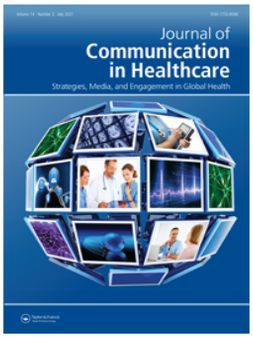

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Journal of Communication in Healthcare
Strategies, Media and Engagement in Global Health

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/ycih20

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To cite this article: Holly M. Burke, Eunice Okumu, Amos Zikusooka, Richard Batamwita, Judith Nalukwago, Samuel Field, Alissa Bernholc, Andres Martinez, Leonard Bufumbo, Musa Kimbowa, Sheila M. Coutinho, Natasha Mack & Jane Alaii (2021) Evaluation of the Obulamu? integrated health communication campaign in Uganda: results from a repeated cross-sectional household survey, Journal of Communication in Healthcare, 14:2, 126-138, DOI: 10.1080/17538068.2020.1860670

To link to this article: https://doi.org/10.1080/17538068.2020.1860670

JOURNAL OF COMMUNICATION IN HEALTHCARE
2021, VOL. 14, NO. 2, 126–138
https://doi.org/10.1080/17538068.2020.1860670

Evaluation of the Obulamu? integrated health communication campaign in Uganda: results from a repeated cross-sectional household survey

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ABSTRACT

Introduction: Uganda's Obulamu? campaign delivered messages relevant to life stage to address evolving health needs of audiences at times they were likely to change behaviors. We estimated Obulamu?'s effects on HIV/AIDS, family planning, maternal and child health, tuberculosis, malaria, and nutrition behavioral outcomes.

Methods: We conducted repeated cross-sectional household surveys with women, men, and children's caregivers in 2015 and 2017 in 16 districts using multi-stage probability sampling weighted by population. Eleven pre-specified outcomes were evaluated in multivariable weighted regression models.

Results: Survey 1 included 2,377 households with 4,012 individuals and survey 2 included 2,398 households with 3,563 individuals. After controlling for time and potentially confounding factors, we observed notable increases among people exposed to topic-specific messages in condom use with at least one non-marital, non-cohabiting partner in the last six months; recent male circumcision; seeking tuberculosis screening/testing for self; seeking tuberculosis screening/testing for child; delivery of baby in a facility; and caregiver seeking advice or treatment for child under five years with fever. Exposure did not appear to influence knowledge of antiretroviral therapy, delay sexual debut, breastfeeding infants and all of the household's pregnant women/children less than five years sleeping under a net the night before the survey.

Conclusion: Exposure to topic-specific messages was associated with improvements in six of the eleven outcomes. Across the health priority areas, we observed improvements in select HIV/AIDS, tuberculosis, and maternal and child health outcomes. We did not observe effects of exposure on select outcomes in the areas of family planning, malaria, or nutrition.

KEYWORDS

Uganda; cross-sectional studies; surveys and questionnaires; health communication; life stage; life cycle; health communication campaign; evaluation; integrated intervention

Introduction

In Uganda, an equatorial country in East Africa with an estimated population of 37.7 million people [1], the health status of the population is characterized by high incidence of malaria and diarrheal diseases, as well as communicable diseases such as HIV, tuberculosis (TB), and respiratory tract infections [2]. Through 2012, the country saw only limited improvements in health, despite ongoing efforts in health communication (HC) programing by the Government of Uganda and its partners [3].

Communication for Healthy Communities (CHC), a project implemented in 2013–2020 through a cooperative agreement between the U.S. Agency for International Development (USAID/Uganda) and FHI 360, aimed to increase the adoption of healthy behaviors through strengthened and targeted social and behavior change communication (SBCC) activities. Six priority health areas were targeted: HIV/AIDS, TB, maternal and child health, family planning, malaria, and nutrition. Gender was an integral component of the program, consisting of efforts to promote gender equality and challenge dominant gender norms that negatively affect health.

Prior to CHC program startup, CHC conducted an HC audit for Uganda [4], which found that HC strategies and implementation at the health area level (e.g. malaria, HIV, or TB) were fragmented and that even strategies that had been reviewed or updated had not been disseminated for programmatic use. In addition, analysis of mass media HC showed sporadic coverage concentrated on commemorative days, such as World AIDS Day and World Malaria Day, reflecting a one-size-fits-all approach.

Based on the audit results, other formative assessments [4–8], and stakeholder engagement processes, including a series of brainstorming workshops with implementing partners, CHC developed an integrated

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Supplemental data for this article can be accessed https://doi.org/10.1080/17538068.2020.1860670

SBCC campaign in Uganda called OBULAMU?. This paper reports the findings on 11 primary outcomes from an evaluative study of the CHC project.

Obulamu? Intervention description

'Obulamu?' or 'How's life?' is a popular greeting in Uganda that elicits responses detailing what is going on in the interlocutor's life and how they feel about it. The integrated Obulamu? campaign, which used a socio-ecological model as its guiding framework, delivered holistic messages relevant to a person's stage of life rather than using a disease approach, as disease-based approaches tend to be fragmented and siloed. A life-stage approach addresses the evolving health needs of specific audience segments across the different stages of life when individuals are most likely to change [9,10], e.g. during a relationship, pregnancy, childbirth, or early parenthood (Figure 1).

CHC packaged integrated messages across the six priority health areas for the following life stages:

Life stage 1: Young adults (20–30 years) in relationships
Life stage 2: Pregnant couples (pregnant women and their partners)
Life stage 3: Families with children (0–14 years), with an emphasis on caregivers of children under age five years
Life stage 4: Adolescent girls and boys (15–19 years)

At each life stage, the campaign also integrated the communication needs of key populations and

Life Stage 1	Life Stage 2	Life Stage 3	Life Stage 4
1. Use condoms 2. Practice mutual fidelity – reduce sexual partners 3. Test for HIV and receive results 4. Men: Get SMC/Women: Support SMC 5. Prevent unplanned pregnancies by using a contraceptive method of your choice 6. Maintain discordant status through adherence to positive prevention and treatment 7. Go for TB screening and testing if your cough lasts two or more weeks 8. Seek correct information on your sexual health and reproduction plans	1. Recognize danger signs of pregnancy 2. Make a birth preparedness plan (Attend ANC, save for birth items and transport) and talk to your partner about it 3. Begin ANC early and attend 4 times 4. When there, demand IPTp 1-2. Test for HIV and enroll into eMTCT if positive, receive malaria net and sleep under it 5. Learn about the recommended newborn care practices, e.g. skin-to-skin contact, and early initiation of breastfeeding 6. Deliver at a health facility 7. Adhere to ART and breastfeeding guidelines 8. Seek information on post-partum care which includes FP and health timing and spacing of children. 9. Practice good nutrition for pregnancy and inform about breastfeeding (e.g., initiation within one hour)	1. Put baby to the breast within one hour after child birth 2. Give your baby ONLY breast milk in the first six months (exclusive breastfeeding) 3. Feed the child 6-24 months a mixed diet in small portions and often (WHO Infant and Young Child Feeding Practices) 4. Breastfeeding women feed on a mixed diet and try eating enough and well 5. Ensure that all children under 5 years sleep under a treated mosquito net 6. Recognize signs of childhood diseases (diarrhea, pneumonia) and seek advice or treatment 7. Give ORS and Zinc for child with diarrhea 8. Go to the health center regularly and follow the full course of immunization for the child 9. Wash hands with soap and water before serving food, after using a toilet, and after changing diapers 10. Space the next pregnancy at least 24 months to ensure about three years between births 11. Adhere to ART for mothers and children (pediatric ART) 12. Mother and child return to the health center for regular check-up and ART refills	1. Seek correct information on how your body grows and about your new fertility 2. Learn how to make good decisions and negotiate what you want to happen to you and your body (Life skills) 3. Learn how to prevent unplanned pregnancy and HIV and other STIs 4. It's harmful to have sex too early and to have children too early 5. Use a condom if sexually active. 6. Boys: Get circumcised to help protect yourself from HIV 7. Test for HIV and get the results

Figure 1. Life stages of the OBULAMU integrated health communication platform

their clients, including fisherfolk, female sex workers, truckers, and other vulnerable populations, with an emphasis on addressing their health risks and needs.

The Obulamu? campaign used targeted communication strategies, including mass media and social media programing, complementary interpersonal communication, and social mobilization, through community dialogues and other interactive activities designed to trigger dialogue, self-reflection, adoption of positive health practices, and linkage to health services.

The campaign was implemented in a phased manner, starting with a teaser campaign from September–December 2014. This was intended to energize and create momentum for the introduction of the Obulamu? campaign. In addition, the previously existing messages about condoms, elimination of mother-to-child transmission of HIV, and family planning promotion were run in tandem with the teaser campaign for seven months (September 2014–March 2015). Rollout of the Life Stage 1–Life Stage 4 campaign messages followed throughout the implementation period, which ended in June 2020.

Study objective

The objective of the study was to determine whether exposure to topic-specific messages increased adoption of health behaviors in the six priority health areas. While the campaign also sought to affect intermediate outcomes, such as knowledge, attitudes, and intentions, this paper presents the findings for the pre-specified primary outcomes, which mainly focused on the uptake of recommended behaviors.

Materials and methods

Study design

The study design consisted of a repeated cross-sectional household survey. The first survey was conducted in 2015 and included 4,012 individuals from 2,377 households. The second survey was conducted in 2017 and included 3,563 individuals from 2,398 households.

Study Sites

Whereas the campaign was implemented at a national level, 16 districts from each of Uganda's eight regions and two districts from each region were purposively selected for the evaluation (Figure 2). Given that the intervention primarily involved mass media and interpersonal communication to support increases in knowledge, changes in health behaviors, and subsequent uptake of health services, the selection criteria for the districts were:

- High prevalence of a given health issue, e.g. malaria
- Low uptake of health-promoting behaviors and/or services
- Presumed availability of health-promoting interventions/services based on the presence of U.S. Government implementing partners

Study population

The study population was comprised of household members up to 49 years living in 80 parishes within the 16 study districts. Measures for children up to 14 years were based on reports from caregivers ages 15 and older. Households that participated in the first observation were not excluded from the second observation. However, the survey rounds were conducted independently and assigned unique ID numbers within each round, so there was no way to link the observations between them. The study population was restricted to the following four strata, varying across outcomes:

- Women 15–49 years who were not pregnant and had not given birth in the previous 11 months
- Women 15–49 years who were pregnant
- Women 15–49 years who had given birth in the previous 11 months
- Men 15–49 years

In each case, individuals who qualified as members of the endpoint-specific study population were eligible to be included in the analyses. All participating households were used in the analyses, as long as a household member met the eligibility criteria associated with the particular outcome and consented to be interviewed.

Sampling

This evaluative survey used a multi-stage probability sampling design weighted by population within the 16 districts, with the sample stratified by parish, district, village, household, and stratum.

In stage one, the sampling of 80 parishes was stratified by district so that at least one parish from each of the 16 study districts was sampled. In the second stage, for each parish sampled, we obtained a list of villages in the parish and randomly sampled three villages using probability proportional to size. In the third stage we sampled 10 households from each village using uniform probability sampling. In the final, fourth stage, the interviewer generated a member list for each sampled household and collected basic demographic information about each household member. For each of the four strata listed above, one member of the household (if he or she was present in the household) was randomly selected to respond to the survey. If there were children in the household, a caregiver was chosen to respond to the caregiver survey. For Round 2, the same villages were sampled, but with a different random selection of households (and members).

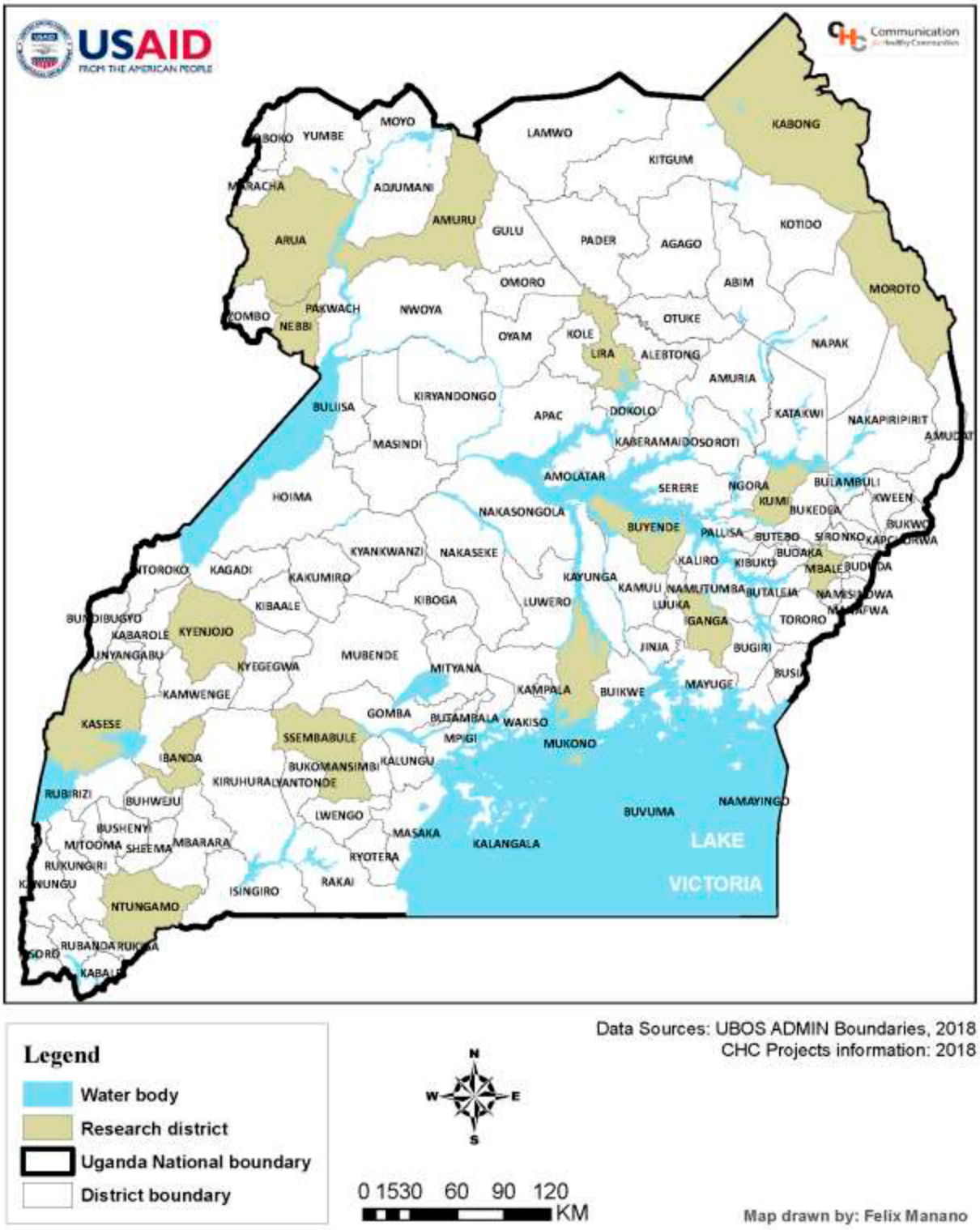

Figure 2. Map of Uganda showing CHC research districts

Outcomes

The following 11 primary outcomes in the six health areas were pre-specified for the evaluation, with individual- or household-level measurement conducted as indicated in parentheses:

HIV/AIDS:

1. *Used a condom with at least one non-marital, non-cohabiting partner in the last six months (for respondents who reported high-risk sexual behavior defined as having sexual intercourse with a non-marital or non-cohabiting partner in the previous six months)* (individual)
2. *Had comprehensive knowledge of ART* (individual)
3. *Had a recent (within the past six months) male circumcision* (individual)

TB:

4. *Sought TB screening and testing services for self after a two-or-more-week episode of coughing* (individual)

5. *A caregiver sought TB screening for a child up to 14 years after a two-or-more-week episode of coughing* (household)

Maternal and Child Health:

6. *Delivered last baby in a health facility (for mothers of children 0–11 months)* (individual)

Family Planning:

7. *Delayed sexual debut defined as adolescents 15–17 years who have not had sex* (individual)

Malaria:

8. *All pregnant women in the household slept under a net the night before the survey* (household)
9. *All children less than five years old in the household slept under a net the night before the survey* (household)
10. *A caregiver sought advice or treatment for a child under five years with a fever* (household)

Nutrition:

11. *A caregiver exclusively breastfed an infant up to five months old* (household)

We also sought to estimate the effects of HC reach (i.e. an individual being exposed to topic-specific messages two or more times) on the outcomes. Exposure was measured at the household level for household-level outcomes, and at the individual level for individual-level outcomes. We created the household exposure variable by determining whether someone interviewed in the household was exposed at least one time to the message. It is possible that an adult who was not interviewed was exposed to the message, but we only had exposure information for the interviewed members.

Data collection

Study staff were trained on research ethics, the study protocol and survey instruments, survey methods, and interview techniques. The instruments were pre-tested in villages in Jinja and Wakiso districts, which were not included in the survey. The survey was administered face-to-face by the trained interviewers in local languages, as appropriate. To improve validity, data were collected and input directly into Android tablets, or onto hard copies when necessary. Observation 1 data were collected 20 April–22 July 2015, which was after the teaser campaign had begun, rendering observations pre-exposure to the campaign impossible. Observation 2 data were collected 11 July–7 August 2017.

Study instruments

Three survey questionnaires were used:

(1) **A household questionnaire** on demographic characteristics and relationships among all household members; household access to water, sanitation, and hand-washing facilities; asset ownership and household construction; and mosquito net ownership and usage and history of indoor residual spraying
(2) **An individual questionnaire for adult men and women ages 15–49 years** on additional individual demographic characteristics, exposure to HC and Obulamu?, behavioral determinants, and initiation of recommended behaviors across the targeted health topics
(3) **A caregiver questionnaire**, which measured exposure to HC and Obulamu? among caregivers of children up to 14 years, behavioral determinants, and initiation of recommended behaviors specific to children ages 0–14 years across the targeted health topics

Data analysis

Descriptive tables were created for all the outcomes broken down by exposure to topic-specific health communication messages, gender, residence (urban or rural), geographic region, education, age, marital status, and religion. The frequencies reported are unweighted; however, sample weights were used to determine the percentages reported. The sample weights were calculated as inverse probability of selection weights, with probabilities of selection at the parish, village, household and individual levels.[1] For each endpoint, only data from individuals and households that provided a valid response were used in the analyses.

The primary outcomes were evaluated using multivariable weighted regression models. For each outcome we fit a multi-level model that adjusted for the clustering of people and households within villages. The model included a dichotomous indicator for time 2 which is not a treatment effect because we did not have a true baseline, and controls for gender and marital status (of the participant if the outcome was for individuals, or of the head of household if the outcome was at the household level); level of education (of the individual when measured for individuals, or the maximum level in the household if at the household level); age (of the individual, or of the head of household if the outcome was at the household level); religion (either individual, or of the household, including a category for mixed households); residence (rural or urban); region (Central, East Central, Eastern, Karamoja, Northern, South

Western, West Nile, and Western); and a household wealth index created from items such as appliances owned and construction materials used for the house [11]. The model also included a dichotomous measure of exposure to topic-specific messages (two or more vs. fewer than two times for the individual, and for the caregiver outcomes, any exposure of someone in the household vs. no exposure for other household outcomes).

Ethics Statement

The study was reviewed and approved by FHI 360's federally registered Protection of Human Subjects Committee (Protocol # 616862–13) and the Makerere School of Public Health (MakSPH) Research Ethics Committee (Protocol # 259). Consent to conduct research was provided by the Uganda National Council for Science and Technology (Protocol # SS 3667) and the Office of the President (Protocol # ADM 154/212/03). All participants provided oral informed consent prior to the survey. For participants 15–17 years, we obtained guardian consent as well as assent from the minor.

Results

The survey at time 1 comprised 2,377 households and 4,012 respondents (1,645 male; 2,367 female) and at time 2 2,398 households with 3,563 respondents (1,502 male; 2,061 female). All respondents were between 15 and 49 years old. Tables 1 and 2 present the model results for the eleven primary outcomes (individual-level outcomes in Table 1 and household-level outcomes in Table 2). We report descriptive characteristics in Supplementary Tables S1–S11.

HIV and AIDS

Condom use during high-risk sex

The percentage of individuals 15–49 years who used a condom with at least one non-martial, non-cohabiting partner in the last six months (among those reporting high-risk sexual behavior) increased from 54.4% (99% CI 46.6–62.1) at time 1 to 57.3% (99% CI 49.3–65.3) at time 2 (Table S1). However, this change was not statistically significant in the model (OR 1.03, 99% CI 0.74–1.43; Table 1, outcome 1). Individuals exposed two or more times to messages about condoms had twice the odds (OR 2.12, 99% CI 1.38–3.25) of condom use compared to individuals exposed fewer than two times to messages.[2] Condom use was also higher among males, but lower among those living in the Western region.

Comprehensive knowledge of ART

The percentage of individuals ages 15–49 years who demonstrated comprehensive knowledge of ART increased from 6.2% (99% CI 4.7–7.7) at time 1 to 13.0% (99% CI 10.3–15.8) at time 2 (Table S2). This change was significant in the model (OR 2.20, 99% CI 1.76–2.75; Table 1, outcome 2). Individuals' exposure to messages about HIV/AIDS treatment, including messages on taking medication every day, did not significantly affect the odds of demonstrating comprehensive knowledge of ART. The odds of individuals having comprehensive ART knowledge were higher for Muslims than Christians, as well as for those in wealthier households. People in the West Nile region had lower odds of comprehensive ART knowledge than those in the Central region.

Male circumcision

The percentage of males 15–49 years recently circumcised decreased from 13.7% (99% CI 7.8–19.6) at time 1 to 8.9% (99% CI 4.7–13.1) at time 2 (Table S3), but this was not statistically significant (OR 0.87, 99% CI 0.51–1.49; Table 1, outcome 3). Males who were exposed two or more times to messages about male circumcision had six times the odds of being recently circumcised than males exposed to messages fewer than two times (OR 6.09, 99% CI 2.00–18.57). Recent circumcision was higher among younger males and Muslims compared to Christians; and higher in the East Central than in the Central region.

Tuberculosis (TB)

TB screening and testing for self

The percentage of individuals 15–49 years who sought TB screening and testing services after a two-or-more-week episode of coughing increased from 27.6% (99% CI 20.7–34.5) at time 1 to 34.6% (99% CI 28.2–41.0) at time 2 (Table S4) and this change was significant (OR 1.51, 99% CI 1.02–2.22; Table 1, outcome 4). Further, those exposed to two or more messages had almost twice the odds of seeking TB services compared to individuals exposed fewer than two times (OR 1.80, 99% CI 1.18–2.75). Seeking TB services was not influenced by the other variables in the model.

TB screening and testing for child

The percentage of caregivers who sought TB screening for a child up to age 14 years after a two-or-more-week episode of coughing increased from 24.4% (99% CI 18.0–30.9) at time 1 to 30.8% (99% CI 25.1–36.6) at time 2 (Table S5), but this increase was not statistically significant. However, caregivers who had been exposed two or more times to messages about TB screening for children had nearly

Table 1: Individual-level outcomes. Reported in each cell are the odds ratio estimates and their 99% confidence intervals in brackets.

	Individual-level Outcome					
	1. Used condom in last 6 months if high-risk behavior	2. Comprehensive ART Knowledge	3. Recent male circumcision	4. Sought TB screening and testing services	6. Delivered baby in health facility	7. Delayed sexual debut
Exposure to messages (2 or more; ref: less than 2)	2.115 [1.378, 3.248]***	1.258 [0.865, 1.831]	6.089 [1.997,18.568]***	1.803 [1.184, 2.746]**	2.620 [1.132, 6.063]*	0.762 [0.482, 1.206]
Follow-up Survey (ref: 1st survey)	1.030 [0.740, 1.434]	2.200 [1.760, 2.751]***	0.868 [0.508, 1.486]	1.508 [1.023, 2.222]*	1.619 [0.838, 3.128]	0.442 [0.276, 0.706]***
Male (ref: females)	1.627 [1.158, 2.286]**	0.857 [0.686, 1.069]		1.209 [0.806, 1.814]		0.972 [0.629, 1.503]
Urban (ref: rural)	1.613 [0.998, 2.608]	0.984 [0.721, 1.342]	0.699 [0.300, 1.629]	1.091 [0.631, 1.887]	2.553 [0.823, 7.921]	1.099 [0.553, 2.183]
Region (ref: Central)						
East Central	0.843 [0.383, 1.856]	1.134 [0.635, 2.023]	5.289 [1.384,20.212]*	1.607 [0.678, 3.805]	1.780 [0.271,11.688]	0.647 [0.223, 1.871]
Eastern	0.550 [0.283, 1.068]	1.048 [0.637, 1.726]	0.862 [0.210, 3.540]	1.128 [0.501, 2.541]	0.402 [0.099, 1.628]	0.827 [0.326, 2.098]
Karamoja	0.050 [0.002, 1.586]	1.022 [0.400, 2.615]	1.181 [0.122,11.400]	3.032 [0.827,11.117]	0.726 [0.123, 4.292]	4.902 [0.269,89.318]
Northern	1.285 [0.581, 2.842]	0.666 [0.363, 1.223]	0.850 [0.226, 3.197]	1.130 [0.450, 2.842]	1.057 [0.190, 5.875]	0.941 [0.322, 2.749]
South Western	0.635 [0.288, 1.403]	0.679 [0.384, 1.199]	0.999 [0.283, 3.518]	0.824 [0.325, 2.089]	0.763 [0.143, 4.080]	3.893 [1.174,12.904]*
West Nile	1.926 [0.947, 3.918]	0.524 [0.306, 0.898]*	2.417 [0.779, 7.507]	0.685 [0.281, 1.667]	1.157 [0.276, 4.857]	1.994 [0.756, 5.262]
Western	0.450 [0.242, 0.836]**	1.059 [0.664, 1.688]	2.010 [0.597, 6.764]	0.487 [0.216, 1.101]	0.642 [0.179, 2.302]	0.884 [0.380, 2.060]
Individual Education Level (reference: no school)						
Primary	0.627 [0.354, 1.111]	1.108 [0.756, 1.625]	0.779 [0.283, 2.143]	0.913 [0.478, 1.743]	2.062 [0.828, 5.134]	1.750 [0.779, 3.932]
Secondary	0.741 [0.397, 1.386]	0.959 [0.627, 1.467]	1.210 [0.413, 3.551]	1.080 [0.521, 2.237]	3.854 [1.172,12.668]*	2.271 [0.913, 5.649]
Tertiary or Higher	1.174 [0.510, 2.705]	1.062 [0.623, 1.810]	0.786 [0.188, 3.290]	0.726 [0.264, 1.994]	8.950 [0.511,156.92]	1.890 [0.406, 8.802]
Age	0.976 [0.950, 1.003]	1.007 [0.992, 1.021]	0.953 [0.916, 0.993]*	1.000 [0.975, 1.026]	0.964 [0.920, 1.010]	0.637 [0.484, 0.838]***
Relationship type (ref: Married/Living together)			NA			NA
Divorced/Separated	0.647 [0.356, 1.176]	1.006 [0.648, 1.562]		0.968 [0.469, 1.999]	1.100 [0.362, 3.340]	
Widowed	1.177 [0.365, 3.797]	0.661 [0.260, 1.681]		1.416 [0.400, 5.014]	0.187 [0.029, 1.215]	
Never married/Single	0.677 [0.429, 1.069]	1.070 [0.790, 1.451]		0.893 [0.504, 1.583]	0.429 [0.156, 1.183]	
Religion (Ref: Christian)						
Muslim	1.213 [0.754, 1.951]	1.393 [1.019, 1.905]*	35.534 [11.019,114.58]***	0.593 [0.334, 1.051]	1.437 [0.419, 4.928]	1.272 [0.652, 2.483]
Other	1.205 [0.300, 4.836]	0.508 [0.190, 1.360]	0.381 [0.036, 4.048]	1.388 [0.404, 4.769]	0.964 [0.164, 5.653]	2.091 [0.347,12.603]
Wealth Index	1.252 [0.849, 1.845]	1.427 [1.126, 1.808]**	1.128 [0.611, 2.083]	1.154 [0.738, 1.804]	1.279 [0.510, 3.209]	1.377 [0.805, 2.355]
Observations	1376	7404	1597	1051	867	800
AIC	6287.22	41304.39	9278.22	4877.00	4680.74	3814.05
BIC	6290.68	41307.87	9281.61	4880.45	4684.18	3817.48

*$p<0.01$, **$p<0.001$, ***$p<0.0001$.

Outcomes are as follows: (1) Used a condom with at least one non-marital, non-cohabiting partner in the last six months (for respondents who reported high-risk sexual behavior during this time); (2) Had comprehensive knowledge of ART; (3) Had a recent (within the past six months) male circumcision; (4) Sought TB screening and testing services for self after a two-or-more-week episode of coughing; (6) Delivered baby in a health facility; and (7) Delayed sexual debut.

NA: Variable not applicable.

Note: High odds ratios are likely due to high prevalence of the behavior in the reference group. Odds ratios should not be interpreted as relative risks; doing so can be particularly problematic for highly prevalent outcomes.

Table 2: Household-level outcomes. Reported in each cell are the odds ratio estimates and their 99% confidence intervals in brackets.

	Household-level Outcome				
	5. TB screening sought for children with cough	8. Pregnant women slept under net	9. Children under 5 slept under net	10. Advice sought for children after fever	11. Exclusive breastfeeding
Exposed to messages (2 or more vs. less than 2; or no one in HH vs. somebody in HH)	1.976 [1.282, 3.047]***	1.897 [0.450, 7.991]	1.028 [0.616, 1.718]	2.408 [1.044, 5.557]*	0.592 [0.243, 1.438]
Follow-up Survey (ref: 1st survey)	1.299 [0.849, 1.987]	0.257 [0.152, 0.433]***	0.310 [0.250, 0.383]***	22.775 [3.779, 137.270]***	1.428 [0.804, 2.537]
Male head of HH (ref: female head)	1.206 [0.482, 3.018]	0.718 [0.256, 2.017]	0.800 [0.515, 1.243]	0.843 [0.299, 2.378]	1.017 [0.310, 3.337]
Urban (ref: rural)	0.854 [0.474, 1.539]	0.669 [0.328, 1.363]	0.731 [0.543, 0.985]*	3.015 [0.591,15.369]	1.038 [0.475, 2.264]
region (ref: Central)					
East Central	1.238 [0.512, 2.994]	2.515 [0.730, 8.670]	2.084 [1.244, 3.491]**	1.322 [0.267, 6.538]	0.983 [0.296, 3.267]
Eastern	1.793 [0.771, 4.170]	6.026 [2.036,17.839]***	2.958 [1.890, 4.631]***	0.506 [0.148, 1.732]	1.233 [0.429, 3.539]
Karamoja	4.645 [1.133,19.038]*	1.227 [0.307, 4.897]	1.540 [0.771, 3.075]	1.044 [0.139, 7.855]	1.755 [0.226,13.626]
Northern	2.023 [0.778, 5.262]	2.071 [0.650, 6.599]	2.526 [1.510, 4.225]***	1.673 [0.318, 8.803]	0.956 [0.254, 3.604]
South Western	1.155 [0.456, 2.926]	2.062 [0.625, 6.802]	1.293 [0.814, 2.055]	0.866 [0.165, 4.555]	0.241 [0.075, 0.772]*
West Nile	1.146 [0.447, 2.935]	4.965 [1.677,14.703]**	3.196 [2.077, 4.917]***	1.785 [0.477, 6.677]	0.953 [0.313, 2.899]
Western	0.787 [0.352, 1.762]	2.612 [1.038, 6.568]*	1.796 [1.208, 2.671]**	6.626 [0.905,48.519]	0.656 [0.258, 1.668]
Education of HH (Secondary or Higher vs. no school/ primary)	1.083 [0.699, 1.677]	1.104 [0.635, 1.918]	1.090 [0.867, 1.372]	0.963 [0.414, 2.241]	0.961 [0.527, 1.751]
Age of HH head	0.994 [0.978, 1.009]	0.974 [0.954, 0.995]*	0.983 [0.974, 0.991]***	0.987 [0.961, 1.013]	0.995 [0.972, 1.017]
Marital status of HH head (ref: Married/Living together)				NA	
Divorced/Separated	0.941 [0.293, 3.019]	1.724 [0.193,15.425]	0.812 [0.431, 1.529]		1.430 [0.194,10.556]
Widowed	1.336 [0.458, 3.900]	0.562 [0.135, 2.342]	0.802 [0.455, 1.414]		0.746 [0.180, 3.085]
Never married/Single	1.046 [0.060,18.297]	0.205 [0.009, 4.612]	0.950 [0.283, 3.187]		0.329 [0.006,18.656]
Religion (ref: Christian)				NA	
Muslim	1.114 [0.586, 2.118]	0.681 [0.285, 1.628]	0.709 [0.494, 1.019]		0.404 [0.163, 1.003]
Other	1.027 [0.200, 5.263]	0.811 [0.155, 4.260]	0.802 [0.386, 1.666]		0.516 [0.088, 3.032]
Mixed household	0.900 [0.358, 2.263]	0.505 [0.179, 1.423]	0.823 [0.494, 1.372]		0.405 [0.116, 1.410]
Wealth Index	1.224 [0.772, 1.941]	2.069 [0.930, 4.602]	1.344 [1.027, 1.759]*	1.485 [0.477, 4.624]	1.116 [0.544, 2.287]
Observations	911	665	2931	1370	468
AIC	4171.61	3066.11	13115.15	10509.90	2131.45
BIC	4175.06	3069.50	13118.63	10509.90	2134.78

*p<0.01, **p<0.001, ***p<0.0001.

Outcomes are as follows; (5) A caregiver sought TB screening for a child after a two-or-more-week episode of coughing; (8) All pregnant women in the household slept under a net the night before the survey; (9) All children less than five years old in the household slept under a net the night before the survey; (10) Advice or treatment was sought for a child under five years with a fever; and (11) A caregiver exclusively breastfed an infant up to five months old.

NA: Variable not applicable.

Note: High odds ratios are likely due to high prevalence of the behavior in the reference group (e.g. the OR for the follow-up survey for outcome 10 is 22.775, due to high prevalence at the first survey). Odds ratios should not be interpreted as relative risks; doing so can be particularly problematic for highly prevalent outcomes.

twice the odds of seeking TB screening for children than for those exposed fewer than two times (OR 1.98, 99% CI 1.28–3.05; Table 2, outcome 5). People in the Karamoja region also had higher odds of seeking TB screening than those in the Central region.

Maternal and child health

The percentage of mothers of infants 11 months or less who delivered their last baby in a health facility increased from 84.9% (99% CI 79.7–90.1) at time 1 to 91.3% (99% CI 86.6–96.0) at time 2 (Table S6). However, this change was not statistically significant in the model (OR 1.62, 99% CI 0.84–3.13; Table 1, outcome 6). Caregivers of infants who had been exposed two or more times to messages about delivering babies in health facilities had more than twice the odds of delivering in a health facility (OR 2.62, 99% CI 1.13–6.06). Also, the odds of delivering in a health facility were higher for mothers with more education.

Family planning

The percentage of adolescents 15–17 years who had never had sex decreased from 70.6% (99% CI 64.0–77.1) at time 1 to 52.8% (99% CI 44.1–61.5) at time 2 (Table S7) and this decrease was statistically significant in the model (OR 0.44, 99% CI 0.28–0.71; Table 1, outcome 7). However, sexual debut among adolescents was not influenced by exposure to messages about modern contraception (the survey did not include questions about exposure to messages on delaying sexual debut). Younger adolescents and those in the South-Western region had higher odds of never having had sex than those in the Central region.

Malaria

The percentage of households where all pregnant women reported sleeping under a net the night before the survey decreased from 76.0% (99% CI 68.1–83.9) at time 1 to 54.2% (99% CI 43.7–64.8) at time 2 (Table S8). This change was statistically significant in the model (OR 0.26, 99% CI 0.15–0.43). Having a household member being exposed to a malaria message did not influence the odds of all pregnant women sleeping under a net (OR 1.90, 99% CI 0.45–7.99; Table 2, outcome 8). Net use for pregnant women was lower among those with older household heads. Also, relative to the Central region, net use for all pregnant women in the household was higher in the Eastern, West Nile, and Western regions.

The percentage of households where all children under five years slept under a net the night before the survey decreased from 70.8% (99% CI 66.3–75.3) at time 1 to 46.3% (99% CI 40.4–52.2) at time 2 (Table S9) and this decrease was statistically significant (OR 0.31, 99% CI 0.25–0.38; Table 2, outcome 9). Having a household member being exposed to a malaria message was not associated with a meaningful change in the odds of all children under five in the household sleeping under a net (OR 1.03 99% CI 0.62–1.72). Net use for all children under five in the household was lower among households located in urban locations, poorer households, and those with older household heads. Also, relative to the Central region, net use for all children under five in the household was higher in the East Central, Eastern, Northern, West Nile, and Western regions.

The percentage of caregivers seeking advice or treatment for the child under five years old who most recently had a fever increased from 93.4% (99% CI 90.6–96.3) at time 1 to 99.7% (99% CI 99.0–100.0) at time 2 (Table S10) and this increase was statistically significant (OR 22.78, 99% CI 3.78–137.27; Table 2, outcome 10).[3] Caregivers who were exposed two or more times to messages about seeking prompt treatment of malaria for sick children had more than twice the odds of seeking treatment for children with a fever compared to caregivers exposed to messages fewer than two times (OR 2.41, 99% CI 1.04–5.56). Treatment seeking was not influenced by the other variables in the model.

Nutrition

The percentage of caregivers who reported exclusive breastfeeding of infants up to five months old increased from 65.7% (99% CI 56.4–74.9) at time 1 to 71.2% (99% CI 71.2–80.9) at time 2 (Table S11). However, this increase was not statistically significant (OR 1.43, 99% CI 0.80–2.54; Table 2, outcome 11). Caregivers being exposed to two or more times to messages about exclusive breastfeeding did not influence the odds of exclusively breastfeeding (OR 0.59, 99% CI 0.24–1.44). Caregivers in the South-Western region had lower odds of exclusive breastfeeding than in the Central region.

Discussion

This study evaluated the Obulamu? integrated health communication intervention which used the life-stage approach. To our knowledge, the life-stage (or sometimes, life cycle or life course) approach has not been widely applied in other health communication campaigns. In addition, rather than focusing on one or two health areas and populations at a time, as has been the norm in HC interventions [12,13], the Obulamu? campaign integrated activities across multiple health areas and populations.

We evaluated the effects of the Obulamu? campaign on 11 outcomes in the domains of HIV/AIDS, family planning, maternal and child health, TB, malaria, and nutrition. After controlling for time and potentially confounding factors, we observed notable increases among people exposed to topic-specific messages in condom use with at least one non-marital, non-cohabiting partner in the last six months; recent male circumcision; seeking tuberculosis screening/testing for self; seeking tuberculosis screening/testing for child; delivery of baby in a facility; and caregiver seeking advice or treatment for child under five years with fever. Exposure did not appear to influence knowledge of antiretroviral therapy, delayed sexual debut, breastfeeding infants and all of the household's pregnant women/children less than five years sleeping under a net the night before the survey.

Significant increases in comprehensive knowledge of antiretroviral therapy were observed for the study population over time, after controlling for potential confounders and regardless of exposure. It is possible that the campaign may have diffused beyond those directly exposed to the messages, perhaps through interpersonal communication or other health initiatives, for this outcome. While our data do not lend themselves to further exploration of this hypothesis, future research could explore if and how messages about antiretroviral therapy diffuse beyond those directly exposed.

Although the number of households with a net decreased over time, we found that net use among pregnant women and children decreased to an even greater extent than this decrease; in other words, households that did have nets were not using them for these two populations. Previous studies of the effects of SBCC activities on bed net use in Zambia and Cameroon found that exposure to radio interventions was significantly associated with increased net use for malaria prevention [12]. In addition, researchers evaluating an intervention in Togo found that a more intensive intervention consisting of two follow-up home visits had a higher effect on bed-net use than a less intensive intervention [13]. This suggests that the form and intensity of the Uganda interventions, including the Obulamu? campaign, may have been insufficient to positively affect the net-use behaviors of the target audiences. Therefore, it is important to increase the intensity of health communication interventions for a greater impact on behavior.

Limitations

The main limitation with this evaluative assessment was that the first cross-section was not a true baseline, as it occurred in the context of CHC's ongoing campaigns, including for HIV testing and condom promotion, activities under the Safe Mothers Giving Life program, and malaria prevention campaign messaging in support of STOP Malaria program activities. The CHC teaser campaign, initiated before commencement of Observation 1, contributed to behaviors being positive already at 'baseline,' which may have attenuated the impact of the campaign measured during Observation 2. Despite this limitation, Obulamu? campaign achievements are notable in the multivariable regression models, indicating that individuals exposed to topic-specific messaging were approximately twice as likely to initiate several of the recommended behaviors. Because the baseline proportions and means (that would have been found before the initiation of the campaign) would have involved regression-based estimations that may not have been accurate or precise, we elected to use the actual data in the analyses. Importantly, although we re-surveyed the same parishes and villages, we did not track households and individuals over time.

In addition, the study reported mixed results for many health areas. Targets to reach with health communication were guided by the Hierarchy of Communication Effects Model [14], which draws from the stages-of-change model, and wider communication effects research by Prochaska and DiClemente [15], Prochaska et al. [16], and Valente [17] on the evaluation of health communication interventions. With the exception of malaria, the health areas under CHC underwent an extensive shift in implementation in the second year, adopting more micro-targeting approaches and strategies. These changes in the intervention strategy, though urgent and important, were not necessarily congruent with the earlier roll-out plan and targets, which had been based on maximizing reach for any given population/target group. These approaches, designed to be responsive to the emerging needs of USAID and U.S. Government implementing partners for every annual work plan, may explain variations in the results from this study. This justification for the modified approach notwithstanding, for this study the post-intervention evaluative study design could not be changed. Therefore, the measurement of future programs in such complex implementation environments should include more agile evaluative methodologies, especially smaller, targeted, and granular evaluative assessments that evolve with the intervention.

Finally, except for selected adolescent sexual and reproductive health topics, the findings did not cover other gender and social norm topics. The survey tools, however, contained questions to generate data on selected gender and social norm variables.

Programmatic implications for SBCC

Our study has several implications for SBCC efforts. Programmatic efforts in HIV prevention should pay

close attention to the gap between intention and actual uptake of HIV prevention behaviors, particularly for condom use. While increasing knowledge remains a critical component of HIV-related SBCC outreach, as shown by our study results, practitioners should focus on working to shift factors that may be hindering people from translating reported intention into action, such as social and gender norms. For example, unfavorable attitudes toward condoms reflect widespread social disapproval among both the general and key populations, further compounding a gendered perspective that causes men to reject attempts by women to suggest condom use.

Based on our finding of an increase in uptake of TB screening and testing among adults and caregivers of children up to 14 years, we recommend that interventions aim to increase exposure to TB-related messaging. Insight from an evaluative qualitative assessment conducted by CHC a few months before the Observation 2 survey indicates that fear and stigma associated with TB persist, particularly the association of TB with HIV coinfection. Therefore, interventions at the community level, much more than at the individual level, are needed to generate discourse on the social barriers to seeking TB care and to enhance community-led demand and identification of suspected TB cases. Targeted interpersonal communication and community dialogue approaches, such as working through cultural leaders and community champions/volunteers, may be effective.

Increases in reported uptake of the delivery of babies at a health facility is near universal in Uganda, but caregivers exposed to messaging at least twice were more than twice as likely to deliver at a health facility. Practitioners should focus on maintaining these noted results, including enhancing interpersonal communication interventions to specifically spearhead household and community-led active use and demand for health facility delivery, child welfare services, and other maternal and child health topics. Importantly, there is a need to identify and address the barriers that prevent some women from accessing facility birthing services. It is important to work with community outreach workers to support families to identify solutions to overcome important considerations of value to women.

Our findings indicated that sexual debut among adolescents was not influenced by their exposure to messages about contraception, but the Determined, Resilient, Empowered, AIDS-free, Mentored and Safe (DREAMS) program implemented by partners found improvements in delaying sexual debut associated with the Stepping Stones intervention. This was due to improved peer-to-peer and caregiver-adolescent communication skills developed through the program, resulting in adolescents being better able to decline sexual advances [18]. Thus, communication interventions should focus on building communication skills rather than on messaging alone.

Both the Uganda Demographic and Health Survey 2016 [1] and our findings documented a decline in mosquito net use among children under five years and pregnant women. Notably, in the period before these surveys, a resurgence of malaria was observed in Uganda despite concerted efforts, including distribution of long-lasting insecticide-treated nets and a supportive HC campaign under the umbrella of Obulamu?. Malaria surveillance data analysis by Raouf et al. [19] links the resurgence of malaria in Uganda with the withdrawal of indoor residual spraying in high-transmission areas, and the concomitant adjustment period that it takes for populations previously receiving a periodic one-off intervention to one that required direct behavioral adherence on their part, every night all year [19]. In this regard, future programs should carefully consider exit and long-term strategies, particularly to facilitate the transition to a proven strategy that they have not commonly used, yet whose effectiveness relies largely on the full participation of users. In such cases, implementers would need ample time to undertake necessary formative assessments to contextualize client support materials, and for community volunteers to be prepared to hold effective dialogues in which they work collaboratively with recipients to identify best solutions to concerns and challenges perceived by individual households.

Caregivers' exposure to messaging had no effect on the odds of exclusive breastfeeding. However, insight from interpersonal communication and other CHC community outreach activities indicates that while caregivers often report being motivated to ensure that their children have a positive nutritional status, individual understanding of what good nutritional status means is lacking. Specifically, interventions should be intensified on enhancing knowledge and skills that promote exclusive breastfeeding, particularly proper breast attachment, adequate diet, breastfeeding frequency, and expression of breast milk to sustain an adequate flow. More active forms of interventions, such as peer counseling visits, have been found to increase reported exclusive breastfeeding prevalence [14].

Conclusions

Overall, our findings indicate favorable shifts in initiation of some of the recommended health behaviors that influenced health outcomes, but not for all the outcomes we studied. Exposure to topic-specific messages was associated with improvements in six of the eleven behavioral outcomes we studied. Looking

across Obulamu?'s six health priority areas we observed improvements for select HIV/AIDS, tuberculosis and maternal and child health behavioral outcomes. We did not observe effects of exposure on select behavioral outcomes in the areas of family planning, malaria, or nutrition.

Geolocation information

This research was conducted in 16 districts distributed across Uganda (Figure 2) in East-Central Africa.

Ethical approval

The study was reviewed and approved by FHI 360's federally registered Protection of Human Subjects Committee (Protocol # 616862–13) and the Makerere School of Public Health (MakSPH) Research Ethics Committee (Protocol # 259). Consent to conduct research was provided by the Uganda National Council for Science and Technology (Protocol # SS 3667) and the Office of the President (Protocol # ADM 154/212/03). All participants provided oral informed consent prior to the survey. For participants 15–17 years, we obtained guardian consent as well as assent from the minor.

Notes

1. The probability of selection for household member *i* in household *j* in village *k* and parish *l*, denoted p_{ijkl}, was the product of (1) the probability of the parish being selected, (2) the probability of the village being selected conditional on the parish being selected, (3) the probability of the household being selected conditional on the village being selected, (4) the probability of the household member being selected conditional on household being selected. The individual-level sample weights were then calculated as $w_{ijkl} = 1/p_{ijkl}$.
2. Note we used logistic regression and provide adjusted odd ratios for each predictor. The odds differ from the risk or prevalence rate, and while the odds ratio may appear high, the change in the prevalence rate may be low.
3. This high odds ratio is in part due to the high prevalence of the behavior at baseline. We caution the reader not to interpret this odds ratio as a relative risk. Note that at both timepoints more than 90% of caregivers were seeking advice or treatment for the child under five years old who most recently had a fever (i.e. high odds of seeking treatment at both timepoints). Further, the percentage at the second timepoint is close to 100%, so the odds ratio is very high and needs to be interpreted with caution.

Acknowledgments

The Communication for Healthy Communities (CHC) Program acknowledges the extensive support of the Uganda Ministry of Health/Health Promotion and Education Department (MOH/HPED), specifically in facilitating research training sessions, review of the statistical analysis plan for the Observation 2 survey, field supervision, and review of preliminary data tables to draw programmatic implications. Similarly, CHC recognizes the valuable contribution of District Health Teams and Local Council and Sub-County Leaders who were instrumental in securing field entry and survey respondents, as well as the commitment of data collection teams. We appreciate the technical and supervisory support provided by Richard Kanakulya and Felix Manano and the CHC regional teams who provided guidance during data collection. On a special note, CHC greatly acknowledges Wilsken Agencies for converting the Open Data Kit script (previously programed by TechLab-FHI 360 USA) into Survey CTO and conducting interviews for Observation 2. Angie Wheeless and Cheryl Shen provided statistical support. Hibiste Astatke, Kelly L'Engle, Antje Becker-Benton, Anne Fiedler, and Emmanuel Kayongo (all formerly of FHI 360) contributed to the conceptualization of the evaluative study. Peter Ndawula (formerly of CHC) led the finance staff in Kampala and field offices to ensure seamless administrative and logistical support throughout.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This publication is made possible by the generous support of the American people through the United States Agency for International Development (USAID) under the terms of Agreement No. AID-617-A-13-00003. The contents are the responsibility of Communication for Healthy Communities (CHC) Project, managed by FHI 360, and do not necessarily reflect the views of USAID or the United States Government.

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