 2 and Group 3.

Group 4: Free distribution of ORS upon retrieval from CHPs home with information
Free distribution of ORS upon retrieval from the CHPs home will only affect the decision making process after the child comes down with diarrhea. The intervention will affect ORS take-up in two ways. First, the caretaker will have been informed that the CHP has free ORS available, which will shift the provider decision pathway towards seeking treatment from the CHP. CHPs are also usually one of the closest providers. Second, upon seeking treatment from the CHP, price and knowledge will no longer be barriers to receiving ORS from the provider. Moreover, the CHP does not provide other treatments aside from ORS and zinc and our intervention will ensure she is fully stocked. Therefore, nearly all mothers that seek treatment from the CHP will received ORS. This shifts the distribution of treatment seeking towards a provider with higher probability of providing ORS. Free distribution upon retrieval overcomes many of the same barriers as free preemptive delivery. The remaining barriers are the hassle costs associated with retrieving the ORS (value of time, distance to provider, and mental bandwidth). Therefore, the difference between free pre-emptive delivery (Group 1) and free distribution upon retrieval (Group 4) is the effect of hassle costs. Free distribution upon retrieval compared to home delivery with cost sharing (Group 3) can be thought of as the difference in overcoming monetary barriers (Group 4) vs. overcoming non-monetary barriers (Group 3).

5 Conceptual Framework: Evidence of Barriers

The barriers to ORS use that are addressed by our interventions are all related to either poor knowledge, price, convenience, or provider barriers. Although the evidence for some of these barriers is limited in the context of ORS use, there has been a substantial amount of work identifying and addressing these barriers in the context of other health products. Below we highlight the evidence for each of these barriers and how the evidence relates to ORS.

5.1 Knowledge

One potential explanation for low ORS use is that caretakers are unaware of the product or its benefits. This suggests that informing caretakers of the life saving benefits of ORS would be effective at increasing take-up. Providing information about healthy behaviors has had success in terms of behavior change in the past (Dupas, 2011; Kremer et al., 2011a) and this thinking has led to many social marketing campaigns aimed at spreading awareness of ORS (**?**Kassegne et al., 2011). Mass information campaigns in the 1980s are often credited with the high ORS usage rates in Bangladesh (**?**) and the large reduction in diarrhea mortality in Egypt (Levine, 2004). Moreover, for the last 3 decades their has been a concerted effort to increase awareness of ORS to treat child diarrhea in Uganda and knowledge generation about proper diarrhea treatment is a key role of CHPs. It appears that this effort has been very effective, evidenced by near universal awareness of ORS across the country. In the most recent Demographic and Health Survey, over 90% of mothers of children under-5 were aware of ORS

(UDHS, 2011). Similarly, among the population of the present study, where CHPs have already been working to increase ORS knowledge, over 96% of mothers had heard of ORS (baseline survey). Moreover, over 85% of the mothers in our sample had used ORS to treat diarrhea at some point in the past. However, this knowledge of ORS does not seem to translate into sufficient use as only 46% of diarrhea cases in the 2 weeks prior to data collection were treated with ORS (UDHS, 2011). Two points emerge from this discussion. First, awareness of ORS is reaching a ceiling and there is little room for increased awareness. Second, awareness of ORS is not enough to results in sufficient ORS use. Therefore, in order for information to affect ORS use, it must be provided in a strategic way that changes preferences or beliefs about ORS a much more difficult task then simply raising awareness about the product. In this study, CHPs will reinforce ORS and zinc knowledge, however, most households will already have received this information and we expect information provide through our study to have little affect on ORS use.

5.2 Price

Another potential reason for under-use of ORS is unwillingness-to-pay even the small often subsidized price. Although ORS is freely available at public health clinics, most caretakers seek care in the private sector where they are required to purchase ORS. Moreover, many community health workers (including BRAC's CHPs) offer ORS at a subsidized price.

Several recent randomized controlled trials (RCTs) show that even highly subsidized prices can result in a substantial reduction in take-up and use of preventive health products relative to free-distribution. Kremer and Miguel (2007) found that free distribution of deworming medication to Kenyan children increased take-up from 18-75% relative to a small fee. Cohen and Dupas (2010) found that take-up of bed nets in Kenya falls by 60% when the price increases from 0 to \$0.60. **?** found that take-up of point-of-use water treatment in Zambia falls by 30% when price increases from \$0.09 to \$0.25. Similarly, Dupas et al. (2016) found that take-up of point-of-use water treatment in Kenya falls by 38% and use falls by 62% when the price increases from zero to a 50% discount. Kremer et al. (2011c) found that a majority of households use chlorine for water treatment in Kenya when provided for free, but only 10% use it at the market rate. Dupas et al. (2011) found that chlorine use increased nearly 3 fold when it was provided for free relative to a 50% discount. Spears (2009) found that take-up of hand washing soap in India falls from 84% to 13% when the price changes from 3-15 rupees. Taken together, these studies suggest that poor people in developing countries are very sensitive to prices of health products, and even highly subsidized prices can substantially reduce take-up and use.

Although people appear to be extremely sensitive to prices of preventive products, demand for remedial health products appears to be relatively price-inelastic. For example, Cohen and Dupas (2010) show that increasing the price of an antimalarial treatment course for young children by 250%, from US\$0.30 to \$1.5, does not reduce the share of households buying the treatment (about 32%). This discrepancy in price sensitivity for curative products and preventive products is often explained using concepts from behavioral economics such as present bias; the benefits from curative products pay off immediately whereas the benefits of preventive products, although a smart investment with high returns, pay off far into the future. Since ORS is only recommended once a child becomes ill with diarrhea, it could be thought of as remedial. Therefore, it is possible there is less price sensitivity than found in the above studies which focused on preventive products. However, ORS has several similar features to preventive products. First, ORS has limited observable effects on the main diarrhea symptoms (i.e. volume and duration of episode). Therefore, similar to preventive products, the benefits

of ORS (keeping the child alive and hydrated) might go unnoticed since the diarrhea persists. On the other hand, malaria treatment directly affects the main symptoms of malaria. Second, ORS initiation is recommended immediately after the diarrhea episode begins, prior to the child becoming dehydrated. Therefore ORS is *actually* recommended as prevention of dehydration. Finally and most importantly, similar to preventive products ORS use remains low although there appear to be substantial returns to investment.

It remains unclear if ORS will fall more in line with preventive or curative products in terms of price sensitivity. There is only poor evidence on how sensitive caretakers are to the price of ORS, and no experimental evidence. Aung et al. (2013), using a survey in Myanmar, find that less than 25% of caretakers are willing to pay the market rate for ORS. Several other studies have documented the impact of community based interventions to increase ORS use, some of which include free distribution (see Das et al. (2013) for a review), however, no studies have isolated for the impact of ORS pricing. The fact that ORS use remains low although it is widely available, low cost, and extremely effective suggests that caretakers are sensitive to ORS price. We expect that free provision of ORS will result in increased coverage.

5.3 Convenience

A third potential barrier to ORS use is convenience of access or hassle costs. Many mothers are required to walk long distances or pay high transport costs to reach their nearest clinic. Time constraints may limit caregivers to rationally choose to only make the long journey if a case becomes "severe", at which point it could be too late. Even when access points are easily accessible, concepts from behavioral economics such as time-inconsistent preferences, inertia, or limited attention could hinder ORS retrieval. For example, mothers may have a preference for retrieval of ORS in a future time period since they are informed of the best practice, but when their child becomes ill in the current period, their preferences are different or a competing task occupies their mental space and they choose not to travel to retrieve ORS.

Several studies suggest that distance and inconvenience can be important barriers to take-up. Thornton (2008) found that distance to HIV testing centers was a key barrier, an even larger barrier than price, to retrieval of HIV test results in Malawi. Kremer et al. (2011b) found that individuals are only willing to walk 3.5 minutes further to collect water from a protected spring that produced clean water as opposed to retrieving contaminated water from an unprotected well. (Banerjee et al., 2010) found that small incentives (less than a days wage) resulted in much greater willingness to travel to immunization camps. Taken together, these studies demonstrate that distance and convenience are important factors in take-up of health services, and that making products more convenient or nudging people to overcoming inertia could increase utilization.

Although there is no direct evidence on how convenience of ORS affects use, several studies find that community interventions that increase ORS availability improved coverage (Das et al., 2013). However, other factors associated with community distribution could be driving these effects.

5.4 Pricing, convenience, and wastage

Free distribution vs. cost sharing for health products has been a contentious issue. Proponents of charging for health goods argue that people don't value products that are given away for free (PSI, 2003). Charging for products could increase use through the *sunk cost effect* (Thaler,

1980) and improve targeting and reduce wastage through the *selection* or *screening* effect (**?**Cohen and Dupas, 2010). However, public health proponents often argue that charging for health products will reduce coverage by dampening demand particularly among the poor and vulnerable. Cohen and Dupas (2010) find no evidence of the sunk cost effect or the screening effect when bed nets were provided to pregnant women for free in Kenya—women who got free nets were no more likely to use them. However, even highly subsidized prices dramatically reduced coverage relative to free distribution. This suggests that free distribution increased coverage (decreased overexclusion) without affecting wastage (no increase in overinclusion). **?** also find no evidence of the sunk cost effect for point of use water treatment in Zambia, however they did find evidence of the screening effect—households that had a higher propensity to use the product were willing to pay a higher price. This suggests that increasing prices could indeed reduce wastage but at the expense of reducing coverage. Dupas et al. (2016) revisit prices, take-up, and wastage of point-of-use water treatment in Kenya and compared subsidized prices, free distribution upon retrieval (hassle cost), and free delivery. They found that the hassle price of retrieving the free product vs. having it freely delivered reduced take-up by 60% but had no effect on product use. On the other hand, a 50% price discount reduced take-up by 50% but also reduced use by 62% relative to free delivery. This suggests that imposing non-monetary hassle prices could be a more efficient way of reducing wastage than charging for products.

Our experimental design is very similar to Dupas et al. (2016). Free delivery of ORS will result in take-up of close to 100%. However, the product could be delivered to caretakers that have a low propensity to use ORS resulting in wastage or overinclusion. The status quo ORS price and the opportunity for pre-emptive home purchase are both likely to reduce wastage through a screening effect but also are likely to exclude some caretakers who would use the product if it were provided for free. However, requiring the hassle of retrieving free ORS from the CHP's home could weed out the caretakers with low propensity to use the product without excluding those with low willingness-to-pay, reducing wastage without compromising coverage.

5.5 Provider Barriers and Default Treatment Options

Even if caretakers travel the long distance to a faraway health provider or overcome the inertia to visit a more convenient provider, they are faced with several treatment choices in addition to ORS and zinc. Often treatment choices are left to the provider's discretion and although most providers are aware that treatment guidelines include ORS, they frequently provide alternatives such as antibiotics or antidiarrheals instead, both of which are often unnecessary and potentially harmful (Sood and Wagner, 2013; Mohanan et al., 2015). In 2011, Only 50% of children in Uganda who visited a health provider for diarrhea care received ORS and under 10% received zinc (UDHS, 2011). Although there is limited evidences to help understand why providers fail to give caretakers ORS, it is often conjectured that private providers have a preference for selling higher cost products. Directly providing ORS and zinc to households for storage and making ORS and zinc freely available may have the effect of making these treatments the default choice. Having ORS delivered and stored in the household or freely available from the CHP will eliminate the need to visit a provider for treatment where other products that don't address dehydration are likely to be given in place of ORS. There is a substantial literature demonstrating the power of defaults (White and Dow, 2015; DellaVigna, 2009), and we expect that making ORS and zinc the default choice with both increase use of ORS and zinc and reduce unnecessary and potentially harmful use of antibiotics.

6 Research Questions

6.1 Primary Research Question

Primary Question 1: Does *preemptive* [1] *home delivery* with *free distribution* of ORS and zinc coupled with information about the importance of proper treatment result in greater use of ORS to treat child diarrhea relative to the status quo?

6.2 Secondary Research Questions

Secondary Question 1: Do *preemptive home visits* with an *offer to sell* ORS and zinc at the typical subsidized price currently charged by CHPs (roughly USD$0.30 per treatment course) coupled with information about the importance of proper treatment result in greater use of ORS to treat child diarrhea relative to the status quo?

Secondary Question 2: Does *free distribution* of ORS and zinc upon *retrieval by caretakers* from the CHP's home coupled with information result in greater use of ORS to treat child diarrhea relative to the status quo?

Secondary Question 3: Does preemptive home delivery with *free distribution* of ORS and zinc result in greater use of ORS to treat child diarrhea relative to preemptive home delivery with *offers to sell* the products?

Secondary Question 4: Does free distribution with *preemptive delivery* of ORS and zinc for household storage result in greater use of ORS than free-distribution upon *retrieval* from the CHP's home?

Secondary Question 5: Same as primary question but assessed for zinc use.

Secondary Question 6: Same as primary question but assessed for ORS and zinc combined.

Secondary Questions 7-11: Same as secondary questions (1-4) but assessed for zinc use.

Secondary Questions 12-16: Same as secondary questions (1-4) but assessed for ORS and zinc combined.

Secondary Question 17-21: What is the impact of these interventions on *time between diarrhea initiation and ORS initiation*?

Secondary Question 22: Does having ORS stored in the home when a child comes down with diarrhea result in greater ORS use?

6.2.1 Tertiary/Exploratory Research Questions

Tertiary Question 1: Does *free distribution* of ORS and zinc upon *retrieval by caretakers* result in greater take-up and use of ORS relative to *preemptive home delivery* with an *offer to sell* the products?

Tertiary Questions 2-6: How do these interventions affect take-up of ORS?

Tertiary Questions 7-11: Do these interventions reduce antibiotic use?

[1] "preemptive" implies prior to the occurrence of a diarrhea episode

Tertiary Questions 12-16: Do these interventions do a better or worse job of targeting ORS to those that will use it?

Tertiary Questions 17-21: What is the impact of these interventions on *time between diarrhea initiation and zinc initiation*?

Tertiary Questions 22: Are caretakers in the preemptive sale group more likely to purchase ORS if their child currently has diarrhea than if their child does not currently have diarrhea?

7 Research Strategy

This project will use a cluster randomized controlled trial design. We will work with BRAC to select 120 villages (see sample size calculations below) where their CHP program is active (CHPs are active in over 2000 villages in Uganda). CHPs are community members who are hired by BRAC to sell essential health products to others in the village, which are purchased by CHPs from BRAC at a subsidized price. CHPs are also trained to provide very basic primary care and health education. The interventions will take place at the village level since one CHP is dedicated to serve an entire village. Each village will be randomly assigned to one of four groups.

Group 1 — Control: No intervention will take place. Caretakers will have standard access to ORS and zinc at local health facilities and pharmacies. Some CHPs in control villages could make household visits, however offers to sell diarrhea treatment pre-emptively are rare and CHPs are generally not the source of diarrhea treatment.

Group 2 — Household Visit + Free Distribution + Preemptive Delivery: CHPs will be provided a small incentive to visit all of the households in their catchment area that contain a child under 5-years-old (roughly 100 households) at the beginning of the study. CHPs will train caretakers on the dangers of diarrhea and the importance of ORS and zinc use. CHPs will then offer to give ORS and zinc to caretakers for free to store in their homes.

Group 3 — Household Visit + Cost Sharing + Preemptive Delivery: CHPs will be provided a small incentive to visit all of the households in their catchment area that contain a child under 5-years-old at the beginning of the study. CHPs will train caretakers on the dangers of diarrhea and the importance of ORS and zinc use. CHPs will then offer to sell ORS and zinc to caretakers at their standard subsidized price (roughly USD$0.30 per treatment course) to store in their homes.

Group 4 – Household Visit + Free Distribution Upon Retrieval: CHPs will be provided a small incentive to visit all of the households in their catchment area that contain a child under 5-years-old at the beginning of the study. CHPs will train caretakers on the dangers of diarrhea and the importance of ORS and zinc use. CHPs will then inform caretakers that they have ORS and zinc available for free that caretakers can retrieved from the CHPs home. The average distance to the CHPs household is about 15 minutes.

7.1 Sampling

7.1.1 Population and Sampling Frame

We will use six of BRAC's microfinance branches as our study sites (BRAC has 128 branches throughout the country). BRAC's "branches" are local offices which are used to administer their programs to the surrounding villages. Each branch corresponds to 20 CHPs resulting in 120 villages/CHPs in total to be included in our sample. All villages within selected branches will be enrolled in the study and randomized to one of the four groups described above. Branches were chosen based on 3 criteria: 1) high diarrhea prevalence, 2) branch managers are willing to participate and help with coordination, and 3) close proximity to Kampala (due to budgetary constraints).

Once branches and villages are selected, the study team will enroll 80 households with a child under 5-years-old in each village. Although most villages have 100+ households, we do not gain much power from including additional households in each cluster as power is driven mostly by the number of villages, and logistical constraints limit our ability to do a full census. In order to draw our sample of households, enumerators will start at the CHP's household (where her operations take place) and visit to the 40 nearest households with a child under-5 during the baseline survey and the 80 nearest households with a child under-5 during the endline survey. Although our sample might not be representative of the entire village population, it will be representative of the households most likely to benefit from the intervention.

Although we will enroll 40 and 80 household per villages at baseline and endline, respectively, only households with at least one child who was reported to have had a case of diarrhea in the past 4 weeks (during baseline or endline) will be included in the analysis (estimated sample size and power described below).

7.1.2 Assignment to Treatment

Random assignment of villages will be stratified by BRAC branch (5 villages in each group per branch) and baseline ORS use. Baseline ORS use will be split into quintiles within each branch and random assignment will ensure that 1 village from each quintile-branch is in each of the 4 groups. We will use the *randtreat* in Stata 14 to carry out this process.

7.1.3 Statistical Power

With 120 villages, 80 households enrolled in each village, and 25% of children having a case of diarrhea in the past month (UDHS, 2011), we expect to have a final sample of 2400 cases of diarrhea (600 per group). Assuming an intra-class correlation (ICC) of .05, we will be able to detect a minimum of an 11-percentage point increase in ORS use between each group, with a comparison group mean of 50% (UDHS 2011). However, we were unable to find a good estimate of the ICC, and therefore we are uncertain of the validity of this assumption. Moreover, there is also some uncertainty in regard to some of our other assumptions as well (e.g. diarrhea prevalence, number of households with a child under-5 per village, number of villages due to budgetary restrictions etc.). We therefore also conduct a series of additional sample size calculations under different assumptions (Figure 2). This figure shows that the detectable effect is particularly sensitive to the ICC. However, even under the worst case scenario—if we are short on funding and can only enroll 25 villages per arm, if the ICC is 0.15, and there are only 15 cases of diarrhea per village—we will still be able to detect a difference of 18 percentage

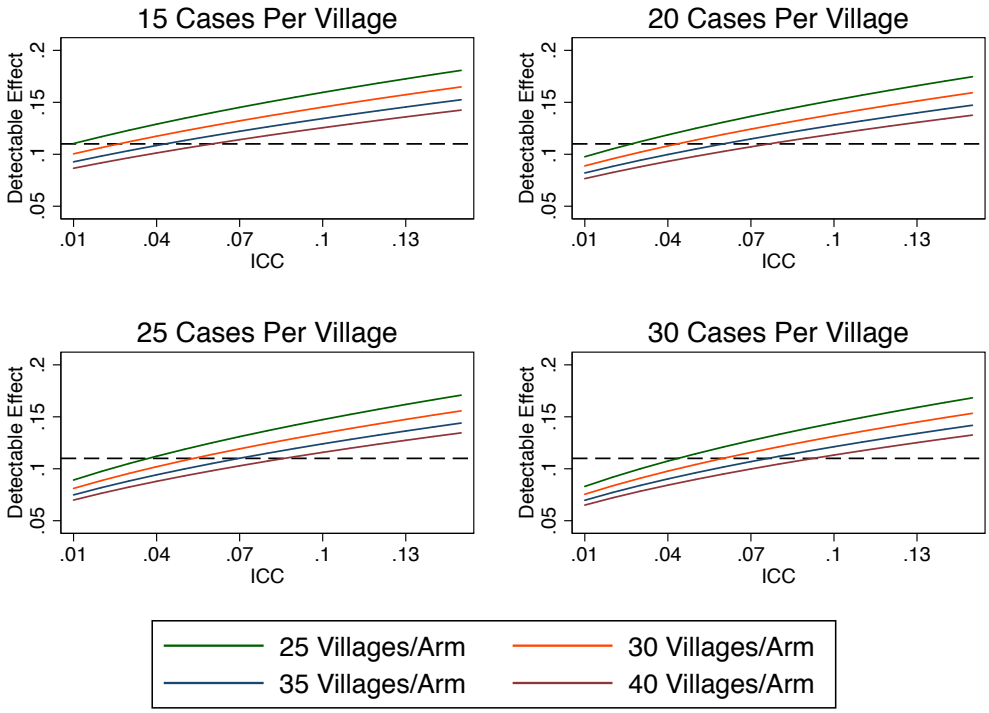

Figure 2: Detectable Effect Under Different Assumptions About Sample

points. During piloting of the Group 2 intervention we found that ORS use increased from 56% at baseline to 94% after the intervention. Therefore we expect that we will be sufficiently powered to detect important effects of these interventions.

7.2 Field Work

7.2.1 Instruments

Our survey instrument is attached as Appendix 1. Survey instruments were programmed into tablet devices which will be used for electronic data collection. We will use 3 survey instruments.

1) **Baseline Survey:** This instrument will be used to collect information on outcomes prior to the interventions, including whether a diarrhea episode occurred in the prior 4 weeks and which diarrhea treatments were used. The baseline survey will also collect information on ORS availability including price paid for diarrhea treatments (if used recently) and distance to nearest ORS distributor.
2) **Follow-up survey:** In addition to the outcome and access information collected at baseline, the follow-up survey will collect a variety of demographic information and other characteristics of the children, households, and caretakers enrolled in the study. This survey will also collect information on knowledge of diarrhea and proper treatment practices.
3) **CHP survey:** All 120 CHPs enrolled in the study will complete the CHP survey which will collect information on village characteristics and CHP practices.

7.2.2 Data Collection

Phase 1 — Listing of households (2 days per village): In the first phase of data collection, CHPs will create a list of all the households with a child under 5-years-old in their catchment area that includes the name and nickname of the household head. Our enumerators will use this list as a sampling frame to track households to enroll. Household will be listed prior to random assignment to avoid cherry picking by CHPs.

Phase 2 — Baseline Survey (1 day per village): Six teams of six enumerators will use the list provided by the CHPs and travel to the 40 closest households on the list (with the CHPs guidance) to conduct a baseline survey. Questionnaires will be completed by primary caretakers and will be recorded in tablet devices. Caretakers that reported a child to have had diarrhea in the past 4-weeks will be asked detailed questions about the diarrhea episode and caretaker treatment decisions. Enumerators will move on quickly from households with no recent diarrhea episode only recording that they did not have an episode (e.g. no demographic information). The CHP survey will also be conducted during the baseline phased.

Phase 3 — Endline Survey (1.5 days per village): Four weeks after the intervention is implemented, all households will be re-visited and asked to complete a follow-up survey that will follow the same protocol as the baseline survey, although it will capture more detailed information no demographics, village level characteristics, and knowledge of diarrhea treatment. Four weeks will be sufficient time for roughly 25% of children to have a post-intervention diarrhea episode (UDHS, 2011).

7.2.3 Data Processing

Data will be collected on tablet devices and stored on a BRAC server. Each survey will be automatically sent to the server via Internet. Raw data will be kept in tact and additional cleaned data sets will be created in Stata. Wagner, Asiimwe, Levine, and Dow will have full ownership over the data.

8 Empirical Analysis

8.1 Variables

8.1.1 Primary Treatment Outcome: ORS Use

The primary outcome for the study is self reported ORS use for a case of child diarrhea that occurred within the last 4 weeks. This will be measured through a series of survey questions which ask caretakers who reported having a child who had a diarrhea episode in the past 4 weeks the following:

1. Did you give (CHILD NAME) anything to treat the Diarrhea?

2. If yes, can you tell me or show me what treatments you gave (CHILD NAME) (either home-prepared or from outside of home)

3. If yes, can you tell me if you gave [CHILD NAME] any of the following treatments [INTERVIEWER WILL READ LIST]

Responses for (2) will not be prompted by the interviewer. For (3), respondents will be read the following list and asked if they used each of the treatments.

1. ORS
2. Zinc
3. Home-prepared treatment
4. Antibiotics

Our main outcome variable will be a binary variable that is set to 1 if the respondent reports that they used ORS in (3) and to 0 if they reported that they did not use ORS in (3) or if they reported that they gave no treatment to the child in (1). We will conduct a robustness check where we use the unprompted response from (2) to create our ORS use variable.

8.1.2 Secondary Treatment Outcomes: Zinc and Antibiotic Use

We will conduct an identical process for creating secondary treatment outcomes; zinc and antibiotic use. All treatment outcomes will be set to missing if 1) the child was not reported to have had diarrhea in the last 4 weeks, or 2) if the caretaker did not know whether the child was given the respective treatment.

8.1.3 Time to Treatment Initiation Outcomes

For ORS and zinc treatments, we are also interested in the time between the diarrhea episode initiation and the treatment initiation. It is recommended by the WHO that both ORS and zinc are started immediately after the first symptoms of diarrhea. We will measure this using the following question, which will be asked to all caretakers that report giving the respective treatment to the child.

"How many days after the diarrhea began did you first give (CHILD NAME) [ORS/zinc]?" The enumerator will report '0' if treatment began on the same day as the diarrhea episode.

We will this measure 2 ways. First, for our main analysis we will keep this variable with days the units and truncate to 7 days to avoid influence of potential outliers. Next, we will also create a binary variable set to 1 if the caretaker started treatment on the same day that the diarrhea began.

8.1.4 Controls/Balance Check Variables

Caretaker Characteristics: We will create variables for caretaker's age (Question 101), education (none, primary, secondary+), (Question 102), marital status (Question 103), number of children (Question 104), and employment status (Question 115).

Household Characteristics: We will create variables for type of latrine used (covered, uncovered, or bush) (Question 109), main source of drinking water (piped, protected well/borehole, open well, surface water (river, damn, lake, etc.)) (Question 110), main source of income (agriculture, private sector, public sector, informal sector) (Question 113).

Child Characteristics: We will create variables for child gender (Question 202), age (Question 203), frequency of diarrhea (Question 206), and severity of diarrhea case (Question 211).

Baseline Village Characteristics: We will collapse the following information to the village level using the baseline survey wave only.

1. *Baseline ORS/Zinc/Antibiotic use:* A potentially important control variable is baseline treatment use, since this will adjust for potential preexisting differences in use between villages that were not balanced between groups after randomization. Moreover, baseline treatment use at the village level is likely a strong predictor of endline treatment use, and including it as a covariate will likely increase the power of our estimates. Since we will have different children at baseline and endline, we will not be able to control for each child's treatment use at baseline, which is why we will control for *village level* treatment use. We will create this variable by taking the mean of each treatment variable (ORS, zinc, and antibiotics) for each village at baseline.

2. *Distance to closest distributor of ORS:* This will be created using questions 122 and 123 combined with 132-140. The first two questions ask "Is there anywhere in your village where you can go to get ORS to treat your childs diarrhea?" and "Where can you go to get ORS to treat your childs diarrhea?". The second set of questions asks "How many minutes does it take to travel to the nearest [INSERT HEALTH PROVIDER TYPE]?". We will set this variable to the minimum time reported across providers where at least 25% of respondents in a village reported that provider as a source of ORS in Q123.

3. *Availability of free ORS:* This will be created using question 124 "Is there anywhere in your village where you can go to get FREE oral rehydration salts (ORS)?". We will set this variable to the mean of Q124 (i.e. the share of respondents that know of a place to get free ORS) for each village.

All of the above variables relating to ORS will also be created for zinc.

8.2 Balance Checks

Among our endline sample (which will be different from our baseline sample) we will check for balance between the 4 groups on all the baseline characteristics mentioned in the previous section. We will report the mean of each variable and report the p-value of each group's difference in means relative to the control group (using t-tests). Moreover, we will calculate p-values of differences in means between each group, the rest of which will be reported in an appendix with significant differences ($p < .05$) acknowledged in the main text. We will also fit a multinomial logit model with group type (Group 1-Group 4) as the dependent variable and report the χ^2 test statistic as the joint test for equality (column 5 of table 1). We will fill the cells of Table 1 for our main balance table.

8.3 Process Evaluation

First, we will test for whether the intervention appeared to be carried out properly by measuring differences in CHP behavior in the past 4 weeks: home visits, delivery of ORS and zinc, free distribution of ORS and zinc. Next we will assess how each intervention affected acquisition and home-storage of ORS and zinc, which will be measured for the entire sample including non-diarrhea cases. We will code a household as having products stored if they currently had them stored during data collection (for both diarrhea and non-diarrhea households) or if they had the products stored when the child came down with diarrhea (for diarrhea households only). We will fill in the cells of Table 2.

8.4 Treatment Effects

Our main analyses will be conducted at the child level which is equivalent to the diarrhea episode level. However, we will also present results at the caretaker level.

8.4.1 Reduced form

We will conduct several analyses to assess the impact of each treatment arm on ORS use. We will refer to our main estimates as reduced form estimates since it is possible some households in our treatment groups will not receive the treatment (e.g. if the CHP fails to make the delivery or does not comply with instructions to provide the products for free). All regressions will be linear probability models (LPMs), which should be similar to a logit or probit model since the mean of our dependent variable (ORS use) is likely to be between 0.2 and 0.8. For comparison, we will also estimate reduced form treatment effects using a logit model and report average marginal effects (using the delta method and Stata's margins command).

First, we will run an un-adjusted regression using the post data only. We present all analyses in terms of ORS use, but analogous analyses will be conducted for each outcome of interest. We will estimate equation 1.

$$ORS_{iv} = \beta_0 + \beta_1 Group2_{iv} + \beta_2 Group3_{iv} + \beta_3 Group4_{iv} + \epsilon_{iv} \quad (1)$$

β_1 estimates the impact of the combined effect of free distribution, preemptive delivery and information, β_2 estimates the impact of preemptive delivery and information (i.e. with no free-distribution), and β_3 estimates the impact of free-distribution and information (i.e. with no preemptive delivery). We will then use the lincom command in Stata 14 to estimate differences between each group. Specifically, we will estimate the following:

$\beta_1 - \beta_2$ (price-effect): The effect of free-distribution with preemptive delivery relative to payment with preemptive delivery.

$\beta_1 - \beta_3$ (distance/convenience effect): The effect of free-distribution with preemptive delivery relative to free distribution upon retrieval from the CHP's home.

$\beta_2 - \beta_3$ (price effect vs. distance/convenience effect): The effect of preemptive delivery with payment relative to free-distribution upon retrieval from the household.

Under the assumption that the effect of each mechanisms on ORS use is additively separable (i.e. $ORS(Free, Delivery) = ORS(Free) + ORS(Delivery)$), we can also test for the impact of increased information provided by the CHP on ORS use. We can do this by estimating the following difference-in-differences.

Impact of $Free + Information = Group4 - Control = \beta_3$
Impact of $Free = Group2 - Group3 = \beta_1 - \beta_2$
Impact of $Information = [Group4 - Control] - [Group2 - Group3]$
$= \beta_3 - [\beta_1 - \beta_2]$

The first term (β_3), is the effect of information combined with free distribution and the second term ($\beta_1 - \beta_2$) is the effect of free distribution alone. Therefore, this difference isolates for the effect of information assuming no interactions. An identical procedure could be done by taking the difference of $\beta_2 - [\beta_1 - \beta_3]$.

The estimates above do not account for potential baseline differences in ORS use between groups, nor do they account for potential confounders that might not be balanced between groups at baseline. We will account for differences in baseline ORS use using two different methods. First we will use a difference-in-differences (DiD) estimation strategy displayed in equation 2.

$$ORS_{ivt} = \beta_0 + \beta_1 Group2_{iv} + \beta_2 Group3_{iv} + \beta_3 Group4_{iv} + \beta_4 Post_t + \beta_5 PostXGroup2_{ivt} + \beta_6 PostXGroup3_{ivt} + \beta_7 PostXGroup4_{ivt} + \epsilon_{ivt} \quad (2)$$

Here, $\beta_5 - \beta_7$ estimate the impact of the respective groups, taking into account pre-intervention differences in ORS use. Moreover, this accounts for any time-invariant unobserved heterogeneity between groups. However, since children with a diarrhea episode at baseline will mostly be different from children with a diarrhea episode at endline, it is possible that there is weak correlation between village level baseline ORS use and endline ORS use. However, the DiD model above imposes a potentially stronger relationship between baseline and endline outcomes than actually exists which could overcorrect for baseline outcomes. To address this, we will use an Analysis of Covariance (ANCOVA) specification, which is a more flexible method for controlling for baseline outcomes. ANCOVA models produce substantial improvements in power relative to difference-in-difference models when autocorrelation in the outcome is low (McKenzie, 2012). The ANCOVA estimating equation is presented in equation 3.

$$ORS_{ivt} = \beta_0 + \beta_1 Group2_{iv} + \beta_2 Group3_{iv} + \beta_3 Group4_{iv} + \beta_4 ORS_{v(t-1)} + \epsilon_{ivt} \quad (3)$$

Here we include the average ORS use in the child's village at baseline on the right hand side of the equation ($ORS_{v(t-1)}$), allowing for flexibility in how baseline ORS use in a child's village affects their ORS use at endline. Due to the expected efficiency gains, this is our preferred model and the main model we will report in our paper. The DiD model will be included in an appendix for reference.

Next we will add a variety of control variables to equations 3 and 4 above to account for potential differences between treatment and control groups that could confound our estimates and to improve precision. We will control for the following characteristics.

[INTERNAL NOTE: IS THIS THE WAY WE SHOULD PRE-SPECIFY CONTROLS OR IS THERE A BETTER WAY (E.G. CHOOSE THE 10 THAT PRODUCE THE SMALLEST SEs ON OUR TREATMENTS)?]

Caretaker Characteristics: age, education, number of children
Child characteristics: age, diarrhea frequency per month
Household Characteristics: water source, latrine type, main source of income
Baseline Village Characteristics: % of households visited by CHP in past month, % of household aware of free ORS in Village, distance to nearest ORS distributor, % of households with ORS stored in their home

We will also include indicators for each branch as covariates to improve power, since we stratified on this variable. Our preferred model is equation 3 with the controls listed above. Example tables for the analyses from this section are presented in tables 3 - 6.

When estimating the impact on time to treatment initiation using days as units, we will use a cox proportional hazard model (truncated at 7 days). When the outcome is binary (indicator for started treatment on the same day as diarrhea) we will follow the same procedure as for ORS use.

8.4.2 Impact Of Home Storage: Instrumental Variables Analysis

Our reduced form estimates will help answer the question of whether the program and variation in how the program is designed effects diarrhea treatment practices. However, as mentioned above, some of the CHPs might not comply with intervention guidelines and therefore some households might not receive the program. A more fundamental question is whether having ORS and zinc stored in the household preemptively (i.e. prior to a diarrhea episode) results in higher use than having to go retrieve the product once a diarrhea episode begins. If this is the case, then other interventions beyond CHP delivery could be used to increase home storage rates. In order to answer this question, we will use an instrumental variables approach where we use random group assignment as an instrument for preemptive home storage. For this analysis we will only use participants in Groups 2 and 4 since both groups have free distribution combined with information, with the only difference between groups being that Group 2 will have the products delivered prior to a diarrhea episode. We expect this to increase the probability of having the ORS and zinc stored in the household preemptively when the child comes down with diarrhea. We will use two-stage least squares (2SLS) to estimate the following equations.

First Stage:

$$Store_{ivt} = \beta_0 + \beta_1 Group2_{iv} + \beta_2 ORS_{v(t-1)} + X_{iv}\beta_4 + u_{ivt} \tag{4}$$

Second Stage:

$$ORS_{ivt} = \alpha_0 + \alpha_1 Store_{iv} + \alpha_2 ORS_{v(t-1)} + X_{iv}\alpha_4 + \epsilon_{ivt} \tag{5}$$

The key assumption that has to hold for random assignment to be a valid instrument is that random assignment into Group 2 relative to Group 4 only affects ORS use through increasing home storage (i.e. $Group2 \perp \epsilon$). Since the only difference between groups is the timing and location at which ORS was provided for free, we expect this assumption to hold. This exclusion restriction might not hold if Groups 1 and 4 were included in the analysis.

We expect β_1 to be positive and significant, implying that assignment to $Group2$ indeed increases the probability of home-storage. We will reject assignment to Group 2 as a "weak instrument" if the *F-Statistic* from equation 4 is equal to 10 or greater. We also expect α_1 to be positive, implying that preemptive home-storage of ORS increases ORS use.

Table 7 presents an example table from equations 4 and 5.

8.5 Heterogeneous Treatment Effects

For targeting purposes it might be helpful to understand for what types of villages or households these interventions will be most effective. We will assess how the program affects outcomes differently based on several characteristics. All analyses in this section are exploratory.

8.5.1 Heterogeneity by ORS Access

We expect this program will be particularly effective for areas that 1) do not have easy access to free ORS and zinc, and 2) are farther away from ORS and zinc distributors. We also expect that households that are farther away from the CHP's home will be less effected by these interventions since CHPs could be less likely to visit the household and the caretakers from Group 4 have to travel further to retrieve the ORS. Therefore, we will measure how each treatment arm affects outcomes differently for villages and households with different levels of these characteristics. We will measure each characteristic in the following way:

Free (village level): Share of respondents that are aware of a place to get free ORS/Zinc
Distance To Distributor (village level): Distance to nearest ORS/Zinc distributor (created as described in section 3).
Distance To CHPs Home: Distance of the caretaker's household to the CHP's household measured in walking time (from question 291b).

In order to assess heterogeneous treatment effects by these 3 variables, we will create interaction terms, where each factor is interacted with each treatment group variable. We will then estimate the following equations.

$$ORS_{ivt} = \beta_0 + \beta_1 Group2_{iv} + \beta_2 Group3_{iv} + \beta_3 Group4_{iv} + \beta_4 KnowFree_v + \beta_5 KnowFreeXGroup2_{iv} + \beta_6 KnowFreeXGroup3_{iv} + \beta_7 KnowFreeXGroup4_{iv} + \beta_8 ORS_{v(t-1)} + X_{iv}\beta_9 + \epsilon_{ivt} \tag{6}$$

$$ORS_{ivt} = \beta_0 + \beta_1 Group2_{iv} + \beta_2 Group3_{iv} + \beta_3 Group4_{iv} + \beta_4 Dist_v + \beta_5 DistXGroup2_{iv} + \beta_6 DistXGroup3_{iv} + \beta_7 DistXGroup4_{iv} + \beta_8 ORS_{v(t-1)} + X_{iv}\beta_9 + \epsilon_{ivt} \tag{7}$$

$$ORS_{ivt} = \beta_0 + \beta_1 Group2_{iv} + \beta_2 Group3_{iv} + \beta_3 Group4_{iv} + \beta_4 Mins_v + \beta_5 MinsXGroup2_{iv} + \beta_6 MinsXGroup3_{iv} + \beta_7 MinsXGroup4_{iv} + \beta_8 ORS_{v(t-1)} + X_{iv}\beta_9 + \epsilon_{ivt} \tag{8}$$

Equations 6 and 7 test how treatment effects vary by village level access to free ORS and village distance to the nearest ORS distributors, respectively. Equation 8 tests how the intervention impacted ORS use differently based on proximity to the CHP's home.

In equation 6, a negative and significant coefficient on the interaction terms will suggest that people that had less access to free ORS experienced a larger improvement from the interventions, suggesting price was an important barrier that the interventions helped overcome. We

would expect this heterogeneous effect to be larger (more negative) for groups 2 and 4, since these groups provide access to free ORS.

In equation 7, a positive and significant coefficient on the interaction terms will suggest that people that had less access to ORS distributors (further away) experienced a larger improvement from the interventions, suggesting that lack of access/availability was an important barrier that the interventions helped overcome. Since all groups increase access to ORS, we do not expect heterogeneous effects to be different across groups.

Finally, in equation 8, a negative and significant coefficient on the interaction terms will suggest the effect of the intervention was stronger for households that were located closer to the CHP's household. We would expect this heterogeneous effect to be stronger Group 4 since greater distance from the CHP's increases the time cost of ORS retrieval. If distance to CHP's home has a significant effect on Group 2 or Group 3 households, then this is likely due to the CHP not properly carrying out the intervention to far away households.

8.5.2 Heterogeneity by Child Vulnerability

It is also important to understand how each of our interventions affects ORS use among the most vulnerable children. For example, does free delivery expand coverage to less vulnerable cases? Does charging for ORS or requiring small hassle costs do a better job of targeting resources to the most vulnerable than giving ORS away for free? To assess these questions, we will assess heterogeneity in intervention impacts by two different measures of child vulnerability.

1. **Age:** The majority of diarrheal mortalities happen within the first year of life. We will use a dummy variable indicating that the child is less than 12 months old.
2. **Frequency of Diarrhea:** More frequent occurrence provides more opportunity for death. We will use question 206 for this which asks this directly.

We will test for how ORS use is affected differently based on these characteristics using the same interaction model framework outlined in equations 6-8

8.6 Targeting of Subsides

Ideally, a policy maker would like to use subsidies to maximize coverage of health products while minimizing wastage of these subsidized products. It is often argued that giving away health products for free does a poor job of targeting since people that might never use the product for its designed purpose will still acquire the product (Ashraf et al., 2010; PSI, 2003). However, charging for health products could result in "overexclusion" Cohen and Dupas (2010); Dupas et al. (2016); Ashraf et al. (2010) resulting in worse health outcomes. We will assess how well the subsidies of our interventions are targeted by comparing the share of participants that received a subsidized product and the share of participants that used the product for its designed purpose. Let α_i be the share of respondents with a diarrhea episode in intervention i that acquired subsidized ORS from the CHP during our study period and β_i be the share of respondents that used ORS to treat a case of diarrhea during our study period. Let $\lambda_i = \frac{\beta_i}{\alpha_i}$, be the measure of how well the product was targeted to those that will use it. There are three important inequalities of the $\lambda's$ and $\beta's$:

1. $\lambda_i > \lambda_j$ and $\beta_i < \beta_j$: this implies that intervention i does a better job of targeting subsidies to people that will use the product appropriately than intervention j, but

intervention j does a better job of getting ORS to all that need it.

2. $\lambda_i > \lambda_j$ and $\beta_i >= \beta_j$: this implies that intervention i does a better job of targeting subsidies to people that will use the product appropriately than intervention j, and also does at least as good of a job at getting ORS to all that need it.

3. $\lambda_i >= \lambda_j$ and $\beta_i > \beta_j$: this implies that intervention i does at least as good as good of a job of targeting subsidies to people that will use the product appropriately, but does a better job at getting ORS to all that need it.

Estimating λ and β for each of our study arms will allow us to assess the trade-off of targeting ORS subsidies and increasing ORS coverage. However, we are underpowered to assess equality (i.e. precise zeros) of $\lambda's$ and $\beta's$ between the two study arms, which is a criteria for scenarios 2 and 3 above and therefore this analysis should be thought of as exploratory. For example, if we find no significant difference between β_i and β_j, the confidence interval of the difference will likely include both important positive and negative values making it difficult to assess which scenario above is satisfied. Moreover, since ORS is extremely cost-effective, even very small differences in coverage are important.

Regardless of the limitations of this analysis, we expect this exercise to contribute to the limited evidence on targeting subsidies with price and non-price mechanisms. In a recent study in Kenya, Dupas et al. (2016) found that free distribution of chlorine tablets upon retrieval from a clinic resulted in lower chlorine take-up but no change in chlorine use relative to free delivery. However, as has been demonstrated in the broader body of literature, charging for chlorine resulted in better targeting but also substantially lower chlorine use. Based on these results, we would expect to find that preemptively selling ORS at a subsidized price will produce a larger λ (those that purchase ORS will be more likely to use it) relative to free delivery, but also a smaller β (fewer cases will be treated with ORS) (Dupas et al., 2016; Ashraf et al., 2010). Moreover, we would expect to find that the non-price hassle cost of free distribution upon retrieval from the CHP's home will produce a larger λ without compromising coverage (scenario 2 above), since such costs are not impeded by financial constraints.

We will measure β as specified in section 8.1.1. To measure α and λ, we will use a survey question asking respondents if they received any ORS from the CHP in the last 4 weeks. For our statistical analysis, we will estimate α and β using equation 3.

8.6.1 ORS Used On Older Children

In some cases a caretaker might use the subsidized ORS to treat a child older than 5-years-old and thus not have ORS available to treat her younger child. Our β estimate will treat this scenario as "not using ORS to treat a case of diarrhea" thus reducing β and λ, although this does not necessary indicate poor targeting or poor usage. We will test for how sensitive our results are to this scenario by coding these both as .5 treated case and 1 treated case.

8.6.2 Other Indicators of Targeting

In addition to our measures of efficient targeting above we will assess two additional measures that could indicate poor targeting. Among households that receive ORS/zinc, we will assess:

1. **Lost Packets:** They no longer have the product stored in their home and they did not use the product to treat a case of diarrhea (recorded for all households including those without diarrhea)
2. **Inappropriate Use:** A non-child family member used the product

Table 8 presents example tables for the targeting-coverage trade-off analyses described in this section.

8.6.3 Cost-Effectiveness

Although the section above assesses the trade-off between targeting and coverage, it does not fully compare which intervention allocates resources in the most efficient way. In order to further assess this, we will compare the incremental cost of each intervention in terms of US Dollars and the incremental benefit of each intervention in terms of DALYs averted. When comparing intervention i to intervention j, we will estimate the following incremental cost-effectiveness ratio (ICER).

$$ICER_i = \frac{Cost_i - Cost_j}{DA_i - DA_j} \tag{9}$$

Where DA represents DALYs averted and intervention i is the intervention with greater coverage of the two. We will estimate the cost of the free interventions (both delivery and retrieval) as the number of ORS packets multiplied by \$.07 (the cost of each packet). We will estimate the cost of the household sale intervention and the control group as the number of ORS packets sold multiplied by \$.03 (\$.03 is the subsidy provided provided by BRAC for each packet). We will assume that each case of diarrhea treated with ORS averts .066 DALYs (PSI, 2008). For example, when comparing the two free distribution arms, this gives the following:

$$ICER_i = \frac{.07 \times (\alpha_i - \alpha_j)}{.066 \times (\beta_i - \beta_j)} \tag{10}$$

Where α and β are take-up and coverage rates, respectively, as described in section 8.6. As a sensitivity analysis, we will re-estimate equation 10 using the full range of α's and β's produced by the 95% confidence interval.

Table 9 presents example tables for the cost-effectiveness analyses described in this section.

8.7 Standard Error Adjustment

All standard errors will be clustered at the village level, the level at which the randomization/intervention will occur. Multiple hypothesis testing adjustments will not be used for the primary outcome, ORS use, since there is only 1 primary outcome. We will us the free step-down resampling method to control the False Discovery Rate (FDR) to adjust standard errors for secondary outcomes since we have multiple secondary outcomes (Anderson, 2012).

[INTERNAL NOTE: SHOULD USE FDR TO ADJUST FOR MULTIPLE TREATMENT ARMS??]

8.8 Outcomes

We assess the impact of the interventions on the following outcomes:

- **Primary Outcome**
  - Used ORS in last 4 weeks
- **Secondary Outcomes**
  - Time to ORS use
  - Used Zinc
  - Time to Zinc use
  - Used ORS+Zinc
  - Used antibiotic
- **Tertiary Outcomes**
  - Diarrhea Prevalence
  - ORS stored in the household currently
  - ORS Stored in household at any point in the last 4 weeks
  - ORS stored in the household when child developed diarrhea
  - Zinc stored in the household currently
  - Zinc Stored in household at any point in the last 4 weeks
  - Zinc stored in the household when child developed diarrhea
  - Acquired ORS in last 4-weeks
  - Purchased ORS in last 4-weeks
  - Free ORS in last 4-weeks
  - Acquired Zinc in last 4-weeks
  - Purchased Zinc in last 4-weeks
  - Free Zinc in last 4-weeks
  - Price Paid for ORS
  - Price Paid for Zinc
  - Used properly prepared ORS (1 liter per pack + boiled)
  - Visited Health Provider for Treatment
  - Knowledge of ORS
  - Knowledge of zinc

9 Robustness Checks

9.1 Addressing Problems With Self-Reported Outcomes

Our main outcome measures are self-reported, which creates several problems. First, there is potential for social desirability bias where caretakers intentionally over-report ORS use. Second, there is potential for recall bias where caretakers mis-remember their past treatment behavior. If either type of measurement error in outcomes is correlated with treatment assignment, this would compromise the study's internal validity. We have several strategies for verifying and validating the self-reported outcomes, which are outlined below.

9.1.1 Intentional Over Reporting of ORS Use

It is possible that there is differential intentional over-reporting of ORS use in the treatment and control groups. For example, Group 2 and Group 4 respondents might over-report use since it was provided to them for free and they thought they would receive more free ORS in future if they reported using it. All treatment groups might over report ORS use relative to the control group since the CHP told them they were supposed to use it. We will account for this potentially differential over-reporting in several ways.

Counting Packets
In Group 2, we will provide incentives for to caretakers to keep the ORS and zinc packets we provide (used and/or unused). Caretakers will be given $0.25 (USD) during the endline survey if they have any of the packets that were provided to them by the CHP as a result of the intervention. All packets delivered during the intervention will have a black mark with permanent marker for identification. Enumerators will record 1) if any packets was observed, 2) the number of used packets, and 3) the number of unused packets. We will then cross check the number of used packets with self-reported ORS use. We will code ORS use to 1 if the household was observed to have an empty packet and to zero otherwise. We will conduct a similar process for zinc use. This will eliminate any upward bias of our estimates that result from differential self-report bias in Group 2. However, it is important to note that this will account for any over-reporting of ORS/zinc use in Group 2, but will not account for over-reporting in the control group since we cannot verify packet use in the control groups. Therefore, these estimates will represent a lower bound of the true effect of the group 2 intervention. Moreover, it would compromise our experimental design to do this procedure in the other treatment groups.

Placebo Tests
We will conduct a series of placebo tests to test for differences between treatment and control groups on self reported child health behaviors that should not be affected by the interventions. No effect on these outcomes will provide confidence that any effects on diarrhea treatment outcomes are a result of the intervention and not differential over-reported on healthy behaviors. We will use the following outcomes as placebo dependent variables in equation 3 with controls.

1. Gave child malaria treatment (conditional on symptoms)
2. Gave child food or liquid that was unclean
3. Frequency of child sleeping under bed net
4. Frequency of hand washing

Assess Predictive Power of CHP Reports We will also assess how predictive CHP reports of ORS/zinc distribution and use are of household reports. Group level CHP reports should be rank consistent with group level household reports.

9.1.2 Unintentional Misreporting Of ORS Use

Change in Recall Duration
We ask respondents to recall diarrhea episodes and treatment behavior that occurred in the past 4 weeks. We use this recall period so that it is aligned with the period when the intervention was active and to satisfy our sample size criteria. However, it is possible that this duration is too long to produce valid estimates. Moreover, this measurement error from recall could be correlated with treatment assignment (e.g. free home delivery households might be better at remembering accurately). Such measurement error can cause unpredictable bias (Arnold et al., 2013). To account for this, we will restrict our analysis to 1) diarrhea cases that are ongoing during data collection (about one third of reported diarrhea cases), and 2) diarrhea cases that ended within 7 days of data collection which is optimal time frame outline by Arnold et al. (2013).

9.2 Attrition and Changes in Group Composition

Attrition: For half of the households in our sample, will have two observations (baseline and follow-up) and for half the housdholds, we will only have one observations (follow-up only). Attrition among the households for which we have a panel could compromise the study's internal validity. Since the duration of the study is relatively short (roughly 4 weeks) we don't expect attrition to be a huge issue. Most, if not all, attrition will be due to refusal to participate in the survey at follow-up among household who agreed to participate at baseline. It is possible that refusal to participate occurs differentially in the treatment and control groups, which could bias our estimates. For example, if the control group is more likely to refuses to participate at follow-up because they do not receive and gift (i.e. free treatment products), whereas all households in Group 2 are happy to participate since they received free ORS and zinc, this could result in groups no longer being comparable. If attrition is correlated with treatment status, we will test for how sensitive our results are to potential changes in group composition due to attrition by running the following additional analyses where we assume that:

1) Everyone in the control group that attrites had a diarrhea episode and used ORS and everyone in the treatment groups that attrite had diarrhea and did not use ORS (lower bound) .

2) Everyone in the control group that attrites had a diarrhea episode and did not use ORS and everyone in the treatment groups that attrite had diarrhea and used ORS (upper bound).

This will provide upper and lower bounds for the potential bias introduced by attrition.

Reporting of Diarrhea Episodes: Another more concerning channel through which group comparability could be compromised is through differential reporting of diarrhea episodes. Since the main outcome of interest (ORS use) is contingent on a child having had a recent case of diarrhea, we will only collect outcome information for children that had a recent diarrhea episode. Therefore, the children for whom we collect outcome information at baseline will

mostly be different than the children for whom we collect outcome information at endline (since most children will not have two episodes during our study period). Equation 11 portrays the impact of intervention I relative to the control group c.

$$\frac{ORS_I + u_I}{D_I + \epsilon_I} - \frac{ORS_c + u_c}{D_c + \epsilon_c} \tag{11}$$

Where ORS represents the number of caretakers that reported using ORS to treat a case of diarrhea, D represents the number of caretakers that reported a diarrhea case, ϵ represents the number of caretakers that had a diarrhea episode but did not report it, and u represents the number of caretakers that used ORS to treat a case of diarrhea that was not reported. We will assume that:

$$\frac{ORS_j}{D_j} >= \frac{u_j}{\epsilon_j}, \forall j \tag{12}$$

This implies that the share of cases treated with ORS among unreported cases is not larger than that of reported cases. If for some I, $\epsilon_I \neq \epsilon_c$ this could be indicative of differential reporting of diarrhea episodes between caretakers in intervention I and the control group suggesting groups might not be exchangeable. We will test for this by estimating the following equation:

$$D_{ivt} = \beta_0 + \beta_1 Group2_{iv} + \beta_2 Group3_{iv} + \beta_3 Group4_{iv} + \beta_4 D_{v(t-1)} + \epsilon_{ivt} \tag{13}$$

Where D_{ivt} represents whether child i in village v at time t had a diarrhea episode reported. The coefficients β_1 - β_3 will indicate whether the treatment groups had a higher or lower probability of reported diarrhea relative to the control group, holding baseline village level diarrhea probability constant.

There are several potential scenarios that could arise that would be indicative of differential reporting.

Scenario 1 $\epsilon_i < \epsilon_c$: it is possible that caretakers in the treatment groups will be more likely to report a diarrhea episode at endline than caretakers in the control group for two reason: 1) treatment group caretakers could have the expectation that they will be provided additional free products if a child had an episode and thus overreport episodes (e.g $\epsilon_i < 0$) and 2) treatment group caretakers might be more likely to accurately recall a recent case of diarrhea as a result of the intervention. This scenario arises if any of β_1-β_3 are positive and statistically significant. Our assumption in equation 12 implies that this will bias our estimates towards the null. If this scenario arises we will provide a potential upper bound of our estimates by doing the following.

1. Assume that the control villages had the same diarrhea prevalence as treatment village by randomly assigning observations to have had a diarrhea episode among the sample in the control group that did not report an episode.
2. Assume $u_c = 0$, everyone in the control group that gets randomly assigned an episode did not use ORS (upper bound) .

Scenario 1 $\epsilon_i > \epsilon_c$: It is also possible that caretakers in the treatment groups under-report diarrhea episodes relative to the control group. For example, this could occur if caretakers who failed to use ORS that was provided for free were embarrassed to admit this, as it could be perceived as negligence, so they instead say there was no episode. This will result in an upward bias. If any of β_1-β_3 are negative will do the following.

1. Assume that the treatment village had the same diarrhea prevalence as the control village by randomly assigning observations to have had a diarrhea episode among the sample in the respective treatment group that did not report an episode.
2. Assume $u_I = 0$ everyone in the treatment group that gets randomly assigned an episode did not use ORS (lower bound).

10 Discussion

This work will contribute to several bodies of existing literature. First, this work will evaluate the impact of a novel way of utilizing community health workers to increase ORS and zinc use (free and preemptive delivery). Community health worker programs are increasingly relied on to increase access to health care and improve health outcomes in rural communities throughout the developing world. This work will help understand how best to use community health workers to increase ORS and zinc use (free distribution, home delivery, or both).

Second, this work will be the first to provide experimental evidence on the role of price and convenience in ORS and zinc use. Although there are a lot of resources invested in programs aimed at increasing ORS and zinc use, evidence on the remaining barriers to ORS use and what works to increase use is scarce.

Third, this study will be the first to assess the causal impact of having ORS stored at home prior to the initiation of a diarrhea episode on ORS use. If home storage is found to positively influence ORS use, this would suggest that other interventions beyond CHP deliveries could be used to increase home storage (e.g. preemptive free distribution at clinics or distribution in larger quantities). Moreover, the share of caretakers that do not use ORS even if they had it stored at home allows for measurement of the extent to which other factors un-related to price and convenience—cultural beliefs, preference other medicines, poor taste—affect ORS use.

Fourth, our findings will contribute to the ongoing debate about free distribution vs. cost-sharing for health products. If caretakers appear to be sensitive to ORS price, consistent with the literature on preventive health products (Kremer et al., 2011a), then a program of free distribution could be more effective than the status quo of subsidized prices charged by CHPs.

Fifth, the comparison of hassle cost, monetary prices, and free delivery will contribute to the evolving literature on efficient targeting of subsidies. If our findings are consistent with Dupas et al. (2016) we will find that hassle costs (free retrieval) provide better targeting than free delivery without compromising coverage, whereas charging improves targeting but at the cost of reduced overage.

This work is limited in several ways. First, our main outcome measure relies on self reports. Although we have several strategies in place to validate our self-report measures, they could still introduce measurement error and potentially bias our results. Second, we only assess the short term affects of these interventions. It is unclear if the impacts will be sustained over time

when the novelty and salience of the interventions wear off. Moreover it is unclear how well CHPs will perform at continually delivering ORS and zinc to households each month, which could diminish the interventions effectiveness. Future work should aim to assess the the long term impacts of these interventions as well as different ways of motivating community health workers to continually carry out the interventions. Third, we do not observe the same child at baseline and endline since many children will not have multiple cases of diarrhea. This makes it impossible to compare balance on and adjust for differences in baseline outcomes for the analysis sample of our four groups and requires us to instead use village-level baseline outcomes. Fourth, in our analysis of efficient targeting of subsidies (section 8.6), we do not observe what will happen for households with no diarrhea episode. It is possible that acquisition of ORS prior to initiation of a diarrhea episode is less efficient for episodes that happen farther in the future since provides more opportunity to lose, use undesired purpose, or give away the ORS. Moreover, some households that acquire ORS preemptively might never have a child with a diarrhea episode.

11 Conclusion

ORS and zinc are extremely effective at preventing mortality from diarrhea yet they remain largely under-used. As a result children continue to die. This research will provide insight into the mechanisms that are likely help increase ORS use. The results could be used to improve CHP programs in Uganda and around the globe, and have the potential to reduce child mortality.

12 Research Team

This project is led by Zachary Wagner and John Bosco Asiimwe under the supervision of William H. Dow and David I. Levine. The research team works closely with Munshi Sulaiman and Robert Mpiira at BRAC and BRAC's community health promoters.

13 Deliverables

We will produce the following deliverables from this project.

- Job market paper for Zachary Wagner that includes everything outlined above (Authors ZW and JBA)
- Article aimed at medical journal audience that assesses the impact the interventions on ORS and zinc use (Authors ZW JBA DIL WHD)
- Article aimed a health economics journal audience that assess mechanisms through which the intervention worked and highlights barriers to ORS use using empirics (Authors ZW JBA DIL WHD)
- Article analyzing efficiency of prices, hassle costs, and free delivery, which will assess wastage and include a cost-effectiveness analysis of the various interventions
- Report on the findings for BRAC

14 Calender

- June-July 2016: Baseline Surveys
- October 2016: Role out of interventions
- November-December 2016: Endline Surveys
- December-January 2016: Job Market Paper

References

Michael L Anderson. Multiple inference and gender differences in the effects of early intervention: A reevaluation of the abecedarian, perry preschool, and early training projects. *Journal of the American statistical Association*, 2012.

Benjamin F Arnold, Sebastian Galiani, Pavani K Ram, Alan E Hubbard, Bertha Briceño, Paul J Gertler, and John M Colford. Optimal recall period for caregiver-reported illness in risk factor and intervention studies: a multicountry study. *American journal of epidemiology*, 177(4):361–370, 2013.

Nava Ashraf, James Berry, and Jesse M. Shapiro. Can higher prices stimulate product use? evidence from a field experiment in zambia. *American Economic Review*, 100(5):2383–2413, 2010. doi: 10.1257/aer.100.5.2383.

Tin Aung, Willi McFarland, Hnin Su Su Khin, and Dominic Montagu. Incidence of pediatric diarrhea and public–private preferences for treatment in rural myanmar: a randomized cluster survey. *Journal of tropical pediatrics*, 59(1):10–16, 2013.

Tin Aung, Dominic Montagu, Hnin Su Su Khin, Zaw Win, Ang Kyaw San, Willi McFarland, ORS+ Zinc Study Group, et al. Impact of a social franchising program on uptake of oral rehydration solution plus zinc for childhood diarrhea in myanmar: a community-level randomized controlled trial. *Journal of tropical pediatrics*, 60(3):189–197, 2014.

Phyllis Awor, Henry Wamani, Thorkild Tylleskar, George Jagoe, and Stefan Peterson. Increased access to care and appropriateness of treatment at private sector drug shops with integrated management of malaria, pneumonia and diarrhoea: a quasi-experimental study in uganda. *PLoS One*, 9(12):e115440, 2014.

Abhijit Vinayak Banerjee, Esther Duflo, Rachel Glennerster, and Dhruva Kothari. Improving immunisation coverage in rural india: clustered randomised controlled evaluation of immunisation campaigns with and without incentives. *Bmj*, 340:c2220, 2010.

Abdullah H Baqui, Robert E Black, Shams El Arifeen, Mohammad Yunus, K Zaman, Nazma Begum, Amira A Roess, and Mathuram Santosham. Zinc therapy for diarrhoea increased the use of oral rehydration therapy and reduced the use of antibiotics in bangladeshi children. *Journal of Health, Population and Nutrition*, pages 440–442, 2004.

Nita Bhandari, Sarmila Mazumder, Sunita Taneja, Brinda Dube, RC Agarwal, Dilip Mahalanabis, Olivier Fontaine, Robert E Black, and Maharaj K Bhan. Effectiveness of zinc supplementation plus oral rehydration salts compared with oral rehydration salts alone as a treatment for acute diarrhea in a primary care setting: a cluster randomized trial. *Pediatrics*, 121(5):e1279–e1285, 2008.

Zulfiqar A Bhutta, Sheila M Bird, Robert E Black, Kenneth H Brown, et al. Therapeutic effects of oral zinc in acute and persistent diarrhea in children in developing countries: pooled analysis of randomized controlled trials. *The American journal of clinical nutrition*, 72(6): 1516–1522, 2000.

Richard A. Cash, David R. Nalin, Roger Rochat, L. Barth Reller, Zahedul A. Haque, and A. S. M. Mizanur Rahman. A clinical trial of oral therapy in a rural cholera-treatment center. *The American Journal of Tropical Medicine and Hygiene*, 19(4):653–656, 1970.

Jessica Cohen and Pascaline Dupas. Free distribution or cost-sharing? evidence from a randomized malaria prevention experiment. *The Quarterly Journal of Economics*, 125(1):1–45, 2010.

Jai K Das, Zohra S Lassi, Rehana A Salam, and Zulfiqar A Bhutta. Effect of community based interventions on childhood diarrhea and pneumonia: uptake of treatment modalities and impact on mortality. *BMC Public Health*, 13(3):1, 2013.

Stefano DellaVigna. Psychology and economics: Evidence from the field. *Journal of Economic literature*, 47(2):315–372, 2009.

Pascaline Dupas. Health behavior in developing countries. *Annu. Rev. Econ.*, 3(1):425–449, 2011.

Pascaline Dupas, Vivian Hoffmann, Michael Kremer, and Alix Zwane. Short-term subsidies, lasting adoption? habit formation in point-of-use water purification in kenya. *Unpublished manuscript*, 2011.

Pascaline Dupas, Vivian Hoffmann, Michael Kremer, and Alix Peterson Zwane. Targeting health subsidies through a nonprice mechanism: A randomized controlled trial in kenya. *Science*, 353(6302):889–895, 2016.

Birger Carl Forsberg, Max G Petzold, Gran Tomson, and Peter Allebeck. Diarrhoea case management in low- and middle-income countries: an unfinished agenda. *Bulletin of the World Health Organization*, 85:42–48, 2007.

Willa Friedman, Benjamin Woodman, and Minki Chatterji. Can mobile phone messages to drug sellers improve treatment of childhood diarrhoea?a randomized controlled trial in ghana. *Health policy and planning*, 30(suppl 1):i82–i92, 2015.

Sethson Kassegne, Megan B Kays, and Jerome Nzohabonayo. Evaluation of a social marketing intervention promoting oral rehydration salts in burundi. *BMC public health*, 11(1):1, 2011.

M Kremer and E Miguel. The illusion of sustainability. *Quarterly Journal of Economics*, 122 (3), 2007.

Michael Kremer, Rachel Glennerster, et al. Improving health in developing countries. *Handbook of Health Economics*, 2:201–315, 2011a.

Michael Kremer, Jessica Leino, Edward Miguel, and Alix Peterson Zwane. Spring cleaning: Rural water impacts, valuation, and property rights institutions. *The Quarterly journal of economics*, 126(1):145–205, 2011b.

Michael Kremer, Edward Miguel, Sendhil Mullainathan, Clair Null, and Alix Peterson Zwane. Social engineering: Evidence from a suite of take-up experiments in kenya. *Work. Pap., Univ. Calif., Berkeley*, 2011c.

Lancet. Water with sugar and salt. *Lancet*, 2(8084):300–1, 1978.

Lindsey M Lenters, Jai K Das, and Zulfiqar A Bhutta. Systematic review of strategies to increase use of oral rehydration solution at the household level. *BMC public health*, 13(Suppl 3):S28, 2013.

Ruth Levine. *Millions saved: proven successes in global health*, volume 3. Peterson Institute, 2004.

Li Liu, Hope L. Johnson, Simon Cousens, Jamie Perin, Susana Scott, Joy E. Lawn, Igor Rudan, Harry Campbell, Richard Cibulskis, Mengying Li, Colin Mathers, and Robert E. Black. Global, regional, and national causes of child mortality: an updated systematic analysis for 2010 with time trends since 2000. *The Lancet*, 379(9832):2151–2161, 2012.

David McKenzie. Beyond baseline and follow-up: The case for more t in experiments. *Journal of Development Economics*, 99(2):210–221, 2012.

Manoj Mohanan, Marcos Vera-Hernández, Veena Das, Soledad Giardili, Jeremy D Goldhaber-Fiebert, Tracy L Rabin, Sunil S Raj, Jeremy I Schwartz, and Aparna Seth. The know-do gap in quality of health care for childhood diarrhea and pneumonia in rural india. *JAMA pediatrics*, 169(4):349–357, 2015.

Melinda K. Munos, Christa L Fischer Walker, and Robert E Black. The effect of oral rehydration solution and recommended home fluids on diarrhoea mortality. *International Journal of Epidemiology*, 39(suppl 1):i75–i87, 2010.

World Health Organization et al. *Programme for Control of Diarrhoeal Diseases: Seventh Programme Report 1988-1989*. The Organization, 1990.

Birte Pantenburg, Theresa J. Ochoa, Lucie Ecker, and Joaquim Ruiz. Use of commercially available oral rehydration solutions in lima, peru. *The American Journal of Tropical Medicine and Hygiene*, 86(6):922–924, 2012.

N. F. Pierce, R. B. Sack, R. C. Mitra, J. G. Banwell, K. L. Brigham, D. S. Fedson, and A. Mondal. Replacement of water and electrolyte losses in cholera by an oral glucose-electrolyte solution. *Annals of internal medicine*, 70(6):1173–1181, 1969.

PSI. What is social marketing? *Population Services International*, 2003. available online at http://www.psi.org/resources/pubs/what is smEN.pdf.

Pavani Kalluri Ram, Misun Choi, Lauren S Blum, Annah W Wamae, Eric D Mintz, and Alfred V Bartlett. Declines in case management of diarrhoea among children less than five years old. *Bulletin of the World Health Organization*, 86:E–F, 2008.

K Vaninadha Rao, Vinod K Mishra, and Robert D Retherford. Knowledge and use of oral rehydration therapy for childhood diarrhoea in india: effects of exposure to mass media. 1998.

Mathuram Santosham. Oral rehydration therapy of infantile diarrhea a controlled study of well-nourished children hospitalized in the united states and panama. *The New England journal of medicine*, 306(18):1070–1076, 1982.

Mathuram Santosham, Aruna Chandran, Sean Fitzwater, Christa Fischer-Walker, Abdullah H. Baqui, and Robert Black. Progress and barriers for the control of diarrhoeal disease. *The Lancet*, 376(9734):63–67, 2010.

Neeraj Sood and Zachary Wagner. Private sector provision of oral rehydration therapy for child diarrhea in sub-saharan africa. *The American Journal of Tropical Medicine and Hygien*, (Forthcoming), 2013.

Philip R. Spandorfer, Evaline A. Alessandrini, Mark D. Joffe, Russell Localio, and Kathy N. Shaw. Oral versus intravenous rehydration of moderately dehydrated children: A randomized, controlled trial. *Pediatrics*, 115(2):295–301, 2005.

Dean Spears. Bounded rationality as deliberation costs: Theory and evidence from a pricing field experiment in india. *Available at SSRN 1444912*, 2009.

Richard Thaler. Toward a positive theory of consumer choice. *Journal of Economic Behavior & Organization*, 1(1):39–60, 1980.

Rebecca L Thornton. The demand for, and impact of, learning hiv status. *The American economic review*, 98(5):1829–1863, 2008.

UDHS. Uganda demographic and health survey 2011 [dataset]. *Uganda Bureau of Statistics [Uganda] and ICF International*, 2011.

USAID. Diarrhoea treatment guidelines: Including new recommendations for the use of ors and zinc supplementation for clinic-based healthcare workers. Technical report, USAID Micronutrient Program, 2005.

Cesar G. Victora, Jennifer Bryce, Olivier Fontaine, and Roeland Monasch. Reducing deaths from diarrhoea through oral rehydration therapy. Technical report, World Health Organization, 2000.

Zachary Wagner, Manan Shah, and Neeraj Sood. Barriers to use of oral rehydration salts for child diarrhea in the private sector: evidence from india. *Journal of tropical pediatrics*, page fmu063, 2014.

Justin White and William H Dow. Intertemporal choices for health. *Behavioral Economics and Public Health*, 2015.

15 Tables

Table 1. Baseline Balance Between Treatment and Control

	(1) Control	(2) Group 2	(3) Group 3	(4) Group 4	(5) χ^2
Caretaker Characteristics					
Caretaker Age					
Caretaker Education: None					
Caretaker Education: Primary					
Caretaker Education: Secondary+					
Caretaker Employed in Last 7 Days					
Number of Children					
Heard of ORS					
Ever used ORS					
Heard of Zinc					
Ever used Zinc					
Child Characteristics					
Age (months)					
Birth order					
Diarrhea Frequency					
Diarrhea Last 4 Weeks					
ORS use					
Zinc use					
Household Characteristics					
Water Source: Pipe					
Water Source: Protected Well/Borehole					
Water Source: Unprotected Well					
Water Source: Surface Water					
Main Income: Agriculture					
Main Income: Public Sector					
Main Income: Private Sector					
Main Income: Self-employed/informal					
Visited by CHP in past month					
Ever visited by CHP					
Free ORS in Village					
Free Zinc in Village					
Distance to nearest ORS distributor					
Distance to nearest zinc distributor					

p-values relative to control reported in brackets
Column 5 is the χ^2 test statistic from a multinomial logit regression

Table 2. Process Evaluation

	Control	Group 2	Group 3	Group 4
CHP visit last 4 weeks				
CHP provided ORS for free last 4 weeks				
CHP provided zinc for free last 4 weeks				
Any ORS last 4 weeks				
Any zinc last 4 weeks				
Any ORS for free last 4 weeks				
Any zinc for free last 4 weeks				
Purchased ORS last 4 weeks				
Purchased zinc last 4 weeks				
CHP delivered ORS last 4 weeks				
CHP delivered zinc last 4 weeks				
ORS stored: currently				
ORS stored: last 4 weeks				
ORS stored: diarrhea initiation				
Zinc stored: currently				
Zinc Stored: last 4 weeks				
Zinc stored: diarrhea initiation				
Purchased ORS from CHP in last 4 weeks				
Price Paid for ORS				
Price Paid for Zinc				
Visited Health Provider for treatment				

p-values are relative to control with SE clustered at the village level

Table 3. Post-intervention treatment outcomes (means)

	Control	Group 2	Group 3	Group 4
Used ORS*				
Time to ORS use**				
Used Zinc**				
Time to Zinc use**				
Used ORS+Zinc**				
Used antibiotic**				
Used antidiarrheal**				
Diarrhea Prevalence				
Used properly prepared ORS				

*primary outcome

**secondary outcome

Note: Estimates are from equation 1

p-values are relative to control with SE clustered at the village level

Table 4. Impact on ORS and Zinc use

	ORS Use				
	Unadjusted	DiD	DiD	ANCOVA	ANCOVA
Group 2-Control					
Group 3-Control					
Group 4-Control					
Group 2-Group 3					
Group 2-Group 4					
Group 3-Group 4					
Controls	No	No	Yes	No	Yes
Obs					
	Zinc Use				
	Unadjusted	DiD	DiD	ANCOVA	ANCOVA
Group 2-Control					
Group 3-Control					
Group 4-Control					
Group 2-Group 3					
Group 2-Group 4					
Group 3-Group 4					
Controls	No	No	Yes	No	Yes
Obs					

$***p < .01, **p < .05, *p < .1$

Village Clustered SEs in parentheses

Unadjusted = Equation 1; DiD = Equation 2; and ANCOVA = Equation 3

Table 5. Impact on Days to ORS and Zinc use

	Days to ORS Use				
	Unadjusted	DiD	DiD	ANCOVA	ANCOVA
Group 2-Control					
Group 3-Control					
Group 4-Control					
Group 2-Group 3					
Group 2-Group 4					
Group 3-Group 4					
Controls	No	No	Yes	No	Yes
Obs					
	Days to Zinc Use				
	Unadjusted	DiD	DiD	ANCOVA	ANCOVA
Group 2-Control					
Group 3-Control					
Group 4-Control					
Group 2-Group 3					
Group 2-Group 4					
Group 3-Group 4					
Controls	No	No	Yes	No	Yes
Obs					

$***p < .01, **p < .05, *p < .1$

Village Clustered SEs in parentheses

Unadjusted = Equation 1; DiD = Equation 2; and ANCOVA = Equation 3

Table 6. Impact on Antibiotic Use

	Unadjusted	DiD	DiD	ANCOVA	ANCOVA
Group 2-Control					
Group 3-Control					
Group 4-Control					
Group 2-Group 3					
Group 2-Group 4					
Group 3-Group 4					
Controls	No	No	Yes	No	Yes
Obs					

$***p < .01, **p < .05, *p < .1$

Village Clustered SEs in parentheses

Unadjusted = Equation 1; DiD = Equation 2; and ANCOVA = Equation 3

Table 7. Impact of Home Storage: 2SLS

	ORS Use			
	First Stage	Second Stage	First Stage	Second Stage
Group 2 Storage				
Controls	No	No	Yes	Yes
Obs				
	Zinc Use			
	First Stage	Second Stage	First Stage	Second Stage
Group 2 Storage				
Controls	No	No	Yes	Yes
Obs				

Columns 1 and 3=Equation 4, Columns 2 and 4=Equation 5

Table 8. Targeting

	Take-Up and Usage		
	% Took-Up	% Used	Ratio
Control			
Group 2			
Group 3			
Group 4			
	Other Targeting Measures		
	Lost ORS	Use for Non-Child	
Control			
Group 2			
Group 3			
Group 4			

Table 9. Cost-Effectiveness

	Costs and DALYs Averted				
	Cost	Incr Cost	DALYs Averted	Incr DALYs Averted	ICER
Control		N/A		N/A	N/A
Group 2					
Group 3					
Group 4					

16 Appendix

16.1 Appendix 1: Survey Instrument

ENGLISH VERSION – DIARRHEA MODULES

2016 UGANDA DIARRHEA PREVENTION AND TREATMENT RESEARCH

TARGET: CAREGIVERS OF CHILDREN BETWEEN 0 AND 59 MONTHS WITH DIARRHEA IN PAST 4 WEEKS

Confidential: Data used for research purposes only

IDENTIFICATION

HOUSEHOLD UNIQUE ID: |___| |___|___|___|___|___|___| |___|___|

REGION: _____

DISTRICT: _____

COUNTY : _____

SUBCOUNTY/TOWN : _____

PARISH: _____

LCI NAME: _____

ENUMERATION AREA: _____

AREA (URBAN=1; RURAL=2) : _____

NAME OF HEAD OF HOUSEHOLD: _____

INTERVIEWER'S VISITS

	1	2	3	FINAL VISIT
DATE	_____	_____	_____	**DAY** ___ **MONTH** ___ **YEAR** 2016
INTERVIEWER'S NAME	_____	_____	_____	**INITIAL** ___
RESULT*	_____	_____	_____	**RESULT*** ___
NEXT VISIT : DATE	_____	_____		TOTAL NBR OF VISITS ___
TIME	_____	_____		

TO BE FILLED BY SUPERVISOR :

TOTAL MAIN CAREGIVERS OF CHILDREN AGED 0-59 MONTHS WITH DIARRHEA IN PAST 4 WEEKS IN HOUSEHOLD (FORM A) ___

TOTAL CHILDREN AGED 0-59 MONTHS WITH DIARRHEA IN PAST 4 WEEKS (FORM B) ___

FIELD SUPERVISOR:	QUALITY CONTROLLER:	DATA ENTRY:
NAME_____/___/___/	NAME _____/___/___/	NAME _____/___/___/

*CODES FOR RESULT

1= Completed
2= No HH member at home/no competent respondent
3= Entire HH absent for extended period
4= Refused to be interviewed
5= Was not at home
6= Dwelling vacant/address not a dwelling
7= Deaf/Did not speak a survey language
8= No adults in household
9= Interview postponed
10= Interview partially completed
11= Other (specify)_____

START TIME /___/___/___/___/

FORM A.

CAREGIVER SELECTION TOOL FOR USE WITHIN HOUSEHOLDS SELECTED FOR DIARRHEA MODULE

1. **What is the total number of MAIN caregivers of children aged 0-59 months that are presently home? A MAIN caregiver is the person that makes decisions about how to care for the children in your household.** _____

2. Please provide the First name and Last initial of all these MAIN caregivers *(Interviewer: list in second column below):*

Serial no.	First name, Last initial (all MAIN caregivers of children 0-59 months and with diarrhea in past 4 weeks)
1	
2	
3	
4	
5	

RANDOM SELECTION (if 2 MAIN caregivers or more are listed in table above):

Interviewer: Take out your phone and use the random number generator application. Set the Min to 1 and the Max to the number of caretakers in the household. Press 'generate' and select the caretaker that corresponds to the number that is generated.

3. The person I need to speak to is _____ *(insert the first name and last initial)*. May I please talk to this person now?

   Yes……1 ***[Interviewer: move to informed consent]***

   Refuse……2 ***[Interviewer: Thank the respondent and move to next eligible household]***

4. Were you or someone from your household asked to complete a questionnaire about your children's health about 4 weeks ago?

INTRODUCTION AND ORAL CONSENT

Good morning/afternoon. My name is _____. I am a researcher working for Makerere University and the University of California, Berkeley in the United States. We are conducting a survey on child health and treatment practices among the residents of Uganda. We are inviting you to participate in this study because you have at least one child under 5-years-old living in your household. This information will be used to inform programming efforts by the Uganda Ministry of Health and other organizations that focus on diarrhea treatment in the country.

PROCEDURES

If you agree to take part, some of the questions that we ask will be about health practices and diarrhea treatment. We will interview you in a private place. The interview will take no more than 30 minutes to complete. To further protect your privacy, your name will not appear on any questionnaire. The answers we collect from you will not be shown to anyone outside of the study team.

RISKS/DISCOMFORTS

It is possible that some of the research questions may make you uncomfortable or upset. You are free to decline to answer any questions you don't wish to, or to stop the interview at any time. As with all research, there is a chance that confidentiality could be compromised; however, we will do everything we can to make sure that this does not happen. Whatever information you provide will be kept strictly confidential and will not be shown to other persons. The answers you give will not be shared with anyone outside of the study team.

BENEFITS

There is no direct benefit to you from being in this study. However, the information we collect will help develop better programs and health services for people in Uganda.

CONFIDENTIALITY

Your study data will be handled as confidentially as possible. If results of this study are published or presented, individual names and other personally identifiable information will not be used.
To minimize the risks to confidentiality, we will do the following:

- The data will be collected anonymously. We will not maintain a link between your identity and the research data. Personal identifiers will be removed as soon as data is entered into our computers.
- Your research records will be stored on a password-protected computer
- Only I/the researcher(s) will have access to your study records.

FUTURE USE OF STUDY DATA

The research data will be maintained for possible use in future research by the study team.

COMPENSATION/PAYMENT

You will receive a bar of soap for your participation in this study.

VOLUNTARY PARTICIPATION

You do not have to agree to be in this study, and you may change your mind at any time without penalty or loss of benefits to which you are otherwise entitled.

QUESTIONS

If you have any questions about this study, you may call Dr. John Bosco Asiimwe at Makerere University at 772-428-489. He will answer any questions or address any concerns you may have. If you have any questions about your rights as a study participant, or if you think you have not been treated fairly, you may call the National Council for Science and Technology, telephone 0-414 250 499.

PERMISSION TO PROCEED
You have been given a copy of this consent form to keep.

Do you have any questions about the survey? Yes/No

Do I have permission to interview you now? Yes / No

Interviewer: If no, thank the respondent and end the questionnaire. Indicate Result in identification table.

_____	_____	_____
Print name of Person Obtaining Consent	Signature of Person Obtaining Consent	Date

FORM B.

CHILD SELECTION TOOL FOR USE WITHIN HOUSEHOLDS SELECTED FOR DIARRHEA MODULE

1. **Interviewer, ask respondent: "Do you have ORS stored in your household?"**

Yes……1
No…….2

2. **Interviewer, ask respondent: "Have any of your children under 5 years old had diarrhea in the past 4 weeks"**

Yes……1 **(Continue to 3)**
No…….2 **(Skip to Form C.)**

3. **What is the total number of children under 5 years old with diarrhea in the last 4 weeks for whom you are responsible:** _____

4. Please provide the First name of all these children *(Interviewer: list in second column below)*

Serial no.	First name (children 0-59 months with diarrhea in the past 4 weeks)
1	
2	
3	
4	
5	

5. We will be discussing the health of these children in the interview today.

HOUSEHOLD QUESTIONNAIRE: SOCIOECONOMIC MODULE

Section 1: Socioeconomic Module				
No	**Questions and Filters**	**Responses**	**Codes**	**Skip To**
101	How old are you?		☐☐	
102	What is the **highest** level of school you attended?	None/ Nursery Primary Vocational Secondary Tertiary/College (Middle level) University	1 2 3 4 5 6	
103	What is your marital status?	Never married Married/Living together Widowed Divorced Separated	1 2 3 4 5	
104	a. How many children do you have? b. How many of these children are under 5-years-old?	☐☐ Children ☐☐ Children		
105	Which of the following items are available in this household? ***Interviewer: Read list. Multiple responses allowed.***	Electricity Radio Television Refrigerator Cell phone/Mobile Landline phone Gas/electric cooker Bicycle Sofa set Water tank NONE OF THE ABOVE	1 2 3 4 5 6 7 8 9 10 11	
106	MAIN MATERIAL OF FLOOR ***(Interviewer: Record observation. If interview is not inside house, ask to see inside)***	NATURAL FLOOR Earth/Sand Earth and Dung FINISHED FLOOR Stones Bricks Parquet or Polished Wood Mosaic or tiles Cement Other (Specify): _____	 1 2 3 4 5 6 7 99	

107	MAIN MATERIAL OF WALL ***(Interviewer: Record observation)***	NATURAL WALLS Thatched/Straw RUDIMENTARY WALLS Mud and poles Un-burnt bricks Un-burnt bricks with plaster Burnt bricks with mud FINISHED WALLS Cement blocks Stone Timber Burnt bricks with cement Other (Specify): _____	 1 2 3 4 5 6 7 8 9 99	
108	MAIN MATERIAL OF ROOF ***(Interviewer: Record observation)***	NATURAL ROOFING Thatched Mud FINISHED ROOFING Wood/planks Iron sheets Asbestos Tiles Tin Cement Other (specify): _____	 1 2 3 4 5 6 7 8 99	
109	What type of toilet does your household use **most** of the time?	Flush toilet VIP latrine Covered pit latrine no slab Covered pit latrine w/ slab Uncovered pit latrine no slab Uncovered pit latrine w/slab Composting toilet Bush Other (Specify): _____	1 2 3 4 5 6 7 8 99	

110	What is the main source of drinking water for the members of your household?	PIPED WATER Piped - into house Piped to yard/plot Public tap/standpipe WATER FROM OPEN WELL/SPRING Open well/spring in yard/plot Open public well/spring WATER FROM PROTECTED WELL/SPRING Protected well/spring in yard/plot Protected public well/spring WATER FROM BOREHOLE Borehole in yard/plot Public borehole SURFACE WATER (RIVER/DAM ETC) River/stream Pond/lake Dam Rain water Tanker truck Vendor Other (Specify): _____	 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 99	
111	How much time does it take you to obtain drinking water (round trip)?	Water on premises Less than 30 minutes 30 minutes or longer Don't know	1 2 3 88	
112	What type of cooking fuel does your household use **most** of the time?	Fire wood Charcoal Kerosene/paraffin Gas/Biogas/LPG Electricity Straw/shrubs/grass No food cooked in the household Other (Specify): _____	1 2 3 4 5 6 7 99	
113	What is the **main** source of income for the household?	Farming Employment: private sector/NGO Employment: Civil service Self employed/own business Jua kali/informal Casual/contract jobs Spousal support Parental support Domestic work Pension Other (Specify): _____	1 2 3 4 5 6 7 8 9 10 99	
114	Does your household own any agricultural land?	Yes No Don't know	1 2 88	

115	Have you worked to earn income in the last **7 days**? ***(Interviewer: include both wage and self employment work)***	Yes No	1 2	
116	Have you worked to earn income in the last **12 months**? ***(Interviewer: include both wage and self employment work)***	Yes No	1 2	
117	How often do you read the newspaper?	Daily Several times a week Once a week Occasionally Never Don't know	1 2 3 4 5 88	 **→Q119** **→Q119**
118	In the **past 1 month**, have you read a newspaper?	Yes No Don't know	1 2 88	
119	Do you have access to and/or do you use the Internet?	Yes No Don't know	1 2 88	

END OF SOCIOECONOMIC MODULE

120	Have you heard of a treatment for child diarrhea called Oral Rehydration Salts (ORS)	Yes No	1 2 →**Q126**
121	Have you ever used ORS to treat a child's diarrhea	Yes No	1 2
122	Is there anywhere in your village where you can go to get oral rehydration salts (ORS) to treat your child's diarrhea?	Yes No	1 2 →Q126
123	Where can you go to get oral rehydration salts (ORS) to treat your child's diarrhea? **Circle all that apply**	Government Health Center Private Health Center Pharmacy/Drug Shop Village Health Team Community Health Promoter Other_____ Don't Know	1 2 3 4 5 88 99
124	Is there anywhere in your village where you can go to get **FREE** oral rehydration salts (ORS)?	Yes No	1 2 →Q126
125	Where can you go to get **FREE** oral rehydration salts (ORS)? **Circle all that apply**	Government Health Center Private Health Center Pharmacy/Drug Shop Village Health Team Community Health Promoter Other_____ Don't Know	1 2 3 4 5 88 99
126	Have you heard of a treatment for child diarrhea called Zinc	Yes No	1 2 →132
127	Have you ever used Zinc to treat a child's diarrhea	Yes No	1 2
128	Is there anywhere in your village where you can go to get Zinc to treat your child's diarrhea?	Yes No	1 2 →132
129	Where can you go to get Zinc to treat your child's diarrhea? **Circle all that apply**	Government Health Center Private Health Center Pharmacy/Drug Shop Village Health Team Community Health Promoter Other_____ Don't Know	1 2 3 4 5 88 99
130	Is there anywhere in your village where you can go to get **FREE** Zinc?	Yes No	1 2 →132
131	Where can you go to get **FREE** Zinc? **Circle all that apply**	Government Health Center Private Health Center Pharmacy/Drug Shop Village Health Team Community Health Promoter Other_____ Don't Know	1 2 3 4 5 88 99

132	a. How many minutes does it take to travel to the nearest **government health center**?	☐☐ **minutes**	
	b. Have you visited the **government health center** in the past 4 weeks?	Yes No	1 2
133	a. How many minutes does it take to travel to the nearest **private health center**?	☐☐ **minutes**	
	b. Have you visited the **private health center** in the past 4 weeks?	Yes No	1 2
134	a. How many minutes does it take to travel to the nearest **pharmacy/Drug Shop**?	☐☐ **minutes**	
	b. Have you visited the **Pharmacy/Drug Shop** in the past 4 weeks?	Yes No	1 2
135	Is there a **Village Health Team (VHT)** in your village?	Yes No DK	1 2 →Q138 99 →Q138
136	Do you know where the VHT's household is located?	Yes No	1 2 →Q137b
137	a. How many minutes does it take to travel to the house of the **Village Health Team (VHT)**	☐☐ **minutes**	
	b. Have you had a visit with the **Village Health Team (VHT)** in the past 4 weeks?	Yes No	1 2
138	Is there a **Community Health Promoter (CHP)** in your village?	Yes No DK	1 2 →Section 2 99 → Section 2
139	Do you know where the CHP's household is located?	Yes No	1 2 →Q140b
140	a. How many minutes does it take to travel to the house of the **Community Health Promoter (CHP)**	☐☐ **minutes**	
	b. Have you had a visit with the **Community Health Promoter (CHP)** in the past 4 weeks?	Yes No	1 2

SECTION 2 – DIARRHEA TREATMENT ***Interviewer:*** Aks Q201-279 for all children 0-59 months who had diarrhea in the past 4 weeks				
No	**Questions and Filters**	**Responses**	**Codes**	**Skip To**
201	First name of selected child ***Interviewer: check Form B***	First name: _____		
202	What is the sex of the child?	Male Female	1 2	
203	How old is the child? ***Interviewer: record age in months***	☐☐ months		
204	What is your relationship with the child?	Mother Grandmother Aunt Sister Other (specify): _____	1 2 3 4 99	
205	How many older siblings does (NAME) have?	☐☐ Siblings		
206	How frequently does (NAME) come down with diarrhea?	At least once per month Once every 2 months Once every 3 months Once every 4 months Less than once every 4 months	1 2 3 4 5	
207	Can you confirm that (NAME) had diarrhea in the last 4 weeks?	Yes No	1 2	**→See instructions in footnote[1]**
208	Does the child currently have diarrhea?	Yes No	1 2	
209	For how many days has/did the child had diarrhea?	☐☐ days		
210	Has (NAME) also had a fever during this diarrhea episode?	Yes No Don't know	1 2 88	
211	Did (NAME) have any blood in the stools when he or she had diarrhea in the last 4 weeks?	Yes No Don't know	1 2 88	
212	How much was (NAME) given to drink during the recent episode of diarrhea? ***Interviewer: Read list. Mark only one answer***	Much less than usual Somewhat less than usual About the same Somewhat more than usual Much more than usual Nothing to drink Don't know/Don't remember	1 2 3 4 5 6 88	
213	Is (NAME) usually breastfed?	Yes No	1 2	***→Q215***

[1] This question is a second check to make sure that we did the screening/selection correctly. If the child did have diarrhea according to the screening information, but they say NO diarrhea here, then stop the interview. First, check if the same caregiver has another child 0-59 months with diarrhea in the past 4 weeks and select that child (or randomly select if more than one). If that selected caregiver doesn't have another child in the same age range w/diarrhea, then check if another caregiver in the household has a child w/diarrhea and re-do the child selection with that different caregiver. If there are no more caregivers in the household with a child with diarrhea in past 4 weeks, then stop and move to next household.

214	How much was (NAME) breastfed during the recent episode of diarrhea? ***Interviewer: Read list. Mark only one answer***	Breastfed less Breastfed about the same Breastfed more Not breastfed at all Too old for breastfeeding Don't know/Don't remember	1 2 3 4 5 88	
215	How much was (NAME) given to eat during the recent episode of diarrhea? Less than usual to eat, about the same amount, more than usual to eat, or nothing to eat? ***Interviewer: Read list. Mark only one answer***	Much less than usual Somewhat less than usual About the same Somewhat more than usual Much more than usual Nothing to eat Don't know/Don't remember	1 2 3 4 5 6 88	
216	Did you seek **advice** from someone outside the home for the diarrhea?	Yes No Don't know	1 2 88	 →**Q220** →**Q220**
217	How many days after the diarrhea began did you first seek advice? ***Interviewer: If the same day, record '00.'***	☐☐ days		
218	Indicate the place where you received the main advice for (NAME)? ***Interviewer: Do not read list. Mark only one answer.***	**Public Sector** Health center Community distributor (VHT or CHP) Other public sector **Private Sector** Private Clinic/provider Private pharmacy/drug store Faith-based, NGO/CBO Friends/Relatives Traditional healer Don't know Other (specify): _____	 1 2 3 4 5 6 7 8 88 99	
219	What advice did you receive from this place? ***Interviewer: Multiple responses allowed. Do not read list.*** ***Probe: Any other advice?*** ***Note:*** • ***Antidiarrheals include products to slow frequency of stools (i.e. Imodium, Lomotil), and bismuth subsalicylate (i.e. Pepto-Bismol)***	Give fluids Give ORS Give zinc Give antibiotic Give antidiarrheal* Give fever medicine Give anti-nausea (vomitting) medicine Give more than usual amount of fluid Give more than usual to eat Continue breastfeeding Take to clinic or hospital Don't know Other (specify): _____	1 2 3 4 5 6 7 8 9 10 11 88 99	

220	Did you **seek treatment** from someone outside the home for the diarrhea? ***Interviewer: make sure respondent understands that "treatment" includes medicine, ORS, zinc, etc.***	Yes No Don't know	1 2 88	 →**Q226** →**Q226**
221	How many days after the diarrhea began did you first seek treatment? ***Interviewer: If the same day, record '00.'***	☐☐ days		
222	Indicate the first place where you first sought treatment for (NAME)? ***Interviewer: Mark only one answer.***	**Public Sector** Health center Community distributor (VHT or CHP) Other public sector **Private Sector** Private Clinic/provider Private pharmacy/drug store Faith-based, NGO/CBO Friends/Relatives Traditional healer Don't know Other (specify): _____	 1 2 3 4 5 6 7 8 88 99	
223	Did request a specific type of treatment or did you let the provider determine the treatment?	Requested Treatment Let Provider Decide Don't know	1 2 88	 →**Q226** →**Q226**
224	What treatment(s) did you ask for? ***Interviewer: Do not prompt. Multiple responses allowed***	ORS Restors Zinc Zinkid Antibiotic Antidiarrheal Don't know Other (specify): _____	1 2 3 4 5 6 88 99	
225	Why did you ask for this treatment? ***Interviewer: Read list. Multiple responses allowed.***	I always use it Most effective Saw it advertised Other (specify): _____	1 2 3 99	
226	Now, I would like to ask you some questions regarding diarrhea treatment. Did you give (NAME) anything to treat the Diarrhea? ***Interviewer: make sure respondent understands that "treatment" includes medicine, ORS, zinc, solutions, pills, etc…***	Yes No Don't know	1 2 88	 →**Q228** →**Q228**

227	a. If yes, can you tell me or show me what treatments you gave (NAME) (either home-prepared or from outside of home) Interviewer: DO NOT PROMPT. RECORD ALL THAT APPLY. b. If yes, can you tell me if you gave your child any of the following treatments ***Interviewer: READ LIST.*** ***Multiple responses allowed; circle all that apply. If respondent still has medicine package, ask to show.*** ***Note:*** • ***Home-prepared treatment include: Sugar Salt Solution, Maize/millet Porridge, Herbal remedies, Passion fruit juice*** • ***Antidiarrheals include products to slow frequency of stools (i.e. Imodium, Lomotil), and bismuth subsalicylate (i.e. Pepto-Bismol)***	ORS Zinc Home-prepared treatment Antibiotic Anti-diarrheal* Intravenous fluid Injection Fever medicine Anti-nausea (vomitting) medicine Other pill/syrup Vitamins Don't know Other (specify): _____	1 2 3 4 5 6 7 8 9 10 11 88 99	
228	Did you have ORS stored in your home when (NAME) started having diarrhea?	Yes No Don't Know	1 2 88	
229	Did you have Zinc stored in your home when (NAME) started having diarrhea?	Yes No Don't Know	1 2 88	
230	***Interviewer: check if q227=1: ORS was given to the child.***	**Yes** **No**	**1** **2**	**→Q241**
231	You mentioned that you have given (NAME) an ORS. Is that correct? ***Interviewer: If did not give ORS, correct q226 and q227.***	Yes No Don't know	1 2 88	 **→Q241** **→Q241**
232	How many days after the diarrhea began did you first give (NAME) ORS? ***Interviewer: If the same day, record '00.'***	☐☐ days		

233	From where was the ORS obtained?	**Public Sector** Health center Community distributor (VHT or CHP) Other public sector **Private Sector** Private Clinic/provider Private pharmacy/drug store Faith-based, NGO/CBO Friends/Relatives Traditional healer Don't know Other (specify): _____	 1 2 3 4 5 6 7 8 88 99	
234	How often did you give the ORS treatment to (NAME)? ***Interviewer: Read the list and ask the respondent to select one response.***	After each liquid stool Morning, mid-day, and night Whenever the child wanted it Once per day Don't know Other (specify): _____	1 2 3 4 88 99	
235	How many packets of ORS did you give to (NAME) during the episode of diarrhea?	Less than 1packet 1 packet 2 packets 3 packets More than 3 packets	1 2 3 4 5	
236	How many days did you give the child the ORS?	☐☐ days		
237	Did you use ordinary water or did you use treated or boiled water when you prepared the ORS?	Ordinary (Non Purified) Water Treated Water Boiled Water Other (specify): _____	1 2 3 99	
238	About how much water did you use for each packet of ORS?	Less than half a liters half a liter 1 liter 2 liters more than 2 liters Don't know	1 2 3 4 5 88	
239	Did you purchase the ORS or obtain it free?	Purchased Free Don't know	1 2 88	 → →
240	What price did you pay for each packet of ORS?	☐☐☐☐ ***UGX*** Don't know	 88	
241	***Interviewer: check if q227=2: Zinc was given to the child.***	**Yes** **No**	**1** **2**	 **→Q252**
242	You mentioned that you have given (NAME) Zinc. Is that correct? ***Interviewer: If did not give Zinc, correct q226 and q226.***	Yes No Don't know	1 2 88	 **→Q252** **→Q252**
243	How many days after the diarrhea began did you first give (NAME) Zinc? ***Interviewer: If the same day, record '00.'***	☐☐ days		

244	From where was the Zinc obtained?	**Public Sector** Health center Community distributor (VHT or CHP) Other public sector **Private Sector** Private Clinic/provider Private pharmacy/drug store Faith-based, NGO/CBO Friends/Relatives Traditional healer Don't know Other (specify): _____	 1 2 3 4 5 6 7 8 88 99	
245	How often did you give the Zinc treatment to (NAME)? ***Interviewer: Read the list and ask the respondent to select one response.***	After each liquid stool Once per day Morning, mid-day, and night Every other day Whenever the child wanted it Don't know Other (specify): _____	1 2 3 4 5 88 99	
246	How many tablets were you given/or did you purchase in total? *Interviewer: Clarify that this tablet NOT packets and includes tablets received from all sources including neighbors.*	Number Don't know	☐☐ 88	
247	How many Zinc tablets did you give the child in total?	☐☐ tablets		
248	***INTERVIEWER***: If respondent did not give all the tablets to the child ask to see remaining tablets. **RECORD NUMBER OF REMAINING TABLETS**	number of remaining tablet_____		
249	How many days did you give the child the Zinc?	☐☐ days		
250	Did you purchase the zinc or obtain it free?	Purchased Free Don't know	1 2 88	
251	What price did you pay for each package of zinc (10 tablets)?	☐☐☐☐ ***UGX*** Don't know	 88	→253 For all responses
252	Can you tell me why you did not give your child zinc to treat the diarrhea?	Did not know where to buy Zinc is too expensive Used a product I had confidence in Other (specify): _____	1 2 3 99	
253	***Interviewer: check if q227=3: Home prepared solution was given to the child.***	**Yes** **No**	**1** **2**	**→Q259**
254	You mentioned that you have given (NAME) a home-prepared solution. Is that correct? ***Interviewer: If did not give home-prepared solution, correct q226 and q227.***	Yes No Don't know	1 2 88	 **→Q259** **→Q259**

255	Was (NAME) given a Sugar Salt Solution (SSS) during the episode of diarrhea?	Yes No Don't know	1 2 88	
256	What was recipe you used for the SSS	RECORD VERBATIM		
257	How often did you give the home-prepared solution to (NAME)? ***Interviewer: Read the list and ask the respondent to select one response.***	Frequently After each liquid stool Morning, mid-day, and night Whenever the child wanted it Don't know Other (specify): _____	1 2 3 4 88 99	
258	Did you use ordinary water or did you use treated water when you prepared the home-based treatment?	Ordinary (Non Purified) Water Treated Water Other (specify): _____	1 2 99	
259	***Interviewer: check Q227 for whether EITHER 1 or 3 are selected: ORS/SSS was given to the child.***	**ORS/SSS was given** **No ORS/SSS was given**	**1** **2**	**→Q261**
260	Why did you not give (NAME) any ORS or SSS solutions? ***Interviewer: Do not read list. Multiple responses allowed.***	Child not seriously ill Could not find anywhere to get ORS Did not know how to prepare SSS Products too costly Child does not like the taste Didn't know about ORS/SSS It is not a real treatment Not very effective treatment Too far to go to retreive Other (specify): _____	1 2 3 4 5 6 7 8 9 99	
261	***Interviewer: check if q227=4: Antibiotic was given to the child.***	**Yes** **No**	**1** **2**	**→Q265**
262	You mentioned that you have given (NAME) an antibiotic. Is that correct? ***Interviewer: If did not give antibiotic, correct q226 and q227.***	Yes No Don't know	1 2 88	 **→Q265** **→Q265**
263	Where did you obtain this antibiotic? ***Interviewer: Mark only one answer.***	**Public Sector** Health center Community distributor (VHT or CHP) Other public sector **Private Sector** Private Clinic/provider Private pharmacy/drug store Faith-based, NGO/CBO Friends/Relatives Traditional healer Don't know Other (specify): _____	 1 2 3 4 5 6 7 8 88 99	
264	Why did you give (NAME) an antibiotic to treat diarrhea? ***Interviewer: Do not read list. Multiple responses allowed.***	Child had blood in stool Child had fever with diarrhea Health provider said it is more effective I asked for an antibiotic Other (specify): _____	1 2 3 4 99	

265	***Interviewer: check if q227=5: Antidiarrheal was given to the child.***	**Yes** **No**	**1** **2**	**→Q269**
266	You mentioned that you have given (NAME) an Antidiarrheal. Is that correct? ***Interviewer: If did not give Antidiarrheal, correct q226 and q227.***	Yes No Don't know	1 2 88	 **→Q269** **→Q269**
267	Where did you obtain the antidiarrheal? ***Interviewer: Mark only one answer.***	**Public Sector** Health center Community distributor (VHT or CHP) Other public sector **Private Sector** Private Clinic/provider Private pharmacy/drug store Faith-based, NGO/CBO Friends/Relatives Traditional healer Don't know Other (specify): _____	 1 2 3 4 5 6 7 8 88 99	
268	Why did you give (NAME) an antidiarrheal to treat diarrhea? ***Interviewer: Do not read list. Multiple answers allowed***	Health provider said it is more effective I think it is most effective I asked for an antidiarrheal This treatment has worked well for me in the past Only treatment available in shop Other (specify): _____ _____ _____	1 2 3 4 5 99	
269	***Interviewer: check if q227=6: Intravenous fluid was given to the child.***	**Yes** **No**	**1** **2**	**→Q272**
270	You mentioned that you gave (NAME) an intravenous fluid treatment. Is that correct? ***Interviewer: If did not give an Intravenous fluid, correct q226 and q227.***	Yes No Don't know	1 2 88	 **→Q272** **→Q272**
271	Where did you obtain this intravenous treatment? ***Interviewer: Mark only one answer.***	**Public Sector** Health center Community health worker Other public sector **Private Sector** Private Clinic/provider Private pharmacy/drug store Community distributor Faith-based, NGO/CBO Friends/Relatives Traditional healer Don't know Other (specify): _____	 1 2 3 4 5 6 7 8 9 88 99	

272	***Interviewer: check if q227=7: Injection was given to the child.***	**Yes** **No**	**1** **2**	**→Q275**
273	You mentioned that you gave (NAME) an injection. Is that correct? ***Interviewer: If did not give an injection, correct q223 and q251.***	Yes No Don't know	1 2 88	 **→Q275** **→Q275**
274	Where did you obtain this injection? ***Interviewer: Mark only one answer.***	**Public Sector** Health center Community health worker Other public sector **Private Sector** Private Clinic/provider Private pharmacy/drug store Community distributor Faith-based, NGO/CBO Friends/Relatives Traditional healer Don't know Other (specify): _____	 1 2 3 4 5 6 7 8 9 88 99	
275	**Interviewer: Check if Q226=1: Child received treatment for their diarrhea.**	**Yes** **No**	**1** **2**	**→279**
276	Can you tell me why you did not provide any treatment to (NAME) during this recent episode of diarrhea?	Child not very sick Could not afford Did not know where to purchase treatment Child too young for drugs No treatment available in my area Don't know Other (specify): _____	1 2 3 4 5 88 99	
277	Did (NAME) have **symptoms of malaria** in the last 4 weeks?	Yes No Don't know	1 2 88	 **→279**
278	Did you give (NAME) any treatment for his/her malaria symptoms?	Yes No Don't know	1 2 88	

ORS use of other household members

Interviewer: Ask once all children with diarrhea in the past 4 weeks have been inquired about (Q201-Q278)

279	Did anyone else in your household aside from the children we discussed use ORS for any reason in the past 4 weeks?	Yes No Don't Know	1 2 88	 **→282**
280	Was this ORS stored in the household?	Yes No Don't Know	1 2 88	
281	Who used the ORS?	Child older than 5 Sibling Husband Other		

282	Do you have any salt stored in your household?	Yes No Don't Know	1 2 88	
283	Do you have any sugar stored in your household?	Yes No Don't Know	1 2 88	

Use of Other Health Products

284	In the past 4 weeks did you use any chlorine tablets to make your water clean and safe for your child/children to drink?	Yes No Don't know	1 2 88	→286
285	How often did you use chlorine tablets to clean the water you gave to your child?	Rarely Some of the time Most of the time Always	1 2 3 4	
286	In the past 4 weeks did your children sleep under a bed net?	Yes No Don't know	1 2 88	→288
287	How often did your children sleep under a bed net?	Rarely Some of the time Most of the time Always	1 2 3 4	

Contact with Community Health Promoter

"Now I am going to ask you some questions about the community health promoter (CHP) in your village. A CHP is someone in your village that visits households and sells health products and other household goods."

288	Is there a community health promoter in your village?	Yes No Don't know	1 2 88	 →Q301 →Q301
289	How often does the CHP visit your household?	Every Week Every Month Every 3 Months Less Than Every 3 Months Never Visited My Household	1 2 3 4 5	 →Q301
290	What does the CHP do when they visit your household? **Do Not Prompt. Circle all that apply.**	Hygiene Training Diarrhea Treatment Training Child Health Training Product Sales Other (Record Verbatim)_____	1 2 3 4 5	
291	Does the CHP ever talk to you about how to treat your child's diarrhea?	Yes No Don't know	1 2 88	
292	Has the CHP Visited Your Household in the **past 4 weeks**?	Yes No Don't know	1 2 88	 →Q301 →Q301
293	What did the CHP do when they visit your household? **Do Not Prompt. Circle all that apply.**	Hygiene Training Diarrhea Treatment Training Child Health Training Product Sales Deliver ORS+Zinc Other (Record Verbatim) _____	1 2 3 4 5	
294	Did the CHP talk to you about how to treat your child's diarrhea?	Yes No Don't know	1 2 88	

SECTION 3 – BELIEFS ABOUT DIARRHEA AND TREATMENT

301	If your child becomes sick with diarrhea, what do you think the best way to treat the child is? ***Instructions to enumerators: Do not prompt. Record all that apply.***	No treatment Increased Fluids Increased Food Herbal remedies Antibiotics Antidiarrheals Zinc ORS Home-made sugar salt solution Others specify_____ Don't know	1 2 3 4 5 6 7 8 9 99 88	
Interviewer: **Check if 301=8 (Respondent chose ORS as best way to treat diarrhea). Ask 302 and 303 if 301=8. Otherwise skip to 304.**				
302	How soon after the childs diarrhea symptoms begin should you begin giving the child ORS? ***Interviewer: Do not read responses. Probe to classify as one of the response options***	Immediately (after 1st loose stool) After child has multiple loose stools After 1 day if diarrhea persists After 2 days if diarrhea persists Other specify_____	1 2 3 4 99	
303	How frequently should the child be given ORS? ***Interviewer: Do not read responses. Probe to classify as one of the response options***	Once per day Twice per day Three times per day Four times per day After each loose stool Other specify_____	1 2 3 4 5 99	
Interviewer: **Check if 301=9 (Respondent chose Zinc as best way to treat diarrhea). Ask 304-306 if 301=9. Otherwise skip to 307.**				
304	How soon after the childs diarrhea symptoms begin should you begin giving the child Zinc? ***Interviewer: Do not read responses. Probe to classify as one of the response options***	Immediately (after 1st loose stool) After child has multiple loose stools After 1 day if diarrhea persists After 2 days if diarrhea persists Other specify_____	1 2 3 4 99	
305	How frequently should the child be given Zinc? ***Interviewer: Do not read responses. Probe to classify as one of the response options***	Only one time per episode Every other day Once per day Twice per day Three times per day Four times per day After each loose stool Other specify_____	1 2 3 4 5 6 7 99	
306	For how many days should the child continue to receive Zinc. ***Interviewer: Record number of days. Record 99 if respondents reports "until 10 tablets used" or "until packet it empty".***	☐☐ ***days*** Until 10 tablets used	 99	

*This section asks your opinion on certain issues. Please tell me if you **believe that** the following statements **are true or false.***

1. Ability: Knowledge				
		True	**False**	**Don't know**
307	Diarrhea can be caused by lack of cleanliness	1	0	88
308	Diarrhea can be associated with lack of cleanliness, such as not washing hands with water and soap before eating	1	0	88
309	Diarrhea can be caused by drinking unsafe water	1	0	88
310	Diarrhea can be caused by eating unclean food	1	0	88
311	Antibiotics should only be used for certain kinds of diarrhea	1	0	88
312	Most diarrhea can be managed at home without any treatment	1	0	88
313	Giving food-based fluids is equally as effective as giving ORS	1	0	88
314	Diarrhea can be caused by growing teeth	1	0	88

*Please tell me if you **"agree strongly," "agree somewhat," "disagree strongly,"** or **"disagree somewhat"** with the following statements.*

2. Motivation: Threat Severity					
		Strongly Agree	**Agree Somewhat**	**Disagree Somewhat**	**Strongly Disagree**
315	Children can die from diarrhea	4	3	2	1
316	Your family will have a problem if one of the members has diarrhea	4	3	2	1
317	It does not seem like anyone around here has a problem because of diarrhea	4	3	2	1
318	Diarrhea is a major health problem in your community	4	3	2	1
319	Diarrhea is a problem in the poorer segment of the community only	4	3	2	1

3. Motivation: Threat Susceptibility (Children Under Five)					
		Strongly Agree	**Agree Somewhat**	**Disagree Somewhat**	**Strongly Disagree**
320	If your child gets diarrhea it is best just to do nothing and it will pass in time	4	3	2	1
321	The children under five in your household are healthy so their bodies can fight off diarrhea without doing anything	4	3	2	1
322	Children under five are too young to experience serious medical problems from getting diarrhea	4	3	2	1
323	You are not worried about the children (child) under five in your household getting diarrhea	4	3	2	1
324	Children are more likely to get diarrhea than adults	4	3	2	1

Interviewer: Skip the following questions if respondent has not heard about ORS in Q120.

4. Opportunity: Availability						
		Strongly Agree	**Agree Somewhat**	**Disagree Somewhat**	**Strongly Disagree**	**Don't know**
325	Drug stores nearby always have ORS for sale	4	3	2	1	88
326	ORS treatments are difficult to get around here	4	3	2	1	88
327	There is a place nearby where you can get ORS when your child needs it	4	3	2	1	88
328	You don't know where to get ORS	4	3	2	1	88
329	ORS treatments are too expensive	4	3	2	1	88
330	You are willing to pay the current price for ORS (UGX 400-500 per sachet)	4	3	2	1	88
331	ORS treatment products are available within walking distance from your home	4	3	2	1	88
5. Motivation: Outcome Expectations						
		Strongly Agree	**Agree Somewhat**	**Disagree Somewhat**	**Strongly Disagree**	**Don't know**
332	ORS is effective for treatment of diarrhea	4	3	2	1	88
333	ORS reduces the duration of a diarrheal episode	4	3	2	1	88
334	ORS does not help in reducing the severity of a diarrheal episode	4	3	2	1	88
335	Use of ORS reduces the risk of dehydration in children	4	3	2	1	88
336	ORS reduces the risk of a new diarrheal episode in the following 2 to 3 months	4	3	2	1	88
337	ORS helps to strengthen the immune system of children	4	3	2	1	88
6. Capacity/Ability: Use of Products						
		Strongly Agree	**Agree Somewhat**	**Disagree Somewhat**	**Strongly Disagree**	**Don't know**
338	ORS should be used for every type of child diarrhea	4	3	2	1	88
339	All child diarrhea should be treated with an antibiotic	4	3	2	1	88
340	ORS has too many side effects, so you don't feel safe giving ORS to your small child	4	3	2	1	88
341	ORS tastes bad so your child won't take it.	4	3	2	1	88
342	You would use ORS the next time your child has diarrhea if you had to pay a small fee for it.	4	3	2	1	88
343	You would use ORS the next time your child has diarrhea if it were free.	4	3	2	1	88

Interviewer: Skip the following questions if respondent has not heard about zinc in Q126.

4. Opportunity: Availability						
		Strongly Agree	**Agree Somewhat**	**Disagree Somewhat**	**Strongly Disagree**	**Don't know**
344	Drug stores nearby always have zinc for sale	4	3	2	1	88
345	Zinc treatments are difficult to get around here	4	3	2	1	88
346	There is a place nearby where you can get zinc when your child needs it	4	3	2	1	88
347	You don't know where to get zinc	4	3	2	1	88
348	Zinc treatments are too expensive	4	3	2	1	88
349	You are willing to pay the current price for zinc (UGX 1000 per 10 tablets)	4	3	2	1	88
350	Zinc treatment products are available within walking distance from your home	4	3	2	1	88
5. Motivation: Outcome Expectations						
		Strongly Agree	**Agree Somewhat**	**Disagree Somewhat**	**Strongly Disagree**	**Don't know**
351	Zinc is effective for treatment of diarrhea	4	3	2	1	88
352	The child should stop receiving Zinc once the diarrhea stops	4	3	2	1	88
353	Zinc reduces the duration of a diarrheal episode	4	3	2	1	88
354	Zinc does not help in reducing the severity of a diarrheal episode	4	3	2	1	88
355	Use of zinc reduces the risk of dehydration in children	4	3	2	1	88
356	Zinc reduces the risk of a new diarrheal episode in the following 2 to 3 months	4	3	2	1	88
357	Zinc helps with the ability of my child to stay healthy	4	3	2	1	88
6. Capacity/Ability: Use of Products						
		Strongly Agree	**Agree Somewhat**	**Disagree Somewhat**	**Strongly Disagree**	**Don't know**
358	Zinc should be used for every type of child diarrhea	4	3	2	1	88
359	Child diarrhea should be treated with an antibiotic	4	3	2	1	88
360	Zinc has too many side effects, so you don't feel safe giving zinc to your small child	4	3	2	1	88
361	Zinc tastes bad so your child won't take it.	4	3	2	1	88
362	Zinc is only a nutritional supplement, not an effective treatment for pediatric diarrhea.	4	3	2	1	88
363	Zinc should be given along with	4	3	2	1	88

	ORS to be most effective.					
364	It is difficult to remember to give a child zinc when the diarrhea has stopped	4	3	2	1	88
365	You would use zinc the next time your child has diarrhea if you had to purchase it	4	3	2	1	88
366	You would use zinc the next time your child has diarrhea if it were free	4	3	2	1	88

END OF DIARRHEA MODULE

FORM C.

Checking Packaging and Incentive Payment

1. **Did the community health promoter in your village provide you with any ORS and zinc packets about 4 weeks ago?**

   Yes……1
   No……2 →[End Interview]

2. **Do you still have any of the packaging, used or unused, from the ORS and zinc you were provided?**

   Yes……1
   No……2 →[End Interview]

3. **Can I please see the packaging you still have?**

   Yes……1
   No……2 →[End Interview]

4. **Interviewer: record observation of packets**

   a. **Total number of ORS packets (full and empty)**_____
   b. **Total number of empty ORS packets**_____
   c. **Total number of full ORS packets**_____
   d. **Total number of zinc packets (full and empty)**_____
   e. **Total number of zinc tablets used**_____
   f. **Total number of zinc tablets remaining**_____

Interviewer: provide respondents who had at least one ORS or zinc packet with incentive payment

THANK YOU FOR PARTICIPATING IN THIS STUDY!

END TIME /___/___/___/___/

INTERVIEWER: PLEASE MAKE SURE HOUSEHOLD UNIQUE ID IS INDICATED ON TOP OF THE IDENTIFICATION TABLE