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Neighbor-to-Neighbor Education to Improve Malaria Treatment in Households in Bungoma District, Kenya

Paula Tavrow and Waverly Rennie

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Acknowledgements

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Executive Summary

This study's main objective was to determine the impact of a low-cost outreach "neighbor-to-neighbor" (jirani kwa jirani or JKJ) education program on caretaker purchase and consumption of anti-malarial drugs in Bungoma District, Kenya. The Bungoma District Health Management Team (DHMT) implemented this intervention with technical support from the Quality Assurance Project (QAP) and facilitation from the African Medical Research and Education Foundation (AMREF). The intervention was intended to complement another intervention to improve anti-malarial prescribing practices of drug sellers in the same district (vendor-to-vendor; see Tavrow et al. 2002 and 2003).

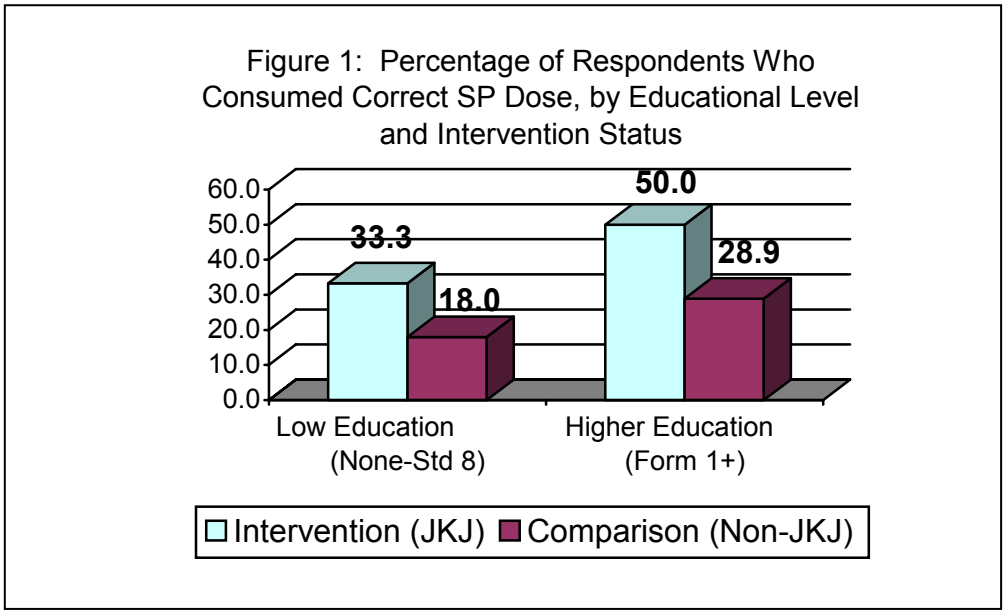
Forty MOH extension health workers (EHWs) received a one-day orientation from the DHMT on the JKJ approach and several copies of two illustrated brochures explaining proper malaria treatment and recommended drugs. About 30 EHWs then led a pyramid distribution of the brochures in 112 villages. They also organized 30 contests where village residents presented songs, dramas, or poems they had created to promote the use of effective anti-malarial drugs. The DHMT and public health officers, who directly supervise the EHWs, monitored the intervention during the six- to eight-week implementation period.

Key Findings

About six weeks after launch, the JKJ intervention had reached 53% of households in the intervention area through a brochure, song contest, or both. Most of the spread was through community members sharing among themselves brochures or what they had heard at a song contest.

Respondents in the intervention area were more likely to know the MOH-recommended anti-malarial drugs and to report intention to use them. This difference was highly significant among respondents with lower education levels. In both intervention and comparison areas, respondents with higher education had better knowledge and practices than those with lower education. More highly educated respondents were also more likely to purchase anti-malarials for their children.

Less educated respondents in the intervention area were significantly more likely to have purchased the first-line anti-malarial drug, sulfadoxine-pyrimethamine (SP), than were those in the comparison area (49% versus 26%) and less likely to have treated malaria with anti-pyretics alone (6% versus 28%). Respondents in the intervention area were significantly more likely to have taken the correct dose of SP (Figure 1).



Note: Significance levels by chi-square were: lower education: 0.009; higher education: 0.029.

Controlling for education and age of patient treated, people living in the intervention area were twice as likely (Odds ratio: 2.2; confidence interval: 1.3–3.6; significance: 0.003) to have purchased and consumed the correct dose of SP as those in the comparison area. For the lower education group, the intervention also seems to have shifted a significant number of people from using anti-pyretics only to SP.

Local costs to replicate the intervention as an add-on to existing DHMT or non-governmental organization activities were estimated to be about 59 Kenya shillings or US$ 0.83 per household in the intervention area. Preliminary results concerning the strategy's impact, feasibility, and low cost have convinced other donors, such as the United Kingdom Department for International Development and the Rotary Club, to replicate it elsewhere in Kenya.

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Neighbor-to-Neighbor Education to Improve Malaria Treatment in Households in Bungoma District, Kenya

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I. Introduction

Since August 1998, the Ministry of Health (MOH)-recommended first-line treatment for malaria in Kenya has been sulfadoxine-pyrimethamine (SP). Because most cases of malaria there are treated outside the public health system with drugs purchased over the counter in shops and small pharmacies and at private clinics, the government issued a gazette notice in October 1999 that permitted SP to be sold over the counter. However, consumers have not been well informed about which of the numerous drugs available in the private sector are recommended as effective by the MOH. As a result, they frequently buy drugs of dubious quality, guided by price rather than by MOH guidelines. Additionally, consumers often purchase incorrect dosages and fail to consume the complete dose.

In many countries, the standard approach to improving malaria treatment is to focus on raising the quality of care in the public sector. However, it is increasingly recognized that greater impact could be achieved through strengthening the private sector's quality of care. In the Bungoma District of Western Kenya, where malaria is hyper-endemic, studies have indicated that most people seeking malaria treatment for themselves or their children first visit private establishments. Given these findings, the Bungoma District Health Management Team (DHMT), with guidance from the Quality Assurance Project (QAP), developed and implemented the vendor-to-vendor (VTV) malaria education strategy in 1999–2001; it trained drug wholesalers and mobile vendors to use normal sales contacts with retailers to inform them about correct malaria treatment and to supply them with job aids that also had treatment information. This strategy had some success in improving the quality of private sector prescribing practices, particularly in shops (see Tavrow et al. 2002 and 2003).

To complement the VTV approach, the neighbor-to-neighbor (jirani kwa jirani or JKJ) strategy was developed in 2001–2002 to heighten consumer demand for correct malaria treatment in Bungoma District. The JKJ strategy was designed as a low-cost outreach education program that could be readily implemented by extension health workers (EHWs), who are responsible for environmental and other health issues at the community level. The JKJ intervention was carried out by the Bungoma DHMT with technical support from QAP and facilitation by the African Medical Research and Education Foundation (AMREF).

II. Description of the Intervention

The JKJ intervention had three main objectives: (1) to create more demand for the approved anti-malarials (SP) based on consumer motivations, e.g., desire for safe, effective, good value treatment; (2) to educate consumers about correct dosages; and (3) to complement the VTV supply-side intervention and motivate retailers to stock the MOH-recommended drugs.

Unlike standard community health education approaches where trained health professionals or community health workers provide information and build awareness, the JKJ approach is based on the concept of word of mouth dissemination and pyramid distribution. In each participating village, EHWs were to orient five villagers on the five key treatment messages and to give those villagers enough educational brochures for all the

Abbreviations

AMREF	African Medical Research and Education Foundation
AQ	Amodiaquine
CI	Confidence interval
CQ	Chloroquine
DHMT	District Health Management Team
EHW	Extension health workers
JKJ	Jirani kwa jirani or neighbor-to-neighbor
Ksh	Kenya shillings
MOH	Ministry of Health
OR	Odds ratio
PHO	Public health officer
QAP	Quality Assurance Project
SP	Sulfadoxine-pyrimethamine
USAID	United States Agency for International Development
VTV	Vendor-to-vendor

households in each of their villages. Each of these initial five "relays" would explain and distribute the brochures to another five villagers, who would each contact five of their neighbors until every household in the village received a brochure. To reinforce the brochure information and further engage the community, villagers were also encouraged to develop malaria treatment songs and poems that they could perform at EWH-organized contests.

The steps in JKJ implementation were as follows:

Choose a team: October 2001. A JKJ team was chosen to oversee and implement the activity. The team comprised about five DHMT and health staff; they received technical assistance from QAP and administrative support from AMREF. The team used information from focus group discussions and individual interviews with malaria clients and caregivers to determine knowledge and attitude gaps about malaria treatment. They assessed how well an existing MOH-produced malaria brochure filled those gaps and identified complementary information still needed by consumers.

Create brochures: March 2002 completion. With the aid of a graphic designer, two comic-book style brochures were created, each about a woman (Nandako or Nafuna) with a sick child: The brochures were written in Swahili, a language commonly understood in the district. The Nandako brochure addressed attitudinal obstacles to SP use and focused on five key treatment messages. It also recommended that people read the more comprehensive MOH brochure, which covered both treatment and prevention. Both JKJ brochures were attractive conversation guides that would legitimize neighborly discussion and advice about malaria. After several rounds of pre-tests and revisions, 30,000 copies of each brochure were printed in March 2002.

Orientation*: *February 2002. Two one-day orientation sessions were presented to about 40 active EHWs. Participants were briefed on the purpose of the JKJ program, the pyramid distribution approach, use of the brochures, organization of the song contests, and monitoring activities. Each EHW was to carry out JKJ in five assigned villages in the course of their normal duties; they received bicycles and four days' lunch allowance for this work. About an eighth of the district's villages were included in the intervention. The intervention managers also briefed EHW supervisors, public health officers (PHOs).

Launch intervention: late March 2002. Each EHW received approximately 1000 copies of each brochure, visited his or her assigned villages, and began the pyramid distribution and explanation process. Each gave the first five contact people in each village sufficient copies of each brochure for all households in the village. These five contacts then divided the brochures among themselves. Next, they distributed stacks of brochures to five of their neighbors during normal village contacts, asking the neighbors to distribute individual brochures to their neighbors until all the brochures were gone.

Contests: April and early May 2002: During the brochure distribution, EHWs also helped community members develop songs about malaria, usually based on the messages in the brochures and often based on the Nandako story line. The EHWs reviewed the songs for technical correctness and organized song contests among five participating villages per sublocation. The song contests were judged by local notables, such as school teachers or mayors. Awards (bednets, malaria calendars created by the JKJ team, and SP doses) were given to the best-performing village groups, and all participants received certificates of appreciation. The JKJ team, including the PHOs, monitored the activity by checking whether the brochures had been distributed and by attending some of the 30 song contests.

III. Evaluation Methodology

A. Data Collection Methods

In late May 2002, about two months after implementation began, the program was evaluated using a household interview survey, focus group discussions, and song transcript analysis. The evaluation pursued answers to the following questions:

- Approximately how many villages did the JKJ intervention reach? In the villages reached, approximately how many people participated in JKJ?

- Were people in JKJ intervention villages aware of the program? Had they seen the brochures? When? What had they understood from them?
- Were people in JKJ intervention villages exposed to malaria treatment songs, poems, or dramas? Could villagers recall any of them?
- Did people residing in JKJ intervention villages have better malaria treatment knowledge than those in comparison villages?
- During the last febrile episode (if it happened after the household received a JKJ brochure), were people in JKJ intervention villages more likely to purchase (or obtain) and correctly consume approved anti-malarial drugs than those in the comparison villages?

The household survey asked respondents about malaria drugs they or their household members had purchased and consumed in the last two weeks, their malaria drug knowledge, their treatment intentions, and their exposure to the JKJ brochures and contests and other sources of information on malaria drugs.

Focus group discussions were held with the EHWs and the DHMT to learn more about the process of implementation. In addition, translated transcripts of some songs from the contests were analyzed for content and style.

B. Sample Design

The household survey was conducted in 33 randomly selected villages. It reached 411 households in 18 villages from the 112 covered by JKJ; these surveys included six sublocations. For comparison, surveys were also held in six villages in two nearby sublocations of Bungoma District (96 households) and nine villages in two sublocations in neighboring Busia District (154 households). Altogether, representatives of 661 households were interviewed.

The research team trained six household interviewers who each worked for eight days. Two or three interviewers visited every selected village, and each interviewed approximately 10 randomly selected households per village.

C. Data Entry and Analysis

All interview forms were checked by a supervisor before being submitted for entry into an SPSS database. Data were analyzed using SPSS 11.0. Chi-square analysis of nominal data and logistical regression were performed on five dependent variables: respondent knowledge of MOH-recommended malaria drugs, whether respondent would recommend SP for a nine-month-old child, whether respondent would use SP the next time he or she had malaria, whether the respondent had purchased SP, and whether SP was consumed in the proper dosage.

IV. Results

Profile of respondents: In both the intervention and comparison areas, the majority of survey respondents were women between 25 and 50 years of age (see Table 1). About two-thirds had less than eight years of education. Because there was a significant difference between JKJ and non-JKJ respondents by educational level, with JKJ respondents being more educated, analysis of the impact of the intervention was disaggregated by educational level.

Table 1 Profile of Respondents (in Percentages)

Respondents	JKJ (n = 411)	Non-JKJ[1] (n = 250)	Significance[2]
Sex			*0.958*
Male	23.1	23.3	
Female	76.9	76.7	
Age			*0.219*
<25	11.4	15.7	
25–50	82.5	79.9	
>50	6.1	4.4	
Education			*0.018*
None to standard 4	25.8	29.6	
Standard 5–8	40.1	48.4	
Form 1 to 4	30.4	18.8	
Above Form 4	3.6	3.2	
Purchased malaria treatment in last two weeks	52.8	55.2	*0.548*
For under-5 child	(47.2)	(65.0)	*(0.001)*
For over-5 child or adult	(52.8)	(35.0)	
Of those who purchased malaria treatment, asked for drug by name	60.4	61.3	*.727*

Notes: 1. Includes non-JKJ areas of Bungoma District and comparison villages in Busia District.
2. Significance using chi-square.

Bungoma District has a distinct malaria season during the long rains (March–May). The intervention had been timed to occur during this season to achieve maximum effect. More than half of respondents from the intervention and comparison areas reported having purchased anti-malarial drugs in the previous two weeks. Because more respondents in the non-JKJ area reported purchasing drugs for under-five children, subsequent data analysis was also disaggregated by the age of the patient.

About six in ten of those who had purchased drugs said that they had asked for drugs by name. Virtually all malaria treatment was purchased from shops, chemists, or pharmacies. Only 8% of respondents reported purchasing malaria treatment from private or government clinics, with no difference by area. Whereas nearly 90% of respondents purchasing from shops asked for drugs by name, significantly fewer asked for drugs by name from chemists (60%) and clinics (7%). This suggests that for drug recommendations, people seek out chemists and particularly health providers, but in general make their own decision about what drug to seek at shops.

Spread of the intervention: About six weeks after launching the intervention, 53% of the households in the intervention area had been reached either by a brochure or contest, as had 18% of households in the comparison area (see Table 2). Most of the "leakage" to the comparison areas occurred in the Bungoma non-JKJ villages. The exposure in the non-JKJ areas consisted largely of seeing the brochures in passing. To check whether people's affirmative responses were influenced by courtesy bias, respondents were also asked if they had seen two brochures that had not been widely circulated in the district. Only 3–6% of people reported having seen them.

Table 2 Spread of JKJ Intervention after Six Weeks (in Percentages)

	JKJ (n = 411)	Non-JKJ (n = 250)	Significance[1]
Brochures			
Saw one or both brochures in passing	52.6	18.2	*0.000*
Had one or both brochures explained	25.5	3.2	*0.000*
(By neighbor or community figure)	(60.4)	(55.5)	
(By health worker or EHW)	(39.6)	(44.4)	
Received one or both brochures	26.0	0.8	*0.000*
Distributed one or both brochures	7.3	0.0	*0.000*
Song contest			
Heard song from contest	19.7	4.0	*0.000*
Attended song contest	9.2	1.2	*0.000*
Exposure status			*0.000*
Exposed to brochures and song	26.8	5.2	
Exposed to brochures only	25.8	13.2	
Not exposed at all	47.4	81.6	

Note: 1. Significance using chi-square.

The intervention appears to have intensively reached about one in four households in the JKJ area, with respondents reporting exposure both to the brochures and the song contests. While only about one in ten respondents reported having attended a song contest, another two in ten reported having heard at least one of the songs. Apparently, the songs were also sung at school assemblies and church. Several respondents spontaneously sang one of the songs when asked about them during the interviews.

About one in four JKJ households reported that the brochures had been explained to them. These people usually also received copies of the brochures. A majority of respondents who reported having the brochures explained to them said a neighbor or other community member had discussed it with them. Nearly one in 13 respondents had served as relays.

Focus group discussions with EHWs indicated that using the JKJ pyramid approach to distribute and explain the contents of the brochures was fairly easy to implement, but that the song contests required considerable time and effort. Moreover, these contests were more expensive than anticipated because the EHWs felt it necessary to motivate judges and participants with sodas, food, and prizes. On the positive side, an analysis of a sample of songs suggested that they conveyed accurate information. They seemed catchy and memorable to analysts, and several seemed to have had considerable staying power, with people still able to sing them several weeks later.

Impact of JKJ intervention: In assessing the impact of the JKJ intervention, we first examined knowledge, intentions, and practice by educational status, since JKJ was an educational intervention. In both JKJ and non-JKJ areas, those with more education (which we defined as having nine years of education or more) had better knowledge of MOH malaria guidelines than those with less. The former were more likely to recommend SP for a nine-month-old child and to intend to use SP themselves when they next fell ill with malaria (see Table 3).

Table 3 Knowledge of Recommended Anti-Malarial Drugs and Intention to Use Them, by Education Level and Geographic Area (in Percentages)

	Lower Education (None to Standard 8)			Higher Education (Form 1 or More)			All		
	Inter-vention (n = 272)	Compar-ison (n = 195)	*Sig*[1]	Inter-vention (n = 139)	Compar-ison (n = 55)	*Sig*[1]	Inter-vention (n = 411)	Compar-ison (n = 250)	*Sig*[1]
Knows MOH-recommended malaria drugs[2]	28.3	12.3	*0.000*	53.2	41.8	*0.152*	36.7	18.8	*0.000*
Would recommend SP to treat 9-month old	27.2	13.3	*0.000*	39.5	32.7	*0.375*	31.4	17.6	*0.000*
Would use SP to treat self	34.6	17.9	*0.000*	61.9	45.5	*0.037*	43.8	24.0	*0.000*

Notes: 1. Significant using chi-square.

2. Cited at least one MOH-recommended drug and no incorrect drugs.

Whereas the JKJ intervention could not eradicate differences in knowledge and intentions between educational levels, it does seem to have had a significant impact on the knowledge and intentions of those with less education. More than twice as many less educated respondents in the JKJ area had correct knowledge regarding government-recommended anti-malarials and intentions to use SP for self-treatment and young child treatment than did less educated respondents in the non-JKJ area. For those with more education, significant differences by intervention status were found for self-treatment intentions only. For both educational levels, the data indicate that considerable reluctance endures to recommend SP for children under one year of age, probably due to the common belief that SP is too strong for children.

Concerning practices, the higher education group from both areas was more likely to have purchased an anti-malarial drug in the past two weeks than the lower education group (64% versus 49%). They also paid on average Kenya shillings (Ksh) 15[1] more for treatment. Several factors might explain this finding: Perhaps more-educated people are not as sick as those with less education, or they are more willing and/or able to pay more for medicine, or they have more money and as a result get charged more or buy more medicines than they really need, just to be safe.

While the intervention seems to have increased the use of SP by all respondents, the data are significant only for those of lower educational status, in part due to sample size (see Table 4 and Figure 1, which appears in the Executive Summary). For the lower education group, the intervention also seems to have shifted a significant number of people from using anti-pyretics only to SP. None of those in the higher educated groups reported using anti-pyretics alone for anti-malarial treatment.

[1] US $ 1 = Ksh 71 (2002).

Table 4 Reported Purchases and Consumption of Anti-Malarial Drugs, by Educational Level (in Percentages except As Noted)

	Less Education (None to Standard 8)			More Education (Form 1 or more)			All		
	Inter-vention (n = 130)	Compar-ison (n= 100)	Sig[1]	Inter-vention (n = 87)	Compar-ison (n = 38)	Sig[1]	Inter-vention (n = 217)	Compar-ison (n = 138)	Sig[1]
Drug purchased			*0.000*			*0.104*			*0.000*
SP (correct drug)	48.5	26.0		62.1	42.1		54.1	30.9	
AQ	28.5	29.0		19.5	26.3		24.8	28.1	
CQ	6.2	5.0		2.3	2.6		4.6	4.3	
Other anti-malarial or antibiotic	10.8	12.0		16.1	28.9		12.8	16.6	
Anti-pyretic only	6.2	28.0		0.0	0.0		3.7	20.1	
Consumed SP in correct dose	33.3	18.0	*.009*	50.0	28.9	*0.029*	40.0	21.0	*0.000*
Asked for approved SP by name	24.6	11.0	*.009*	37.5	18.4	*0.035*	29.8	13.0	*0.000*
Mean amount spent[2]	41	38	*.579*	53	60	*0.386*	46	44	*0.649*
(Range)	(2-460)	(2-210)		(8-280)	(20-150)		(2-460)	(2-210)	

Notes: 1. Significant using chi-square. AQ: amodiaquine; CQ: chloroquine.
2. Amounts are in Kenya shillings.

For respondents at both levels of education, those living in the intervention area were significantly more likely to have taken the correct dose of SP than those in the comparison area. In addition, of those who asked for a drug by name, those in the intervention area were twice as likely to have asked for an MOH-approved SP. There was no significant difference in the amount spent by interventions and comparisons, but the gap does seem to have narrowed in the intervention area. Interestingly, about 85% of consumers reported purchasing at least two different types of drugs, with one drug usually being an anti-pyretic.

To show the effect of the intervention on treatment practices for children under five, we present the data by age group in Table 5. Again, the intervention group was significantly more likely to ask for and purchase SP and less likely to treat fever with anti-pyretic alone for both age groups. The data also show that those treating a patient under age five were significantly less likely to ask for an approved SP by name, although those in the JKJ area were twice as likely to do so. There was no difference in expenditures on treatment by age group, with the average amount spent being 45 Ksh (US$ 0.63).

Table 5 Reported Purchases and Consumption of Anti-Malarial Drugs, by Age of Patient (in Percentages except As Noted)

	Patient under Age Five			Patient over Age Five		
Drug purchased	Intervention (n = 103)	Comparison (n = 89)	*Sig*[1] *0.000*	Intervention (n = 115)	Comparison (n = 48)	*Sig*[1] *0.000*
SP (correct drug)	48.5	30.3		59.2	31.2	
AQ	25.2	30.3		24.3	22.9	
CQ	5.8	2.2		3.5	8.3	
Other anti-malarial or antibiotic	17.5	12.4		8.7	25.0	
Anti-pyretic only	2.9	24.7		4.3	12.5	
Consumed SP in correct dose	28.7	15.9	*0.036*	50.0	29.2	*0.015*
Asked for approved SP by name	20.4	10.1	*0.051*	38.3	18.8	*0.015*
Mean amount spent[2]	44	44	*0.957*	48	43	*0.522*
(Range)	(2-460)	(2-130)		(5-280)	(4-210)	

Notes: 1. Significant using chi-square.
2. Amounts are in Kenya shillings.

Impact of different exposure levels: On a scale of one to 10, with one being no exposure and 10 being maximum exposure (i.e., distributing brochures and attending a contest), people had a mean exposure level of 2.5, with a standard deviation of 3.1. There was a strong dose-response relationship between level of exposure to the intervention and all outcome variables tracked. Those who were exposed to both the songs and the brochures, even if they did not attend the song contest or distribute the brochures, had significantly better knowledge and practices than those who were only exposed to songs (see Table 6). There was no significant difference in effect between those who had the brochure explained to them by a neighbor and those who had it explained by a health worker or EHW (data not shown).

Table 6 Impact of Level of Exposure to JKJ on Knowledge, Intentions, Purchase, and Consumption of Anti-Malarial Drugs in JKJ Area (in Percentages)

	Know MOH-Recommended Malaria Drugs (n = 411)	Would Recommend SP for 9-Month Old (n = 411)	Would Use SP for Self (n = 411)	Purchased Approved SP Drug in Last 2 Weeks (n = 215)	Consumed Correct Dose of SP (n = 215)
Exposed to both brochures and songs	63.6	53.6	71.8	71.0	58.8
Exposed to brochures only	49.1	39.6	46.2	50.7	43.3
No exposure, except in passing	14.9	14.4	26.7	32.5	21.3

Note: Exposure level was highly significant (0.000) for all outcomes.

Controlling for education and age of patient treated, logistic regression analysis indicates that people living in the intervention area were twice as likely to have purchased and consumed the correct dose of SP as those in the comparison area and three times as likely to have correct knowledge of anti-malarial drugs (see Table 7).

Table 7 Impact of Selected Predictor Variables on Knowledge, Intentions, Purchase, and Consumption of Anti-Malarial Drugs (Odds Ratio [OR] and 95% Confidence Interval)

Predictors	Knowledge of Recommended Malaria Drugs (n = 661)	Would Recommend SP for 9-Month Old (n = 661)	Would Use SP for Self (n = 661)	Purchased Approved SP Drug in Last 2 Weeks (n = 355)	Consumed Correct Dose of SP (n = 351)
	OR (95% CI)	*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*
Live in JKJ area	3.1 (2.2 - 4.5)	2.1 (1.4 - 3.0)	2.3 (1.6-3.4)	2.2 (1.4-3.5)	2.2 (1.3-3.6)
Higher education	2.4 (1.6 - 3.5)	1.9 (1.3 - 2.7)	3.1 (2.1-4.4)	1.5 (1.0-2.4)	1.9 (1.2-3.1)
Bought drugs last 2 weeks	2.0 (1.3 - 2.8)	1.8 (1.2 - 2.6)	1.8 (1.3-2.5)	---	---
Purchased drugs for under-5 child	---	---	---	0.8 (0.5-1.2)	0.4 (0.3-0.7)

Note: ---: variable not included in the analysis.

Costs of the intervention: Replicating this intervention would cost an estimated 59 Ksh (US $0.83) per household in the intervention area, not including the cost of EHWs' and DHMT members' time and other existing resources such as office space. The intervention was intended to reach 150 villages (five per EHW). The number of villages actually reached was 112, not including leakage to non-JKJ villages. If we assume that JKJ villages have 200 households on average, the total number of households in the intervention area was about 22,400. Based on the cost of implementing the JKJ intervention, it is estimated that the total cost of replication would be US$ 18,591 or 83 cents per household (Table 8).

Table 8 Cost of Replication (in Kenya Shillings)

Replication Element	Cost
Adaptation of existing brochures (using artist)	90,000
Printing of 80,000 brochures (40,000 of each)	433,000
Training of 40 EHWs	200,000
Transportation and lunch allowances for 30 EHWs1/	132,000
Song contests in 30 sub-locations, including food, judging fees, awards	375,000
Monitoring by DHMT and PHOs	100,000
Total	1,320,000
Total cost per household	59

Notes: Thirty EHWs assumes the attrition of 10 after training. Also, in the study, bicycles were supplied to the EHWs instead of transport allowances. In retrospect, we believe that the activity could have been more easily implemented by supplying the EHWs with transport allowances, so we present that option in our replication cost projection. Using bicycles again would increase the cost of replication above our estimate by about Ksh 108,000.

As mentioned earlier, the cost per household includes only those households situated in the intervention area. Costs would decline per household by including an estimate of the leakage to other areas or if program modifications were made as described in the following section.

V. Discussion

The JKJ intervention appears to have been a rapid, low-cost, and feasible strategy to achieve significant impact on rural consumers' anti-malarial knowledge, purchases, and correct consumption of anti-malarial drugs. The intervention was particularly effective in improving the knowledge and practices of people with less than eight years' education, perhaps the people most in need of malaria

treatment education and assistance. Within a short time, more than half of the randomly sampled households reported awareness of the intervention and about one in four had been reached intensively.

Since the evaluation took place soon after the intervention occurred, it is not known if its effects were short term only, especially in view of rising resistance to SP in Western Kenya. On the other hand, the effect of the intervention may have spread further after the evaluation, as brochures and songs continued to circulate. It is also not known whether the JKJ intervention would have been as effective if the recommended treatment were more complex and/or expensive than SP.

While the intervention appeared to be affordable, it might be possible to reduce costs during replication. For example, one brochure, such as the government's most recent version, might be almost as effective as two and would decrease the cost significantly. To reduce the costs of the song contests, EHWs might consider encouraging village-based rather than sublocation-level contests, thereby reducing expectations concerning refreshments and awards. Alternatively, radio diffusion of songs composed by community members might be tried.

During the household survey, it was found that chloroquine use had diminished significantly. Hence, future educational efforts in the district should probably concentrate more on reminding people of the importance of early treatment and correct doses of SP for children.

VI. Conclusions

The JKJ activity appears to have had a rapid and significant impact on malaria drug knowledge, purchasing, and consumption behaviors. It is likely that this strategy could also be used to quickly disseminate important policy changes (e.g., a change in first-line malaria treatment) or to remind people of other recommended behaviors, such as use of impregnated bednets. It is important to ensure that whenever consumer demand is being created, an adequate local supply exists of the promoted commodity or service.

Preliminary results of this evaluation have already sparked interest by other donors, such as the United Kingdom Department for International Development and the Rotary Club, which provided funds to replicate the JKJ pyramid distribution (but not the song contests) elsewhere in Kenya. In some of these areas, very few shops were stocking SPs, so it was necessary to brief local shopkeepers on SPs so they could meet the demand created by the JKJ intervention.

Despite the apparent success of the intervention, it should be noted that many people exposed to JKJ still did not purchase the recommended anti-malarial treatment. Many factors contribute to treatment choices, and client education alone cannot affect all such factors. First, although the national guidelines recommend presumptive treatment with SP for all cases of fever, not all fevers are caused by malaria, and not all malaria is sensitive to SP. Consequently, some clients choosing to purchase other drugs, such as AQs or anti-pyretics alone, may still derive benefit from or even be cured by these medications.

Second, many factors can lead to the purchase of a drug other than those known to be recommended by the MOH: the presence of numerous drugs in the shops of unknown or dubious quality, aggressive advertising by manufacturers and distributors of drugs that are not approved for first-line malaria treatment, drug retailers' desire to sell existing stock and make a profit, and clients' difficulty in affording SP.

The probable change to a more expensive first-line combination treatment for malaria will pose new challenges, given how little money less educated people appear to be able to spend on malaria drugs and their difficulties in understanding the correct drug regimens. One promising note is that most rural consumers in this area already seem to be purchasing more than one drug for malaria. However, any treatment regimen that exceeds Ksh 50 (US $0.70) per treatment would probably be prohibitive for the most vulnerable in the rural population.

Achieving correct malaria home-based care in Kenya will remain a major challenge until the supply of inappropriate drugs is reduced through national drug control programs, the first-line drug regimen is

more effective, retailers obtain a reasonable profit by promoting the recommended drugs to consumers, and most clients can afford to purchase the approved drugs in adequate amounts.

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QUALITY ASSURANCE PROJECT

OPERATIONS RESEARCH RESULTS

Neighbor-to-Neighbor Education to Improve Malaria Treatment in Households in Bungoma District, Kenya

Paula Tavrow and Waverly Rennie

May 2004

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Executive Summary

This study's main objective was to determine the impact of a low-cost outreach "neighbor-to-neighbor" (jirani kwa jirani or JKJ) education program on caretaker purchase and consumption of anti-malarial drugs in Bungoma District, Kenya. The Bungoma District Health Management Team (DHMT) implemented this intervention with technical support from the Quality Assurance Project (QAP) and facilitation from the African Medical Research and Education Foundation (AMREF). The intervention was intended to complement another intervention to improve anti-malarial prescribing practices of drug sellers in the same district (vendor-to-vendor; see Tavrow et al. 2002 and 2003).

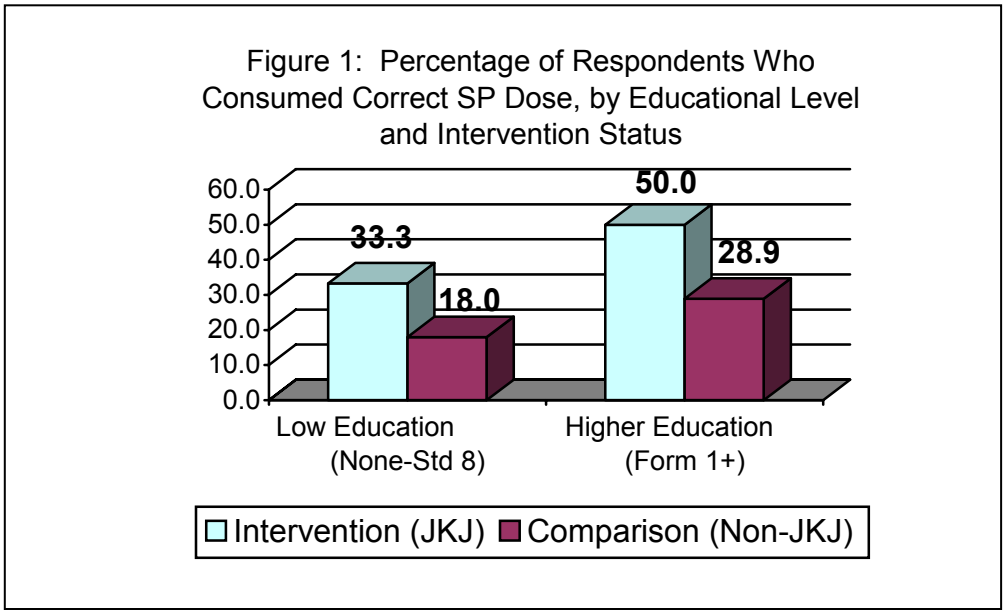
Forty MOH extension health workers (EHWs) received a one-day orientation from the DHMT on the JKJ approach and several copies of two illustrated brochures explaining proper malaria treatment and recommended drugs. About 30 EHWs then led a pyramid distribution of the brochures in 112 villages. They also organized 30 contests where village residents presented songs, dramas, or poems they had created to promote the use of effective anti-malarial drugs. The DHMT and public health officers, who directly supervise the EHWs, monitored the intervention during the six- to eight-week implementation period.

Key Findings

About six weeks after launch, the JKJ intervention had reached 53% of households in the intervention area through a brochure, song contest, or both. Most of the spread was through community members sharing among themselves brochures or what they had heard at a song contest.

Respondents in the intervention area were more likely to know the MOH-recommended anti-malarial drugs and to report intention to use them. This difference was highly significant among respondents with lower education levels. In both intervention and comparison areas, respondents with higher education had better knowledge and practices than those with lower education. More highly educated respondents were also more likely to purchase anti-malarials for their children.

Less educated respondents in the intervention area were significantly more likely to have purchased the first-line anti-malarial drug, sulfadoxine-pyrimethamine (SP), than were those in the comparison area (49% versus 26%) and less likely to have treated malaria with anti-pyretics alone (6% versus 28%). Respondents in the intervention area were significantly more likely to have taken the correct dose of SP (Figure 1).



Note: Significance levels by chi-square were: lower education: 0.009; higher education: 0.029.

Controlling for education and age of patient treated, people living in the intervention area were twice as likely (Odds ratio: 2.2; confidence interval: 1.3–3.6; significance: 0.003) to have purchased and consumed the correct dose of SP as those in the comparison area. For the lower education group, the intervention also seems to have shifted a significant number of people from using anti-pyretics only to SP.

Local costs to replicate the intervention as an add-on to existing DHMT or non-governmental organization activities were estimated to be about 59 Kenya shillings or US$ 0.83 per household in the intervention area. Preliminary results concerning the strategy's impact, feasibility, and low cost have convinced other donors, such as the United Kingdom Department for International Development and the Rotary Club, to replicate it elsewhere in Kenya.

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Neighbor-to-Neighbor Education to Improve Malaria Treatment in Households in Bungoma District, Kenya

Paula Tavrow and Waverly Rennie

I. Introduction

Since August 1998, the Ministry of Health (MOH)-recommended first-line treatment for malaria in Kenya has been sulfadoxine-pyrimethamine (SP). Because most cases of malaria there are treated outside the public health system with drugs purchased over the counter in shops and small pharmacies and at private clinics, the government issued a gazette notice in October 1999 that permitted SP to be sold over the counter. However, consumers have not been well informed about which of the numerous drugs available in the private sector are recommended as effective by the MOH. As a result, they frequently buy drugs of dubious quality, guided by price rather than by MOH guidelines. Additionally, consumers often purchase incorrect dosages and fail to consume the complete dose.

In many countries, the standard approach to improving malaria treatment is to focus on raising the quality of care in the public sector. However, it is increasingly recognized that greater impact could be achieved through strengthening the private sector's quality of care. In the Bungoma District of Western Kenya, where malaria is hyper-endemic, studies have indicated that most people seeking malaria treatment for themselves or their children first visit private establishments. Given these findings, the Bungoma District Health Management Team (DHMT), with guidance from the Quality Assurance Project (QAP), developed and implemented the vendor-to-vendor (VTV) malaria education strategy in 1999–2001; it trained drug wholesalers and mobile vendors to use normal sales contacts with retailers to inform them about correct malaria treatment and to supply them with job aids that also had treatment information. This strategy had some success in improving the quality of private sector prescribing practices, particularly in shops (see Tavrow et al. 2002 and 2003).

To complement the VTV approach, the neighbor-to-neighbor (jirani kwa jirani or JKJ) strategy was developed in 2001–2002 to heighten consumer demand for correct malaria treatment in Bungoma District. The JKJ strategy was designed as a low-cost outreach education program that could be readily implemented by extension health workers (EHWs), who are responsible for environmental and other health issues at the community level. The JKJ intervention was carried out by the Bungoma DHMT with technical support from QAP and facilitation by the African Medical Research and Education Foundation (AMREF).

II. Description of the Intervention

The JKJ intervention had three main objectives: (1) to create more demand for the approved anti-malarials (SP) based on consumer motivations, e.g., desire for safe, effective, good value treatment; (2) to educate consumers about correct dosages; and (3) to complement the VTV supply-side intervention and motivate retailers to stock the MOH-recommended drugs.

Unlike standard community health education approaches where trained health professionals or community health workers provide information and build awareness, the JKJ approach is based on the concept of word of mouth dissemination and pyramid distribution. In each participating village, EHWs were to orient five villagers on the five key treatment messages and to give those villagers enough educational brochures for all the

Abbreviations

AMREF	African Medical Research and Education Foundation
AQ	Amodiaquine
CI	Confidence interval
CQ	Chloroquine
DHMT	District Health Management Team
EHW	Extension health worker
JKJ	Jirani kwa jirani or neighbor-to-neighbor
Ksh	Kenya shillings
MOH	Ministry of Health
OR	Odds ratio
PHO	Public health officer
QAP	Quality Assurance Project
SP	Sulfadoxine-pyrimethamine
USAID	United States Agency for International Development
VTV	Vendor-to-vendor

households in each of their villages. Each of these initial five "relays" would explain and distribute the brochures to another five villagers, who would each contact five of their neighbors until every household in the village received a brochure. To reinforce the brochure information and further engage the community, villagers were also encouraged to develop malaria treatment songs and poems that they could perform at EWH-organized contests.

The steps in JKJ implementation were as follows:

Choose a team: October 2001. A JKJ team was chosen to oversee and implement the activity. The team comprised about five DHMT and health staff; they received technical assistance from QAP and administrative support from AMREF. The team used information from focus group discussions and individual interviews with malaria clients and caregivers to determine knowledge and attitude gaps about malaria treatment. They assessed how well an existing MOH-produced malaria brochure filled those gaps and identified complementary information still needed by consumers.

Create brochures: March 2002 completion. With the aid of a graphic designer, two comic-book style brochures were created, each about a woman (Nandako or Nafuna) with a sick child: The brochures were written in Swahili, a language commonly understood in the district. The Nandako brochure addressed attitudinal obstacles to SP use and focused on five key treatment messages. It also recommended that people read the more comprehensive MOH brochure, which covered both treatment and prevention. Both JKJ brochures were attractive conversation guides that would legitimize neighborly discussion and advice about malaria. After several rounds of pre-tests and revisions, 30,000 copies of each brochure were printed in March 2002.

Orientation*: *February 2002. Two one-day orientation sessions were presented to about 40 active EHWs. Participants were briefed on the purpose of the JKJ program, the pyramid distribution approach, use of the brochures, organization of the song contests, and monitoring activities. Each EHW was to carry out JKJ in five assigned villages in the course of their normal duties; they received bicycles and four days' lunch allowance for this work. About an eighth of the district's villages were included in the intervention. The intervention managers also briefed EHW supervisors, public health officers (PHOs).

Launch intervention: late March 2002. Each EHW received approximately 1000 copies of each brochure, visited his or her assigned villages, and began the pyramid distribution and explanation process. Each gave the first five contact people in each village sufficient copies of each brochure for all households in the village. These five contacts then divided the brochures among themselves. Next, they distributed stacks of brochures to five of their neighbors during normal village contacts, asking the neighbors to distribute individual brochures to their neighbors until all the brochures were gone.

Contests: April and early May 2002: During the brochure distribution, EHWs also helped community members develop songs about malaria, usually based on the messages in the brochures and often based on the Nandako story line. The EHWs reviewed the songs for technical correctness and organized song contests among five participating villages per sublocation. The song contests were judged by local notables, such as school teachers or mayors. Awards (bednets, malaria calendars created by the JKJ team, and SP doses) were given to the best-performing village groups, and all participants received certificates of appreciation. The JKJ team, including the PHOs, monitored the activity by checking whether the brochures had been distributed and by attending some of the 30 song contests.

III. Evaluation Methodology

A. Data Collection Methods

In late May 2002, about two months after implementation began, the program was evaluated using a household interview survey, focus group discussions, and song transcript analysis. The evaluation pursued answers to the following questions:

- Approximately how many villages did the JKJ intervention reach? In the villages reached, approximately how many people participated in JKJ?

- Were people in JKJ intervention villages aware of the program? Had they seen the brochures? When? What had they understood from them?
- Were people in JKJ intervention villages exposed to malaria treatment songs, poems, or dramas? Could villagers recall any of them?
- Did people residing in JKJ intervention villages have better malaria treatment knowledge than those in comparison villages?
- During the last febrile episode (if it happened after the household received a JKJ brochure), were people in JKJ intervention villages more likely to purchase (or obtain) and correctly consume approved anti-malarial drugs than those in the comparison villages?

The household survey asked respondents about malaria drugs they or their household members had purchased and consumed in the last two weeks, their malaria drug knowledge, their treatment intentions, and their exposure to the JKJ brochures and contests and other sources of information on malaria drugs.

Focus group discussions were held with the EHWs and the DHMT to learn more about the process of implementation. In addition, translated transcripts of some songs from the contests were analyzed for content and style.

B. Sample Design

The household survey was conducted in 33 randomly selected villages. It reached 411 households in 18 villages from the 112 covered by JKJ; these surveys included six sublocations. For comparison, surveys were also held in six villages in two nearby sublocations of Bungoma District (96 households) and nine villages in two sublocations in neighboring Busia District (154 households). Altogether, representatives of 661 households were interviewed.

The research team trained six household interviewers who each worked for eight days. Two or three interviewers visited every selected village, and each interviewed approximately 10 randomly selected households per village.

C. Data Entry and Analysis

All interview forms were checked by a supervisor before being submitted for entry into an SPSS database. Data were analyzed using SPSS 11.0. Chi-square analysis of nominal data and logistical regression were performed on five dependent variables: respondent knowledge of MOH-recommended malaria drugs, whether respondent would recommend SP for a nine-month-old child, whether respondent would use SP the next time he or she had malaria, whether the respondent had purchased SP, and whether SP was consumed in the proper dosage.

IV. Results

Profile of respondents: In both the intervention and comparison areas, the majority of survey respondents were women between 25 and 50 years of age (see Table 1). About two-thirds had less than eight years of education. Because there was a significant difference between JKJ and non-JKJ respondents by educational level, with JKJ respondents being more educated, analysis of the impact of the intervention was disaggregated by educational level.

Table 1 Profile of Respondents (in Percentages)

Respondents	JKJ (n = 411)	Non-JKJ[1] (n = 250)	Significance[2]
Sex			*0.958*
Male	23.1	23.3	
Female	76.9	76.7	
Age			*0.219*
<25	11.4	15.7	
25–50	82.5	79.9	
>50	6.1	4.4	
Education			*0.018*
None to standard 4	25.8	29.6	
Standard 5–8	40.1	48.4	
Form 1 to 4	30.4	18.8	
Above Form 4	3.6	3.2	
Purchased malaria treatment in last two weeks	52.8	55.2	*0.548*
For under-5 child	(47.2)	(65.0)	*(0.001)*
For over-5 child or adult	(52.8)	(35.0)	
Of those who purchased malaria treatment, asked for drug by name	60.4	61.3	*.727*

Notes: 1. Includes non-JKJ areas of Bungoma District and comparison villages in Busia District.
2. Significance using chi-square.

Bungoma District has a distinct malaria season during the long rains (March–May). The intervention had been timed to occur during this season to achieve maximum effect. More than half of respondents from the intervention and comparison areas reported having purchased anti-malarial drugs in the previous two weeks. Because more respondents in the non-JKJ area reported purchasing drugs for under-five children, subsequent data analysis was also disaggregated by the age of the patient.

About six in ten of those who had purchased drugs said that they had asked for drugs by name. Virtually all malaria treatment was purchased from shops, chemists, or pharmacies. Only 8% of respondents reported purchasing malaria treatment from private or government clinics, with no difference by area. Whereas nearly 90% of respondents purchasing from shops asked for drugs by name, significantly fewer asked for drugs by name from chemists (60%) and clinics (7%). This suggests that for drug recommendations, people seek out chemists and particularly health providers, but in general make their own decision about what drug to seek at shops.

Spread of the intervention: About six weeks after launching the intervention, 53% of the households in the intervention area had been reached either by a brochure or contest, as had 18% of households in the comparison area (see Table 2). Most of the "leakage" to the comparison areas occurred in the Bungoma non-JKJ villages. The exposure in the non-JKJ areas consisted largely of seeing the brochures in passing. To check whether people's affirmative responses were influenced by courtesy bias, respondents were also asked if they had seen two brochures that had not been widely circulated in the district. Only 3–6% of people reported having seen them.

Table 2 Spread of JKJ Intervention after Six Weeks (in Percentages)

	JKJ (n = 411)	Non-JKJ (n = 250)	Significance[1]
Brochures			
Saw one or both brochures in passing	52.6	18.2	*0.000*
Had one or both brochures explained	25.5	3.2	*0.000*
(By neighbor or community figure)	(60.4)	(55.5)	
(By health worker or EHW)	(39.6)	(44.4)	
Received one or both brochures	26.0	0.8	*0.000*
Distributed one or both brochures	7.3	0.0	*0.000*
Song contest			
Heard song from contest	19.7	4.0	*0.000*
Attended song contest	9.2	1.2	*0.000*
Exposure status			*0.000*
Exposed to brochures and song	26.8	5.2	
Exposed to brochures only	25.8	13.2	
Not exposed at all	47.4	81.6	

Note: 1. Significance using chi-square.

The intervention appears to have intensively reached about one in four households in the JKJ area, with respondents reporting exposure both to the brochures and the song contests. While only about one in ten respondents reported having attended a song contest, another two in ten reported having heard at least one of the songs. Apparently, the songs were also sung at school assemblies and church. Several respondents spontaneously sang one of the songs when asked about them during the interviews.

About one in four JKJ households reported that the brochures had been explained to them. These people usually also received copies of the brochures. A majority of respondents who reported having the brochures explained to them said a neighbor or other community member had discussed it with them. Nearly one in 13 respondents had served as relays.

Focus group discussions with EHWs indicated that using the JKJ pyramid approach to distribute and explain the contents of the brochures was fairly easy to implement, but that the song contests required considerable time and effort. Moreover, these contests were more expensive than anticipated because the EHWs felt it necessary to motivate judges and participants with sodas, food, and prizes. On the positive side, an analysis of a sample of songs suggested that they conveyed accurate information. They seemed catchy and memorable to analysts, and several seemed to have had considerable staying power, with people still able to sing them several weeks later.

Impact of JKJ intervention: In assessing the impact of the JKJ intervention, we first examined knowledge, intentions, and practice by educational status, since JKJ was an educational intervention. In both JKJ and non-JKJ areas, those with more education (which we defined as having nine years of education or more) had better knowledge of MOH malaria guidelines than those with less. The former were more likely to recommend SP for a nine-month-old child and to intend to use SP themselves when they next fell ill with malaria (see Table 3).

Table 3 Knowledge of Recommended Anti-Malarial Drugs and Intention to Use Them, by Education Level and Geographic Area (in Percentages)

	Lower Education (None to Standard 8)			Higher Education (Form 1 or More)			All		
	Inter-vention (n = 272)	Compar-ison (n = 195)	*Sig*[1]	Inter-vention (n = 139)	Compar-ison (n = 55)	*Sig*[1]	Inter-vention (n = 411)	Compar-ison (n = 250)	*Sig*[1]
Knows MOH-recommended malaria drugs[2]	28.3	12.3	*0.000*	53.2	41.8	*0.152*	36.7	18.8	*0.000*
Would recommend SP to treat 9-month old	27.2	13.3	*0.000*	39.5	32.7	*0.375*	31.4	17.6	*0.000*
Would use SP to treat self	34.6	17.9	*0.000*	61.9	45.5	*0.037*	43.8	24.0	*0.000*

Notes: 1. Significant using chi-square.
2. Cited at least one MOH-recommended drug and no incorrect drugs.

Whereas the JKJ intervention could not eradicate differences in knowledge and intentions between educational levels, it does seem to have had a significant impact on the knowledge and intentions of those with less education. More than twice as many less educated respondents in the JKJ area had correct knowledge regarding government-recommended anti-malarials and intentions to use SP for self-treatment and young child treatment than did less educated respondents in the non-JKJ area. For those with more education, significant differences by intervention status were found for self-treatment intentions only. For both educational levels, the data indicate that considerable reluctance endures to recommend SP for children under one year of age, probably due to the common belief that SP is too strong for children.

Concerning practices, the higher education group from both areas was more likely to have purchased an anti-malarial drug in the past two weeks than the lower education group (64% versus 49%). They also paid on average Kenya shillings (Ksh) 15[1] more for treatment. Several factors might explain this finding: Perhaps more-educated people are not as sick as those with less education, or they are more willing and/or able to pay more for medicine, or they have more money and as a result get charged more or buy more medicines than they really need, just to be safe.

While the intervention seems to have increased the use of SP by all respondents, the data are significant only for those of lower educational status, in part due to sample size (see Table 4 and Figure 1, which appears in the Executive Summary). For the lower education group, the intervention also seems to have shifted a significant number of people from using anti-pyretics only to SP. None of those in the higher educated groups reported using anti-pyretics alone for anti-malarial treatment.

[1] US $ 1 = Ksh 71 (2002).

Table 4 Reported Purchases and Consumption of Anti-Malarial Drugs, by Educational Level (in Percentages except as Noted)

	Less Education (None to Standard 8)			More Education (Form 1 or more)			All		
	Inter-vention (n = 130)	Compar-ison (n= 100)	Sig[1]	Inter-vention (n = 87)	Compar-ison (n = 38)	Sig[1]	Inter-vention (n = 217)	Compar-ison (n = 138)	Sig[1]
Drug purchased			*0.000*			*0.104*			*0.000*
SP (correct drug)	48.5	26.0		62.1	42.1		54.1	30.9	
AQ	28.5	29.0		19.5	26.3		24.8	28.1	
CQ	6.2	5.0		2.3	2.6		4.6	4.3	
Other anti-malarial or antibiotic	10.8	12.0		16.1	28.9		12.8	16.6	
Anti-pyretic only	6.2	28.0		0.0	0.0		3.7	20.1	
Consumed SP in correct dose	33.3	18.0	*0.009*	50.0	28.9	*0.029*	40.0	21.0	*0.000*
Asked for approved SP by name	24.6	11.0	*0.009*	37.5	18.4	*0.035*	29.8	13.0	*0.000*
Mean amount spent[2]	41	38	*0.579*	53	60	*0.386*	46	44	*0.649*
(Range)	(2-460)	(2-210)		(8-280)	(20-150)		(2-460)	(2-210)	

Notes: 1. Significant using chi-square. AQ: amodiaquine; CQ: chloroquine.
2. Amounts are in Kenya shillings.

For respondents at both levels of education, those living in the intervention area were significantly more likely to have taken the correct dose of SP than those in the comparison area. In addition, of those who asked for a drug by name, those in the intervention area were twice as likely to have asked for an MOH-approved SP. There was no significant difference in the amount spent by interventions and comparisons, but the gap does seem to have narrowed in the intervention area. Interestingly, about 85% of consumers reported purchasing at least two different types of drugs, with one drug usually being an anti-pyretic.

To show the effect of the intervention on treatment practices for children under five, we present the data by age group in Table 5. Again, the intervention group was significantly more likely to ask for and purchase SP and less likely to treat fever with anti-pyretic alone for both age groups. The data also show that those treating a patient under age five were significantly less likely to ask for an approved SP by name, although those in the JKJ area were twice as likely to do so. There was no difference in expenditures on treatment by age group, with the average amount spent being 45 Ksh (US$ 0.63).

Table 5 Reported Purchases and Consumption of Anti-Malarial Drugs, by Age of Patient (in Percentages except As Noted)

	Patient under Age Five			Patient over Age Five		
Drug purchased	Intervention (n = 103)	Comparison (n = 89)	*Sig*[1] *0.000*	Intervention (n = 115)	Comparison (n = 48)	*Sig*[1] *0.000*
SP (correct drug)	48.5	30.3		59.2	31.2	
AQ	25.2	30.3		24.3	22.9	
CQ	5.8	2.2		3.5	8.3	
Other anti-malarial or antibiotic	17.5	12.4		8.7	25.0	
Anti-pyretic only	2.9	24.7		4.3	12.5	
Consumed SP in correct dose	28.7	15.9	*0.036*	50.0	29.2	*0.015*
Asked for approved SP by name	20.4	10.1	*0.051*	38.3	18.8	*0.015*
Mean amount spent[2]	44	44	*0.957*	48	43	*0.522*
(Range)	(2-460)	(2-130)		(5-280)	(4-210)	

Notes: 1. Significant using chi-square.
2. Amounts are in Kenya shillings.

Impact of different exposure levels: On a scale of one to 10, with one being no exposure and 10 being maximum exposure (including distributing brochures and attending a contest), people had a mean exposure level of 2.5, with a standard deviation of 3.1. There was a strong dose-response relationship between level of exposure to the intervention and all outcome variables tracked. Those who were exposed to both the songs and the brochures, even if they did not attend the song contest or distribute the brochures, had significantly better knowledge and practices than those who were only exposed to brochures (see Table 6). There was no significant difference in effect between those who had the brochure explained to them by a neighbor and those who had it explained by a health worker or EHW (data not shown).

Table 6 Impact of Level of Exposure to JKJ on Knowledge, Intentions, Purchase, and Consumption of Anti-Malarial Drugs in JKJ Area (in Percentages)

	Know MOH-Recommended Malaria Drugs (n = 411)	Would Recommend SP for 9-Month Old (n = 411)	Would Use SP for Self (n = 411)	Purchased Approved SP Drug in Last 2 Weeks (n = 215)	Consumed Correct Dose of SP (n = 215)
Exposed to both brochures and songs	63.6	53.6	71.8	71.0	58.8
Exposed to brochures only	49.1	39.6	46.2	50.7	43.3
No exposure, except in passing	14.9	14.4	26.7	32.5	21.3

Note: Exposure level was highly significant (0.000) for all outcomes.

Controlling for education and age of patient treated, logistic regression analysis indicates that people living in the intervention area were twice as likely to have purchased and consumed the correct dose of SP as those in the comparison area and three times as likely to have correct knowledge of anti-malarial drugs (see Table 7).

Table 7 Impact of Selected Predictor Variables on Knowledge, Intentions, Purchase, and Consumption of Anti-Malarial Drugs (Odds Ratio [OR] and 95% Confidence Interval)

Predictors	Knowledge of Recommended Malaria Drugs (n = 661)	Would Recommend SP for 9-Month Old (n = 661)	Would Use SP for Self (n = 661)	Purchased Approved SP Drug in Last 2 Weeks (n = 355)	Consumed Correct Dose of SP (n = 351)
	OR (95% CI)	*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*
Live in JKJ area	3.1 (2.2 - 4.5)	2.1 (1.4 - 3.0)	2.3 (1.6-3.4)	2.2 (1.4-3.5)	2.2 (1.3-3.6)
Higher education	2.4 (1.6 - 3.5)	1.9 (1.3 - 2.7)	3.1 (2.1-4.4)	1.5 (1.0-2.4)	1.9 (1.2-3.1)
Bought drugs last 2 weeks	2.0 (1.3 - 2.8)	1.8 (1.2 - 2.6)	1.8 (1.3-2.5)	---	---
Purchased drugs for under-5 child	---	---	---	0.8 (0.5-1.2)	0.4 (0.3-0.7)

Note: ---: variable not included in the analysis.

Costs of the intervention: Replicating this intervention would cost an estimated 59 Ksh (US $0.83) per household in the intervention area, not including the cost of EHWs' and DHMT members' time and other existing resources such as office space. The intervention was intended to reach 150 villages (five per EHW). The number of villages actually reached was 112, not including leakage to non-JKJ villages. If we assume that JKJ villages have 200 households on average, the total number of households in the intervention area was about 22,400. Based on the cost of implementing the JKJ intervention, it is estimated that the total cost of replication would be US$ 18,591 or 83 cents per household (Table 8).

Table 8 Cost of Replication (in Kenya Shillings)

Replication Element	Cost
Adaptation of existing brochures (using artist)	90,000
Printing of 80,000 brochures (40,000 of each)	433,000
Training of 40 EHWs	200,000
Transportation and lunch allowances for 30 EHWs[1/]	132,000
Song contests in 30 sub-locations, including food, judging fees, awards	375,000
Monitoring by DHMT and PHOs	100,000
Total	1,320,000
Total cost per household	59

Note: 1. Thirty EHWs assumes the attrition of 10 after training. In the study, bicycles were supplied to the EHWs instead of transport allowances. In retrospect, we believe that the activity could have been more easily implemented by supplying the EHWs with transport allowances, so we present that option in our replication cost projection. Using bicycles again would increase the cost of replication above our estimate by about Ksh 108,000.

As mentioned earlier, the cost per household includes only those households situated in the intervention area. Costs would decline per household by including an estimate of the leakage to other areas or if program modifications were made as described in the following section.

V. Discussion

The JKJ intervention appears to have been a rapid, low-cost, and feasible strategy to achieve significant impact on rural consumers' anti-malarial knowledge, purchases, and correct consumption of anti-malarial drugs. The intervention was particularly effective in improving the knowledge and practices of people with less than eight years' education, perhaps the people most in need of malaria

treatment education and assistance. Within a short time, more than half of the randomly sampled households reported awareness of the intervention and about one in four had been reached intensively.

Since the evaluation took place soon after the intervention occurred, it is not known if its effects were short term only, especially in view of rising resistance to SP in Western Kenya. On the other hand, the effect of the intervention may have spread further after the evaluation, as brochures and songs continued to circulate. It is also not known whether the JKJ intervention would have been as effective if the recommended treatment were more complex and/or expensive than SP.

While the intervention appeared to be affordable, it might be possible to reduce costs during replication. For example, one brochure, such as the government's most recent version, might be almost as effective as two and would decrease the cost significantly. To reduce the costs of the song contests, EHWs might consider encouraging village-based rather than sublocation-level contests, thereby reducing expectations concerning refreshments and awards. Alternatively, radio diffusion of songs composed by community members might be tried.

During the household survey, it was found that chloroquine use had diminished significantly. Hence, future educational efforts in the district should probably concentrate more on reminding people of the importance of early treatment and correct doses of SP for children.

VI. Conclusions

The JKJ activity appears to have had a rapid and significant impact on malaria drug knowledge, purchasing, and consumption behaviors. It is likely that this strategy could also be used to quickly disseminate important policy changes (e.g., a change in first-line malaria treatment) or to remind people of other recommended behaviors, such as use of impregnated bednets. It is important to ensure that whenever consumer demand is being created, an adequate local supply exists of the promoted commodity or service.

Preliminary results of this evaluation have already sparked interest by other donors, such as the United Kingdom Department for International Development and the Rotary Club, which provided funds to replicate the JKJ pyramid distribution (but not the song contests) elsewhere in Kenya. In some of these areas, very few shops were stocking SPs, so it was necessary to brief local shopkeepers on SPs so they could meet the demand created by the JKJ intervention.

Despite the apparent success of the intervention, it should be noted that many people exposed to JKJ still did not purchase the recommended anti-malarial treatment. Many factors contribute to treatment choices, and client education alone cannot affect all such factors. First, although the national guidelines recommend presumptive treatment with SP for all cases of fever, not all fevers are caused by malaria, and not all malaria is sensitive to SP. Consequently, some clients choosing to purchase other drugs, such as AQs or anti-pyretics alone, may still derive benefit from or even be cured by these medications.

Second, many factors can lead to the purchase of a drug other than those known to be recommended by the MOH: the presence of numerous drugs in the shops of unknown or dubious quality, aggressive advertising by manufacturers and distributors of drugs that are not approved for first-line malaria treatment, drug retailers' desire to sell existing stock and make a profit, and clients' difficulty in affording SP.

The probable change to a more expensive first-line combination treatment for malaria will pose new challenges, given how little money less educated people appear to be able to spend on malaria drugs and their difficulties in understanding the correct drug regimens. One promising note is that most rural consumers in this area already seem to be purchasing more than one drug for malaria. However, any treatment regimen that exceeds Ksh 50 (US $0.70) per treatment would probably be prohibitive for the most vulnerable in the rural population.

Achieving correct malaria home-based care in Kenya will remain a major challenge until the supply of inappropriate drugs is reduced through national drug control programs, the first-line drug regimen is

more effective, retailers obtain a reasonable profit by promoting the recommended drugs to consumers, and most clients can afford to purchase the approved drugs in adequate amounts.

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