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Research Article

Addressing Inequities in Access to Health Products through the Use of Social Marketing, Community Mobilization, and Local Entrepreneurs in Rural Western Kenya

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While social marketing can increase uptake of health products in developing countries, providing equitable access is challenging. We conducted a 2-year evaluation of uptake of WaterGuard, insecticide-treated bednets (ITNs), and micronutrient Sprinkles in Western Kenya. Sixty villages were randomly assigned to intervention and comparison groups. Following a baseline survey (BL), a multifaceted intervention comprising social marketing of these products, home visits by product vendors from a local women's group (Safe Water and AIDS Project, or SWAP), product promotions, and modeling of water treatment and safe storage in was implemented in intervention villages. Comparison villages received only social marketing of WaterGuard and ITNs. We surveyed again at one year (FU1), implemented the intervention in comparison villages, and surveyed again at two years (FU2). At BL, <3% of households had been visited by a SWAP vendor. At FU1, more intervention than comparison households had been visited by a SWAP vendor (39% versus 9%, $P < 0.0001$), and purchased WaterGuard (14% versus 2%, $P < 0.0001$), Sprinkles (36% versus 6%, $P < 0.0001$), or ITNs (3% versus 1%, $P < 0.04$) from that vendor. During FU2, 47% and 41% of original intervention and comparison households, respectively, reported ever receiving a SWAP vendor visit ($P = 0.16$); >90% those reported ever purchasing a product from the vendor. WaterGuard ($P = 0.02$) and ITNs ($P = 0.005$) were purchased less frequently by lower-SES than higher-SES households; Sprinkles, the least expensive product, was purchased equally across all quintiles.

1. Introduction

In 2005, 1.4 billion people in the developing world lived on less than $1.25 per day [1]. Children living in these regions also experienced the highest global burden of morbidity and mortality from acute respiratory infections, diarrhea, malaria, and malnutrition, and the poorest access to health services and improved water sources [2].

Provision of health products and services in resource-poor countries is a major challenge to governments and aid organizations. Understanding the multiple competing needs of the poor, providing affordable products and services to meet those needs, and mobilizing resources for delivery of products and services, particularly to geographically remote areas, is challenging. Social marketing—broadly described as the combination of education to motivate healthy behaviors and the provision of attractively packaged, affordable products and services to low-income persons [3]—is one tool that has become widely used in recent years to promote health products such as condoms [4–6], insecticide-treated

bednets (ITNs) [7–10], water treatment products, and other items [11] in developing countries. Although social marketing in developing countries has created product awareness through advertising and improved product access through widespread distribution, it has limitations. Among these are the requirement for individuals or families to have at least some disposable income, and the difficulty in ensuring availability of products to communities beyond the reach of existing commercial distribution networks [3, 12, 13]. Consequently, access to socially marketed products is frequently uneven and inequitable [9, 14].

Nyanza Province, located in Western Kenya, has the worst mortality rates among children under 5 years of age in the country (149/1,000, compared with 74/1,000 in Kenya overall) [15]. In Nyanza Province, the prevalence of anemia in children <3 years old was shown in a cross-sectional study to be 71–76% [16]; the 2008-2009 Demographic and Health Survey [15] indicated that 24% of children under 5 years old had symptoms suggestive of malaria and 17% had diarrhea in the preceding two weeks. Anemia, malaria, and diarrhea can be prevented by intake of iron-rich or iron-fortified food, ITNs, and household water chlorination, respectively.

A number of health products have been socially marketed in Kenya during the past decade. One Kenyan nongovernmental organization involved in the distribution of socially marketed products is the Safe Water and AIDS Project (SWAP). SWAP was designed to extend the reach and increase the impact of social marketing by mobilizing business-trained and microfinance-supported women's groups whose members act as promoters and vendors of health products in rural Kenyan communities, providing local awareness, health education, and access to these products.

The Nyando Integrated Child Health and Education Project (NICHE), which began in 2007 in Nyando District, a rural area of Nyanza Province, Kenya, aimed to evaluate the impact of SWAP's approach on the use and health impact of health products, particularly on children under 5 years old (2007). We present a report of SWAP's impact on equity of access to and use of water treatment products, a multiple micronutrient powder (Sprinkles), and ITNs.

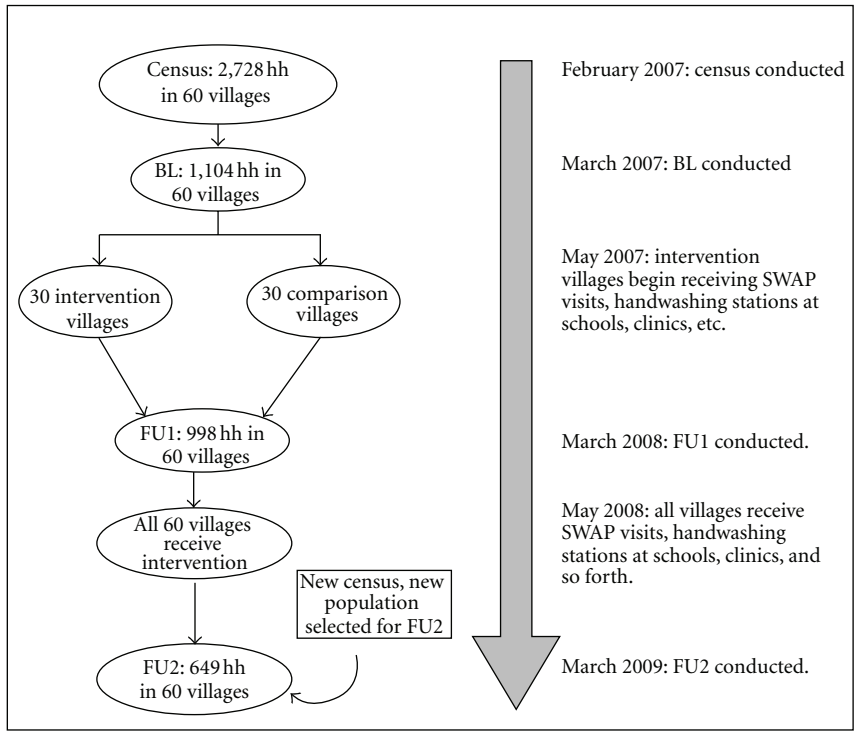
2. Methods

2.1. Study Design. The NICHE project was a two-year, longitudinal study of 60 villages in rural western Kenya. At the time of selection, villages were randomized into intervention and comparison groups of 30 villages each. Awareness and household use of socially marketed health products were measured among study households in intervention and comparison villages at baseline (BL), after which the intervention (see below) was implemented in intervention communities. All BL study households were visited every 2 weeks to monitor product purchases, product use, and household member morbidity for the duration of the study (these data will be presented elsewhere). At the end of the first year, a follow-up survey (FU1) was conducted in all 60 villages to evaluate overall changes in health product access, awareness, purchases, and use by study households. Following FU1, intervention activities were implemented in comparison villages. At the end of the second year, a second cross-sectional survey (FU2) was conducted. This study is registered at http://www.clinicaltrials.gov/, identifier NCT01088958.

2.1.1. Sampling and Enrollment Procedures. The study took place in Nyando Division, which has a population of approximately 80,000 persons in 15,000 households. Details of the formative research, study site and design are described elsewhere [17, 18]. We used a two-stage cluster-sampling strategy to select the study population. In the first stage, we selected a random sample of 30 intervention and 30 comparison villages population proportional to size using 1999 census data. Intervention and comparison villages were selected from separate political divisions in an attempt to maintain geographical separation between study groups. In February 2007, we carried out a population census of the 60 study villages (Figure 1). In the second stage of sampling, we randomly selected 25 children aged 6 to 35 months from households in each intervention and comparison village. In villages with 25 or fewer children in the target age group, all children were sampled.

2.1.2. Baseline Survey (BL). At BL, trilingual (English, Kiswahili, and Dholuo) interviewers administered a questionnaire to one respondent identified as the main caretaker in each sampled household. The questionnaire included questions about household assets; knowledge, purchase, and use of certain health products; household health and hygiene practices. In addition, respondents were asked about home visits and purchases from product vendors ("SWAP vendors"; see below), and observations were made of bottles of WaterGuard in their homes. Following enrollment, the same person served as the household respondent over time, unless he or she became unavailable, at which point a permanent replacement respondent was selected from the household.

2.1.3. Implementation of Product Promotion and Sales: Intervention Communities. Before the study was initiated, project staff met with the Provincial and District Medical Officers, the District Commissioner, and local chiefs and assistant chiefs to obtain their approval and participation. After the baseline survey, women's groups participating in the Safe Water and AIDS Project (SWAP) were provided with basic health education and training on the proper use of health products, business practices, and microcredit. SWAP group members served their communities as educators, promoters, and vendors of health products, including the water treatment product WaterGuard, ITNs, and micronutrient Sprinkles. All products sold by SWAP except Sprinkles were available commercially in kiosks and markets in local villages and towns throughout the study area. WaterGuard and ITNs were socially marketed throughout Kenya using wall posters, paintings, and radio and print advertisements [19–21]. ITNs were distributed for free by the Kenyan government in 2006 during a national measles vaccination campaign (2007) and are now widely used throughout Kenya [22, 23]. Sprinkles had not been introduced in Kenya prior to this study and were only available from SWAP vendors.



hh: households

Figure 1: Timeline of NICHE study, Nyando District, Kenya, 2007–2009.

SWAP vendors conducted product "launches" in villages to increase product awareness and then sold products door to door and, occasionally, in community settings (such as village meetings, kiosks, and churches). Launches were half-day events during which posters, promotional materials (such as branded plastic cups or calendars), educational leaflets, and product samples were given away, and a truck with a loudspeaker was used to broadcast information about the products. WaterGuard was advertised as a product to "make water safe"; ITNs were promoted as products to "prevent malaria," and Sprinkles was advertised as a product to "prevent low blood" (the local description of anemia) in children aged 6–59 months. A local mother with her child volunteered to be the "face" of Sprinkles, attending each launch during which the mother became known as "Mama Sprinkles." During the first year of the program, the development and activity of SWAP groups (product launches and door-to-door sales) occurred only in intervention villages; SWAP vendors were asked to limit the sale of their products to these villages (Figure 1). Products sold by SWAP were warehoused in the centrally located towns of Ahero and Awasi, in Nyando District. SWAP vendors traveled to these sites, purchased the products at wholesale prices, sold the products at retail prices, and kept the profit. Wholesale and retail product prices are shown in Table 1.

To increase exposure to water treatment and opportunities for good hygiene practices, and to provide a platform for teaching community members about hygiene, water stations for drinking water and hand washing, consisting of 60-liter plastic buckets with taps and lids, metal stands, and a starter supply of WaterGuard and soap, were installed in health facilities, primary schools, churches, and chiefs' homes in intervention villages by NICHE program staff. Program staff instructed persons receiving the water stations about proper use and continued to provide follow-up visits at least once per month throughout the study to reinforce their use. During the first year of the study, water stations were installed only at sites in the intervention villages.

Table 1: Wholesale and retail prices of products (KSh) sold by SWAP vendors, NICHE study, Nyando District, Kenya, 2007–2009.

	Wholesale price to vendors	Retail price for purchasers
WaterGuard	15 KSh	20 KSh
Insecticide-treated bednets	40 KSh	50 KSh
Sprinkles	1 KSh	2 KSh

* 1 KSh ~ 0.012 USD.

2.1.4. Follow-Up Survey 1 (FU1). In March 2008, at the end of the first year of the study, we conducted a follow-up survey (FU1) in the project population. At FU1, household respondents were asked to answer the same questions asked at BL.

2.1.5. Implementation of Product Promotion and Sales—Comparison Communities. During year two, women's groups in comparison villages received training and water

stations as described above; Sprinkles community launches were also conducted in these villages in July 2008 (Figure 1).

2.1.6. Follow-Up Survey 2 (FU2). Immediately before the 24-month follow-up survey (FU2) in March 2009, a new census of all 60 villages was conducted, since all children from the originally selected households had aged out of the cohort (Figure 1). From this census, 12 children aged 6–35 months were randomly selected from each village to participate in FU2. At FU2, household respondents from both the original and the newly enrolled cohort were asked the same questions asked at BL and FU1.

2.1.7. Research Ethics. The protocol was approved by human subjects review committees at the Kenya Medical Research Institute (protocol 1176) and CDC (protocol 5039). Informed consent was obtained from all household respondents before enrollment.

2.2. Data Analysis. Data were collected using PDAs programmed with Visual CE software (Syware Inc, Cambridge, MA), downloaded to Microsoft Access 2000 databases, and analyzed using SAS 9.2 (SAS Institute, Cary, NC). Purchases of any product from vendors are reported only for persons receiving household visits from vendors; the denominator used for calculating utilization rates included the entire study population to enable evaluation of community-wide product uptake. Utilization rates were compared between different study groups using chi-square, Fisher's exact results, or Cochran-Armitage tests for trend, where appropriate. Data were analyzed after accounting for cluster sampling, with clusters at the village level. To classify respondents by socioeconomic status (SES), we used a principal component analysis (PCA) to group households into quintiles within the study population on the basis of household asset scores calculated by assigning values to housing materials and household possessions and summing them [24]. To determine the relative wealth of study households in comparison to the country as a whole, we also used summed asset scores to assign households to quintiles established for a national sample of Kenyan households [25]. To assess whether being observed modified product purchasing behavior ("Hawthorne effect"), FU2 data were grouped by whether the surveyed households had been visited before FU2 or for the first time during FU2, and product use rates were compared between the two groups.

3. Results

3.1. Baseline Enrollment. Of 2,728 households included in the original census, 1,104 households with at least one child aged 6 to 35 months were enrolled (Figure 1). At BL, 88% of the NICHE study population was in the lowest SES quintile in Kenya (2007).

3.1.1. SWAP Activity. At BL, only 3% of respondents in intervention villages and 2% in comparison villages reported ever having received a household visit from a SWAP vendor ($P = 0.43$) (Table 2). By FU1, 39% of respondents in intervention villages and 9% of respondents in comparison villages reported ever having received a household visit by a SWAP vendor ($P < 0.0001$), and among these, a greater percentage of respondents from intervention than comparison households purchased a product from a SWAP vendor (95% versus 88%, $P = 0.01$). At FU2, 47% of respondents from the original intervention villages and 41% of respondents from the original comparison villages had received a household visit from a SWAP vendor ($P = 0.16$), and at least 90% from each group receiving a visit had purchased a product ($P = 0.53$).

Among intervention villages, there was substantial inter-village variation with regard to the proportion of NICHE respondents receiving a visit from a SWAP vendor at FU1 (median and mode proportion of respondents per village receiving a visit: 38%, 38%; range 8–83%) and FU2 (median and mode proportion of respondents per village receiving a visit: 46%, 54%; range 14–77%); this was not associated with distance of the village from the SWAP vendor product purchasing center (data not shown).

At BL, similar percentages of respondents in intervention and comparison households reported ever purchasing WaterGuard (2% versus 1%), ITNs (<1% versus 0%), or Sprinkles (0% versus 0%) from SWAP vendors (Table 2). At FU1, greater proportions of respondents from intervention households than comparison households who received SWAP vendor visits reported purchasing WaterGuard (14% versus 2%, $P < 0.0001$), ITNs (3% versus 1%, $P < 0.04$), and Sprinkles (36% versus 6%, $P < 0.0001$) from SWAP vendors. At FU2, the percentages of respondents from both intervention and comparison households that reported purchasing WaterGuard (27% versus 21%), ITNs (5% versus 5%), and Sprinkles (39% versus 33%) from SWAP vendors were not significantly different.

3.2. WaterGuard Purchases from SWAP Vendors. At BL, similar proportions of intervention and comparison households (23% each) were observed to have WaterGuard at home; however, at FU1, more intervention households (33%) than comparison households (23%) were observed to have a bottle of WaterGuard at home ($P < 0.001$) (Table 3). By FU2, the proportion of intervention (55%) and comparison (48%) households with WaterGuard present had increased significantly from BL and FU1, although there were not significant differences between the two household groups at FU2.

Among households observed to have WaterGuard present at BL, no significant differences existed between intervention (7%) and comparison (14%) households with respect to whether the respondent reported that it was purchased from a SWAP vendor (Table 3); however, at FU1, a significantly greater proportion of respondents from intervention households (48%) than comparison household (7%) with WaterGuard present reported purchasing it from a SWAP vendor ($P < 0.0001$) (Table 3). By FU2, these differences were no longer significant: (48% versus 37%; $P = 0.19$).

3.3. SES Analysis. The likelihood of a project household having received a home visit from a SWAP vendor, having made any purchase from a SWAP vendor, or having purchased

Table 2: Proportion of NICHE households ever receiving a visit from a SWAP vendor and frequency of purchases from vendors, NICHE study, Nyando District, Kenya, 2007–2009.

	BL				FU1				FU2			
	I ($n = 574$)	*C* ($n = 532$)	*P*	Total ($n = 1104$)	*I* ($n = 514$)	*C* ($n = 484$)	*P*	Total ($n = 998$)	*I* ($n = 327$)	*C* ($n = 322$)	*P*	Total ($n = 649$)
Ever visited by a SWAP vendor	17/573 (3%)	10/527 (2%)	0.43	27/1100* (2%)	195/496 (39%)	42/466 (9%)	<0.0001	237/962* (25%)	153/326 (47%)	130/321 (41%)	0.16	283/647* (44%)
Ever purchased anything from SWAP vendor†	12 (75%)	6 (60%)	0.35	18/26* 69%)	185 (95%)	37 (88%)	0.01	232/247 (94%)	141 (92%)	117 (90%)	0.53	258/283 (91%)
Ever purchased WaterGuard from SWAP vendor†	10 (2%)	5 (1%)	0.28	15 (1%)	66 (14%)	8 (2%)	<0.0001	74 (8%)	87 (27%)	66 (21%)	0.12	153 (24%)
Ever purchased ITN from SWAP vendor †	2 (<1%)	0 (0%)	0.50	2 (<1%)	14 (3%)	3 (1%)	0.04	17 (2%)	16 (5%)	15 (5%)	0.91	31 (5%)
Ever purchased Sprinkles from SWAP vendor †	0 (0%)	0 (0%)	N/A	0 (0%)	177 (36%)	30 (6%)	<0.0001	207 (22%)	126 (39%)	105 (33%)	0.20	231 (36%)

I: NICHE intervention villages; *C*: NICHE comparison villages. *P* values refer to differences between the intervention and comparison villages during the specified survey. Note that the intervention was provided differentially during Year 1 but not Year 2 of the study.

† Among households visited by a SWAP vendor.

* Missing data.

Table 3: Presence of WaterGuard and sources of WaterGuard in intervention and comparison households with children in NICHE study, Nyando District, Kenya, 2007–2009.

	BL			FU1			FU2		
	I	*C*	Total	*I*	*C*	Total	*I*	*C*	Total
Households with WaterGuard present	130/574 (23%)	122/532 (23%)	252/1104 (23%)	166/497 (33%)	107/467 (23%)	273/964 (28%)†	179/327 (55%)	153/322 (48%)	332/649 (51%)
Purchased current bottle from SWAP vendor (at home visit or otherwise)	9/130 (7%)	17/122 (14%)	26/252 (10%)	80/166 (48%)	8/107 (7%)	88/273† (32%)	74/155* (48%)	52/139* (37%)	126/294* (43%)

* Missing responses.
† $P < 0.001$ for differences between comparison and intervention groups. No other comparisons were significant at a $P < 0.05$ level.

Table 4: Proportion of NICHE respondents ever receiving a household visit from a SWAP vendor, and frequency of purchases from vendors at FU2, by socioeconomic quintile, Nyando District, Kenya, 2007–2009. Q0: poorest quintile; Q4: least poor quintile.

	Q1 ($n = 130$)	Q2 ($n = 144$)	Q3 ($n = 112$)	Q4 ($n = 130$)	Q5 ($n = 128$)	*P* (Cochran-Armitage test for trend)
Visited by a SWAP vendor? ($n = 644$)	52 (40%)	66 (46%)	43 (39%)	69 (53%)	51 (40%)	0.62
Purchased anything from a SWAP vendor? ($n = 281$)†	44 (85%)	60 (91%)	42 (98%)	63 (91%)	47 (92%)	0.22
Purchased WaterGuard ($n = 644$)¥	21 (16%)	32 (22%)	26 (23%)	41 (32%)	33 (26%)	0.02
Purchased ITNs ($n = 644$)¥	2 (2%)	6 (4%)	3 (3%)	11 (8%)	9 (7%)	0.005
Purchased Sprinkles ($n = 644$)¥	40 (31%)	54 (38%)	36 (32%)	59 (45%)	40 (31%)	0.51

† Among households visited by a SWAP vendor.
¥ Among all households in quintile.

Sprinkles was similar across all five socioeconomic quintiles (Table 4). However, households in wealthier quintiles were more likely than households in poorer quintiles to purchase WaterGuard ($P = 0.02$) and ITNs ($P = 0.005$ [Table 4]).

3.4. Hawthorne Effect. From 810 households randomly selected during the new census conducted before FU2, we enrolled 649 households with 708 children aged 6–35 months. Among these 649 households, 372 (58%) had not previously participated in the NICHE study (new participants) and 264 (41%) had participated and received biweekly household visits throughout the two years of the study (two-year participants). We excluded 13 (2%) respondents, 11 of whom had previously dropped out of the study and 2 (<1%) who did not complete the FU2 survey. Among two-year participants, 130 (49%) reported ever having been visited by a SWAP vendor, compared with 146 (39%) new participants ($P = 0.02$); 121 (93%) of 130 two-year participants and 132 (90%) of 146 new participants reported ever having purchased an item from a SWAP vendor ($P = 0.40$). After controlling for the occurrence of household SWAP vendor visits, a higher percentage of two-year participants than new participants reported purchasing an ITN (16% versus 7%, $P = 0.04$). There were no statistically significant differences between two-year participants and new participants in the purchase of Sprinkles (90% versus 89%, $P = 0.69$) or Waterguard (61% versus 57%, $P = 0.56$).

4. Discussion

In this study, we found that among persons in very low-income, rural households in Kenya, a multifaceted intervention that combined social marketing, community mobilization, and household product sales by local vendors increased both access to and purchase of proven health technologies, compared with social marketing alone. At baseline, all study households had little or no exposure to SWAP; after the first year of the intervention, households in intervention villages showed higher levels of exposure to and product purchasing from SWAP vendors compared with the comparison group. During the second year in which all study households and communities were exposed to the intervention, the comparison households "caught up" to the intervention households in reported product exposure and purchasing, with no measurable differences between the original intervention and comparison groups by the end of the second year. Household visits by SWAP vendors were equitably distributed across SES quintiles, although higher-priced items (WaterGuard and ITNs) were more likely to be purchased by respondents in higher wealth quintiles than

lower wealth quintiles. Sprinkles, a nutritional supplement, appeared to be within the financial means of all groups, as evidenced by the similar rates of purchase across SES quintiles and the fact that Sprinkles was the most frequently tried product. These findings demonstrate that this type of intervention can be effective at both increasing access to and purchases of much-needed health products among the rural poor.

Several features of the intervention explain its effectiveness. First, the high level of community engagement required by the intervention likely contributed to increased exposure to products and sales. Second, the intervention was implemented at multiple levels of influence [26], including district and provincial governments, through mass media; local chiefs, religious leaders, school teachers, and health care providers; local village residents (i.e., SWAP group members). This approach created multiple opportunities for reinforcement of health messaging, provided many opportunities for product purchase, and enabled community members to view modeling of healthy behaviors. Third, using local residents as the "faces" of the health products and involving them in the design and execution of product promotions in the communities took advantage of preexisting relationships between vendors and purchasers, which might have facilitated sales. Finally, the use of home visits as a product delivery mechanism was well accepted by the population, as demonstrated by the finding that over 80% of community members receiving visits from SWAP vendors purchased something from the vendors at FU1 and FU2.

Although we collected "ever-visit" and "ever-purchase" data in each village with regard to household SWAP visits and products, respectively, we tracked neither individual vendor sales nor the frequency of SWAP visits to individual NICHE study participants' homes; thus, it is not known how variable the frequency of individual vendor visits were at NICHE participants' homes or between intervention villages. We found substantial variation between intervention villages in the proportions of residents ever receiving a visit from a SWAP vendor and can hypothesize that variation existed similarly in terms of how frequently different vendors sold SWAP products door to door; this likely would have influenced both individual NICHE participant and intervillage purchasing frequencies. Reasons for these variations might relate to mitigating social, economic, or political factors taking place during that time period. Focus group discussions with the SWAP vendors about sales of Sprinkles [18] demonstrated that several factors affected the ebb and flow of sales, including promotions intended to boost sales, vendor incentives, stockouts of Sprinkles, and postelection violence in Western Kenya during 2007–2008. In addition, the two centers for the vendor purchase of wholesale health products were located in two distinct areas of Kisumu (Awasi and Ahero), which may not have been equally accessible to all vendors. Sprinkles sales were shown to generally be inversely related to the distance from the SWAP distribution center to the village [18]. Some of these factors undoubtedly influenced sales of all products, while others influenced sales of only certain products. Although we did not track the reported use of all health products sold by SWAP, many products (not only the ones discussed here) were sold by the vendors, and thus their livelihoods were not dependent on single or a small number of products. Individual stockouts were unlikely to affect SWAP vendor activity as much as accessibility of the wholesale centers and political instability that made travel unsafe during certain periods. However, locations of wholesale centers, vendor and consumer incentives, and stockouts are modifiable factors; future implementations of this type of intervention may be able to be improved upon, to minimize the negative effects of these factors.

Study findings are unclear regarding whether a Hawthorne effect (the presence of observers influencing study results) took place among households that were visited regularly by study personnel for two years. Among study participants who were visited biweekly for two years (and therefore among whom a Hawthorne effect would be more likely), sales of ITNs were higher than among households newly enrolled for FU2, but sales of WaterGuard and Sprinkles were similar in the two groups. Repeated messaging is known to positively affect behaviors and uptake of new products, [27] and could explain study results.

With the exception of Sprinkles, uptake of health products by the poorest households remained a challenge for the SWAP vendors. This group is typically the most difficult to reach with any intervention [28], and additional efforts may be needed to promote intervention uptake in general, and among the poorest in particular. Targeted efforts focused on these groups may boost accessibility and sales. Parker et al. demonstrated that clinic-based education about water treatment at a maternal and child health clinic in western Kenya resulted in increases in reported purchases of water treatment products [29]; however, women participating in this study were unlikely to have been the poorest group, as many had businesses or salaried jobs. Briere et al. demonstrated that the bundling of immunizations and free hygiene interventions improved hygiene practices without adversely affecting immunizations [30]. Similarly, another study reported that including free hygiene kits as part of antenatal services in Malawi, in the context of a media campaign to support use of water treatment products, led to sustained increases in water treatment and handwashing knowledge, even among the very poor [31]. Free mass distribution has been shown to be the most effective method of decreasing inequities in distribution with other health interventions, such as ITNs [23, 32–34]; however, this approach is commonly criticized as it requires no "buy-in" from the recipients and thus may result in less value being place on the service or product. Although removal of all disparities with regard to access to health interventions may not be possible, continued investigation of combined approaches is critical to determining methods that are both cost-effective and disparity reducing.

Our study had several limitations: first, the data originated from one division in one district in Kenya and were therefore not necessarily representative of either Nyanza Province or Kenya as a whole. Second, because households were added at FU1 and a new population was selected at FU2 (albeit from the same villages), data from FU2 include

responses from at least some new respondents and are therefore not directly linked to the baseline population. Finally, SES in African communities is not always reflected in household possessions and could be dependent on support from a relative or extended family [35]; therefore our assessment of household SES may have been inaccurate.

In summary, a combined intervention that augmented social marketing with product promotion at multiple levels of influence, community mobilization, and use of local self-help groups to market and sell products successfully increased product awareness, access, and use among a rural Kenyan population. Strategies utilizing multiple implementation approaches, multiple price points, and multiple levels of influence are a promising approach to increasing access to health interventions among the populations who need them most.

Conflict of Interests

The authors have no conflict of interests to declare.

Authors' Contribution

R. Quick, P. Suchdev, and P. Juliao conceived the study; they, L. Ruth and A. Obure were involved in study design. A. Obure, C. Ochieng, L. Ruth, V. Were, S. H. Faith, S. Kola, R. Otieno, and I. Sadumah were involved in study design and execution. J. Harris, M. k. Patel, and V. Were analyzed and interpreted the data. J. Harris and R. Quick drafted the paper. All authors provided critical review of the paper.

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