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Impact of community health promoters on awareness of a rural social marketing program, purchase and use of health products, and disease risk, Kenya, 2014–2016

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Impact of community health promoters on awareness of a rural social marketing program, purchase and use of health products, and disease risk, Kenya, 2014–2016

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ABSTRACT

The Safe Water and AIDS Project (SWAP), a non-governmental organization in western Kenya, opened kiosks run as businesses by community health promoters (CHPs) to increase access to health products among poor rural families. We conducted a baseline survey in 2014 before kiosks opened, and a post-intervention follow-up in 2016, enrolling 1,517 households with children <18 months old. From baseline to follow-up, we observed increases in reported exposure to the SWAP program (3–11%, $p = 0.01$) and reported purchases of any SWAP product (3–10%, $p < 0.01$). The percent of households with confirmed water treatment (detectable free chlorine residual (FCR) >0.2 mg/ml) was similar from baseline to follow-up (7% vs. 8%, $p = 0.57$). The odds of reported diarrhea in children decreased from baseline to follow-up (odds ratios or OR: 0.77, 95% CI: 0.64–0.93) and households with detectable FCR had lower odds of diarrhea (OR: 0.53, 95% CI: 0.34–0.83). Focus group discussions with CHPs suggested that high product prices, lack of affordability, and expectations that products should be free contributed to low sales. In conclusion, modest reported increases in SWAP exposure and product sales in the target population were insufficient to impact health, but children in households confirmed to chlorinate their water had decreased diarrhea.

Key words | children, diarrhea, Jamii, social marketing, SWAP

HIGHLIGHTS

- SWAP opened kiosks run as businesses to increase access to health products among rural families of Kenya.
- SWAP exposure and product sales were modest.
- It was likely a consequence of poverty in the target population and expectations for free distribution.
- The program was insufficient to impact the health of young children.

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INTRODUCTION

Despite decades of public health investments and improving health indicators in western Kenya, the population continues to suffer from a high burden of preventable morbidity and mortality (CDC 2018). The 2014 Kenya Demographic and Health Survey (DHS) estimated that mortality among children <5 years old was 82 and 64 per 1,000 live births, respectively, in Nyanza and Western Provinces (Kenya National Bureau of Statistics 2014). Similarly, in the 2 weeks preceding the survey, 19–20% of children <5 years old were reported to have diarrhea, 10–13% had symptoms of acute respiratory infection, and 36–37% had reported fever (Kenya National Bureau of Statistics 2014).

A number of health interventions have been shown to reduce the burden of waterborne, vectorborne, and respiratory infections in low-income countries (Curtis & Cairncross 2003; Hawley *et al.* 2003; Clasen *et al.* 2007; Smith *et al.* 2011; Sugar *et al.* 2017). However, barriers such as poverty, low educational levels, and lack of access often contribute to low uptake of these interventions (Harris *et al.* 2012; Schilling *et al.* 2013).

The Safe Water and AIDS Project (SWAP), a local non-governmental organization based in western Kenya (http://www.swapkenya.org), has worked with community-based organizations since 2005 to improve the health of local populations by building their capacity to develop profitable, health-oriented micro-enterprises. SWAP trains and supports community health promoters (CHPs) to generate income by selling health products (e.g., soap, water treatment solution, bednets, etc.). Over time, SWAP has added health products to increase the number of public health interventions available to target populations and the income generated by CHP micro-enterprises. The selection of products has been based on a number of factors including disease burden, affordability, acceptability, local availability, and the existence of partnerships. In 2010, in collaboration with Procter & Gamble Co., SWAP opened 'Jamii Centers', kiosks run by CHPs that serve as hubs for purchase and storage of household drinking water treatment and other health and hygiene products, weekly meetings of CHPs to remit money from sales and order new stock, and training and implementation of health promotion activities to better reach vulnerable communities in rural areas with limited access to health services (SWAP 2018). The CHPs purchase products from SWAP at wholesale and sell products at retail prices door-to-door and at meetings in communities, with a goal of covering an average of 100 households each (SWAP 2013). CHPs made a limited number of sales directly from Jamii Centers. In this study, we evaluated whether the Jamii Center program increased reported exposure to, and purchase and use of, SWAP health products, and higher prevalence of confirmed household drinking water treatment, and we examined program impact on disease among young children.

METHODS

Study design

Rural villages in three subcounties in western Kenya (Rangwe subcounty (in Homa Bay County, south of Lake Victoria), Lurambi subcounty (in Kakamega County, north of Lake Victoria), and Gem subcounty (in Siaya County, north of Lake Victoria)) were selected as study sites as they would be served by planned Jamii Centers. Because Gem subcounty was scheduled to receive two Jamii Centers in two different wards (Wagai and Yala), we included each ward as a separate study site, resulting in a total of four study sites. In September to October 2014, which coincided with the dry season preceding the short rains, we conducted a baseline survey in households in the four study sites with at least one child <18 months old to ensure that at least one child per household remained <5 years old throughout the 3-year project period as young children have a higher prevalence of diarrhea (Clasen *et al.* 2007). Following the baseline survey, the Jamii Center program with its cadre of CHP vendors was implemented in the study counties. In February to March 2016, which coincided with the dry season preceding the long rains, a follow-up/post-intervention evaluation was conducted in the same households selected at baseline. Of note, a cholera outbreak affected Homa Bay and Siaya Counties between December 2014 and January 2016 (George *et al.* 2016). At follow-up, one to two focus group discussions (FGDs) per subcounty were conducted with CHPs to determine their opinions about the program and the training they received.

Sample size calculation

Based on results of previous studies in western Kenya, we assumed that confirmed use of water treatment solution (brand name WaterGuard) would be 10% in households exposed to SWAP and 2% in households not exposed to SWAP, and that approximately 25% of households would have had exposure to the SWAP program (Freeman *et al.* 2009; Harris *et al.* 2012). With these assumptions, a confidence level of 95% and power of 90%, we calculated an approximate sample size of 127 households exposed to SWAP and 381 non-exposed households and multiplied the number of selected households by four to account for design effect, resulting in a target sample of 2,032 households. Based on 2013 census data, approximately 3% of Kenya's population was <12 months old (one birth cohort), and each enumeration area (EA) in a subcounty contained about 500 people. Therefore, the estimated number of children <18 months old (1.5 birth cohorts) was 23 in each EA. To obtain the required number of households from our sample size calculation, we randomly selected 90 EAs from each of the four study sites (≥22 EAs per study site), for an estimated total of 2,070 households.

Data collection

At both baseline and follow-up, trained local bilingual enumerators administered a survey to the female head of selected households. The survey included demographic and socio-economic characteristics, drinking water source and treatment, previous experience (if any) with SWAP or Jamii Centers, reported purchase of SWAP products, and health problems among the target children in the preceding 2 days (diarrhea, cough, and fever) or 2 weeks (malaria and hospitalization for any reason) of the survey. In addition, enumerators recorded observations of health products in the home, and the results of stored water testing for free chlorine residual (FCR), using the *N*,*N*-diethyl-1,4-phenylenediamine sulfate (DPD) method (Hach, Loveland, CO). A result >0.2 mg/ml FCR was defined as confirmed water treatment.

Seven FGDs were conducted with a convenience sample of 6–11 CHP vendors per group. Two Kenyan qualitative research assistants facilitated FGDs in the local language in a private place located near each Jamii Center. They followed a standardized guide which probed about CHP vendor experiences selling SWAP products, working with the Jamii Center, and educating the community about health topics. No names or personal identifiers were captured which would link participants to responses.

Data analysis

Data were entered into a Microsoft Access© 2013 (Redmond, WA, USA) database, and all analyses were performed using SAS v9.4 (SAS 2013). Paired proportions at baseline and follow-up were compared using McNemar's test. The associations between reported illnesses of children and time (baseline vs. follow-up) were examined using multivariable logistic regression, adjusting for SWAP exposure (yes or no), respondent age (<25 vs. 25+ years), household size (≤4, 5–7, and >7), and FCR (positive vs. negative) in stored water. SWAP exposure was defined as a response of yes to either of two questions: 'Have ever visited a Jamii Center?' or 'Have bought any health product from a Jamii Center or SWAP member?'. Potential correlation from the clustered data structure (illness reports at baseline and follow-up < household < district in a subcounty) was considered using a Generalized Estimating Equation approach with the compound symmetry correlation structure.

FGDs were tape-recorded, transcribed verbatim, and translated into English. Two qualitative researchers read all transcripts and developed a codebook through an iterative process of transcript review and revision of codes and coded text. Transcripts were coded in MAXQDA (version 11, Berlin, Germany), key concepts were mapped, and analysis memos were written to elucidate key themes. Qualitative findings were also validated through the team approach and the application of codes by two independent researchers.

Ethical considerations

The study protocol was reviewed and approved by CDC's Institutional Review Board (protocol 6577) and the Ethical Review Committee of the Kenya Medical Research Institute (protocol 2789). Informed consent was obtained from all participants in their native language and personal identifiers were irretrievably destroyed at the conclusion of the study.

RESULTS AND DISCUSSION

We located and chose to interview all 2,115 caregivers of children <18 months old at baseline, of whom 1,517 (72%) were also interviewed at follow-up; 598 (28%) were lost to follow-up. Reasons for loss to follow-up included moved away (47%), unable to find (24%), moved out (20%), not at home at time of interview (6%), refused to participate (1%), and other (3%). Our analysis included the 1,517 caregivers from whom we had baseline and follow-up data.

Demographic and socio-economic characteristics at baseline

The median age of caregivers at baseline was 25 years (range: 16–75), 75% attained a primary or lower level of education, 88% were married, and 94% were homeowners (Table 1). The median household size was 5 (range: 2–26), with a median of two children <5 years old (range: 1–5 children). The homes of 85% of respondents had mud walls, 80% had earthen floors, 19% had a television, and 10% had electricity, which reflected the low-income status of the majority of this population.

Drinking water source, management, and products in the home

At baseline, 56% of respondents reported using an improved water source (tap/piped water, water from protected borehole/well/spring, or rain water), 97% said they stored water in the home, 32% used a water storage container with a spigot or spout (ceramic filter or Jerry can), and 88% covered the container with a lid (Table 2). Of 823

Table 1 | Socio-demographic characteristic distribution of households at baseline, *N* = 1,517, Kenya, 2014

	N[a] (%) or median [IQR]
Age, years	25 [21–30]
16–24	674 (44)
25–75	843 (56)
Education	
No formal schooling	45 (3)
≤ Primary	1,091 (72)
> Primary	381 (25)
Marital status	
Married	1,333 (88)
Single	184 (12)
Home ownership	
Own	1,431 (94)
Rent	86 (6)
Household size	5 [4–7]
≤ 4	539 (36)
5–7	748 (49)
> 7	229 (15)
No. of children <5 years old	2 [1–2]
Household assets	
Car/refrigerator/househelp	84 (5)
Electricity	154 (10)
Radio	1,140 (75)
Bike	553 (36)
TV	287 (19)
Stove	237 (16)
Mobile phone	1,179 (78)
Main material for floor observed	
Dung/earth/sand/mud/broken bricks	1,221 (80)
Cement /tile/linoleum	295 (20)
Other	1 (0.1)
Main material for wall observed	
Dung/earth/sand/mud	1,294 (85)
Metal/wood/cement/plaster/brick/block/stone	217 (14)
Other	6 (0.4)
Main material for roof observed	
Thatch	197 (13)
Metal/Iron sheets Tile/asbestos sheets/cement	1,320 (87)

[a]*N* does not add up to total for some variables due to missing values.

Table 2 | Number and percentage of households by drinking water source, storage, treatment, and health products observed in home at baseline and follow-up, Kenya, 2014–2016

	Baseline *N* (%)	Follow-up *N* (%)	*P*-value
Store water in home			
Yes	1,468 (97)	1,462 (96)	0.54
No	48 (3)	54 (4)	
Water source[a]			**< 0.01**
Improved	856 (56)	717 (47)	
Unimproved	659 (44)	798 (53)	
Observed type of water container[b]			0.64
Improved	478 (32)	487 (33)	
Unimproved	1,008 (68)	999 (67)	
Observed water container covered with a lid			**0.02**
Yes	1,269 (88)	1,306 (90)	
No	179 (12)	142 (10)	
Water treatment			
Chlorination[c]	328 (61)	339 (63)	0.44
Unproven[d]	100 (19)	53 (10)	**< 0.01**
Boil	100 (19)	136 (25)	**< 0.01**
Ceramic filter	7 (1)	7 (1)	1.00
Chlorine residual test			0.57
Positive	97 (7)	104 (8)	
Negative	1,239 (93)	1,232 (92)	
Products observed in home			
Washing soap	908 (60)	798 (53)	**< 0.01**
Diapers	43 (9)	205 (14)	**< 0.01**
Feminine pads	319 (21)	346 (23)	0.20
Toilet tissue	396 (26)	404 (27)	0.69
Fortified flour	154 (10)	69 (5)	**< 0.01**
Condoms	162 (11)	180 (12)	0.26
Mosquito net	1,418 (93)	1,412 (93)	0.65
Cook stove	174 (11)	197 (13)	0.20
Hand soap	1,340 (88)	1,404 (93)	**< 0.01**
Child bed net	1,344 (91)	1,398 (95)	**< 0.01**

Bold values denote *P*-value < 0.05.
[a]Improved includes Tap/piped water, water from protected borehole/well/spring, and rain water. Unimproved includes open well, unprotected spring/borehole, bottled water, and river/lake/dam/pond.
[b]Improved includes ceramic filter/jerrycan. Unimproved includes no container, clay pot, cooking pot, plastic bottles, and water tank/barrel/drum/bucket.
[c]PuR, WaterGuard, Aqua.
[d]Sieve, Alum.

(40%) respondents who reported their usual household water treatment method, 61% reported using chlorine products, 19% said they boiled, and 19% indicated other unproven methods, such as alum or sieving water through a cloth. Water treatment was confirmed through FCR >0.2 mg/ml in 7% of water samples in respondent households at baseline.

From baseline to follow-up, there were increases in the percentage of respondents whose households had water containers covered with a lid (88–90%, $p = 0.02$), treated water by boiling (19–25%, $p < 0.01$) and were observed to have products including diapers (9–14%, $p < 0.01$), hand soap (88–93%, $p < 0.01$), and insecticide-treated bednets (ITN) for children (91–95%, $p < 0.01$) in the home (Table 2). From baseline to follow-up, there were decreases in the percentage of respondents who reported use of an improved water source (56–47%, $p < 0.01$), used an unproven water treatment method (19–10%, $p < 0.01$), and were observed to have certain health products in the home, including soap (60–53%, $p < 0.01$) and fortified flour (10–5%, $p < 0.01$).

SWAP exposure and product purchases

From baseline to follow-up, we observed increases in the percentage of respondents who were aware of SWAP (12–32%), had heard of Jamii Centers (9–23%), visited a Jamii Center (1–3%) (all $p < 0.01$), reported purchasing any product from SWAP (3–10%, $p < 0.01$), and reported purchasing specific products, including clothes washing detergent, diapers, feminine pads, toilet tissue, hand soap, and WaterGuard water treatment solution (Table 3).

Reported illness in children <5 years old

From baseline to follow-up, there was a decrease in the 2-day period prevalence of reported diarrhea (21–17%, $p < 0.01$), and increases in reported fever (29–32%, $p < 0.01$) and in 2-week period prevalence of reported malaria (18–28%, $p < 0.01$) (Table 4). One percent of children were reported to have been hospitalized in the 2 weeks preceding baseline and follow-up surveys. In a multivariable analysis, the adjusted odds of diarrhea in children <5 years old was lower at follow-up than at baseline (OR: 0.77, 95% CI: 0.64–0.93), while the odds of cough (OR: 1.19, 95% CI: 1.02–1.38), fever (OR: 1.19, 95% CI: 1.02–1.39), and malaria (OR: 1.78, 95% CI: 1.49–2.14) were higher (Table 5). Overall, younger respondent age (<25 years old) and bigger household size (>7 people) were associated with increased reports of illness. Confirmed water treatment (detectable FCR) was associated with lower odds of diarrhea (OR: 0.53, 95% CI: 0.34–0.83) and cough (OR: 0.73, 95% CI: 0.54–1.00). Hospitalization was not associated with any factors examined.

Qualitative research results

Twelve CHPs who participated in FGDs indicated that the program helped them learn about business and health, connect with and serve their communities, increase their social status, and improve the health of themselves, their families, and communities (Supplementary Table S1). CHPs also reported many challenges, including difficulties with the business aspects of the project, such as high product prices, low profits, stockouts, theft, transport, competition with stores, and community expectation of free product distribution. CHPs suggested a number of things SWAP could do to improve the program, including decreasing product prices; providing refresher business and health trainings; adding higher profit medicines to the CHPs' basket of goods; providing training on how to engage clients; and assisting with advertising the health products.

Results of this study suggested that there was a modest increase from baseline to follow-up in awareness of the SWAP program and reported the purchase of SWAP products in rural households in western Kenya. Small increases in reported purchase and confirmed use of water treatment products were observed despite the detection of a cholera outbreak in two project counties following Jamii program implementation in 2014, suggesting little effect of waterborne disease risk on water treatment practices. Similar evidence of modest water treatment was also observed during a cholera outbreak in 2008 in the same region of Kenya (Date *et al.* 2013). At least two other studies of similar programs in western Kenya showed similarly low utilization of socially marketed products (Freeman *et al.* 2009; Harris *et al.* 2012). Each of these studies highlights the challenges experienced in Kenya and elsewhere in achieving robust product sales that would permit full cost recovery from sales to poor, rural households (Karamchandani *et al.* 2009; Garrette & Karnani 2010).

There are several possible explanations for the modest increases in SWAP product purchases observed in this evaluation. First, most of the project population was in a low socio-economic category, as demonstrated by the high proportion of homes with mud walls and earthen floors, low electrical coverage, and high exposure to unimproved water sources. It has been shown that poor populations have little or no disposable income to spend on preventive

Table 3 | SWAP product prices in Kenya shillings and US dollars, number and percent of households, reporting SWAP program experience and purchasing products from SWAP, at baseline and follow-up, Kenya, 2014–2016

	Product price (KSH)[a]	Product price (USD)[b]	Reported purchase, baseline *N* (%)	Reported purchase, follow-up *N* (%)	*P*-value
SWAP program					
Heard of SWAP vendor	–	–	184 (12)	488 (32)	<**0.01**
Bought any SWAP product	–	–	40 (3)	158 (10)	<**0.01**
Heard of Jamii Center	–	–	135 (9)	355 (23)	<**0.01**
Visited Jamii Center	–	–	12 (1)	49 (3)	<**0.01**
Reported purchasing from SWAP					
Purchased any item below:			41 (3)	157 (10)	<**0.01**
Washing soap	15	0.15	15 (1)	92 (6)	<**0.01**
Diaper	200	2.00	18 (1)	45 (3)	<**0.01**
Feminine pad	83	0.83	4 (0.3)	25 (2)	<**0.01**
Toilet tissue	20	0.30	5 (0.3)	38 (3)	<**0.01**
Fortified flour	75	0.75	2 (0.1)	6 (0.4)	0.10
Condom	20	0.20	1 (0.1)	5 (0.3)	0.10
Mosquito net	420	4.20	11 (0.7)	16 (1)	0.34
Antiseptic liquid	190	1.90	1 (0.1)	5 (0.3)	0.10
Cook stove	800	8.00	0 (0)	8 (0.5)	NA
Hand soap	25	0.25	7 (0.5)	23 (1.5)	<**0.01**
WaterGuard	25	0.25	17 (1)	80 (5)	<**0.01**
Water filter	2,000	20.00	0 (0)	7 (0.5)	NA

Bold values denote *P*-value < 0.05. NA, not available.
[a]Kenya shillings.
[b]US dollars.

Table 4 | Number and percentage of households reporting illnesses of children <5 years old at baseline and follow-up, Kenya, 2014–2016

	Baseline *N* (%)	Follow-up *N* (%)	*P*-value
In the past 2 days			
Diarrhea	315 (21)	250 (17)	<**0.01**
Cough	531 (36)	573 (38)	0.09
Fever	426 (29)	484 (32)	**0.01**
In the past 2 weeks			
Malaria	267 (18)	414 (28)	<**0.01**
Hospitalization	20 (1)	26 (1)	0.38

Bold values denote *P*-value < 0.05.

health products and have competing needs for their limited resources (Freeman *et al.* 2009; Harris *et al.* 2012; Schilling *et al.* 2013). Second, CHPs noted during FGDs that the relatively modest SWAP product prices, as shown in Table 3, were too high, a finding that has been observed in studies of similar interventions (Onwujekwe *et al.* 2004; Dupas 2009; Ashraf *et al.* 2010; Shah *et al.* 2013; Blum *et al.* 2014; Dupas 2014), suggesting that consumers are very sensitive

Table 5 | Adjusted odds ratio (95% CI) of illnesses of children <5 years old in household, Kenya, 2014–2016

	Diarrhea	Cough	Fever	Malaria	Hospitalization[a]
Time					
Baseline	Ref	Ref	Ref	Ref	Ref
Follow-up	**0.77 (0.64–0.93)**	**1.19 (1.02–1.38)**	**1.19 (1.02–1.39)**	**1.78 (1.49–2.14)**	1.21 (0.63–2.30)
SWAP exposure					
Yes	1.14 (0.77–1.67)	0.96 (0.71–1.31)	1.12 (0.82–1.52)	0.97 (0.69–1.38)	1.25 (0.41–3.84)
No	Ref	Ref	Ref	Ref	Ref
Respondent age					
<25 years	**1.33 (1.08–1.64)**	**1.23 (1.03–1.46)**	**1.30 (1.09–1.56)**	**1.29 (1.06–1.57)**	0.66 (0.34–1.26)
25+ years	Ref	Ref	Ref	Ref	Ref
Household size					
≤4	Ref	Ref	Ref	Ref	Ref
5–7	1.09 (0.88–1.36)	0.92 (0.77–1.10)	**1.38 (1.14–1.67)**	1.13 (0.92–1.39)	0.53 (0.28–1.02)
>7	**1.49 (1.11–1.99)**	1.07 (0.84–1.36)	**1.61 (1.24–2.09)**	**1.46 (1.09–1.94)**	0.51 (0.19–1.39)
Chlorine residual testing					
Positive	**0.53 (0.34–0.83)**	**0.73 (0.54–1.00)**	0.81 (0.59–1.11)	1.13 (0.80–1.60)	1.89 (0.79–4.50)
Negative	Ref	Ref	Ref	Ref	Ref

Bold values denote *P*-value < 0.05.
[a]Hospitalization of children for any illness.

to the price of social marketing products and demand for products decreases when product prices increase (Shah *et al.* 2013). In a study conducted in rural Cambodia, only one-fifth of participants were willing to pay for latrines at the market price, while half were willing to pay half the market price (Shah *et al.* 2013). Further research is needed to better understand consumer demand in relation to price in poor populations. Third, in FGDs, CHPs identified barriers to product sales in the target population such as scarce resources for transport, competition from stores, and expectations that products be given away free. Fourth, because of limited access to transport, CHP coverage of target households was incomplete and only about a third of survey respondents were aware of SWAP at follow-up.

Although reported diarrhea rates decreased from baseline to follow-up, this change cannot be attributed to SWAP product use. Because of low baseline rates of reported diarrhea and low product sales, the sample of households was insufficient to measure the effect of product use on illness. Although some studies have suggested that an association exists between social marketing programs and conditions such as anemia, or hospitalizations for diarrhea (Suchdev *et al.* 2012; Suchdev *et al.* 2016), a recent literature review found few studies documenting a positive health impact of social marketing programs (Firestone *et al.* 2017). Confirmed use of chlorine in stored water was, however, associated with reduced odds of reported diarrhea, a result which has been documented in a number of other studies (Clasen *et al.* 2007). An explanation for the increases in reported fever and malaria, which often are seasonal occurrences, typically during the rainy season (Odongo-Aginya *et al.* 2005), was beyond the scope of this evaluation. Baseline data were collected in the dry months preceding the short rains and follow-up data collection took place during the dry months preceding the long rains, so it was unlikely that weather conditions influenced the increases observed.

Toward the end of 2016, funding support for the Jamii Centers ended, sales and promotional activities were scaled down, and several kiosks were closed because of sustained financial losses (SWAP 2018). This experience highlighted the challenge of recovering costs when serving poor populations and reinforced similar findings in other studies (Dunston *et al.* 2001; Freeman *et al.* 2009; Loewenberg 2011; Harris *et al.* 2012). Investments are needed to develop, implement, and evaluate models for social marketing approaches that have the potential for at least partial cost recovery, or come up with alternative program implementation strategies in populations where social marketing is not feasible.

This evaluation had several limitations. First, the relatively small number of CHPs and transportation challenges limited SWAP's capacity to reach the full population targeted by the program. Nevertheless, SWAP CHPs did manage to make contact with about a third of project households and to modestly increase sales. Second, the high frequency of water treatment (61%) reported by respondents compared to confirmed treatment (7%) at baseline and at follow-up (63% vs. 8%) indicated that water treatment behavior was over-reported, most likely as a result of social desirability bias. We controlled for this bias by measuring FCR, an objective measure of product use, and using that variable in our analysis. Third, we lacked the resources to include a control group, so we could not account for non-program influences on SWAP program awareness and product use during the two-year implementation period between baseline and follow-up. Fourth, the study results about household illness and water treatment could have been influenced by seasonal differences between baseline and follow-up. Although baseline and follow-up survey data were each collected during the dry seasons in western Kenya, there may have been subtle environmental and climatic differences between the two periods that could have impacted the health of study participants. Finally, because we enrolled a convenience sample of four subcounties, the evaluation population was not representative of western Kenya.

CONCLUSIONS

In conclusion, although exposure to SWAP's Jamii program increased modestly from baseline to follow-up in our study, reported purchases of SWAP products remained low, most likely as a consequence of poverty in the target population and expectations that products be distributed for free. FGDs with CHPs revealed several barriers to adequate income generation, including low earnings, competition from the commercial sector, and poor access to transport to get to client households. Many CHPs were motivated, however, by social benefits of the program and the opportunity to improve conditions in their communities. Further research is needed to develop strategies to better address economic barriers to health interventions and reach target populations more effectively and sustainably.

COMPETING INTERESTS

The authors declare no conflicts of interest.

DISCLAIMER

The contents of this paper are solely the responsibility of the authors and do not necessarily reflect the official views of the Centers for Disease Control and Prevention (CDC).

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DATA AVAILABILITY STATEMENT

Data cannot be made publicly available; readers should contact the corresponding author for details.

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