Communication for development to improve health behaviours in Ghana

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Grantee Final Report

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Note to readers

This final impact evaluation grantee report has been submitted in partial fulfilment of the requirements of grant OW4.1122 awarded under Open Window 4. 3ie is making it available to the public in this final report version as it was received. The report is not in the series as the RCT was contaminated which makes it difficult to make causal claims. The report has been reviewed and is technically sound. No further work has been done.

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The 3ie technical quality assurance team comprises Tara Kaul, Deo-Gracias Houndolo, Stuti Tripathi, Radhika Menon, Emmanuel Jimenez, an anonymous external impact evaluation design expert reviewer and an anonymous external sector expert reviewer, with overall technical supervision by Marie Gaarder.

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Executive Summary

This evaluation was conducted in twelve Ghanaian districts in 2012 to measure the impact of different components used within the *Communication for Development (C4D) program* designed to increase the practice of key health behaviors including the utilization of insecticide-treated mosquito nets (ITN), the use of oral rehydration solution (ORS) and zinc for the treatment of diarrhea, hand-washing, exclusive breastfeeding and delivery with a skilled birth attendant. Communities were randomly assigned to receive community-based theaters, live video screenings or live radio broadcasting in addition to other C4D components that were rolled out in both treatment and control areas. In addition, voice messages were sent to randomly selected participants under the *Mobile for Development (M4D)* program. All interventions directly focused on the same five behaviors, highlighting their importance for child health as well as the importance of regular and sustained practicing of healthy behaviors. In order to allow for a rigorous assessment of intervention components, we implemented a cluster-randomized controlled trial (RCT). We selected a total of 216 communities for the RCT and impact evaluation. Of these communities, 108 were used as controls and 108 communities were randomly selected for either receiving live theater or video screening (54 communities each) as well as for receiving live radio (50% of treated). In all treatment communities community-based agents also received additional training and resources to support their work. Within both treatment and control communities, caregivers with access to cell phones were invited to participate in the M4D intervention program. One third of these participants did not get any message; one third received voice messages from the same person (voice) throughout the program, and one third received messages from different individuals. To track behavior over time, three rounds of household survey data were collected: a first round of baseline data prior to program launch in 2012; a midline survey in 2014 and an endline survey in 2016. To complement the quantitative component, we conducted a qualitative study examining the role of socio-economic, cultural and geographic characteristics on health behaviors and seeking to determine how implementation processes may have produced program impact.

The results presented in this report suggest that remarkable progress with respect to all five health behaviors has been made over the past few years: ITN utilization increased from 22% at baseline in 2012 to 77% at endline in 2016, the proportion of diarrhea cases treated with ORS or brought to a clinic increased from 85% to 98%, exclusive breastfeeding in the first six months increased from 78% to 90%, regular utilization of soap for handwashing increased from 31% to 46% and skilled birth attendant coverage increased for 58% to 73%. No additional changes in health behavior were found for the randomly assigned community activities. One of the most likely reasons was intervention targeting, with only a minority of targeted caregivers participated in these programs. Overall, the difference in self-reported exposure to key C4D interventions between treated and control areas was less than 15 percentage points, making larger outcome differentials rather unlikely ex-ante. Even those exposed appear to have participated in very few events with many communities reporting less than a single radio or drama show in a given year. We also detected widespread exposure to other behavior change interventions in all communities. Most subjects reported high exposure to radio programs and home visits by community-based agents, which likely contributed to the overall change in behavior, but may also have lowered the potential impact of the complementary interventions.

Results are slightly more positive for mobile messaging, which seems to have increased ITN utilization and the presence of soap in households by 5 and 9 percentage points, respectively.

Overall, remarkable progress has been made over the study period; while some of this progress can be attributed to the M4D intervention, the contribution of the three complementary interventions studied in the randomized evaluation was likely small. On the other hand, national community volunteer and radio programs – which were also part of the larger C4D program - appear to have reached the overwhelming majority of study participants, and may thus account for a substantial share of the overall progress made.

The overall project experience underlines the difficulty associated with conducting impact evaluations of behavior change programs rolled out at scale through many implementation partners. Less complex designs, alternative methods of measuring program efforts and a tighter control over implementing agencies are likely to strengthen future impact evaluations of similar projects.

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Lists of figures and tables

Abbreviations and acronyms

3ie	International Initiative for Impact Evaluation
C4D	Communication for Development
CBA	Community-Based Agent
CF	Complementary Feeding
CHC	Community Health Compound
CHO	Community Health Officer
CHPS	Community-based Health and Planning Services
CNC	Center for National Culture
DHS	Demographic and Health Survey
EBF	Exclusive Breastfeeding
FGD	Focus Group Discussion
GCRN	Ghana Community Radio Network
GHS	Ghana Health Service
HWWS	Handwashing With Soap
IPA	Innovations for Poverty Action
IRB	Institutional Review Board
ITN	Insecticide Treated Net
M4D	Mobile for Development
MoH	Ministry of Health
NHIA	National Health Insurance Authority
NHIS	National Health Insurance Scheme
ORS	Oral Rehydration Solution
PMI	President's Malaria Initiative
SBCC	Social and Behavioral Change Communication
SDHT	Sub-District Health Team
UNICEF	United Nations Children's Fund

1. Introduction

Despite major progress in the area of child health over the past 25 years, the global burden of under-five mortality remains high, with an estimated 5.9 million children under age-five dying in 2015.[1] In Ghana, infectious diseases such as malaria, diarrhea and acute respiratory infections continue to cause a large number of child deaths. In addition, the prevalence of both acute and chronic malnutrition is high amongst children, and maternal mortality remains high. A large proportion of the disease burden in Ghana as well as poor observed maternal health outcomes, result from diseases and conditions which are easily preventable through consistent practice of simple, health-promoting behaviors. Promotion of these behaviors has become an international public health priority, and social and behavior change communication (SBCC) interventions are increasingly being implemented in countries across the world. However, rigorous evidence on the effectiveness of the SBCC approach and its different modalities is still limited.

In 2012, Ghana Health Services (GHS), with funding from the United Nations Children's Fund (UNICEF), launched a Communication for Development (C4D) program in twelve districts of the four poorest regions of Ghana. The main objective of this program was to encourage families to adopt and consistently practice five health behaviors which are critical for preventing under-five mortality: sleeping under an insecticide-treated mosquito net (ITN), utilization of oral rehydration solution (ORS) for the treatment of diarrhea, hand-washing with soap, exclusive breastfeeding and delivery with a skilled birth attendant.

The C4D intervention package tried to achieve behavioral change through four main activities:

1. Home visits and counseling by Community-Based Agents (CBAs) affiliated with GHS
2. Ghana Community Radio Network (GCRN) community radio broadcasts of focus group discussions and jingles
3. Theatre dramas supported by the Center for National Culture (CNC)
4. Video screening of recorded drama supported by the CNC

Additionally, a mobile messaging intervention (Mobile for development or M4D) was developed to complement the ongoing C4D activities. The M4D program targeted the same behaviors as the C4D program. Rather than relying on home visits, drama or radio programming, the program relied on voice messages directly delivered to female respondents through their cell phones.

The main objective of this evaluation was to determine the impact of the C4D and M4D programs on the practice of the five key behaviors mentioned above. In order to allow for a rigorous evaluation of these programs, the C4D program was randomly rolled out at the community level, while the M4D program was randomized at the individual level. To capture changes in behavior, three survey rounds were conducted: A baseline survey in 2012, a midline survey in 2014 and an endline survey in 2016. Two round of qualitative data collection were also conducted to complement and explain the findings of the quantitative analysis. This report summarizes the main results of this project.

The C4D program, research question and theory of change are introduced in the following section. Section 3 provides some contextual information on the Ghanaian health sector and the regions where the evaluation was conducted. The timeline of the evaluation and intervention implementation activities

[1] Childmortality.org. (2017). *CME Info - Child Mortality Estimates*. [online] Available at: http://www.childmortality.org/ [Accessed 13 Jul. 2017].

is described in section 4. The design of the quantitative and qualitative components of the evaluation, as well as the data collection phases, are presented in the fifth section. Section 6 delves into the details of the C4D and M4D interventions and their implementation. A presentation of the findings is followed by a discussion in sections 7 and 8 respectively. The final section provides the policy implications of the results of the study.

2. Intervention, theory of change and research hypotheses

2.1. The Communication for Development program

C4D is "a two-way process for sharing ideas and knowledge using a range of communication tools and approaches that empower individuals and communities to take actions to improve their lives" (UNICEF [2017].) GHS and UNICEF launched the Communication for Development program in 2012 in twelve districts of the four poorest regions of Ghana: Central, Upper East, Upper West and Northern Region. The program aims at increasing awareness of common health problems in Ghana and inducing positive behavior change to reduce the risk of diseases and death particularly for children under five through advocacy, social mobilization, and Social and Behavior Change Communication (SBCC).

The C4D program seeks to promote the adoption of best practices aimed at reducing preventable deaths among children and easily implementable at the household level. In Ghana, the five target behaviors identified were (i) exclusive breast feeding for the first six months and complementary feeding from six months; (ii) hand washing with soap, most importantly at key times; (iii) sleeping under an ITN; (iv) treating diarrhea using ORS and zinc; and (v) birth delivery by a skilled attendant. This decision was informed by the 2003 Lancet Child Survival Series, which classified these interventions as most likely to reduce child mortality due to preventable diseases (Jones *et al.* [2003].) The relationships between child survival interventions and reduction in mortality due to diarrheal disease, malaria, pneumonia and other acute respiratory infections, as supported by Jones *et al.* (2003), are presented below in Table 1.

The fifth best practice, relating to skill birth attendance, was included because of the low use of skilled attendants[2]. Only 59 percent of births in Ghana are delivered with the assistance of a health professional according to the 2008 Demographic and Health Survey (DHS.) Low use of skilled attendants is a major contributor to maternal mortality in Ghana according to Ghana Maternal Health Survey 2007.

Table 1. Child survival interventions and effect on mortality from the major causes of under-five deaths

	Diarrhea	Pneumonia	Malaria
ITNs			X
ORS	X		
Zinc	X	X	
Hand-washing with soap	X		
Exclusive breastfeeding	X	X	
Complementary feeding	X	X	X

Note: A cross denotes a proven effect of the intervention on mortality due to a major cause of under 5 deaths.
Source: Jones *et al.* (2003).

[2] The GHS Child Health Strategy long-term national goal is for all deliveries to be attended by a skilled birth attendant. A skilled attendant is defined as a health professional, midwife, doctor or nurse, who has been educated and trained to proficiency in the skills needed to manage normal (uncomplicated) pregnancies, childbirth and the immediate postnatal period, and in the identification, management and referral of complications in women and newborns. Obstetricians or adequately trained general doctors provide emergency obstetric neo natal care (EmONC). CHOs who are midwives are classified as skilled attendants. CHOs who are not midwives, can manage deliveries when women are in the second stage of labor or later.

This evaluation focuses on the SBCC component of the C4D program, which is being implemented in 270 communities in the three northern regions of Ghana. SBCC refers to an interactive process to develop and rollout communication strategies aimed at building a supportive environment for the sustained adoption of healthy behavior, through changes in awareness and knowledge of health challenges as well as improved motivation to address these challenges. The target population is composed of women between 18 and 49, who have at least one child under the age of five. A mix of communication channels were used in the framework of the C4D program, including (i) interactive community radio programming, (ii) live drama shows, (iii) night video screenings and (iii) household visits by village-level community based agents. In addition to these four communication channels, a mobile messaging component, Mobile for Development, was developed and implemented by IPA and VOTO mobile. Under M4D, mobile phone messages are sent to mothers of children under five to encourage the five target health behaviors.

2.2. Research question and main outcomes

The study aims to measure the impact of the C4D and M4D interventions on health behavior in the target population within the Upper West, Upper East and Northern regions and to explore the determinants and barriers to changes in these behaviors.

Primarily, the impact evaluation seeks to answer the following research question: what is the impact of mobile messaging, community dramas, radio programs and household visits by community-based agents on four identified stages of changes of health behaviors, namely awareness, access, use and continuous use? Secondary research questions aim to identify the determinants of behavior change, and the benefits of using mobile phones as a development tool for behavior change.

The M4D and C4D programs when carried out appropriately, should lead to the following targeted outcomes:

- *Short-term*
    - Increased knowledge about the causes of each disease
    - Increased knowledge of the benefits of practicing the targeted behavior and the risks of not doing so
    - Increased awareness of the severity and likelihood of each health problem (malaria, diarrhea, acute respiratory infections, underweight/ malnutrition/ stunting, and maternal morbidity and mortality)
    - Stimulation of community-wide discussions
- *Long-term*
    - Increased and sustained practice of key behaviors
    - Modification of community norms and sustained community support for each behavior

This is expected to be accomplished in four stages:

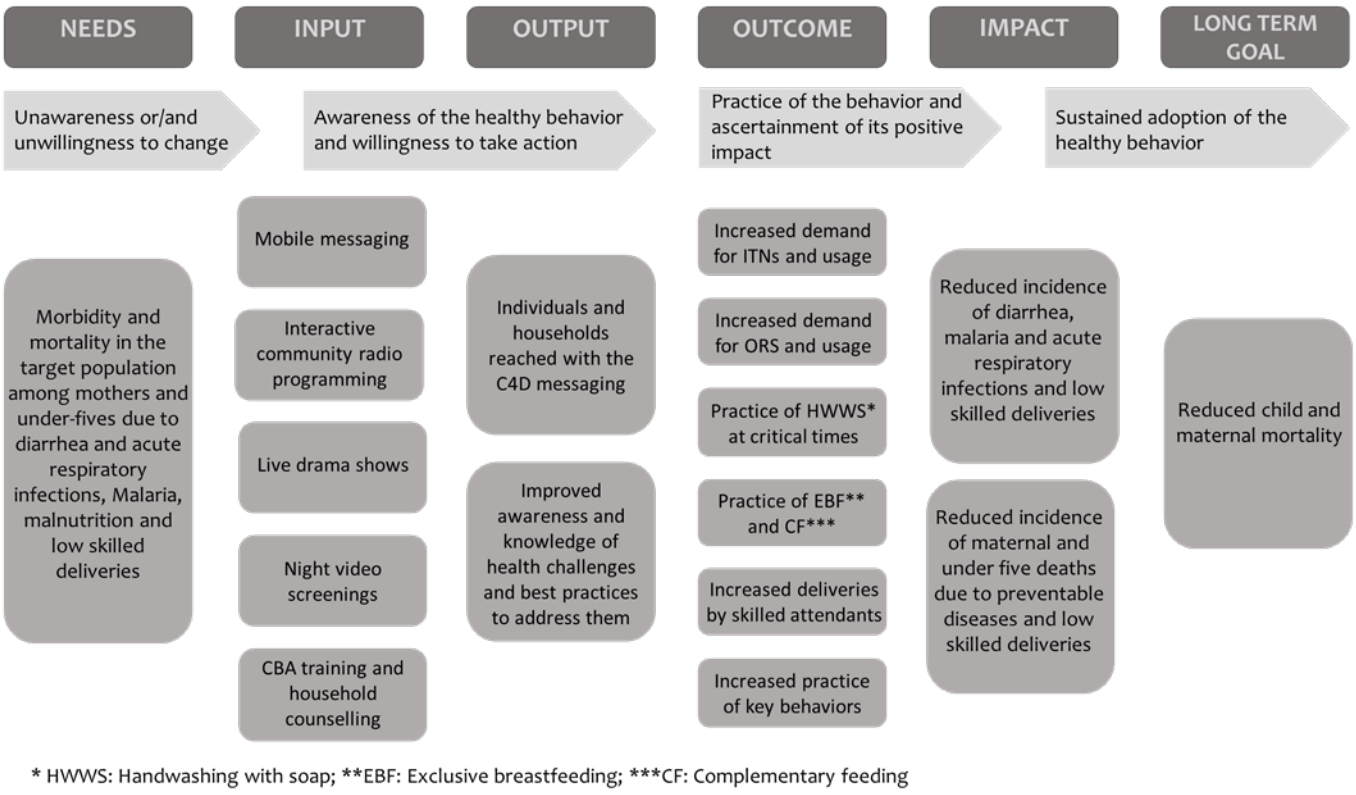
- *Awareness:* Being aware of or having heard all or part of a message, without necessarily having full comprehension of the reasoning for or methods of a particular behavior. Ex: Having heard others say that using a mosquito net is a good idea.
- *Access:* Having a more comprehensive understanding of the reasoning for a behavior and/or the ways in which one may achieve the behavior. Ex: Possessing the knowledge that a mosquito net can protect against malaria by preventing mosquitoes from biting a child.
- *Use:* The actual change in behavior. This may include trying a behavior once, for a short time or inconsistent use of the behavior. Ex: Having one's child sleep under a mosquito net.

- *Continuous Use:* 1) The individual continuation of the new practice. Ex: Having one's child sleep under a mosquito net every night. 2) The promotion of an environment (in the household and community) conducive to the behavior. Ex: Promoting the use of mosquito nets amongst peers.

2.3. Theory of change

The theory of change relies on the assumption that a combination of communication channels, sustained over time, will improve the awareness, access, use, and continuous use of five key behaviors. It borrows from the Stage of Changes identified in the Transtheoretical model of behavior change (Prochaska and Velicer 1997), according to which people are initially unaware to engage in unhealthy behavior or unwilling to change this practice, and progressively build their readiness to change, take action and eventually adopt this practice in a sustainable way.

Figure 1. Theory of change



* HWWS: Handwashing with soap; **EBF: Exclusive breastfeeding; ***CF: Complementary feeding

A first step to initiate sustained adoption of healthy behavior is to ensure that the target population is aware of the health challenges faced in their community and have knowledge of best practices used to address these challenges. The process of raising awareness involves sharing relevant information while fostering conversations to ensure the interactive learning and dissemination of the knowledge and best practices. Developing an interactive and compelling communication strategy, which caters not only to individuals' reason but also to their perceptions and beliefs, is essential to ensure that better understanding of healthy behaviors eventually translates into practice.

To this end, C4D deployed a communication platform relying on interpersonal communication as well as popular and familiar medias which conveyed a straightforward and clear message to the target population. This multi-channel approach is necessary to create the enabling environment to sustain

desired behaviors. Different channels are suited to achieve different goals: communication via mass media is likely to improve awareness of health challenges and best practices among the target population, while interpersonal communication might be better adapted to accompany the decision to take action. In addition, using several channels increases the reach of the program and the frequency of exposition to key messages. A regular and consistent exposition to information and discussions on the target behaviors should inculcate persistent behavior change.

3. Context

3.1. Health sector and health outcomes in Ghana

Ghana has a three-tiered health system: primary, secondary and tertiary. The primary level consists of CBAs, Community Health Compounds-Community-based Health and Planning Services (CHC-CHPS) (although only 35% of the population is covered by this facility) and sub district health teams (SDHTs). The sub-district level, including the health center and the CHPS compound, is responsible for providing clinical, public health and maternity services to the catchment population using a combination of clinic based, regular outreach and mass campaigns in close collaboration with communities, community institutions and village-based health workers. The secondary level, consisting of the district hospitals, serves as the first referral point for the primary level. The tertiary level consists of regional hospitals that serve as the second point of referral. In addition, there are teaching hospitals, which form the apex of specialized care in the country. The private health care system accounts for nearly 50% of all services. In 2008 the National Health Insurance Authority (NHIA) was established under the Ministry of Health (MoH) and the National Health Insurance Scheme (NHIS) was launched. The scheme currently covers approximately 60% of the population and includes antenatal care, delivery and 3-month postnatal care but currently does not include family planning.

Preventable diseases are major public health problems in Ghana. According to the President's Malaria Initiative, malaria accounts for 22 percent of under-five deaths and nine percent of maternal deaths (PMI [2014].) Children make up 900,000 of the suspected cases of malaria that are reported to public health facilities each year, which is approximately a third of all cases. Further, malaria accounts for 61 percent of hospital admissions of children under the age of five and eight percent of admissions of pregnant women. More than 70% of malaria episodes in rural areas, and 50% in urban areas, are treated at home highlighting the opportunity for C4D to make an appreciable difference (MoH/GHS [2009].) Further, the 2008 DHS found that one in five children under the age of five had diarrhea in the two weeks preceding the survey and that 6 percent had displayed symptoms of acute respiratory infection during the same period, this prevalence being higher in the North. Episodes of malaria, pneumonia and diarrhea can occur concurrently and mortality amongst children sick with both pneumonia and diarrhea or malaria is greater than for either illness alone (Black et al, 2003).

Ghana has a high burden of malnutrition amongst children. The 2008 DHS determined that 14% of under-fives are underweight while levels of those stunted, wasted and overweight are 28%, 9% and 4% respectively. Exclusive breast feeding for the first six months and appropriate complementary feeding after six months is the GHS policy. Most babies are breast fed at some point, 98% (GSS [2009a]) and nearly 75% (UNICEF [2006]) of babies are breast fed within one day of birth but only a third of those within the first hour of birth.

MoH and development partners are actively targeting children under five and pregnant women in the distribution of ITN, through voucher schemes, subsidized distribution in health centers or occasional free distribution as part of immunization campaigns. Despite these efforts, only 28 percent of under-five slept under an ITN the night before the survey according to the 2008 DHS (and 41% of them slept under a net, treated or not). Still in the 2008 DHS, 45% of children under five with diarrhea in the past two weeks were treated with ORS.

The maternal mortality rate in Ghana is 560 per 100,000 live births and is highest in the three northern Regions, causes of maternal mortality are predominantly hemorrhage, anemia and infections

respectively. In Ghana 59% of women deliver with the assistance of a health professional.[3] The proportion of skilled birth attendance is lowest in the three northern regions, ranging from 48% to 27%, while this concerns at least more than half of the population in the other regions. Homebirths are generally more common in rural areas.

3.2. Geographical focus of the evaluation

The target geographic regions for the C4D intervention are the Northern, Upper East and Upper West Regions. The program was implemented in 270 communities across 12 districts. The evaluation focused on a random subsample of 216 communities located in nine districts are: Tamale, Tolon/Kumbungu, Savelugu/Nanton in the Northern region, Bolgatanga, Bongo, Builsa in Upper East and Wa, Jirapa, Sissala East in Upper West. The communities were identified using district level lists provided by GHS.

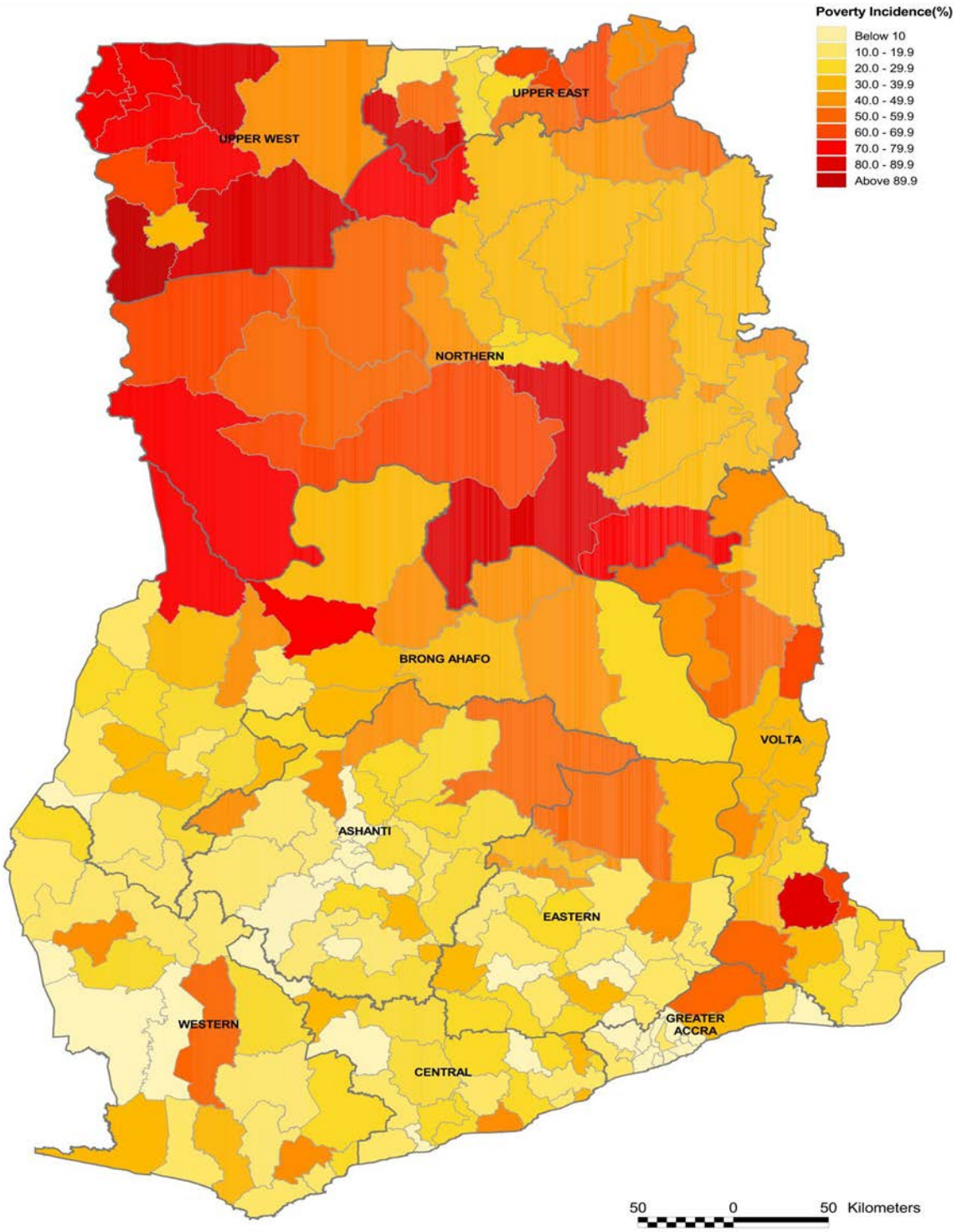
According to the Ghana Statistical Service's (GSS) poverty map in 2015, poverty incidence in terms of poverty headcount and depth of poverty is highly concentrated in these three regions of Ghana. These regions were targeted based on their high rates of poverty, low levels of education, and generally poor health indicators compared to other regions (GHS [2011].) Infectious diseases such as diarrheal disease and malaria are very prevalent, particularly during the rainy season (June-October). As few as one in four births in these regions occurs in a health facility, compared to four in five births in Greater Accra (GSS *et al.* [2009a]).

3.3. Representativeness of the sample

Our sampling methods were designed to allow us to detect an impact from the C4D program. However, the resulting sample cannot be considered representative at the national or regional level. For this study, only 9 districts were selected as described above – from these districts, a random sample of households was then drawn. Since the target regions were chosen for their relatively high rate of poverty and poor maternal and child health outcomes, it is not possible to assume that the impact detected in the context of this study would be applicable to the rest of the country. On one hand, the impact of the intervention might be larger in these regions since there might be more room for improvement due to lower levels of behavior adoption. On the other hand, the characteristics explaining the relatively poorer health outcomes in the studied districts might also affect the enabling environment and prevent substantial changes in attitude and behavior among the target population.

[3] All figures in the paragraph are from the DHS 2008.

Figure 2. Poverty incidence by district



Source: Ghana Statistical Service (2015)

4. Timeline

4.1. Evaluation implementation

Figure 3 summarizes all program activities, starting from the initial selection of communities in 2011 and endline with data cleaning and analysis in 2017.

Figure 3. Timeline of evaluation activities

Activity	2011	2012	2013	2014	2015	2016	2017
Evaluation							
Community Selection							
Census							
Baseline data collection							
Qualitative Round 1 (C4D)							
Midline data collection							
Qualitative Round 2 (M4D)							
Intervention monitoring							
Endline data collection							
Data Cleaning and Analysis							
Final Reports							

All survey activities on the project, including quantitative and qualitative data collection, were completed as of 2017.

Three main quantitative data collection rounds were conducted for baseline, midline and endline in January to March, 2012, July to September 2014 and May to November 2016 respectively. The endline survey was postponed from summer 2015 to summer 2016, this decision being informed by the results from the midline data analysis suggesting that little effects of the program were observed due to the low intensity of implementation of the different interventions. Extending the implementation period was meant to ensure that the program was appropriately implemented.

Two qualitative rounds were conducted over the life of the study. The first one was focused on the C4D interventions and was conducted in February 2013. Its main objective was to assess the role of the socioeconomic, cultural and geographic context in driving the five key behaviors and explore how these factors may affect C4D's behavioral impact. In addition, a qualitative study was carried out in some selected M4D sample communities in March 2015 to better understand both the administrative and quantitative data collected after implementation of the first phase. The third round of qualitative data collection was replaced by an in-depth monitoring of the program implementation led by IPA, between May and July 2016, as the midline results revealed the need to collect up-to-date data on all the implementation activities in the evaluation districts. This monitoring round included the collection of existing data on the intervention activities implemented by the partners and a survey of key informants in all evaluation communities.

Data cleaning and analysis were performed during the first and second quarter of 2017.

4.2. Intervention implementation

Figure 4. Implementation Timeline

Activity	2011	2012	2013	2014	2015	2016	2017
Intervention Implementation							
C4D interventions							
M4D design							
M4D pilot							
M4D round 1							
M4D round 2							

IPA was not involved in the implementation and monitoring of the C4D program, which were the responsibility of GHS, the Center for National Culture, the Ghana Community Radio Network and UNICEF, and therefore cannot provide detailed information on the implementation schedule. The different interventions were implemented in phases from 2012 to 2016.

A M4D Content Development Workshop was conducted in December to introduce GHS and UNICEF to the mobile platform and begin developing content for the messaging program. M4D's message development and pretesting were completed between January and March 2014. The first phase of M4D implementation was carried out between February and September 2014 in all 216 communities in the C4D evaluation sample. Message development and pretesting of the second phase of the M4D intervention was carried out between April and June 2015. Messages were developed based on the findings from the qualitative study, and were translated and recorded in the five local languages spoken amongst the sample population. Implementation of the second phase of M4D was initially planned for 2015, but due to the extension of the endline survey to summer 2016, the implementation was rescheduled to happen from January to November 2016.

5. Evaluation: Design, methods and implementation

5.1. Design overview

The mixed-methods evaluation of the C4D and M4D programs assesses the impact of the program, including the individual intervention components, the operations of the program, and the effect on communities' attitudes and practices. The quantitative component is a randomized controlled trial (RCT). The qualitative component complements and strengthens the quantitative component by helping to explain quantitative findings based on the local context. It also seeks to document and describe the ways in which implementation processes may produce program impact.

IPA uses RCTs to determine which types of interventions are effective, and to what extent they are effective. RCTs determine the true impact of an intervention by comparing the outcome of the intervention to what would have happened without it. Using randomization to select treatment and control groups ensures that the groups are identical at the outset. Individuals in these groups are likely to live through similar external events throughout the same period of time, and thus experience similar events that determine their health behaviors.

A total of 216 communities from 9 districts were selected for this study. For the C4D program, 50% of communities were selected as controls; the remaining 50% received different combinations of C4D program activities. The M4D program was restricted to households with a working cell phone at baseline. Randomization for the M4D program was done at the individual level among the C4D treatment and control groups.

5.2. Ethical considerations

Ethical review and approval was provided by IPA's Institutional Review Board (IRB) throughout the duration of the evaluation, guaranteeing that the research protocols developed in the framework of this study respect ethical principles and guidelines for the protection of participating human subjects.

The anticipated risk associated with participation in this study was minimal and sensitive questions were not included in the instruments. Informed consent was formally requested at the beginning of each interview to ensure that all respondents were willing to participate in the study and were informed of the risks incurred in doing so (see below example of the text read by surveyors to the household survey respondents at endline to seek their informed consent to participate in the study).

Figure 5. Participation consent text included in the endline household survey

PARTICIPATION CONSENT. My name is [surveyor name] and I work at Innovations for Poverty Action. Almost two years ago we invited you to participate in a research study to help us learn about health issues in your community, and about the well-being of families in the districts across Northern Ghana. At that time we mentioned that we would try to contact you again to follow-up. We would like to invite you to participate in this follow-up. Your participation in this research is completely voluntary.

Although this study may not benefit you personally, we hope that the results of this research will help develop policies that improve the economic conditions in this region. If you agree to participate in this research study we will ask you questions about your household, education, health, economic activities and household expenditures. We may also ask you to play a simple game, or to look at some items in your household.

If you agree to participate, your answers will be written on this computer. You may refuse to answer any of the questions we ask and you may stop me at any time to ask questions or to end the interview completely. Your participation in this study will be confidential and the answers you provide will be stored securely in the offices

of Innovations for Poverty Action. If you have any other problems or questions, do not hesitate to contact the liaison officer in your community for IPAs contact information:

Innovations for Poverty Action (IPA)

P.O. Box 1272

Research Associate: XXX

Telephone Number: XXX

Do you have any questions about the research or anything I have just said?

SURVEYOR: GIVE THE RESPONDENT TIME TO ASK QUESTIONS

These questions will take approximately one hour, and no more than two. We will also try to contact you again to ask more questions approximately one year and two years from now. Your name and any other identifying information will be accessible only to the researchers and will never appear in any sort of report that might be published.

If you think I have addressed all your questions about this study, please tell me, do you

agree to participate?

Confidentiality of data and of participants is of the highest priority to the study team, while in the field and in the offices. Every effort was made to ensure confidentiality by holding surveys in private settings and the study team members took great care in protecting data in both transport and storage. All digital data including personally identifiable information is encrypted and only accessible to team members approved by the IPA IRB. As per IPA IRB requirement, all the members of the evaluation team completed a recognized Human Subject training (either the National Institute of Health's Protecting Human Research Participants or the Collaborative Institutional Training Initiative's Certification in Human Protections.)

5.3. Quantitative component: Sampling and treatment arms

5.3.1. C4D intervention: community level randomization

For the C4D evaluation, 216 communities were randomly selected from a comprehensive list of communities within each district provided by GHS. Of them, 108 (50%) were randomly selected as control areas and 108 (50%) as treatment areas. In order to be able to identify the most effective interventions, the 108 communities selected for treatment received various combinations of behavior change interventions. All treated communities received CBA training and either live drama/theater (50%) or video screenings (50%). In addition, 50% of communities also received interactive community radio programming. This design was used to measure the additional effect of local radio programming on individuals' health knowledge and behaviors compared to community dramas and household visits by CBAs alone. Randomization was done in Stata by the Principal Investigators. Communities in the control group were not actively made aware of the C4D interventions conducted in the treatment communities.

Table 2. Treatment arms for C4D activities

Groups	Number of communities	Interactive community radio programming	Live dramas	Video screenings	CBA provided with training and resources
Treatment 1	27		X		X
Treatment 2	27			X	X
Treatment 3	27	X	X		X
Treatment 4	27	X		X	X
Control	108				

5.3.2. C4D intervention: household and individual level selection

Following the community selection, a household census was conducted by IPA. From each of the 216 communities, a random sample of, on average, 20 households with at least one child under the age of five were enrolled at baseline in 2012, and followed up through a midline survey in 2014 and an endline survey in 2016.

5.3.3. M4D intervention

The sampling frame for the M4D intervention was households interviewed at baseline with access to a functioning cell phone. Randomization was done at the household level, regardless of the C4D treatment or control status: households were randomized with equal probability to control (1/3), single voice messaging (1/3) and multiple voice messaging (1/3). The randomization code was programmed using a statistical analysis software and performed by the Principal Investigators and IPA. It was not performed publicly and the respondents from the control group were not actively made aware of the M4D intervention.

5.4. Quantitative component: Data collection and attrition

Three rounds of quantitative data collection were conducted under the study: the baseline from January to March 2012, the midline from July to September 2014 and the endline from July to November 2016 (with some mop-up conducted in March 2017). In total, 4269 respondents were interviewed at baseline, 3,434 at midline and 3,396 at endline, implying an overall follow rate of 80% over the four-year study period. The primary reasons for loss to follow-up were permanent and temporary relocation of respondents. No differences in attrition across treatment arms were found.

5.4.1. Survey instruments

For the baseline survey, four instruments were utilized: (i) the baseline household survey, (ii) the baseline principal respondent survey, (iii) the baseline children health measurement survey and (iv) the baseline community survey. At midline, the household survey and the principal respondents survey were merged in a two-part survey and no child measurements or community data were collected. At endline, the household survey, the principal respondent survey as well as child health measurements and a Caregiver Reported Early Childhood Development Index (CREDI) survey were conducted. In addition, the list randomization instrument – a game-like data collection methodology used for gathering information about sensitive behaviors – was introduced at midline. These instruments are described in detail in Appendix C.

5.4.2. Field work

For each survey, IPA hired and trained approximately 80 field staff to carry out the data collection. IPA has extensive experience in training, hiring and managing field officers for quantitative and qualitative data collection and relies on a network of skilled surveyors to conduct its survey activities. During training, instruments were presented to familiarize surveyors with the questions and ensure they develop a technical understanding of the questionnaire, through discussions, role play and practice (this latter point was especially relevant for the child health measurement instruments) facilitated by the trainers. The training was also the opportunity to review data quality guidelines, research ethics concepts and field protocols. Selection of the surveyors was based on the results of quizzes conducted during training and trainers' observations recorded in a pre-designed performance assessment framework.

Surveyors worked in 9 different field teams, each with a Team Leader, an Editor and an Auditor. In addition, one Field Supervisor was hired in every region. Their role was to manage the multiple field teams, but also support the project staff, Survey Coordinators and GHS staff with monitoring of the data collection. Paper interviews were used during the baseline survey with editors hired specifically to ensure that all errors were identified and corrected. For the midline survey, the team moved to computer assisted interviews using netbooks and Blaise software. At endline, data collection was performed using tablets and SurveyCTO. Respondents received soap as a gift for their participation in the survey and children whose measurements were taken at endline received biscuits.

Several strategies were implemented to ensure the highest data quality during field work. Survey accompaniments, where an assessor from the country office evaluation team or the field supervision team sits with the surveyor and observes them conducting a survey, were frequently conducted at the initial stage of the data collection to ensure that the questionnaire was appropriately understood and administered by the surveyors. Accompaniments were followed by immediate feedback and, if needed, in-field refresher trainings. As per IPA guidelines, 15% of all surveys were audited and results from the discrepancy checks were satisfactory. High frequency and data scrutiny checks were conducted regularly to identify and correct any mistakes in the data submitted by the field teams, potentially leading to follow-up visits to respondents to clarify specific answers. Random spot checks, when supervisors unexpectedly visit a community and observe the team operating, were regularly conducted during the survey period. Data cleaning and analysis were done using the STATA program.

5.4.3 Overview of study attrition

Out of a total of 4269 C4D households, 3,396 households (79.55 percent) were followed up at endline.

The following Stata output confirms that attrition rates were not different across study arms:

```
. reg endline_avail live video comradio, cluster( hh_comm_id)

Linear regression                               Number of obs     =      4,269
                                                F(3, 215)         =       0.49
                                                Prob > F          =     0.6913
                                                R-squared         =     0.0007
                                                Root MSE          =     .40339

                                   (Std. Err. adjusted for 216 clusters in hh_comm_id)
------------------------------------------------------------------------------
             |               Robust
endline_av~e |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        live |   .0205836   .0230983     0.89   0.374    -.0249446    .0661118
       video |  -.0002007   .0241024    -0.01   0.993     -.047708    .0473065
    comradio |   .0069972   .0235694     0.30   0.767    -.0394595    .0534539
       _cons |   .7886863   .0127777    61.72   0.000     .7635007    .8138719
------------------------------------------------------------------------------
```

M4D interventions were restricted to women with cell phones. Out of 2380 women surveyed at baseline, 1,972 (82.86 percent) were followed up. Once again, there were no statistically meaningful differences across study arms:

```
. reg endline_available i.m4d, cluster( hh_comm_id)

Linear regression                               Number of obs     =      2,380
                                                F(2, 213)         =       0.12
                                                Prob > F          =     0.8896
                                                R-squared         =     0.0001
                                                Root MSE          =     .3771

                                   (Std. Err. adjusted for 214 clusters in hh_comm_id)
------------------------------------------------------------------------------
             |               Robust
endline_availa~e |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----------------+----------------------------------------------------------------
      m4d_treatment |
Different Voice  |  -.0066887   .0195777    -0.34   0.733    -.0452795    .0319022
   Single Voice  |  -.0088193   .0187913    -0.47   0.639    -.0458601    .0282215
                 |
           _cons |   .8337563   .0148999    55.96   0.000     .8043861    .8631266
------------------------------------------------------------------------------
```

5.5. Qualitative component for C4D: Sampling

The qualitative evaluation of the C4D program has two research objectives. The primary research objective is focused on social norms and local context, while the secondary research objective examines program implementation. Two types of individuals were targeted for the qualitative study: 1) mothers, fathers, and grandmothers of children under the age of five residing in the communities selected for the evaluation; and 2) health workers serving those same regions, that is CBAs, Traditional Birth Attendants

(TBAs), Community Health Officers (CHOs) and midwives. Inclusion criteria for both groups were being 18 years or older, able to provide informed consent, and living in and/or serving the target community. Health workers also had to be currently working as a CBA, TBA, CHO or midwife for inclusion.

5.5.1. District and community sampling

Selection of districts within the three C4D target regions was done using "extreme case sampling," a type of purposive sampling where cases near the ends of the distribution are targeted in order to learn more about what is causing successes or failures on a topic of interest. We selected the districts in each region based on areas with poorest results on the quantitative baseline survey for each behavior. We chose to focus on the worst performing districts because we wanted to target the districts with the greatest proportions of people who have not adopted the behaviors of interest, and thus have the most room for improvement.

Communities within each district were selected from the list of communities where GHS, GCRN and CNC have been implementing C4D activities. Eligibility criteria were a population of 200 to 1000 people and presence of a CBA who received C4D training. In order to select communities from among those eligible, for each selected district, we assigned adjectival ratings ("ok," "better," or "best") to communities based on how many and which types of C4D intervention activities they had received. Study communities were then randomly selected from among those with the highest adjectival rankings in each district.

5.5.2. Focus Group Discussion participants and positive deviants' selection

Within each community, local health workers, CBAs or CHOs, were asked to help identify mothers, fathers, and grandmothers of children under the age of five meeting the eligibility criteria. Eligibility criteria were: male/female (as appropriate); having a child or grandchild under the age of five; and not a health worker or member of the chief's family. Within those criteria, we asked the leaders to attempt to bring together a variety of informants in terms of age, socio-economic status, religion, etc. Ethnic groups were extremely homogenous in our study communities. FGDs ranged in size from eight to ten participants.

A separate set of selection criteria was used for individuals named as potential positive deviants[4] by local health workers and FGD participants. In order to identify positive deviants for the behaviors of interest, focus groups (mothers, fathers, and grandmothers) and local health workers (CBAs, TBAs, CHNs) were asked to identify three women who are known in their communities as having adopted each of the five behaviors. For triangulation purposes, we compared the lists independently provided by the different groups, and identified individuals who appeared on more than one list. Those individuals were then visited in their homes to confirm their positive deviant status.

5.5.3. Selection of health workers

Selection of health workers for in-depth interviews was based on individuals' abilities to provide expert knowledge on the topics and communities of interest. More specifically, we sought out health workers who were actively serving our target communities on topics relating to our behaviors of interest. We

[4] Positive deviance is defined as "the observation that in most settings a few at risk individuals follow uncommon, beneficial practices and consequently experience better outcomes than their neighbors who share similar risks" (Marsch [2008].)

included both community- and facility-based health workers to benefit from their different perspectives and experiences. In addition, since C4D target behaviors four and five relate to reproductive health, we included health workers who specialize in pregnancy, labor and delivery. These individuals were identified through consultation with community leaders and other health workers.

5.6. Qualitative component for C4D: Data Collection

Data collection was conducted in September 2013 and consisted of 18 community FGDs (6 with mothers, 6 with fathers, and 6 with grandmothers), 45 interviews (21 with health workers and 14 with positive deviants) as well as 19 key informant interviews at the district, regional, and national levels.

5.6.1. Data collection instruments

Three main activities were conducted: (i) community focus group discussions, (ii) health workers interviews and (iii) positive deviant interviews. Field guides were developed to facilitated these three activities and are presented in Appendix C. In addition, basic demographic information was collected during the visits through a very short survey using demographic sheets (see Appendix C.)

5.6.2. Data collection activities

FGDs were chosen as a data collection method because group interaction offers a different and valuable perspective on social norms and community perceptions of health problems and practices. The group interaction also facilitated discussion and encouraged participants to think of the topics in new ways.

Interviews were conducted with both community and facility-based health workers serving each of the selected communities (CBAs, TBAs, CHOs, midwives). In-depth interviewing techniques allowed us to learn from the health workers' extensive experience and rich knowledge of beliefs and practices associated with key behaviors in our target communities. Since CBAs and CHOs work on a wide spectrum of community health topics, they were asked about all five of the target behaviors. Given their specialty area, TBAs and midwives were only asked about target behaviors four and five (EBF and skilled delivery).

Interviews were conducted with mothers of children under the age of five who were identified by their communities as "positive deviants" for one of the behaviors of interest. Positive deviance is defined as "the observation that in most settings a few at risk individuals follow uncommon, beneficial practices and consequently experience better outcomes than their neighbors who share similar risks." In-depth interviewing techniques were used to carry out "positive deviant inquiry," which aimed to explore what makes these individuals different, and how and why they have been able to practice the behaviors of interest and improve our understanding of the context-specific barriers and facilitators to the target behaviors. One positive deviant per behavior was identified and interviewed in each region.

5.6.3. Field work

Like the quantitative data collection, we hired, trained and managed field staff conducting the fieldwork. In total, 3 Field Supervisors, 4 Interviewers and 3 Transcriptionists were selected to conduct the field work from September to October 2013. Data quality insurance protocols were observed, including accompaniments (50% of the interviews and the FDGs were conducted or observed by the Field

Manager) and audits of the transcriptions and translations of the audio files were performed on randomly selected five-minute segments for all audio recordings.

5.7. Qualitative component for M4D

A qualitative study was carried out in some selected M4D sample communities in March 2015 to better understand both the administrative and quantitative data collected after implementation of the first phase.

The main research questions were: (i) What are the reasons why some respondents do not answer the calls and/or listen to the entire message? (ii) What changes can be made to increase the rate of people picking up the phone? In addition, secondary questions were explored during the study, on whether the content of the messages sent were appropriate and informative, and what time(s) of day are respondents easily able to answer and listen to the messages.

In total, the qualitative study included 13 FDGs and 39 one-on-one interviews. All respondents in the community who received messages were part of the FDGs, and three respondents were selected for the one-on-one interviews, per the following criteria: (i) the highest receiver of messages, (ii) the least receiver of messages and (iii) the most active participant in the focus group discussion, which was not (i) or (ii).

6. Program: Design, methods and implementation

6.1. Intervention design

6.1.1. Core C4D interventions

The interventions under the C4D program were designed by GHS, Center for National Culture (CNC) and Ghana Community Radio Network (GCRN) with technical assistance provided by UNICEF. These three agencies were responsible for implementing the intervention while UNICEF oversaw external monitoring. More information on each of the four interventions is provided in this section.

GHS is responsible for the implementation of national health policies and it is mandated to provide and prudently manage comprehensive and accessible health service with special emphasis on primary health care at regional, district and sub-district levels in accordance with approved national policies. The main objectives of the service are to 1) Implement approved national policies for health delivery in the country; 2) Increase access to good quality health services; and 3) Manage prudently resources available for the provision of the health services.

CNC is responsible for the implementation of the drama component of the C4D interventions. One of the main functions of CNC is to execute public education and information.

GCRN implements the interactive radio component of the C4D interventions. GCRN is an association of community radio stations in Ghana broadcasting in local languages. GCRN innovates through participatory approaches to enable local knowledge combined with the power of radio to build strong and engaged communities.

Below the four C4D interventions tested in this evaluation are described in more detail.

Community-based Agents training and household visits: In all the communities included in the evaluation, community volunteers were identified in each community and tasked to carry out regular house-to-house visits in their respective communities to educate households about the practice of the five key health behaviors. However, volunteers in treatment communities received additional trainings and resources on the behaviors and how to interact with community members during their visits at least twice every year. CBAs were also expected to be able to cover at least 15 households every month to hold dialogues about the five key behaviors. During the second phase of implementation, apart from the work of the traditional GHS volunteers, volunteers for the Red Cross Society and Christian Council also carried out similar household and community education on the C4D behaviors.

The Live Dramas intervention: Scripts were developed around the key health behaviors and local actors were recruited to dramatize the scripts in selected C4D treatment communities. Community members gather mostly at community centers, the chief's palace or school yards to watch the plays.

The Community Radio intervention: This intervention involved local radio teams visiting selected communities to organize focus group discussions with different groups of people – fathers, mothers, grandmothers, grandfathers, children etc. At the group level, discussions on the five key health behaviors were held where good practices and barriers inhibiting the practice of the behaviors were listed and later presented to the entire community. These discussions were recorded and later played on air. The discussions usually took 5 to 7 hours.

The Night Video Screenings: Recorded videos of the live dramas were made by CNC and given to Ghana Health Service to show in treatment communities in the C4D sample. The night screenings were

usually projected in communities at night and community members were invited to come and watch. In the Northern Region, this intervention was implemented by Country Wise during the final phase.

6.1.2. M4D intervention

The M4D intervention was designed by VOTO Mobile and IPA and implemented by VOTO mobile, with monitoring provided by IPA. VOTO Mobile is a Ghana-registered organization with staff in Ghana, Canada, and the United States. Its mission is to strengthen communication and feedback loops between local governments, non-governmental organizations, health providers, and the citizens they serve.

Health messages were recorded in five local languages (Buli, Dagbani, Dagaare, Gruni and Sissali) by three different female voices per language. The voice message was delivered as a normal phone call, but contains a prerecorded message that starts playing once the participant picks up the phone call. Fifteen unique messages were recorded to cover the five target behaviors; each message was repeated three or four times during the program. Messages contained a mix of informational messages (e.g. “ORS can help your child to recover faster”), normative messages (such as “Please always make sure your child sleeps under a net”) as well as illustrative (and potentially fear-inducing) short narratives (e.g. “My neighbor never used nets; last year one of her girls got sick and then died of malaria. Please always use nets”).

During the first phase, from February to September 2014, the treated individuals received 2 messages a week throughout the 6-months implementation period. Half of the treatment group received messages from three difference voices and the other half received messages from one same voice.

At the second phase, spanning from January 2016 to November 2016, messages were sent once every week on Saturdays for 45 weeks. Unlike the Phase I of the project where participants would only hear the messages for the particular week, the second Phase of was modified to include auxiliary messages which teach the participant how to repeat a message, how to trigger a second call to listen to the week’s message and a phone number to dial if participants require to speak to VOTO Mobile project management to seek further clarification on the content or about the project. Thus a complete call includes the core message plus auxiliary messages to help subscribers navigate the system.

6.2. Implementation and monitoring

6.2.1. Core C4D interventions

IPA was solely responsible for the data collection and analysis and was not involved in regular intervention monitoring throughout the implementation period. We conducted a limited number of monitoring visits to ensure that randomization was respected (only treatment communities receive the interventions), the focus of the implementation was still on the five key behaviors and that implementation processes adopted is similar across all 9 districts.

6.2.2. M4D intervention

Given that the M4D intervention was delivered through an automated electronic system, detailed implementation data were collected as part of the program. Specifically, the M4D system recorded the start and end time of each call made, message content of each call (message number, voice ID) and duration of the call. The M4D system also documented failed calls, and the number of call-backs made by recipients. Recipients were allowed to call back to listen to the messages as often as they liked –

the system recorded the total number of calls attempted as well as the total number of calls completed by each household; households were identified through their primary contact phone number within the system.

7. Impact analysis and results of the key evaluation questions

7.1. Quantitative analysis

Table 3 summarizes household behaviors at baseline for the C4D and M4D treatment and control groups. Despite moderate ownership of ITNs, utilization was remarkably low, with only about 20% of mothers and children reporting sleeping under a bed net the night before the interview. Skilled birth attendance was 58% on average, and only around 32% of households had soap at their usual washing place. In terms of the targeted behaviors, baseline levels were highest for the utilization of ORS (90%) and exclusive breastfeeding in the first six month (79%). The baseline sample was balanced across all outcomes, with p-values > 0.10 for a mean difference test for all outcomes at baseline.

Table 3. Household behaviors at baseline (2012)

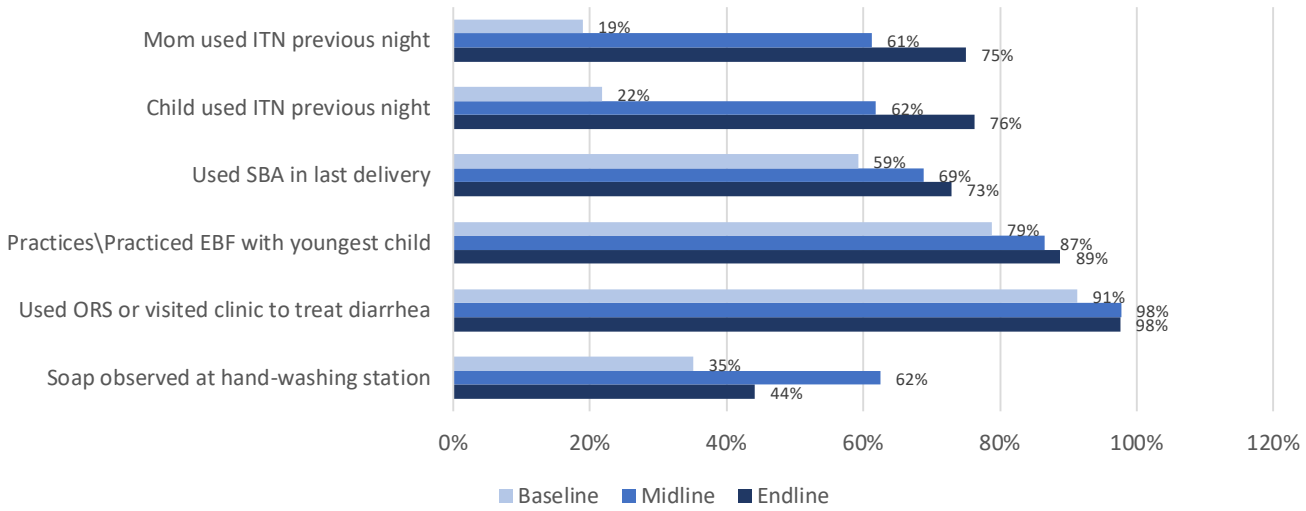
	C4D Sample				M4D Sample			
	N= 2139		*N = 2130*		*N= 788*		*N= 1592*	
	Control		**Treatment**		**Control**		**Treatment**	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Number of ITNs owned	1.68	2.52	1.37	1.95	1.42	1.99	1.55	2.28
Mom used ITN previous night	0.21	0.41	0.21	0.40	0.20	0.40	0.21	0.41
Child used ITN previous night	0.22	0.42	0.22	0.41	0.22	0.41	0.22	0.42
Delivered last child at health facility	0.53	0.50	0.53	0.50	0.54	0.5	0.54	0.50
Used SBA in last delivery	0.57	0.49	0.56	0.50	0.58	0.49	0.59	0.49
Used TBA in last delivery	0.33	0.47	0.32	0.47	0.31	0.46	0.32	0.47
Practices/Practiced EBF with youngest child	0.78	0.41	0.78	0.41	0.79	0.41	0.79	0.41
Has ORS at home	0.11	0.32	0.11	0.32	0.12	0.33	0.12	0.32
Treated diarrhea with ORS and/or by going to clinic	0.90	0.29	0.90	0.30	0.92	0.27	0.90	0.30
Soap observed at hand-washing station	0.31	0.46	0.31	0.46	0.33	0.47	0.32	0.47
Used soap last time washed hands before eating	0.57	0.49	0.57	0.49	0.58	0.49	0.60	0.49

Note: All numbers reflect behaviors reported or observed during the baseline survey conducted in 2012.

As documented in Ghana's 2014 Demographic and Health Survey, Ghana has made major progress in both health behaviors and health outcomes in recent years. These positive trends are strongly confirmed by all data collected as part of this project. This is illustrated in Figure 5, which shows the main health behavior over time in the control group. Substantial increases were observed for exclusive breastfeeding (EBF), which increased from 79 to 89%, ORS treatment which increased from 91% to 98%, skilled birth attendance (SBA) which increased from 59 to 73% and for the presence of soap at the washing station, which increased from 35 to 44%. The largest improvements were observed for ITN utilization, which increased from baseline levels of around 20% to 75% in mothers and 76% in children. Given that the timing of the midline and endline surveys largely coincided with the rainy season, the

positive trends in bed net utilization may at least partially be driven by increased malaria risk during the later survey rounds.

Figure 5. Adoption of health behaviors over time, control group



Note: Rates presented are based on baseline (2012), midline (2014) and endline (2016) data for household receiving neither a C4D nor a M4D treatment.

In terms of the potential additional improvements created by the intervention packages, further improvements were clearly possible ex ante for all outcomes.

7.1.1. Main impact results

Results Table 1 shows the main impact of the C4D intervention packages. In the top panel, we show preliminary impacts as observed in the midline survey in 2014; in the bottom panel of the table, we show final impact results as observed in the endline survey in 2016.

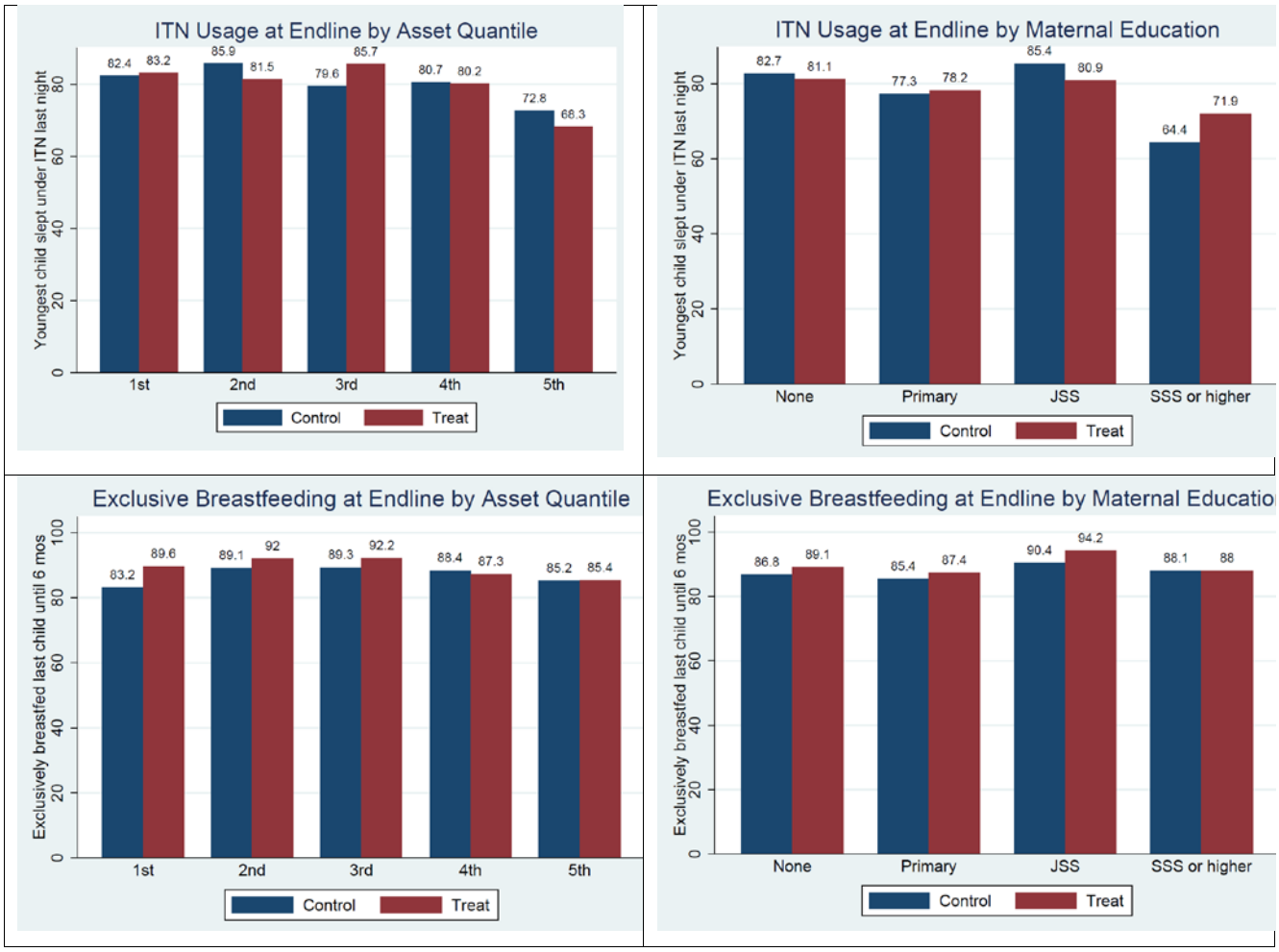
Results Table 1. Impact of the C4D Program

Outcome	Mother slept under ITN last night	Child slept under ITN last night	Last birth attended by skilled staff	Last child exclusively breastfed for six months	Last diarrhea treated with ORS or brought to clinic	Soap observed at washing station
Midline Impact						
C4D treatment	-0.042	-0.023	-0.001	0.032*	0.011	0.016
	(0.037)	(0.035)	(0.040)	(0.017)	(0.011)	(0.041)
Video instead of theater	0.030	0.006	-0.008	-0.030*	-0.004	-0.007
	(0.036)	(0.034)	(0.038)	(0.018)	(0.013)	(0.041)
Live radio events	-0.007	-0.002	0.033	-0.001	-0.009	0.015
	(0.036)	(0.034)	(0.038)	(0.018)	(0.013)	(0.040)
N	3,403	3,397	3,353	3,249	2,954	1,698
R-squared	0.018	0.019	0.259	0.054	0.011	0.011
Endline Impact						
C4D treatment	-0.023	-0.018	0.029	0.029	0.004	0.024
	(0.030)	(0.028)	(0.032)	(0.020)	(0.010)	(0.062)
Video instead of theater	0.023	0.022	0.001	-0.018	0.003	-0.041
	(0.032)	(0.031)	(0.031)	(0.020)	(0.009)	(0.063)
Live radio events	0.009	0.007	0.013	0.002	0.001	-0.006
	(0.032)	(0.031)	(0.031)	(0.020)	(0.009)	(0.063)
N	3,383	3,368	3,331	2,325	1,997	831
R-squared	0.008	0.007	0.166	0.032	0.000	0.003

Notes: 1.Results presented were obtained running a regression of the outcome on treatment, sub-treatments, and baseline value of the outcome variable. 2. Standard errors are clustered at the community level.
Significance levels:* 10 percent, ** 5 percent, *** 1 percent.

Overall, impact was very limited. Out of the six core outcome measures analyzed, marginally significant effects for the C4D treatment were only found at midline for breastfeeding in communities that got live theater. These effects were however rather small, and no longer significant at endline. Figure 6 shows behavioral differences by maternal education as well as household wealth for ITN utilization and breastfeeding – treatment impact was very modest across the spectrum. Interestingly, general compliance with recommended behavior seems lower in the top wealth and education groups, with particularly large gaps in the utilization of bed nets.

Figure 6: C4D impact by maternal education and household asset quintile



Results Table 2 shows the overall impact of the M4D messaging treatments. While no impacts were found on ORS treatment and skilled delivery, moderately-sized positive impacts were observed at endline for the utilization of ITNs by both mothers and children as well as the presence of soap.

Results Table 1. Impact of M4D treatment

Outcome	Mother slept under ITN last night	Child slept under ITN last night	Last birth attended by skilled staff	Last child exclusively breastfed for six months	Last diarrhea treated with ORS or brought to clinic	Soap observed at washing station
Midline Impact						
M4D treatment	0.043*	0.062***	-0.030*	-0.004	-0.002	0.049
	(0.023)	(0.021)	(0.017)	(0.014)	(0.009)	(0.031)
N	1,987	1,984	1,951	1,904	1,150	997
R-squared	0.023	0.026	0.264	0.056	0.004	0.015
Endline Impact						
M4D treatment	0.048***	0.048***	0.009	0.002	-0.002	0.112**
	(0.018)	(0.018)	(0.019)	(0.019)	(0.009)	(0.048)
N	1,965	1,959	1,930	1,405	1,150	483
R-squared	0.009	0.008	0.166	0.030	0.004	0.024

Notes: 1. Results presented were obtained running a regression of the outcome on treatment, sub-treatments, and baseline value of the outcome variable. 2. Standard errors are clustered at the community level.
Significance levels: * 10 percent, ** 5 percent, *** 1 percent.

In Results Table 3, we show disaggregated results by message treatment. As mentioned above, 50% of treated subjects received all messages from the same voice (three different voices were used), while the remaining 50% of treated households received messages from different speakers. Overall, the impact of the two messaging programs looks very similar. We find slightly larger effects for the multiple voice treatment and the presence of soap at endline – the estimated difference in impacts are significant at the 10% level (p-value= 0.086).

Results Table 2. Impact of M4D treatment by study arm

Outcome	Mother slept under ITN last night	Child slept under ITN last night	Last birth attended by skilled staff	Last child exclusively breastfed for six months	Last diarrhea treated with ORS or brought to clinic	Soap observed at washing station
Endline Impact						
Single source message	0.055***	0.046**	-0.008	0.010	-0.008	0.062
	(0.019)	(0.018)	(0.023)	(0.021)	(0.011)	(0.055)
Multiple source message	0.042*	0.050**	0.027	-0.006	0.005	0.153***
	(0.022)	(0.022)	(0.021)	(0.022)	(0.010)	(0.054)
N	1,965	1,959	1,930	1,405	1,150	483
R-squared	0.010	0.008	0.167	0.031	0.005	0.029

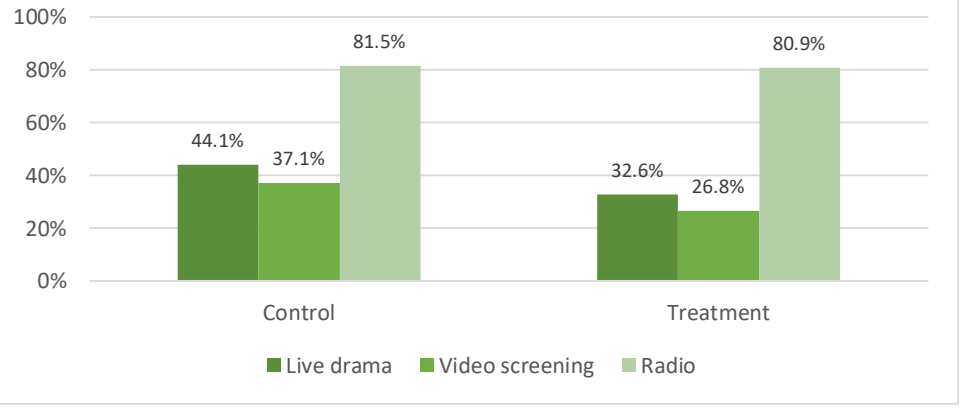
Notes: 1. Results presented were obtained running a regression of the outcome on treatment, sub-treatments, and baseline value of the outcome variable. 2. Standard errors are clustered at the community level.
Significance levels: * 10 percent, ** 5 percent, *** 1 percent.

7.1.2. C4D Targeting

One of the key challenges with interventions targeting key health behaviors is the likely presence of other organizations trying to achieve similar behavior change, as well as the general difficulty to avoid spillovers at the local level. As Figure 7 illustrates, targeting was clearly a challenge for the C4D project. At endline, 44.1% of respondents in treatment communities indicated to have heard health information through live drama – this number seems plausible given that attendance of these drama events is optional, and thus definitely not universal. The main challenge for the evaluation is that 32.6% of individuals in the control group also indicate to have received information through live theater. While respondents did not indicate where they saw such live dramas, it is clearly possible that they attended dramas in treated areas; it is also quite likely that other organizations organized dramas in their own communities. The same patterns emerge for video screenings and radio shows, with the difference in exposure in the latter being less than 1 percentage point and not statistically significant.

The limited exposure to the intervention in treated areas as well as the rather pronounced exposure to intervention in the control areas greatly reduces the anticipated differentials between treatment and control, and thus also the ex-post likelihood to find statistically meaningful differences between C4D treatment and control groups.

Figure 7. Intervention exposure in treatment and control groups



Source: Endline household survey (2016)

The lack of targeting become obvious after the midline survey in 2014. To be able to give more detailed feedback to implementers, an additional intervention monitoring survey was conducted in 2016. All 216 C4D study communities in the Northern, Upper East and Upper West regions were visited. In each community, at least one community-based agent (CBAs), a senior community member (senior female) leader and five randomly selected C4D-evaluation respondents were interviewed on recent program efforts.

Table 4 shows reported live drama shows. In practice, neither female leaders nor CBAs were able to identify the organizer of such dramas. Overall, such dramas were rather common in both treatment and control groups, even though the reported frequency varied a bit by year. In general, shows focusing on ITNs were most commonly reported. On average about two thirds of women reporting a show also attended it.

Table 4: Live drama coverage according to 2016 Monitoring Survey

Variable	Awareness		Participation	
	Treated (%) n = 227	Control (%) n = 759	Treated (%) n = 227	Control (%) n = 759
Any live drama shows/performance organized in this community by CNC/GHS	70.48	44.01		
ITN in 2012	41.85	21.21	30.4	14.23
Hand washing and diarrhea management using ORS in 2012	33.48	18.18	22.47	11.46
Exclusive breastfeeding, complementary feeding and skilled delivery in 2012	25.99	13.18	16.74	6.72
All C4D health behaviors in 2013	25.11	10.94	14.98	4.74
All C4D health behaviors in 2014	22.91	13.31	12.33	5.80
All C4D health behaviors in 2015	35.24	17.00	23.79	10.28
All C4D health behaviors in 2016	20.70	10.01	17.62	6.85
Other live drama shows in the last 4 years	9.25	8.17		

Source: C4D Monitoring Survey (2016) - Household respondent questionnaire

Table 5 shows the results for live radio. Live radio coverage was substantially lower, with only 32% of respondents in treatment communities and 24% of respondents in control communities reporting ever having heard of such an event. Approximately 50% of those being aware attended such events. The resulting effective coverage in treated areas is only about 7% compared to 3% in control areas.

Table 5: Live radio coverage according to 2016 Monitoring Survey

Variable	Awareness		Participation	
	Treated (%) n = 217	Control (%) n = 769	Treated (%) n = 217	Control (%) n = 769
Any live community radio discussions	32.26	23.93		
2012	12.44	8.32	7.37	3.25
2013	6.45	5.07	3.23	0.91
2014	6.45	4.81	3.69	1.17
2015	8.76	7.93	5.99	4.03
2016	11.98	4.03	7.37	2.47

Source: C4D Monitoring Survey (2016) - Respondent questionnaire

Table 6 shows the results for the video screenings. 58% of respondents in treatment communities and 31% of respondents in control communities reporting ever having heard of such an event, and about 50% of those being aware attended. The resulting effective coverage in treated areas is low with less than 20% of treated women attending any live video event in 2015 (the year preceding the survey).

Table 6: Night video coverage according to 2016 Monitoring Survey

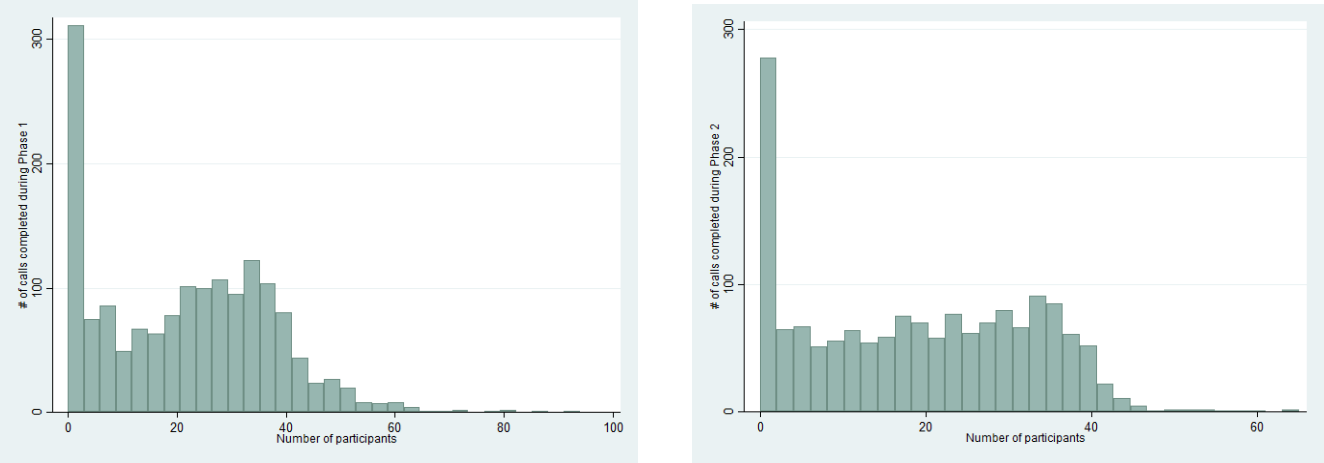
Variable	Awareness		Participation	
	Treated (%) n = 226	Control (%) n = 760	Treated (%) n = 226	Control (%) n = 760
Any night video shows organized by GHS	58.41	30.66		
2012	19.47	10.66	13.72	5.00
2013	13.72	7.50	7.52	3.16
2014	17.70	8.16	11.06	3.29
2015	29.65	13.55	18.14	6.05
2016	13.27	7.11	9.29	3.68

Source: C4D Monitoring Survey (2016) - Household respondent questionnaire

7.1.3. M4D Targeting

Compared to the C4D program, targeting of the M4D intervention was relatively easy. The main logistical challenge with the M4D program was the lack of reliable phone numbers at which subjects could be reached, and the relatively frequent discontinuation of phone numbers provided to the project. As a result, 15.4% of targeted households were never reached in phase I, and 13% of targeted households were never reached in phase 2. Figure 8 illustrates the frequencies of calls: on average, 14.4 calls per participant were completed in phase 1, and 12.8 calls were completed in phase 2.

Figure 8. Message exposure in M4D treatment group



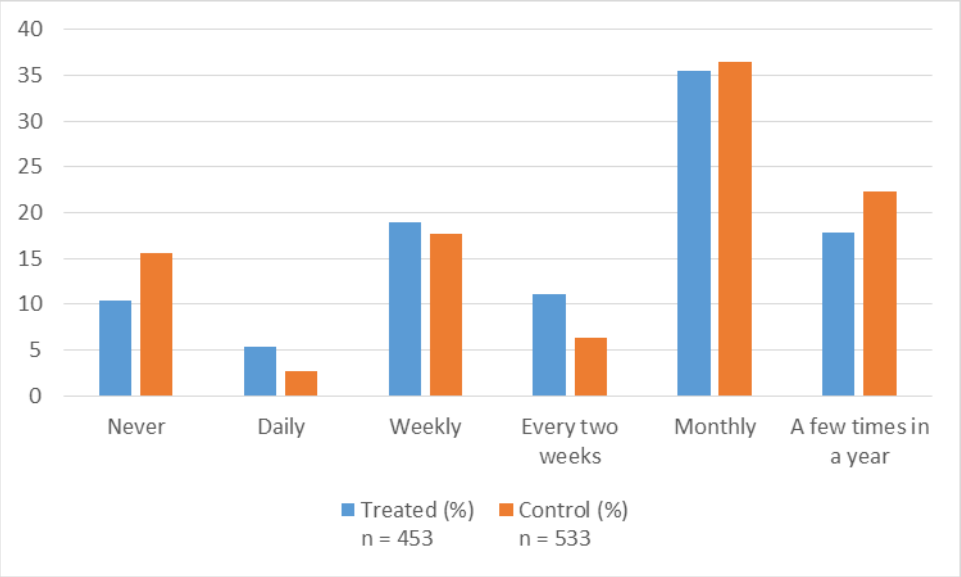
Number of M4D calls completed between baseline and midline

7.1.4. Other Programs

As part of the 2016 monitoring survey, we also collected additional data on other community-programs targeting behavioral change in the program area. The two primary programs run in the study area over the past few years are community based agents and general radio programs. Community based agents (CBAs) are volunteers identified in each community to do regular house-to-house visits in their respective communities to educate households about the practice of key health behaviors. Volunteers receive trainings on these behaviors and also on how to interact with community members. CBAs are

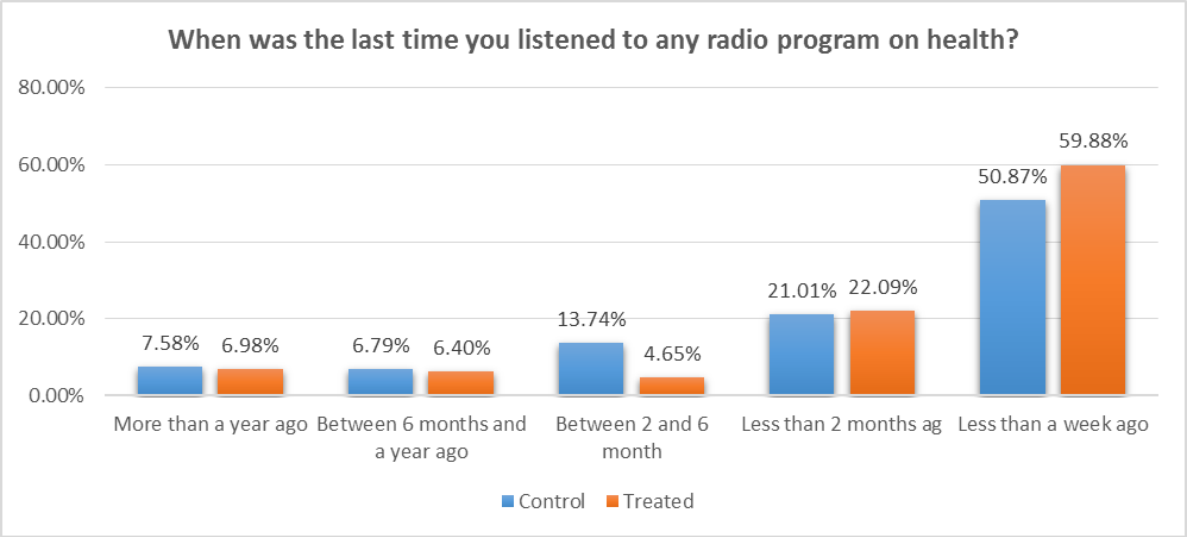
meant to visit all households in their communities at least twice every year. As shown in Figure 9 below, these visits seem to actually be happening on a regular basis. In the 2016 monitoring survey, 85% of female respondents indicated that they had been visited by CBAs: Most respondents report monthly or quarterly visits – some report even higher frequencies. As expected, these visits were equally frequent in treatment and control villages.

Figure 9: Frequency of CBA home visits



The second main mechanism through which Ghana Health Services has been trying to reach households is public radio programming. Based on the 2016 monitoring surveys, these programs are quite popular, with 55% of respondents reporting having listened to such programs within the last week, and an additional 22% report listening to programs within the past two months. Only 7% report not listening at all to such programs in the past year.

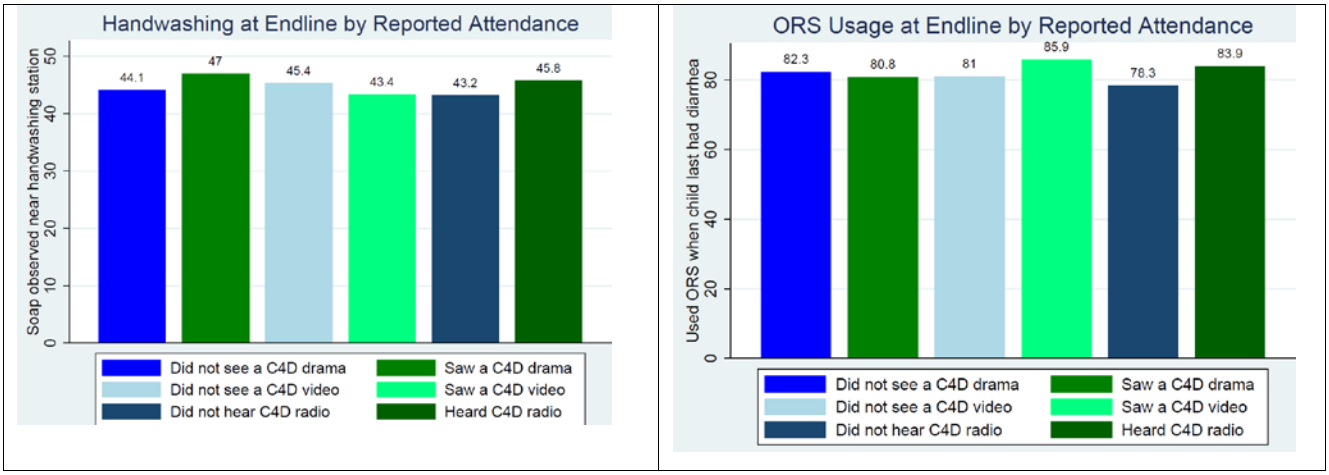
Figure 10: Frequency of radio programming exposure

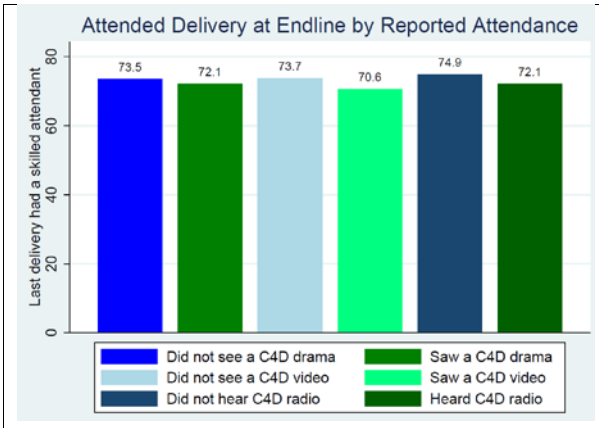


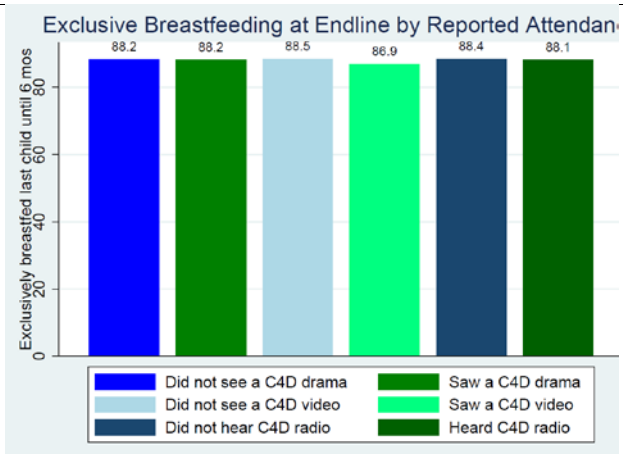
7.1.5. Cross-sectional relationship between program participation and reported health behaviors

In order to provide a clearer sense of the general relationship between program participation and health behavior, we plot average reported behaviors by program attendance in Figure 11 below. While we do find generally higher rates of healthy behavior among participants, the overall differences are minor, and likely reflect at least to some extent differential interest and intrinsic motivation of respondents.

Figure 11: Program participation and health behavior







7.2. Qualitative analysis

We found that across levels and methods, informants had high levels of knowledge on our health topics of interest (i.e., malaria, diarrhea and malnutrition, obstetric complications), as well as the recommended measures for prevention and mitigation of these health problems. We used several different methods to gather information from several types of informants because we expected variation in our findings and we wanted to obtain a complete picture of the social and cultural context around reproductive health issues in our selected communities. However, upon analysis, we found our results were remarkably consistent across groups and methods, with the only notable variations occurring based on differing levels of exposure to certain health issues and practices in different demographic groups (e.g., age, gender, levels of health education/training.)

The findings of the qualitative analysis were detailed in the qualitative evaluation report submitted in April 2014. The main results are described below.

Informants consistently said that diarrhea is slowly improving, but it remains a serious concern in their communities. It is largely viewed as a children's issue, which can lead to malnutrition and delayed physical and mental development. People were aware of how quickly children suffering from diarrheal diseases can develop high fevers and become seriously dehydrated. Based on this knowledge of the potential severity of the problem, when a child develops diarrhea, caretakers respond rapidly. Awareness and availability of ORS are high and people say their first course of action is to seek out ORS packets, generally from a CBA. Informants could describe proper preparation of ORS in detail, often emphasizing the need to boil the water, and discard any extra after 24 hours. In terms of barriers for diarrhea prevention behaviors, the cost of soap was cited as the primary obstacle to practicing proper handwashing. For EBF, a key barrier consistently mentioned by informants was the fact that mothers generally are not the sole caretakers of their infants.

For obstetric dangers, post-partum hemorrhage, anemia and obstructed labor were commonly cited concerns across groups but maternal health was not considered to be among the top three health problems in their communities. Awareness of the recommended behaviors in all groups was high enough to indicate that lack of knowledge may be less of a barrier to behavior change than factors like social pressures, related access issues, and negative experiences with facility-based health workers. On this latter point, several health workers expressed frustration about women failing to report early to

the health facilities or bringing certain materials with them when they come, despite being advised to do so. When health workers are frustrated because they feel their efforts at health education have been in vain, it creates tension between the provider and the patient from the moment the woman arrives at the facility.

Malaria continues to be a major concern for informants throughout our study communities, especially during the rainy season. Mosquitoes are universally known to be the cause of the disease, although a few people also mentioned the lingering traditional belief that the disease is linked to cold temperatures. However, generally when people talked about cold, it was presented in a blended etiology with mosquitoes. Pregnant women and young children are seen to be the most vulnerable to malaria, so people reported they are usually given priority when allocating bed nets within a household. Of greater concern is the fact that while people generally agreed that LLINs are effective in preventing malaria when used properly, they also state that despite widespread use of the nets, people are still getting malaria. This was often attributed to the fact that people realized they were getting mosquito bites in the early evening hours, prior to bed. The implied question is, even if the nets work at night, if they are going to get malaria anyways from the bites they get in the early evening, why should they bother using the nets?

These findings suggest that lack of knowledge on healthy practices is not a main barrier to their adoption. The cost of required supplies (like soap), the distance to the clinic, perceived poor quality of service delivery at the health centers and social stigma were cited as deterrents to the regular practice of the five key behaviors promoted by the program.

The data from the qualitative study focused on the M4D implementation showed that a high number of respondents did not answer their phones and those who answered, sometimes did not listen to the entire message. Overall feedback for the M4D program was very positive however.

8. Discussion

The results presented in this report have yielded three main results: first, and most positively, very high levels of coverage of key health behaviors have been reached in Ghana's three northern regions. According to the endline data collected in this study, 80% of children slept under an ITN the night before the survey, 88% of children got exclusively breastfed at endline, and 97% of children with diarrhea were either taken to a clinic or given ORS at home. Given that the timing of the midline and endline surveys largely coincided with the rainy season, the positive trends in bed net utilization may partially be driven by increased malaria risk during the later survey rounds; the overall progress is however very positive. In terms of the behaviors targeted by this project, the only areas where substantial progress still needs to be made is skilled birth attendants and hand-washing with soap. Skilled birth attendance (73% at endline) tends to be hard to change both due to strong cultural norms and to logistical barriers. However, recent trends are positive, and suggest that even higher coverage rates will be possible in coming years. The area with least progress is handwashing with soap, with less than 50% of households having soap available at endline. Interestingly, general compliance with recommended behavior seems lower in the top wealth and education groups, with particularly large gaps in the utilization of bed nets.

The second, and less positive finding of the project is that the randomized rollout of specific behavior change interventions did not lead to any additional increases in the targeted health behavior. One of the reasons why no impact was detected empirically for a rather comprehensive (and complex) set of interventions was the lack of targeting and incomplete program implementation. The monitoring data collected as part of this project suggests that a larger number of targeted communities never benefitted from the assigned interventions, and that even in targeted communities intervention exposure was low, with on average less than one event organized. Respondents who did report participating in the selected interventions showed marginal and insignificant improvements in the targeted health behaviors; these differences could however also reflect differential selection of women into these activities. Overall, the limited reach of the randomly assigned and evaluated C4D program activities (local radio shows, live theater, and video) stands in contrast to the comprehensive reach of behavioral change programs run nationally through national radio broadcasting and community volunteers, which seem to have reached most households on a regular basis.

The last key finding is that that voice-messages can trigger and further support behavior change for some outcomes, with a 5% points (6.3%) increase in the likelihood of using ITNs for both mothers and children at endline, and a 9.5% points (24.7%) increase in the likelihood of households having soaps at their washing station.

9. Specific findings for policy and practice

The project has yielded four main insights for policy and practice:

1.) The experience of the 9 districts monitored in this project suggests that major improvement in key health behaviors is possible in relatively limited time frames. The data presented in this report suggest that even behaviors traditionally perceived as hard to change like skilled birth attendance can increase by more than 10 percentage points in poor areas if appropriate policy measures are taken.
2.) The overall experience with the C4D evaluation suggests that larger scale evaluations of interventions targeting health behaviors are difficult primarily because rollout has to happen in a decentralized manner that complicates monitoring, and because of the large number of (often undocumented or at least uncoordinated) projects and programs targeting these behaviors. Future evaluation of large-scale SBCC programs should involve a more detailed rollout and monitoring plan for implementers, as well as a continued presence in targeted communities to detect and prevent the implementation of similar activities by external stakeholders.
3.) From an impact perspective, the two components that likely caused the largest changes were large scale radio programs and household visits by community health workers – these components were however not randomized so that their exact impact could not be assessed within this evaluation.
4.) From an evaluation perspective, using designs that simultaneously assess multiple combinations of intervention packages in settings where control over rollout is restricted (because various implementing partners are involved or the monitoring structure limited) is challenging. The multiplicity of intervention arms complicates rollout and likely reduces ex-post ability to detect impact differentials.
5.) In terms of mobile-phone based programs, the results from the M4D intervention, shown in Table 2, suggest that simple phone messages can indeed change behaviors. The observed magnitudes are not very large (5-10%), but may still make these interventions cost-effective given the relatively small marginal cost of sending these messages.

10. Learning and Lessons for Other Researchers

Despite all the efforts made, the extent to which this project allowed scientific learning is rather limited. While the overall positive trends suggest that the behavioral change interventions may actually have induced some change, we cannot causally attribute this impact to any specific intervention due to the lack of differences between treatment and control groups. From a research perspective, there are several lessons learnt that may also apply to other researchers and future projects.

1) When evaluating a program that is implemented by an external agency (rather than the researcher), ensure that there is frequent, independent implementation monitoring and that implementers can be held accountable for delivering interventions. In the project studied, implementation was outsourced to relatively large number of different NGOs through Ghana Health Services, who received periodic feedback, but had only weak incentives to comply with the actual rollout protocols.

2) Communication for behavior change programs are very difficult to measure with standard household surveys, especially if they do not happen on a continued basis. In the project studied, theater performances or live video showings happened only sporadically, and it was very hard for respondents to recall when (or if) such events had happened because a relatively large number of them were obviously not able to attend such events personally. To measure actual program efforts, high frequency data collected in communities (did activity X occur last week and how many attended?) are likely the much better way to measure community activities

3) When doing evaluations with implementing partners, researchers should resist the temptation to go for complicated designs. For this project, UNICEF was very interested in the specific contribution of each intervention platform, and thus very keen on doing a factorial design. While interesting in principle, factorial designs require meticulous implementation of programs on the ground, which seems unlikely without continued monitoring and direct accountability of implementers. Our main recommendation would be to restrict the interventions tested to one or two combinations, and to randomize at the highest level feasible. This will obviously reduce power, but may still have a higher chance of finding meaningful impact estimates.

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Online Appendixes

Online appendix A: Field notes and other notes from formative work.
http://www.3ieimpact.org/media/filer_public/2018/08/28/ow41122-health-behaviour-ghana-appendix-a.pdf

Online appendix B: Sample design.
http://www.3ieimpact.org/media/filer_public/2018/08/28/ow41122-health-behaviour-ghana-appendix-b.pdf

Online appendix C: Survey instruments.
http://www.3ieimpact.org/media/filer_public/2018/08/28/ow41122-health-behaviour-ghana-appendix-c.pdf

Online appendix D: Pre-analysis plan.
http://www.3ieimpact.org/media/filer_public/2018/08/28/ow41122-health-behaviour-ghana-appendix-d.pdf

Online appendix E: Sample size and power calculations.
http://www.3ieimpact.org/media/filer_public/2018/08/28/ow41122-health-behaviour-ghana-appendix-e.pdf

Online appendix F: Monitoring Plan.
http://www.3ieimpact.org/media/filer_public/2018/08/28/ow41122-health-behaviour-ghana-appendix-f.pdf

Online appendix G: Structural or theoretical model specification (if relevant).
http://www.3ieimpact.org/media/filer_public/2018/08/28/ow41122-health-behaviour-ghana-appendix-g.pdf

Online appendix H: Descriptive statistics.
http://www.3ieimpact.org/media/filer_public/2018/08/28/ow41122-health-behaviour-ghana-appendix-h.pdf

Online appendix I: Results
http://www.3ieimpact.org/media/filer_public/2018/08/28/ow41122-health-behaviour-ghana-appendix-i.pdf

Online appendix J: Cost data for the program implementation to provide the 'ingredients' into CEA, CBA or CUA.
http://www.3ieimpact.org/media/filer_public/2018/08/28/ow41122-health-behaviour-ghana-appendix-j.pdf

Online appendix K: do files.
http://www.3ieimpact.org/media/filer_public/2018/08/28/ow41122-health-behaviour-ghana-appendix-k.pdf