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Vendor-to-vendor education to improve malaria treatment by private drug outlets in Bungoma District, Kenya

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Abstract

Background: Private outlets are the main suppliers of uncomplicated malaria treatment in Africa. However, they are so numerous that they are difficult for governments to influence and regulate. This study's objective was to evaluate a low-cost outreach education (vendor-to-vendor) programme to improve the private sector's compliance with malaria guidelines in Bungoma district, Kenya. The cornerstone of the programme was the district's training of 73 wholesalers who were equipped with customized job aids for distribution to small retailers.

Methods: Six months after training the wholesalers, the programme was evaluated using mystery shoppers. The shoppers posed as caretakers of sick children needing medication at 252 drug outlets. Afterwards, supervisors assessed the outlets' knowledge, drug stocks, and prices.

Results: The intervention seems to have had a significant impact on stocking patterns, malaria knowledge and prescribing practices of shops/kiosks, but not consistently on other types of outlets. About 32% of shops receiving job aids prescribed to mystery shoppers the approved first-line drug, sulfadoxine-pyremethamine, as compared to only 3% of the control shops. In the first six months, it is estimated that 500 outlets were reached, at a cost of about \$8000.

Conclusions: Changing private sector knowledge and practices is widely acknowledged to be slow and difficult. The vendor-to-vendor programme seems a feasible district-level strategy for achieving significant improvements in knowledge and practices of shops/kiosks. However, alternate strategies will be needed to influence pharmacies and clinics. Overall, the impact will be only moderate unless national policies and programmes are also introduced.

Introduction

Malaria is a major public health problem, killing at least one million people each year, mostly in sub-Saharan Africa [1]. Current strategies to combat malaria, led by the World Health Organization's "Roll Back Malaria" initiative, include early and effective treatment [2]. This strategy is hampered by ambiguous symptoms that delay recogni-

tion of malaria, inaccessibility of health facilities, and the lack of universally efficacious and inexpensive drugs. Treatment is further compromised by the widespread use of anti-malarial drugs for all fevers and by incorrect dosing. These factors contribute to drug resistance, which necessitates continual change in malaria treatment guidelines.

In regions of sub-Saharan Africa where malaria is endemic and public health facilities are not very accessible, about 50% to 80% of people first visit private drug outlets or practitioners for malaria treatment [3–5]. Unfortunately, the level of technical knowledge of private clinics, pharmacies and shops is often low [6,7]. Because private outlets are so numerous and are often unregistered, they are outside of most governments' capacity to inform, update, monitor and regulate.

Monitoring and influencing the quality of private services is now recognized as a key component of effective malaria treatment [8]. However, as noted by a WHO Study Group, achieving rational prescribing in the private sector is "notoriously difficult" due to influences from patient demand, drug advertising and profit margins [6]. Even communicating new standards of diagnosis and treatment to private practitioners in developing countries poses immense challenges to governments with limited resources. Innovative approaches are needed to achieve higher quality private services without increasing significantly the burden or cost to governments.

Objective of the study

The purpose of this study was to test whether a low-cost outreach education programme, managed by a district health management team (DHMT) in a rural district of Kenya, could increase private drug outlets' knowledge of and compliance with national malaria treatment guidelines. The cornerstone of the programme was to train and equip drug wholesalers – both mobile drug vendors and wholesale counter attendants – to serve as unpaid outreach educators of the new malaria guidelines. Since the wholesalers were to educate the drug retailers during their normal business interactions with them, the programme was called "vendor-to-vendor." Retailers consisted of shops, kiosks, pharmacies and private clinics, many of them unlicensed.

Study setting

In Kenya, approximately 26,000 children die each year from malaria, or about 72 per day [9]. In August 1998 the Government of Kenya changed its first-line anti-malarial treatment from chloroquine to sulfadoxine-pyrimethamine (SP) [10]. Amodiaquine was to be the second-line drug. A gazette notice in October 1999 permitted SP to be sold over the counter and required that chloroquine be sold only by prescription. (Amodiaquine was not mentioned, so it continued to be sold over the counter.) In 1999 the Government of Kenya also conducted tests of 33 SP brands and approved five. However, because of lack of enforcement, the 28 unapproved SP drugs still remained in the market, as well as chloroquine and amodiaquine. Furthermore, the gazette notice was not well-publicized,

so many shops and kiosks still believed that they were prohibited from selling SP.

Bungoma district, located in Western Province, Kenya, is a malaria endemic area with a population of about 900,000 [11]. Home treatment of malaria, using drugs purchased from private outlets, is common. A 1996 study found that 47% of children received home treatment with an anti-malarial drug, purchased mainly from pharmacies (54%) or small shops (29%) [5]. A 1998 survey conducted by the Bungoma DHMT estimated the district had about 1500 private drug outlets (as compared to 38 health facilities). The survey revealed that 87% of the shopkeepers had never received training on drug use, but 60% gave their customers some instruction on dosages. Nearly 27% did not know the difference between anti-malarials and anti-pyretics [11].

Description of the programme

The main components of the vendor-to-vendor programme were: design and production of a shopkeeper job aid and a client awareness aid, orientation of wholesale owners, training and equipping of mobile vendors and wholesale counter attendants, and monitoring.

With the assistance of the USAID-funded Quality Assurance Project and the African Medical Research and Education Foundation, members of the Bungoma DHMT first conducted focus groups and individual interviews with private drug outlets, wholesalers, and consumers. They learned the common misperceptions the public had about SP (e.g., that it is "too strong" for children below one year of age), and the main difficulties faced by drug sellers (e.g., when consumers demand anti-malarial drugs of doubtful efficacy). The team then worked with a Kenyan graphic artist to develop two posters in Kiswahili to communicate Kenya's new malaria guidelines to retailers and to motivate the public to purchase the approved SP drugs.

- The **shopkeeper job aid** was for a retailer to consult when selling anti-malarial drugs. It was to be hung where the retailer could easily use it when serving clients. The job aid listed the clinical symptoms of malaria, a dosage chart of the approved brands of SP and anti-pyretics, treatment advice, and common situations faced by private outlets with suggestions on how to deal with them.
- The **client awareness poster** was to be hung near the entrance of the outlet to generate consumer demand for the five approved brands of SP and to communicate that SP was now available over the counter. It urged customers to treat malaria properly by using one of these recommended drugs which were depicted in their actual packaging.

The DHMT next conducted two three-hour orientation sessions for owners of wholesale shops and pharmacies to gain their cooperation. Following these sessions, virtually all agreed to send their counter attendants to the training and let them distribute the job aids and posters during their work.

In April-May 2000, the DHMT conducted five one-day training sessions for mobile vendors and wholesale counter attendants. Mobile vendors are entrepreneurs who purchase drugs from wholesale general shops (not wholesale pharmacies) and re-sell them by motorcycle or bicycle to small retailers; wholesale counter attendants are stationary employees of wholesale pharmacies or general shops who are paid a daily wage. Of approximately 105 wholesalers identified, about 70% were trained: 22 wholesale pharmacy attendants, 11 wholesale shop attendants, and 40 mobile drug vendors. Extensive role plays were performed on how to communicate the posters and advise outlets on where to hang them. Additionally, each trainee received a receipt book to record recipients of posters and to obtain their agreement to comply with the new guidelines. Wholesalers were to discuss and distribute the job aids at the point of sale: for mobile vendors, at the retail outlet; for wholesale attendants, at the wholesale outlet. No retail outlets were directly trained by the DHMT. At the end of the training, all wholesalers received caps and shirts with the malaria dosage chart on the front.

About three months after training, the DHMT monitored the mobile vendors and wholesale counter attendants. During the visits, the team checked malaria knowledge with a 10-question quiz and collected receipts. Although the DHMT was not able to observe how the wholesalers communicated the guidelines to the retail outlets, they were able to confirm that the wholesalers had the requisite knowledge and understood every element of the shopkeeper job aid.

The total cost of the programme that would be borne by a district was \$8300. The cost breakdown was as follows: formative research to learn about malaria treatment issues (\$2000); design and production of 1500 shopkeeper job aids and 1500 client posters (\$3000); training of mobile vendors and wholesale counter attendants, including t-shirts, caps and receipt books (\$2800); and monitoring of mobile vendors and wholesale counter attendants by the DHMT (\$500). These costs do not include the time spent on this activity by district health personnel or by outside technical advisors, but it does include daily allowances to district personnel for the days they spent in training or monitoring.

Methods

Research design

Six months after training the mobile vendors and wholesale attendants, the study team employed eight mystery shoppers (unemployed people posing as clients) and four supervisors (members of the DHMT) to assess the implementation and impact of the programme. The mystery shopper evaluation approach was chosen because it has been used effectively elsewhere to assess the quality of drug retailers (primarily dispensing practices for diarrhoea and respiratory infections) without observation bias [12]. The study team received clearance for using this approach from the Steering Committee overseeing the Bungoma District Malaria Initiative during their 1999 annual meeting, which included representatives from the National Malaria Control Programme and the Ministry of Health. Care was taken to follow ethical guidelines, such as preserving confidentiality of individual outlets.

Data were collected for eight days. Two mystery shoppers (one man and one woman) and one supervisor visited each drug outlet included in the sample. The females were to have a nine-month old child at home whom they believed had malaria. They asked the outlet attendant for advice on what drug to purchase. The males were to have a two-year old child sick at home. They specifically asked for Malarquin (a popular brand of chloroquine). Both types of mystery shoppers were only to provide information (e.g., age of the child, duration of the illness, etc.) if asked. Immediately after leaving the outlet, the shopper discreetly completed a form to record the interaction. Some time after both mystery shoppers visited an outlet, a supervisor entered to check stocks, look for job aids, and ask questions to assess malaria knowledge.

Sample design

Determining an appropriate sample design posed some challenges. First, since the DHMT had no control over which retail outlets were reached by the wholesalers, it was not possible to randomize outlets into intervention and control groups or localities. Second, because the DHMT had conducted its own survey of private drug outlets in Bungoma district only two years before implementing the vendor-to-vendor programme, it was reluctant to delay launching the programme in order to allow researchers to perform an additional baseline survey focused on private prescribing practices.

Hence, the study team opted for a post hoc evaluation, recognizing the limitations of this design. Because it was not possible to randomize outlets, the researchers decided that "informed outlets" would be defined as outlets that had received the posters, confirmed either by the presence of a shopkeeper job aid or the respondent stating that it

Table 1: Profile of respondents and outlets (in %, unless noted)

		Informed outlets (n = 101)	Control outlets (n = 151)	All outlets (n = 252)	signif.*
Sex	Female	56.4	55.0	55.6	.818
	Male	43.6	45.0	44.4	
Education	Standard 8 or less	21.0	26.7	24.4	.542
	Form 1–4	69.0	61.0	64.2	
	Above Form 4	10.0	12.3	11.4	
Employment status	Owner	44.6	39.7	41.7	.044
	Employee	28.7	19.2	23.0	
	Family member	26.7	41.1	35.3	
Locale	Rural	58.4	57.6	57.9	.900
	Urban	41.6	42.4	42.1	
Type of outlet	Shop/Kiosk	67.3	78.8	74.2	.016
	Pharmacy	26.7	12.6	18.3	
	Clinic	5.9	8.6	7.5	
Sources of drugs	Wholesale pharmacy	46.5	31.8	37.7	.018
	Wholesale general shop	33.7	52.3	44.8	.004
	Mobile vendor	31.7	11.9	19.8	.000
Malaria clients	Reported average number of malaria clients per day	10	8	9	.161

*From Pearson chi-square

had been received. Outlets never having received job aids would be defined as controls.

The study team was aware that informed and control outlets might differ in ways that could affect directly the outcomes of interest. To increase internal validity, the team sought to visit control outlets that resembled receipted outlets in terms of location, size, and type. In addition, during data analysis, the team examined whether the respondent's position (employee, family member or owner), educational level or gender could bias results. None of these seemed to be confounders. A post hoc step-wise logistic regression analysis found that the only variable predicting whether an outlet was labeled informed or control was its sources of drugs (informed outlets were more likely to report purchasing drugs from mobile vendors). However, it is not known if informed and control outlets differed in other ways not measured by the study team, such as receptivity to being educated by a wholesaler.

For locating informed outlets, the team started with the 231 receipts collected from wholesalers. They discarded 105 for the following reasons: 10 were duplicates; 19 were schools or laboratories, did not have names or were outside the district; and 76 were in remote sub-locations. Thus, 126 informed outlets were sought. Of these, 47 (37%) were no longer operational or could not be found, 9 (7%) had never received the job aids, and 7 (5%) were

not visited by one mystery shopper. Hence, 63 of the receipted outlets sought were characterized as informed. The nine which did not receive job aids were characterized as controls.

For control outlets, the strategy was to select one to two drug outlets near the receipted outlets, as well as 15 outlets from a neighbouring district (Teso). Of the approximately 200 non-receipted outlets visited, 20 (10%) did not have anti-malarials in stock, 38 (19%) had received job aids and were labeled informed outlets and 142 (72%) never received job aids and were labeled controls. In all, 101 informed and 151 control outlets were obtained.

Data analysis

Data entry and statistical analysis was conducted using SPSS 8.0. Chi-square, ANOVA, and logistic regression were performed to compare informed versus control outlets, to examine the potential impact of confounders and to check for differences by mystery shopper scenario.

Results

Profile of private outlets, drugs and prices

Private drug outlets

More than half of the attendants at the 252 retail outlets interviewed by supervisors were female and about 42% were the owners (see Table 1). Nearly 25% had eight years or less of education. About 75% of these outlets were

Table 2: Percent of outlets having various anti-malarial drugs in stock, by programme status and type of outlet

	Drugs in stock	Informed outlets	Control outlets	All outlets	Signif*
Shops/Kiosks (n = 187)	CQ	22.1	42.0	34.8	.006
Informed = 68	SP	47.1	6.7	21.4	.000
Control = 119	AQ	76.5	79.0	78.1	.689
Pharmacies (n = 46)	CQ	70.4	63.2	67.4	.607
Informed = 27	SP	92.6	94.7	93.5	.772
Control = 19	AQ	92.6	94.7	93.5	.772
Private clinics (n = 19)	CQ	0.0	53.8	36.8	.024
Informed = 6	SP	100.0	69.2	78.9	.126
Control = 13	AQ	83.3	69.2	73.7	.516
All outlets (n = 252)	CQ	33.7	45.7	40.9	.057
Informed = 101	SP	62.4	23.2	38.9	.000
Control = 151	AQ	81.2	80.1	80.6	.836

Notes: CQ = chloroquine (to be sold by prescription only); SP = sulfadoxine-pyrimethamine (first-line drug); AQ = amodiaquine (second-line drug); *From Pearson chi-square.

shops or kiosks, and 58% were in rural areas. Outlets reported serving nine malaria clients on average per day (range: one to 120), of whom half were children under five. About 20% of these outlets obtained anti-malarial drugs from mobile vendors.

Informed and control outlets were similar in terms of sex and education level of attendants, as well as setting. Informed outlets were more likely to be pharmacies, but they did not have a significantly larger clientele on average than control outlets. Informed outlets were also more likely to purchase their drugs from wholesale pharmacies and mobile vendors. About 27% of informed outlets reported getting job aids from wholesale attendants, 51% from mobile vendors, and 22% did not know who supplied them.

Drugs available

More than 70 different brands of various anti-malarial drugs and over 30 brands of anti-pyretics were found in the outlets visited. This represents a significant increase from 17 brands of anti-malarials found in Kenya in 1995 [7]. On average, pharmacies had 10 different brands of various anti-malarials in stock, while shops had two and private clinics five. Amodiaquine (AQ), the second-line drug, was the most frequently stocked (see Table 2). Of outlets visited, 81% stocked AQ, while only 39% stocked SP and 41% stocked chloroquine (CQ). Drug stocking and source of drugs were found to differ significantly by type of outlet. About 60% of shops/kiosks bought drugs from wholesale general shops, which only stock over-the-counter drugs. In contrast, almost all pharmacies/chemists and private clinics obtained their drugs from large wholesale pharmacies. Mobile vendors sold mainly to rural shops and kiosks.

Drugs sold to mystery shoppers

Not only was AQ the most stocked anti-malarial, it was also sold most frequently to mystery shoppers (see Table 3). SP was sold to less than 15% of mystery shoppers, about the same proportion who were sold CQ. Mystery shoppers were never sold injectables and very few were sold combinations of anti-malarial drugs. About 5% of shoppers were sold antibiotics, anti-pyretics or other drugs as anti-malarials. Nine mystery shoppers (2%) were sold drugs that were not genuine. In 29% of visits, the outlet refused to sell any drug, probably due to concerns by shopkeepers about the legality of selling drugs for young children. Refusal to sell drugs differed significantly by child's age and outlet type: 43% of shops versus 3% of pharmacies would not sell anti-malarial drugs for a 9-month old child, whereas 26% of shops versus 2% of pharmacies would not sell for a 2-year-old child.

Whether shoppers were told the correct dose differed significantly by type of drug. Shoppers who were sold SP were much more likely to be told the correct dose (76%) than those sold AQ (26%) or CQ (7%). The fact that SP is a single dose treatment may have made it easier for attendants to remember. Many attendants mistakenly recommended a single dose of AQ instead of the required three-day treatment.

Drug prices

The prices paid by the mystery shoppers for treating their child's malaria as recommended by outlet attendants varied widely, from about \$0.03 to \$2.29. These prices included anti-pyretics. On average, the price per tablet was \$0.10, whereas the price per bottle of syrup was \$0.81. The price within drug brands also varied. For example, one tablet of Malaratab (the most popular AQ) ranged

Table 3: Drugs sold to mystery shoppers and whether told the correct dose

Anti-malarial drug	Mystery shoppers who were sold the drug		Mystery shoppers who were told correct dose	
	n	(%)	n	(%)
AQ-based	180	(35.7)	46	(25.5)
CQ-based	75	(14.9)	5	(6.6)
SP-based	74	(14.7)	56	(75.7)
Other**	30	(6.0)	3	(10.0)
Not sold any drug	145	(28.8)	--	--
Total	504	(100.0)	110	(30.6)

Notes: AQ = amodiaquine (second-line drug); SP = sulfadoxine-pyrimethamine (first-line drug); CQ = chloroquine (to be sold by prescription only).

*Three were sold anti-malarials (e.g. quinine). Others were sold anti-biotics or anti-pyretics.

Table 4: Malaria knowledge score* (and standard deviation) by programme status and type of outlet

	Informed outlets (n = 101)	Control outlets (n = 151)	All outlets (n = 252)	p-value**
Shop/Kiosk	8.8 (1.6)	7.0 (1.6)	7.7 (1.9)	.000
Pharmacy/Chemist	8.6 (1.1)	7.5 (1.5)	8.2 (1.4)	.000
Clinic	7.8 (1.6)	7.6 (1.4)	7.7 (1.5)	.685
Total	8.7 (1.5)	7.1 (1.6)	7.6 (1.8)	.000

*The score was based on a 10-question true/false quiz administered to each outlet, with 10 as maximum score. The questions focused malaria treatment practices, such as whether sulfadoxine-pyrimethamine (SP) is more effective than chloroquine, whether SP is too strong for children, whether SP is a single-dose treatment, etc. **From ANOVA F-test.

from \$.07 to \$.21. Profit margins may provide a motive for why AQ was sold so frequently. In general, AQ drugs had higher profit margins than SP drugs, and syrups had higher profit margins than tablets. Average profits for a full child dose ranged from \$.03 for Fansidar tablets (SP) to \$.34 for Malaramed syrup (AQ).

Coverage and acceptability

Coverage

During the training, about 1400 copies of each poster were distributed to the wholesale attendants and mobile vendors for dissemination. Based on the receipts collected and the proportion of unreceipted informed outlets found during the study, it is estimated that in six months about 450 to 500 private drug outlets were reached, with minimal effort from the DHMT.

Job aids acceptability, visibility and use

About 63% of the informed outlets were displaying the shopkeeper job aid and the client poster at the time of the supervisor's visit. The majority of the shopkeeper job aids were displayed in a visible location, such as on a wall. About 62% of retail attendants said they used the shop-

keeper job aid, and 47% believed clients used the client poster. An indication of the usefulness of the shopkeeper job aid was that 31% of informed outlets spontaneously used it when asked about dosages of SP drugs.

Impact of programme

Knowledge of correct malaria treatment

During the evaluation the supervisors administered a ten-question malaria knowledge quiz. Informed outlets scored significantly better than control outlets on seven out of ten questions, and slightly better or equivalent on the rest. Informed outlets had better knowledge of important concepts, such as that SP is not too strong for children and that SP can be sold in shops. Among outlets that stocked SP, 76% of informed outlets (48/63) knew the correct dose of SP for an 18-month-old child, as compared to 43% of controls (15/35) (chi-square = 10.9, $p < .001$).

A total knowledge score was calculated by assigning one point to a correct answer and zero points for an incorrect answer or "don't know". Informed outlets scored 8.7 (out of 10) on average while control outlets scored 7.1. Informed outlets receiving job aids from mobile vendors

had significantly higher scores than those receiving job aids from wholesale attendants (9.2 vs. 8.6). Analysis by education level revealed that, at each level, informed outlets scored higher. When compared by outlet type, the intervention appears to have had a significant impact on shops' and pharmacies' knowledge, but not private clinics (see Table 4).

Stocking of drugs

As shown in Table 2, informed outlets were significantly more likely to stock SP than control outlets (62% vs. 23%). Shops mainly accounted for the striking difference in SP stocking. Overall, there was no significant difference in stocking of AQ. Informed shops were significantly less likely than control shops to stock CQ (22% vs. 42%), as were informed clinics relative to control clinics (0% vs. 54%).

Dispensing practices

The key malaria dispensing practice is selling an approved first-line anti-malarial. The Kenya National Malaria Guidelines state that SP is the first-line drug for uncomplicated malaria in all age groups and should be taken with an anti-pyretic. As shown in Table 5, the intervention seems to have had a differential impact by outlet type. Of those mystery shoppers who went to shops/kiosks, 32% visiting informed outlets were sold SP, compared to only 5% at control outlets ($p < .000$). There was no significant differences in the other outlet types. Among the informed outlets, those receiving job aids from mobile vendors were significantly more likely to sell correct drugs than those who received aids from wholesale attendants (29% vs. 7%).

Explicit consumer demand appeared to have an impact. Overall, 9% of female shoppers (who did not demand CQ) were sold a CQ-based drug, compared to 21% of male shoppers (who did demand CQ). If more than 40% of outlets had stocked CQ, the demand effect might have been higher. Controls were twice as likely as informed outlets to sell CQ-based drugs to mystery shoppers (see Table 5).

Of all shoppers who were sold a drug, 24% (37/157) purchased an approved SP and an anti-pyretic at informed outlets, as compared to only 3% (6/202) at control outlets. More than twice as many mystery shoppers were told the correct dose by informed outlets (38%) than by control outlets (15%). All told, 17% of shoppers who purchased drugs at informed outlets both received an approved drug and were told the correct dose, as compared to only 2% at control outlets ($p < .001$).

To provide effective malaria treatment the drug seller should ask several diagnostic questions. In comparing

informed to control outlets, 92% vs. 85% inquired about the child's age, 50% vs. 30% asked about symptoms, and 21% vs. 11% about the duration of illness. All of these differences were statistically significant ($p < .001$). Significantly more informed outlets (24%) than control outlets (13%) told the mystery shopper what to do if a child's health worsens.

Discussion

In areas with a high transmission of malaria, adverse outcomes from malaria can only be reduced if malaria symptoms are recognized early (within the first 12–18 hours after onset) and sick children are treated promptly with effective anti-malarial drugs in the right doses. Public education campaigns on malaria symptoms and the importance of prompt and effective treatment are vital. Yet these campaigns will be of limited value if consumers are sold ineffective drugs in the wrong doses. For this reason, strengthening the capacity of private drug outlets to provide the recommended anti-malarial drugs and information is important. The challenge is to achieve greater performance of private outlets at a cost low enough for the activity to be scaled up nationally.

Four strategies have been advanced for improving the practices of retail pharmacies in developing countries: information, persuasion, incentives and coercion [13]. To date, very few interventions to change retailer behaviours through persuasion (or any other means) have been systematically introduced and evaluated [14]. One intervention for pharmacy attendants in Kenya and Indonesia, called "face to face educational outreach," resulted in significant short-term improvements in diarrhoeal product sales and communication with customers on diarrhoea treatment [15]. Other studies have indicated that job aids tailored to the needs of the target audience can positively affect performance [16].

The vendor-to-vendor programme combined the strategies of persuasion and customized information to achieve improved knowledge and dispensing practices among all private retailers. Prior research by the DHMT had revealed that wholesalers were considered credible sources of drug information for retailers. Hence, they were designated as the "persuaders." Informal interviews indicated that the mobile vendors were more enthusiastic distributors of the job aids than were the wholesale attendants, largely because being involved in the programme apparently heightened their status. Also, since they were not facing queues of retailers, communicating the guidelines was more feasible for mobile vendors.

The main alternate model for changing shopkeeper anti-malarial dispensing behaviours has been piloted in Kilifi, Kenya. The model consisted of a series of three work-

Table 5: Drugs sold to mystery shoppers, by programme status and type of outlet (in %)

Drugs sold	Informed outlets	Control outlets	All outlets	Signif.*
Shop/Kiosk	(n = 136)	(n = 238)	(n = 374)	.000
SP	31.6	2.5	13.1	
AQ	28.7	33.2	31.6	
CQ	5.1	18.9	13.9	
Other anti-malarial	0.0	0.4	0.3	
Not an anti-malarial	5.9	6.7	6.4	
Not sold any drug	28.7	38.2	34.8	
Pharmacy/Chemist	(n = 54)	(n = 38)	(n = 92)	.352
SP	24.1	23.7	23.9	
AQ	48.1	63.2	54.3	
CQ	20.4	10.5	16.3	
Other anti-malarial	0.0	0.0	0.0	
Not an anti-malarial	5.6	0.0	3.3	
Not sold any drug	1.9	2.6	2.2	
Private Clinic	(n = 12)	(n = 26)	(n = 38)	.369
SP	16.7	3.8	7.9	
AQ	33.3	30.8	31.6	
CQ	8.3	26.9	21.1	
Other anti-malarial	0.0	7.7	5.3	
Not an anti-malarial	0.0	0.0	0.0	
Not sold any drug	41.7	30.8	34.2	
Total	(n = 202)	(n = 302)	(n = 504)	.000
SP	28.7	5.3	14.7	
AQ	34.2	36.8	35.7	
CQ	9.4	18.5	14.9	
Other anti-malarial	0.0	1.0	0.6	
Not an anti-malarial	5.4	5.3	5.3	
Not sold any drug	22.3	33.1	28.8	

Notes: SP = sulfadoxine-pyrimethamine (recommended first-line drug); Amodiaquine (second-line drug only); Chloroquine (not recommended, to be sold by prescription only); Other anti-malarial (quinine, etc.); Not an anti-malarial (anti-pyretics or anti-biotics only). *Based on Pearson chi-square.

shops, each lasting for three days, followed by a two-day refresher training. The activity seems to have led to dramatic improvements in CQ prescribing practices among a limited number of shops [17]. But due to the high turnover among employees and the shortlife spans of many outlets, this model would require constant identification and training, which could be onerous for districts. Furthermore, the Kilifi approach does not involve the wholesale distributors, who seem to play a key role in influencing drug purchasing and prescribing practices.

While the vendor-to-vendor programme did seem to improve shops' knowledge and behaviour in a relatively short time, the gap between actual and desired performance was still depressingly large. This could be due to several factors. First, informed outlets still had stocks of old drugs that they needed to sell. Virtually all drug outlets operate on very limited budgets and cannot afford to discard drugs that are no longer recommended. Second, confusion and fear about SP were common in the district. Many outlets still were not sure whether they were indeed

entitled to sell SP over-the-counter. Also, nearly half still believed that SP was too strong for children. Third, the programme did not address the use of AQ, which had become extremely popular in the district due to extensive advertising, high profit margins for sellers, and an apparently cheaper price for consumers than SP due to misleading packaging. It seems likely that the main reason that the programme did not significantly affect pharmacists relates to the large profit margins on AQ syrups, which were only available in pharmacies. For the vendor-to-vendor programme to have a substantial rather than a limited impact, these issues would need to be addressed.

Affordability is a critical issue for scaling up. The vendor-to-vendor model can be considered "high quantity" (wide coverage) and "moderate quality" (significant but limited improvements) at low cost (about \$40 per wholesale outlet reached – including mobile vendors – and about \$9–11 per retail outlet reached). To help other districts to launch the activity on their own, the Quality Assurance Project has produced a comprehensive how-to manual for

district managers interested in introducing the vendor-to-vendor programme in their districts. (The manual can be downloaded from the QAP website, <http://www.qaproject.org>.)

It should be noted that the evaluation had some serious limitations, mostly related to the sampling design. Informed and control outlets might have differed in important ways that were not measured but could affect the outcomes presented. Informed outlets may have been "self-selected"; i.e., control outlets may have been offered job aids but refused them.

Another form of selection bias may have resulted from the decision to exclude receipted outlets in remote locations due to logistical considerations. Moreover, because outlets were not randomly selected, one cannot extrapolate from the study to estimate the percent of all outlets in Bungoma district stocking SPs or giving correct advice to customers. Hence, additional studies of the programme are needed to validate the findings.

Using mystery shoppers yielded important information, but it also had some drawbacks. Mystery shoppers cannot evaluate institutions where they would be detected as outsiders (e.g., school dispensaries) or where they are required to bring their child with them (e.g., some private clinics). If the mystery shoppers had brought sick children, private clinics probably would have dispensed more injections. It is also possible that real clients, who are familiar to the shopkeepers, would be refused treatment less often than unknown clients (mystery shoppers).

Conclusions

The vendor-to-vendor programme, a low-cost outreach education strategy, seems to have had a moderate impact on private drug outlets' knowledge of and compliance with malaria treatment guidelines in a rural district of Kenya. Given the difficulty of changing private sector practices, the DHMT found the results encouraging. Significant differences were observed between informed and control outlets on types and brands of drugs sold, dosages sold, questions asked of clients, and advice given. The programme has also had a positive impact on knowledge of malaria treatment guidelines, especially among retail attendants with less education. The programme appears to have had the greatest impact on shops and kiosks. These effects could be heightened if the programme addressed several issues more intensively, such as building consumer demand for SP and sustaining the interest of wholesale attendants in the activity, perhaps through an incentive programme. (The district launched a "neighbour-to-neighbour" programme in 2002 to raise public awareness about correct malaria treatment.)

However, this programme will not be able to achieve a high degree of success without national policies and programmes addressing the profit margins of SP versus AQ drugs, advertising and sales of unapproved drugs, the enforcement of correct dosage labeling, and retrieval from the market of inefficacious drugs. Moreover, the national government needs to be more active in educating consumers about the importance of early recognition and prompt treatment for malaria, why SP is the preferred first-line drug, and which drugs have been approved. Coupled with these national activities, district-level vendor-to-vendor programmes would probably have greater impact.

List of abbreviations used

AMREF African Medical Research and Education Foundation

AQ amodiaquine

ANOVA analysis of variance

CQ chloroquine

DHMT District Health Management Team

QAP Quality Assurance Project

SP sulfadoxine-pyrimethamine

USAID United States Agency for International Development

WHO World Health Organization

Authors' contributions

PT conceived the study, performed most of the data analysis, and drafted the results and discussion sections of the manuscript. JS participated in the research design, supervised data collection, and drafted the description of the study methodology. SM participated in the research design and performed some of the data analysis. All authors read and approved the final manuscript.

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