Differences in willingness to pay for artemisinin-based combinations or monotherapy: experiences from the United Republic of Tanzania

Virginia Wiseman,[1] Obinna Onwujekwe,[1] Fred Matovu,[1] Theonest K. Mutabingwa,[2,3] & Christopher J.M. Whitty[3]

Objectives The cost of combination treatment is thought to be one of the greatest barriers to their deployment, but this has not been tested directly. Estimates of willingness to pay were compared across four drug combinations used to treat Tanzanian children with uncomplicated malaria. The reasons behind respondents' valuations and the effect of socioeconomic status on willingness to pay were explored.

Methods One hundred and eighty mothers whose children had been recruited into a recently completed randomized effectiveness trial of amodiaquine + artesunate (AQ+AS), amodiaquine + sulfadoxine–pyrimethamine (AQ+SP), artemether–lumefantrine (co-artemether) and amodiaquine monotherapy (AQ) were interviewed about their willingness to pay for these drugs two weeks after treatment. Estimates of willingness to pay were elicited with the bidding game technique.

Findings A significant difference was detected in the mean amounts respondents were willing to pay, with those who received AQ+AS willing to pay the most, followed by co-artemether, AQ+SP and finally AQ. The amounts patients' mothers were willing to pay for the artemisinin-based combinations, however, fell well short of the market costs. Socioeconomic status was not found to have a statistically significant effect on mean willingness to pay scores for any treatment group.

Conclusions This study shows that families who live in an area in which drug resistance to monotherapy is very high are willing to pay more for more effective artemisinin-based combination therapies. These amounts, however, are nowhere near the real costs of delivering the new drugs. Only with subsidies will artemisinin-based combination therapies realistically have any impact.

Keywords Malaria/drug therapy/economics; Antimalarials/economics; Drug therapy, Combination/economics; Amodiaquine; Sesquiterpenes; Sulfadoxine; United Republic of Tanzania (*source: MeSH, NLM*).

Mots clés Paludisme/chimiothérapie/économie; Antipaludique/économie; Polychimiothérapie/économie; Amodiaquine; Sesquiterpènes; Sulfadoxine; République-Unie de Tanzanie (*source: MeSH, INSERM*).

Palabras clave Paludismo/quimioterapia/economía; Antimaláricos/economía; Quimioterapia combinada/economía; Amodiaquina; Sesquiterpenos; Sulfadoxina; República Unida de Tanzanía (*fuente: DeCS, BIREME*).

الكلمات المفتاحية: الملاريا، المعالجة الدوائية للملاريا، اقتصاديات الملاريا، مضادات الملاريا، اقتصاديات مضادات الملاريا، المعالجة الدوائية، المعالجة الدوائية المركَّبة، اقتصاديات المعالجة الدوائية، الأمودياكوين، مركبات سيسكويتيربين السلفادوكسين. جمهورية تنـــزانيا المتحدة. (المصدر: رؤوس الموضوعات الطبية، المكتب الإقليمي لشرق المتوسط)

Bulletin of the World Health Organization 2005;83:845-852.

Voir page 851 le résumé en français. En la página 851 figura un resumen en español. يمكن الاطلاع على الملخص بالعربية في صفحة 851.

Introduction

A malaria treatment crisis faces much of Africa because of the emergence and rapid spread of resistance to antimalarial drugs. Consensus that a move from monotherapy to combination treatment, and probably artemisinin-based combinations, is the only realistic option in many countries is growing (1). The major barrier to changing to combination therapy also is widely accepted to be the high cost of new combinations, which are up to 10 times more expensive than current antimalarial treatment with one drug. If the full cost of combination treatments is passed on to patients, the fear is that this will lead to patients delaying seeking care or being excluded from care altogether (2). The issue of the willingness and ability of patients to pay for antimalarial drug combinations thus is central to the debate, but relatively little is known. This study compares willingness to pay for the three available drug combinations recommended by a consultative group of WHO for deployment by countries when they move from monotherapy (3). We are aware of only one other study from Nigeria that has explored consumers'

[1] Department of Public Health and Policy, London School of Hygiene and Tropical Medicine, 50 Bedford Square, London, WCIB 3DP, England. Correspondence should be sent to Dr Wiseman at this address (email: virginia.wiseman@lshtm.ac.uk).

[2] National Institute for Medical Research, PO Box 9653, Dar es Salaam, United Republic of Tanzania.

[3] Department of Infectious and Tropical Diseases, London School of Hygiene and Tropical Medicine, Keppel St, London, WC1E, England.

Ref. No. **05-023556**

(*Submitted: 27 April 2005 – Final revised version received: 26 July 2005 – Accepted: 5 August 2005*)

willingness to pay for combination treatment for malaria (4). This study aims to address the question directly in an area with some of the highest drug resistance in Africa.

Currently, chloroquine and sulfadoxine–pyrimethamine cost about US$ 0.15 per adult treatment dose. At the conservative end of the scale, the use of artemisinin-based combinations has been predicted to double the cost of treatment (5), and more recent estimates predict they could cost anywhere between 10 and 20 times as much as existing drugs. Wherever the true estimate lies on this spectrum, little doubt exists that drug costs for a single treatment will increase.

Information on willingness to pay has implications for the successful introduction and sustainable deployment of all combinations, especially artemisinin-based combinations. This technique can be used to identify optimal treatment pricing, as well as provide governments and donors with a basis for intervening in the market for artemisinin-based combinations. Such strategies might include subsidizing payments, targeted subisidies or providing free drugs to the poor.

Methods

This study was part of a recently completed randomized effectiveness trial of three drug combinations and one monotherapy to treat Tanzanian children with non-severe, slide-proven malaria (11). The drugs included: amodiaquine (AQ) monotherapy, combinations of AQ + sulfadoxine–pyrimethamine (AQ+SP), AQ + artesunate (AQ+AS) or artemether–lumefantrine (co-artemether, six-dose regimen). Drugs were taken unobserved at home. In this area, at day 28, parasitological failure rates for SP and AQ as first- and second-line treatments are >50% (11, 12). The effectiveness trial showed parasitological failure rates at day 14 in this setting to be 42% for AQ, 20% for AQ+SP, 11% for AQ+AS and 1% for co-artemether.

Patients were recruited from the maternal and child health clinic of Teule Hospital in Muheza District. One hundred and eighty randomly selected mothers whose children had been recruited to the main trial and randomized to one of the combinations for uncomplicated malaria were interviewed about their willingness to pay for combination therapy about 14 days after starting treatment, when women and their children attended a follow-up clinic at the hospital. Box 1 shows the original trial's inclusion and exclusion criteria.

Trained field workers selected from the study district administered the questionnaire about willingness to pay. These field workers were independent of the main study, were not involved in clinical management and conducted interviews outside the clinical setting. The questionnaire was translated into Kiswahili and was piloted on 35 women from different ethnic groups, who had varying levels of education and were from rural and urban backgrounds. The questionnaire was shortened and some modifications were made as a result of the pilot. All questionnaires were double entered by two data entry clerks who used Microsoft Access (version 7.0). The data were then analysed with SPSS PC+ (version 12.0).

Estimates of willingness to pay were compared across the four treatment groups to investigate whether participants valued these treatments differently and to determine the reasons for any differences. In addition, detailed information on the individual and household characteristics of each participant was collected in order to explore the extent to which willingness to pay varied across socioeconomic groups. Two forms of data on socioeconomic status also were collected. These included a series of questions about asset ownership, as well as a subjective question from which interviewers ranked participants on a scale of 1 to 5, with 1 being "very poor" and 5 being "very rich".

Information on asset ownership was used to derive an index of socioeconomic status, which was used to examine whether socioeconomic groups showed systematic differences in willingness to pay for the drugs. Principal component analysis (14, 15) was used to generate a household socioeconomic status index using combined household-level information on assets and per capita value of food. The household assets were ownership of a radio, bicycle, television set, kerosene lamp, motorcycle and motor car. The first principal component was used to derive weights for the index of socioeconomic status. Weights assigned were 0.54 for ownership of a bed, 0.52 for a kerosene lamp, 0.45 for a radio, 0.41 for a bicycle, 0.25 for a motorcycle, 0.04 for a motor vehicle and 0.04 for food value. Households were divided into quintiles on the basis of the value of the index of socioeconomic status. The quintiles were poorest (worst), very poor, poor, fairly poor and least poor.

Estimates of willingness to pay were elicited using the bidding game (15–17). The bidding game presents the respondent with an amount and asks whether she is willing to pay that amount. Depending on the answer given, respondents are asked to bid up or down using a predetermined bidding iteration until the maximum number of predetermined bidding iterations is reached (15). In this study, we began by asking participants if they would be willing to pay for combination therapy and if not, why not. They then were asked if they would be prepared to pay 650 shillings, followed by 750 shillings and then 550 shillings. Finally, participants were asked to state the maximum amount they would pay for combination therapy.

The importance of investigating the reasons behind people's responses about willingness to pay also has been reported widely in the literature on willingness to pay (18). This information particularly is useful in interpreting results, as well as identifying potential biases in estimates of willingness to pay. In light of this, respondents in this study were asked two open-ended questions about what they liked and disliked about the drug their child had taken in the trial.

Box 1. **Inclusion and exclusion criteria**

Inclusion criteria

- Children younger than five years with symptoms suggestive of malaria and:
- Levels of *P. falciparum* of at least 2000 parasites/μL blood
- Able to take study drugs by the oral route
- Able to attend stipulated days for follow-up clinic and provide blood smears
- Have parent or guardian who can give informed written or verbal consent

Exclusion criteria

- Severe and complicated forms of malaria (13)
- Mixed plasmodial infection
- Concomitant disease masking assessment of the treatment response (cases in whom advanced HIV infection is suspected were referred for HIV counselling)
- Recent effective full dose antimalarial treatment (within 7 days), excluding chloroquine
- Known hypersensitivity to one of the trial drugs

The estimates of willingness to pay, reasons for liking or disliking treatment and respondent characteristics are described with proportions for categorical data and means for continuous data. The Kruskal–Wallis test was used to test for significant differences in mean willingness to pay across treatment groups, socioeconomic groups and health outcomes. All estimates on willingness to pay are expressed in the local currency (US$ 1 = 1063 Tanzanian shillings). Clearance for this research was obtained from the ethics committees of the National Institute for Medical Research (United Republic of Tanzania) and the London School of Hygiene and Tropical Medicine. The study ran from June 2004 to November 2004.

Results

Table 1 shows the distribution of patients across the study groups. Respondents were spread evenly across the socioeconomic quintiles (48 people per quintile). Interviewers gave most respondents a subjective wealth rating of "2" on a scale of 1 to 5, where 5 represented "very rich" and 1 "very poor". No statistically significant differences were detected across treatment groups at the 95% level for any of the variables shown in Table 1.

Although all respondents were willing to pay something for the drugs their child had been given, Table 2 shows that there was a significant difference in the amounts they were willing to pay: those who received AQ+AS were willing to pay the most, followed by those who received co-artemether, AQ+SP and finally AQ. A series of pairwise comparisons showed that only when AQ was compared with artemether–lumefantrine (P=0.008) or with AQ+AS (P=0.007) were statistically significant differences detected.

Table 3 shows the parasitological and clinical outcomes by day 14. The scores of willingness to pay for each treatment group generally were consistent with the effectiveness results, with the more effective drugs receiving higher scores on willingness to pay compared with the less effective treatments. One difference between the willingness to pay and health outcome rankings is that willingness to pay was higher for AQ+AS compared with co-artemether, while both the parasitological and clinical measures showed that co-artemether was the more effective treatment. Socioeconomic status did not have a statistically significant effect on mean scores of willingness to pay for any treatment group.

Finally, Table 4 shows that few respondents (14%) said there was anything they did not like about the drugs they had been taking. Moreover, most of the problems identified were symptom related rather than non-medical factors, such as dosage regimens or the taste of a drug. The most common problem reported was fatigue, which mothers attributed to the drug being "too strong" for their child. Although the mothers of patients who took AQ+AS reported more frequent side-effects, the total number of reported problems across all drugs is too small to make any meaningful comparisons. In contrast, almost all respondents (n = 178) reported at least one thing they liked about the drug they were taking. The main reasons cited across all treatment groups were that it cured the malaria quickly and with no side-effects.

Discussion

Although all respondents in this study stated that they would be willing to pay something for the drugs they had received, the mean amounts varied across treatment groups. Respondents were prepared to pay the most for AQ+AS followed by co-artemether, AQ+SP and AQ alone. This difference was statistically significant, and, when pairwise comparisons of the drugs were made, AQ was driving this difference between mean estimates of willingness to pay. With the exception of AQ+SP, when AQ was compared with any of the other drugs, respondents were willing to pay significantly less for AQ. This currently is second-line treatment in the United Republic of Tanzania and, like SP, is known widely. Respondents tended to give a higher value to the more effective drugs. One exception being that willingness to pay was higher for AQ+AS compared with co-artemether, while both parasitological and clinical measures showed that co-artemether was the more effective treatment. Although very few respondents reported anything they disliked about the drugs their children had taken, where criticism existed, surprisingly it tended to be levelled at the most highly valued treatment of AQ+AS. Specific problems included side-effects such as fatigue and loss of appetite.

In this study, mean willingness to pay also was compared across socioeconomic groups. This is important when one considers the "inverse care" law (19) or "inverse equity hypothesis" (20) that a new health intervention will tend to increase inequities because the intervention initially will reach people with a higher socioeconomic status, although the evidence for this is mixed (21–23). Interestingly, in this study, no significant differences were detected in mean willingness to pay across socioeconomic groups for three groups of combination drugs (i.e. only for amodiaquine). One reason for this may have been the relatively flat socioeconomic gradient in the study setting: most households were relatively poor and most in each treatment group were given a wealth rating of only "2" (on a relative scale of 1 to 5, where 1 represented very poor and 5 very rich), so small differences may not be detected.

The willingness to pay approach generally is accepted as a theoretically sound method for estimating the value of goods and services to consumers (15, 24). The contingent valuation method is based on a hypothetical market in which respondents are not actually required to make the payments they state they are prepared to make (25). This technique often is criticized on the basis that it asks about hypothetical payments and, as such, willingness to pay is a poor indicator of actual willingness to pay (26, 27). Some empirical studies, however, show that the contingent valuation method can be a good predictor of actual willingness to pay in both high-income (28, 29) and low-income settings (4, 30).

To ensure that hypothetical payments reflect reality, respondents must have a clear understanding of what they are being asked to value and, in turn, that they are all valuing the same thing (i.e. in this case, antimalarial drugs) (18). In this study, we asked mothers about their willingness to pay for the drugs used to treat their children. Some mothers may have included aspects of the treatment process in their valuations, such as the way they were treated by staff at the hospital or the time they had to wait to receive treatment. This has been referred to as a "nesting" or "embedding" effect, whereby one good or service is incorporated into a larger bundle of goods or services (18). The fact that this study was undertaken within a randomized clinical trial, in which all patients were treated by the same team, should, however, minimize this effect. Moreover, although this study showed that willingness to pay was associated positively with measured effectiveness, it should not be assumed that this always will be the case. Willingness to

Table 1. **Demographic and socioeconomic characteristics of patients, mothers and their households**

Variable	Treatment group			
	Artemether–lumefantrine	Amodiaquine	Amodiaquine + sulfadoxine–pyrimethamine	Amodiaquine + artesunate
Sex of child				
Male	25 (51.0)[a]	11 (61.1)	36 (64.3)	27 (47.4)
Age of child (years)				
0–1	10 (20.4)	5 (27.8)	11 (19.6)	14 (24.6)
1–2	11 (22.4)	5 (27.8)	25 (44.6)	16 (28.1)
2–3	11 (22.4)	2 (11.1)	12 (21.4)	12 (21.1)
3–4	6 (12.2)	2 (11.1)	3 (5.4)	4 (7.0)
4–5	11 (22.4)	4 (22.2)	5 (8.9)	11 (19.3)
Mean age (months)	27.0	24.7	22.5	24.9
Mother's education				
Unable to read	0	0	1 (1.8)	0
No formal education	1 (2.0)	0	4 (7.1)	1 (1.8)
Primary education	48 (98.0)	17 (94.4)	49 (87.5)	55 (96.4)
Secondary education	0	1 (5.6)	2 (3.5)	1 (1.8)
University	0	0	0	0
Distance from home to hospital (km)				
<5	16 (32.7)	9 (50.0)	32 (57.1)	22 (38.6)
5–10	11 (22.4)	2 (11.1)	9 (16.1)	13 (22.8)
10–20	22 (44.9)	7 (38.9)	15 (26.8)	22 (38.6)
⩾20	0	0	0	0
Mean distance travelled to hospital (km)	9.2	8.0	6.4	8.3
Own at least one:				
Kerosene lamp	48 (98.0)	18 (100.0)	55 (98.2)	55 (96.5)
Bed	48 (98.0)	18 (100.0)	54 (96.4)	57 (100.0)
Radio	39 (80.0)	17 (94.4)	43 (76.8)	37 (64.9)
Bicycle	26 (53.1)	14 (77.8)	26 (46.4)	31 (54.4)
Motorcycle	0	0	1 (1.8)	1 (1.8)
Motor car	0	1 (5.6)	0	1 (1.8)
Socioeconomic status (quintiles)				
Poorest	11 (18.6)	3 (10.0)	14 (18.7)	20 (26.3)
Very poor	10 (16.5)	4 (13.3)	18 (24.0)	16 (21.1)
Poor	13 (22.0)	10 (33.3)	12 (16.0)	13 (17.1)
Fairly poor	14 (23.7)	5 (16.7)	15 (20.0)	14 (18.4)
Least poor	11 (19.6)	8 (26.7)	16 (21.3)	13 (17.1)
Subjective wealth ranking				
0[b]	0	0	0	0
1	3 (6.1)	0	6 (10.7)	4 (7.0)
2	37 (75.5)	15 (83.3)	37 (66.1)	40 (70.2)
3	9 (18.4)	3 (16.7)	13 (23.2)	10 (17.5)
4	0	0	0	1 (1.8)
5[c]	0	0	0	0
Missing				2 (3.5)

[a] Values in parentheses are percentages.
[b] Very poor.
[c] Very rich.

pay is a complex composite measure. Within this study, there is, for example, an interesting mismatch between expressed willingness to pay for AQ+AS and relative dislike for AQ+AS (see Tables 2 and 4).

Although the fact that patients or their mothers are willing to pay more for combinations, in particular artemisinin-based combinations, is encouraging, the amounts they were willing to pay are nowhere in the region of what it is expected to cost to treat patients with these new drugs. Patients or their mothers are prepared to pay amounts that would be realistic for the AQ+SP combination, which has proved effective in other parts of Africa (30, 31), but not effective in this part of the United Republic of Tanzania (12). Negotiations between WHO and some drug companies have reduced the cost of artemisinin-based combinations to around US$ 0.90–1.4 for a treatment course for children up to seven years old and around US$ 2.40 per adult dose. Shortage of the raw material, however, means that costs are unlikely to show a sharp drop in the foreseeable future, although they are anticipated to reduce in price. As respondents in this study were willing to pay US$

Table 2. **Pairwise comparisons of willingness to pay for drugs**

Variable	Treatment group			
	Artemether–lumefantrine	Amodiaquine	Amodiaquine + sulfadoxine–pyrimethamine	Amodiaquine + artesunate
Mean willingness to pay	740.8 (310.0)[a]	547.2 (239.2)[a]	692.0 (384.9)[a]	803.5 (534.7)[a]
Pairwise comparisons[b]				
Amodiaquine + sulfadoxine–pyrimethamine	1153.0 *0.15*[c]	406.5 *0.21*[c]	NA[d]	1336.5 *0.13*[c]
Artemether–lumefantrine	NA	257.0 *0.008*[c]	1153.0 *0.15*[c]	1342.0 *0.73*[c]
Amodiaquine	257.0 *0.008*[c]	NA	406.5 *0.21*[c]	296.5 *0.007*[c]
Amodiaquine + artesunate	1342.0 *0.73*[c]	296.5 *0.007*[c]	1336.5 *0.13*[c]	NA

[a] Numbers in parentheses are standard deviations.
[b] Comparisons were undertaken using Mann-Whitney U non-parametric test.
[c] Numbers in italics are *P*-values.
[d] NA = not applicable.

0.65–0.75 (600–700 Tanzanian shillings) for the treatment of one episode of malaria with co-artemether or AQ+AS, this presents a serious gap between what people are willing to pay and the predicted cost of treatment. This is compounded by the fact that the average child younger than five years in Muheza experiences about three clinical episodes per year (33), and many additional febrile episodes will be treated with antimalarials even in the absence of parasites (34, 35). If participants in this study were asked to pay a subsidized price of US$ 0.90 (1000 Tanzanian shillings), about 70% would not pay this amount, and, in the case of US$ 1.40 (1500 Tanzanian shillings), the corresponding figure is 95%. This makes sense when one considers that the mean monthly income of rural households in the United Republic of Tanzania is only US$ 13.4 (14 134 Tanzanian shillings) and US$ 29.0 (30 426 Tanzanian shillings) for urban households outside Dar es Salaam (36). This reinforces the importance of subsidization if these drugs are to be deployed widely, which was reviewed carefully recently (37). Ongoing efforts, especially by the Global Fund, to provide heavily subsidized drugs therefore are essential, although at present whether these will be available through the private sector (where many people get their treatment for malaria) as well as the public sector is not clear.

One suggested way to address any gap between people's willingness to pay and the cost of treatment is to educate the public about the potential net savings that can be achieved at the household level by using the new effective drugs (15). However, up-front lump payments for expensive treatment are not always feasible, even when a family understands that this may be outweighed by future savings. Moreover, it takes time for people to gather the experience and confidence in new drugs to be able to weigh up their costs and benefits — and this is a limitation for policy as well as a study such as this, in which well-known treatments are being compared with less well-known drugs.

Table 3. **Comparison of mean willingness to pay with drug effectiveness and socioeconomic status**

Variable	Treatment group			
	Artemether–lumefantrine (*n* = 49)	Amodiaquine (*n* = 18)	Amodiaquine + sulfadoxine–pyrimethamine (*n* = 56)	Amodiaquine + artesunate (*n* = 57)
Drug effectiveness (%)[a]	1	42	20	11
Clinical failure by day 14[b]	0	13	7	2
Level of willingness to pay				
Mean	740.8 (310.9)[c]	547.2 (239.2)	692.0 (384.9)	803.5 (534.7)
Median	650	500	550	750
Range	200–2000	200–1000	100–2000	100–4000
$\chi^2 = 8.951$[d]				
Mean willingness to pay by socioeconomic status quintile				
1 (poorest)	895.0 (477.5)	800.0 (282.8)	486.4 (362.0)	687.5 (245.3)
2 (very poor)	683.3 (207.7)	433.3 (208.2)	760.7 (220.3)	726.9 (434.3)
3 (poor)	672.7 (343.0)	520.0 (277.5)	685.7 (617.6)	992.9 (362.2)
4 (fairly poor)	830.0 (181.4)	750.0 (353.6)	791.7 (483.3)	1045.0 (1070.2)
5 (least poor)	611.1 (165.4)	475.0 (133.2)	704.2 (251.8)	722.7 (234.9)
χ^2	6.06 *0.20*[e]	4.13 *0.40*	8.8 *0.067*[e]	3.63 *0.46*

[a] Percentage parasitological failure by day 14 from main trial (11).
[b] From main trial (11).
[c] Values in parentheses are standard deviations.
[d] $P<0.05$.
[e] Numbers in italics are *P*-values.

Table 4. **Frequency of things respondents liked and disliked about their malaria drugs**

Variable	Treatment group			
	Artemether–lumefantrine	Amodiaquine	Amodiaquine + sulfadoxine–pyrimethamine	Amodiaquine + artesunate
Disliked				
Felt weak	1	0	2	5
Loss of appetite	1	0	4	1
Rise in temperature	1	0	1	3
Did not cure fever	0	3	0	1
Other	2	1	1	2
Total[a]	**5**	**4**	**8**	**12**
Liked				
Cured the malaria quickly	34	17	43	44
No side-effects	26	2	20	19
Easy to administer to a child (i.e. not bitter)	3	0	2	0
Other	2	0	2	0
Total	**65**	**19**	**67**	**63**

[a] Two individuals identified more than one problem, so the total number of problems (n = 29) exceeds the number of individuals who reported problems (n = 26).

Without the support of the international donor community or governments, families are not going to be in a position to bear the additional cost of artemisinin-based combinations. This study has shown that families who live in an area where drug resistance to monotherapy is known to be high are willing to pay more for artemisinin-based combinations. These amounts, however, are nowhere near the real cost of delivering the new drugs. On the basis of the evidence from this study, unless market prices decrease dramatically, artemisinin-based combinations will realistically make any impact only when the end-users receive subsidies — especially among the poorest patients. Mustering the political will to achieve this in a sustainable way is essential. The debate should be about how best to do it, including how to involve the informal as well as the formal sector, rather than whether it should be done (37). ■

Acknowledgements

The authors would like to thank the participants in this study for sharing their valuable time and the superintendent and staff of Muheza Designated District Hospital. We also thank our data collectors, Eva Frank Parnis and Mohammed Fue, as well as Brian Beard for his careful assistance with data management. This study was sponsored by the Gates Malaria Partnership with a grant from the Bill and Melinda Gates Foundation. Logistical support also was provided by Dr William Mwengee and Bombo and Teule Hospitals in the United Republic of Tanzania. Finally, the authors are grateful for the constructive comments provided by two anonymous referees.

Competing interests: none declared.

Résumé

Mesure dans laquelle l'usager est disposé à payer pour se procurer différents antipaludiques - amodiaquine + artésunate, amodiaquine + sulfadoxine-pyriméthamine, artéméther-luméfantrine ou amodiaquine seule: l'expérience de la Tanzanie

Objectif Le coût des associations thérapeutiques est considéré comme l'un des principaux obstacles à leur utilisation bien qu'aucune étude n'ait directement été consacrée à cette question. Les estimations visant à déterminer dans quelle mesure l'usager est prêt à payer pour se procurer quatre associations médicamenteuses ou médicaments pour traiter le paludisme sans complication chez l'enfant en Tanzanie ont été comparées. On a exploré les raisons expliquant les évaluations des mères interrogées et les effets du statut socio-économique sur la possibilité de payer.

Méthodes On a demandé à 180 mères dont les enfants ont été visés par un essai d'efficacité randomisé récemment effectué concernant les associations amodiaquine + artésunate (AQ+AS), amodiaquine + sulfadoxine-pyriméthamine (AQ+SP), artéméther-luméfantrine (co-artéméther) ainsi que l'amodiaquine seule (AQ) dans quelle mesure elles étaient prêtes à payer pour obtenir ces produits deux semaines après le traitement. Les estimations ont été établies en faisant participer les mères à un processus d'enchères.

Résultats Une différence significative a été constatée quant aux montants moyens que les mères étaient prêtes à payer, celles qui recevaient AQ+AS étant disposées à payer le plus, suivies dans l'ordre par celles qui recevaient le co-artéméther, AQ+SP et enfin AQ. Les sommes que les mères des enfants touchés étaient prêtes à payer pour obtenir les associations comportant de l'artémisinine étaient toutefois loin de couvrir les prix du marché. On n'a pas constaté d'influence statistiquement significative du statut socio-économique sur les résultats obtenus pour les différents groupes de traitement.

Conclusion Cette étude montre que les familles qui vivent dans une zone où s'observe une très forte résistance à la monothérapie sont disposées à payer davantage pour se procurer des associations médicamenteuses plus efficaces comportant de l'artémisinine. Ces montants restent toutefois nettement inférieurs aux prix réels des nouveaux médicaments. Pour que les associations médicamenteuses comportant de l'artémisinine puissent avoir un véritable effet, il paraît donc indispensable de subventionner ces traitements.

Resumen

Diferencias en la voluntad de pago para obtener amodiaquina + artesunato, amodiaquina + sulfadoxina-pirimetamina, artemetero-lumefantrina o monoterapia de amodiaquina: experiencias de Tanzanía

Objetivo Se considera que el costo de la terapia combinada es uno de los mayores obstáculos para su despliegue, pero esto no es algo que se haya determinado directamente. Se compararon las estimaciones de la voluntad de pago para cuatro combinaciones medicamentosas utilizadas para tratar a niños tanzanos con malaria sin complicaciones, analizándose los motivos subyacentes a las valoraciones de los entrevistados y el efecto del estatus socioeconómico en la voluntad de pago.

Métodos Ciento ochenta madres cuyos niños habían sido reclutados en un ensayo aleatorizado de reciente conclusión sobre la eficacia de la amodiaquina + artesunato (AQ+AS), amodiaquina + sulfadoxina–pirimetamina(AQ+SP), artemetero–lumefantrina (coartemetero) y monoterapia de amodiaquina (AQ) fueron entrevistadas para determinar su voluntad de pago por esos medicamentos dos semanas después del tratamiento. Dicha variable se estimó empleando la técnica del juego de ofertas.

Resultados Se detectaron diferencias significativas entre las cantidades medias que las entrevistadas estaban dispuestas a pagar: las que recibieron AQ+AS fueron las dispuestas a pagar más, seguidas de las que recibieron coartemetero, AQ+SP y, por último, AQ. Las cantidades que las madres de los pacientes estaban dispuestas a pagar por las combinaciones basadas en la artemisinina, sin embargo, estaban muy por debajo de los costos de mercado. No se halló ningún efecto estadísticamente significativo de la situación socioeconómica en la voluntad media de pago en ninguno de los grupos de tratamiento.

Conclusión Este estudio revela que las familias que viven en zonas con una elevada farmacorresistencia a la monoterapia están dispuestas a pagar más por las terapias combinadas más eficaces basadas en la artemisinina. Esas cantidades, sin embargo, están muy lejos de los costos reales asociados a la administración de los nuevos medicamentos. Sólo mediante la ayuda de subvenciones podrían la terapias combinadas basadas en la artemisinina tener algún tipo de impacto.

ملخص

الفروق بين الترحيب بالدفع مقابل المعالجة المفردة بالأموديا كن أو مقابل الأموديا كين والأريتســـونات أو مقابل الأموديا كين والســـلفادوكين البيريميثامين أو مقابل الأرتيميثير لوميفانترين: خبرات من تنـــزانيا

الهدف: يعتقد أن تكاليف المعالجة المركبة من أهم العراقيل التي تعيق نشرها، إلا أن هذا المعتقد لم يختبر بشكل مباشر. وقد أجرينا تقديراً لمدى الترحيب بالدفع مقابل أربع خطط مركبة تستخدم في تنـــزانيا لمعالجة الأطفال التنـــزانيـــين المصابين بالملاريا غير المصحوبة بمضاعفات، وتعرَّفنا على الأسباب الكامنة خلف تقيـــيم المستجيبين للأدوية، وتأثير الوضع الاجتماعي والاقتصادي على الترحيب بدفع التكاليف.

الطريقة: تم استجواب 180 من الأمهات اللاتي أُخْضِع أطفالهن مؤخراً لدراسة مستكملة ومعشاة حول نجاعة المعالجة المركبة بالأموديا كين والأرتيسونات أو بالأموديا كين والسلفادوكسين بيريميثامين، أو بالأرتيميثير لوميفانترين (كو أموديا كين) أو المعالجة المفردة بالأموديا كين، لمعرفة مدى ترحيبهم بالدفع مقابل هذه الأدوية لمدة أسبوعين بعد انتهاء المعالجة. وقد تم استنتاج تقديرات حول مدى ترحيب الأمهات بالدفع باستخدام أسلوب المباراة بالعروض.

الموجودات: لقد اكتشفت فروق ملحوظة بين وسطي عدد المستجيبات اللاتي رحَّبن بالدفع، وقد وجدنا أن اللاتي تلقين الأموديا كين والأرتيسونات رحَّبن بالدفع أكثر من غيرهن من اللاتي تلقين الأرتيميثير واللوميفانترين، ثم تلاهن اللاتي تلقين المعالجة بالأموديا كين والسلفادوكسين مع البيريميثامين، ثم تلاهن اللاتي تلقين المعالجة الوحيدة بالأموديا كين. وقد لوحظ أن مقدار ما يمكن أن تدفعه الأمهات اللاتي رحَّبن بالدفع مقابل المعالجة المركبة التي تتضمن الأرتيميسينين أقل بكثير من التكاليف في السوق، فالحالة الاقتصادية والسياسية لم تكن ذات أهمية إحصائية معنوية أو هامة في تأثيرها على وسطي درجات أو أحراز الترحيب بالدفع لقاء المعالجة في كل مجموعة من المجموعات المعالجة.

الاستنتاج: لقد أظهرت هذه الدراسة أن الأسر التي تعيش في المناطق التي تكون فيها المقاومة للمعالجة بعلاج وحيد شائعة جداً ستكون أكثر ترحيباً بالدفع أكثر مقابل المعالجات المركبة المرتكزة على الأرتيميسينين، إذا كانت هذه المبالغ مقاربة للتكاليف الحقيقية للحصول على هذه الأدوية الجديدة. وقد لا يكون للمعالجات المركبة المرتكزة على الأرتيميسينين تأثير مقبول إلا بالتعويض عنها.

References

1. White NJ, Nosten F, Looareesuwan S, Watkins WM, Marsh K, Snow RW, et al. Averting a malaria disaster. Lancet 1999;353:1965-7.
2. Whitty CJM, Allan R, Wiseman V, Ochola S, Nakyanzi-Mugisha MV, Vonhm B, et al. Averting a malaria disaster in Africa — where does the buck stop? Bull World Health Organ 2004;82:381-4.
3. Antimalarial drug combination therapy: report of a technical consultation. Geneva: World Health Organization, 2001.
4. Onwujekwe O. Criterion and content validity of a novel structured haggling contingent valuation question format versus the bidding game and binary with follow-up format. Soc Sci Med 2004;58:525-37.
5. BBC News. Doctors urge two-pronged attack on malaria. London: BBC News, 1999. Available at: http://news.bbc.co.uk/1/hi/health/360372.stm (last accessed 8 September 2005).
6. Improving access to antimalarial medicines: report of the RBM Partnership meeting 30 September–2 October 2002. Geneva: World Health Organization, 2003. WHO document WHO/CDS/RBM/2003.44.
7. Médecins Sans Frontières. "FACT" sheet: DNDi fixed-dose artesunate combination therapy (FACT) project. Geneva: Médecins Sans Frontières, 2004. Available at: http://www.msf.org/msfinternational/invoke.cfm?component=article&objectid=982E0013-5ED3-4FE7-AD3721FFF22B6BFB&method=full_html (last accessed 8 September 2005).
8. Ifakara Health Research and Development Centre. IMPACT TANZANIA. "Interdisciplinary monitoring programme for antimalarial combination therapy in Tanzania." Information sheet for an evaluation of the effectiveness of combination therapy for malaria in inhibiting drug resistance. Ifakara: Ifakara Health Research and Development Centre, 2002. Available at: http://www.mimcom.org.uk/ifakara/impact.htm (last accessed 9 September 2005).
9. Marsh VM, Mutemi WM, Wiletts A, Bayah K, Were S, Ross S, et al. Improving malaria home treatment by training drug retailers in rural Kenya. Trop Med Int Health 2004;9:451-60.

10. Abuya TO, Molyneux CS, Orago AS, Were S, Marsh V. Quality of care provided to febrile children presenting in rural private clinics on the Kenyan coast. African Health Science 2004;4:160-70.
11. Mutabingwa TK, Anthony D, Heller A, Hallett R, Ahmed J, Drakeley C, et al. Amodiaquine alone, amodiaquine+sulfadoxine-primethamine, amodiaquine+ artesunate and artemether-lumefantrine for outpatient treatment of Tanzanian children: a four-arm randomised effectiveness trial. Lancet 2005; 365:1474-80.
12. Mutabingwa T, Nzila A, Mberu E, Nduati E, Winstanley P, Hills E, et al. Chlorproguanil-dapsone for treatment of drug-resistant falciparum malaria in Tanzania. Lancet 2001;358:1218-23.
13. World Health Organization, Communicable Diseases Cluster. Severe falciparum malaria. Trans R Soc Trop Med Hyg 2000;94 (Suppl 1):S1-90.
14. Filmer D, Pritchett LH. Estimating wealth effects without expenditure data – or tears: an application to educational enrollments in states of India. Demography 2001;38:115-32.
15. Onwujekwe O, Uzochukwu B, Shu E, Ibeh C, Okonkwo P. Is combination therapy for malaria based on user-fees worthwhile and equitable to consumers? Assessment of costs and willingness to pay in Southeast Nigeria. Acta Trop 2004;91:101-15.
16. O'Brien B, Goeree R, Gafni A, Torrance GW, Pauly MV, Erder H, et al. Assessing the value of a new pharmaceutical: a feasibility study of contingent valuation in managed care. Medical Care 1998;36:370-84.
17. Onwujekwe O, Nwagbo D. Investigating starting-point bias: a survey of willingness to pay for insecticide-treated nets. Soc Sci Med 2002;55:2121-30.
18. Cookson R. Willingness to pay methods in health care: a sceptical view. Health Econ 2004;12:891-4.
19. Hart TJ. The inverse care law. Lancet 1971;i:405-12.
20. Victora CG, Vaughan JP, Barros FC, Silva AC, Tomasi E. Explaining trends in inequities: evidence from Brazilian health studies. Lancet 2000;356:1093-8.
21. Webb E. Children and the inverse care law. BMJ 1998;316:1588-91.
22. O'Dea J, Kilham R. The inverse care law is alive and well in general practice. Med J Aust 2002;177:78-9.
23. Adams J, White M. Is the inverse care law no longer operating? J Epidemiol Community Health 2004;58:802.
24. Donaldson C, Farrar S, Mapp T, Walker A, McPhee S. Assessing community values in health care: is the 'willingness to pay' method feasible? Health Care Anal 1997;5:7-29.
25. Foster V, Bateman IJ, Harley D. Real and hypothetical willingness to pay for environmental preservation: A non-experimental comparison. Journal of Agricultural Economics 1997;48:123-38.
26. Diamond P, Hausman J. Contingent valuation: is some number better than no number? J Econ Perspect 1994;8:45-64.
27. Donaldson C. Willingness to pay for publicly-provided goods: a possible measure of benefit. J Health Econ 1990;9:103-18.
28. Frykblom P. Hypothetical question modes and real willingness to pay. J Environ Econ Manage 1997;34:275-87.
29. Blumenschein K, Johannesson M, Yokoyama KK, Freeman PR. Hypothetical versus real willingness to pay in the health care sector: Results from a field experiment. J Health Econ 2001;20:441-58.
30. Onwujekwe O, Chima R, Shu E, Nwagbo D, Okonkwo P. Hypothetical and actual willingness to pay for insecticide-treated nets in five Nigerian communities. Trop Med Int Health 2001;6:545-53.
31. Staedeke SG, Mpimbaza A, Kamya MR, Nzarubara BK, Dorsey G, Rosenthal PJ. Combination treatments for uncomplicated falciparum malaria in Kampala, Uganda: randomised clinical trial. Lancet 2004;364:1950-7.
32. Schellenberg D, Kahigwa E, Drakeley C, Malende A, Wigayi J, Msokame C, et al. The safety and efficacy of sulfadoxine-pyrimethamine, amodiaquine, and their combination in the treatment of uncomplicated Plasmodium falciparum malaria. Am J Trop Med Hyg 2002;67:17-23.
33. Alilio MS, Kitua A, Njunwa K, Medina M, Ronn AM, Mhina J et al. Malaria control at the district level in Africa: the case of the Muheza district in northeastern Tanzania. Am J Trop Med Hyg 2004;71:205-13.
34. Reyburn H, Mbatia R, Drakeley C, Carneiro I, Mwakasungula E, Mwerinde O, et al. Overdiagnosis of malaria in patients with severe febrile illness in Tanzania: a prospective study. BMJ 2004;329:1212-6.
35. Amexo M, Tolhurst R, Barnish G, Bates I. Malaria misdiagnosis: effects on the poor and vulnerable. Lancet 2004;364:1896-8.
36. National Bureau of Statistics Tanzanian. Household budget survey 2000/01. Dar es Salaam: National Bureau of Statistics Tanzanian, 2002. Available at: http://www.tanzania.go.tz/hbs/HomePage_HBS.html (last accessed 9 September 2005).
37. Arrow KJ, Panosian CB, Gelband H, eds. Saving lives, buying time: economics of malaria drugs in an age of resistance. Washington (DC): National Academies Press, 2004.