

# Operational and economic evaluation of an NGO-led sexually transmitted infections intervention: north-western Cambodia

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**Objective** Sexually transmitted infection (STI) services were offered by the nongovernmental organization Médecins Sans Frontières–Holland in Banteay Meanchey province, Cambodia, between 1997 and 1999. These services targeted female sex workers but were available to the general population. We conducted an evaluation of the operational performance and costs of this real-life project.

**Methods** Effectiveness outcomes (syndromic cure rates of STIs) were obtained by retrospectively analysing patients' records. Annual financial and economic costs were estimated from the provider's perspective. Unit costs for the cost–effectiveness analysis included the cost per visit, per partner treated, and per syndrome treated and cured.

**Findings** Over 30 months, 11 330 patients attended the clinics; of these, 7776 (69%) were STI index patients and only 1012 (13%) were female sex workers. A total of 15 269 disease episodes and 30 488 visits were recorded. Syndromic cure rates ranged from 39% among female sex workers with genital ulcers to 74% among men with genital discharge; there were variations over time. Combined rates of syndromes classified as cured or improved were around 84–95% for all syndromes. The total economic costs of the project were US\$ 766 046. The average cost per visit over 30 months was US\$ 25.12 and the cost per partner treated for an STI was US\$ 50.79. The average cost per STI syndrome treated was US\$ 48.43, of which US\$ 4.92 was for drug treatment. The costs per syndrome cured or improved ranged from US\$ 46.95–153.00 for men with genital ulcers to US\$ 57.85–251.98 for female sex workers with genital discharge.

**Conclusion** This programme was only partly successful in reaching its intended target population of sex workers and their male partners. Decreasing cure rates among sex workers led to relatively poor cost–effectiveness outcomes overall despite decreasing unit costs.

**Keywords** Sexually transmitted diseases/prevention and control; Nongovernmental organizations; Prostitution; Sexual partners; Delivery of health care/organization and administration; Treatment outcome; Costs and cost analysis; Evaluation studies; Cambodia (*source: MeSH, NLM*).

**Mots clés** Maladies sexuellement transmissibles/prévention et contrôle; Organisations non gouvernementales; Prostitution; Partenaire sexuel; Délivrance soins/organisation et administration; Evaluation résultats traitement; Coûts et analyse coût; Etude évaluation; Cambodge (*source: MeSH, INSERM*).

**Palabras clave** Enfermedades sexualmente transmisibles/prevencción y control; Organizaciones no gubernamentales; Prostitución; Parejas sexuales; Prestación de atención de salud/organización y administración; Resultado del tratamiento; Costos y análisis (*fuentes: DeCS, BIREME*).

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Voir page 441 le résumé en français. En la página 441 figura un resumen en español.

يمكن الاطلاع على الملخص بالعربية في صفحة 441.

## Introduction

Sexually transmitted infection (STI) control has been advocated as an effective intervention both for human immunodeficiency virus (HIV) prevention and as part of an essential health package (1, 2). Two approaches to controlling STIs are case management using the syndromic approach and the targeting of populations at highest risk of acquiring and transmitting infections (3). In Africa these approaches are among the most cost-effective HIV prevention interventions (2, 4).

Several pilot projects have demonstrated that STI interventions targeted at female sex workers and their sexual partners can have a large impact on HIV and STI transmission (5–7). Data from areas where there is a high prevalence of STIs, such as Malawi or the United Republic of Tanzania, suggest that the syndromic approach may be highly cost-effective in primary health care settings (8, 9). However there is little evidence on the efficacy and cost-effectiveness of delivering STI services in Asia. In Bangladesh, where the prevalence of STIs among

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the general population is low, studies have documented poor specificity and the resulting high costs of case management among a general female population served by primary health care services (10). STI treatment costs in Bangkok varied widely depending on whether they were delivered through public or private channels (11). There is concern that beneficial effects observed in carefully monitored research projects may not be entirely reproducible in real-life situations.

STI control is a growing concern in south and south-east Asia, where half of the world's 340 million new curable cases of STIs are thought to occur annually (12). This is paralleled by a fast-developing HIV epidemic in parts of the continent. Cambodia is one of three Asian countries classified as having an established HIV epidemic with an estimated adult prevalence of 2.7% (13). High rates of gonorrhoea and syphilis among female sex workers and men in the military and the police have been documented (14). In response to its growing HIV epidemic, Cambodia has followed the Thai model, combining intensive promotion of condom use with free access to STI care for female sex workers (15, 16). Given Cambodia's limited resources, the collaboration of international agencies and nongovernmental organizations (NGOs), such as Médecins Sans Frontières (MSF), has been actively encouraged. There is little information from NGO-led interventions to assist policy-makers in making decisions about whether to scale up seemingly successful interventions (17).

This paper presents an evaluation of the operational performance, costs and cost-effectiveness of an STI intervention programme implemented by MSF–Holland in the Banteay Meanchey province of north-western Cambodia during the initial 30 months of operation (1997–99). It is the first study to systematically evaluate an NGO collaboration model for the delivery of STI services outside a pilot or trial setting and to include an economic analysis of services for both the targeted and general populations in an Asian area of high STI prevalence.

## Methods

### Study setting

In 1997, the Cambodian government asked MSF to establish two STI clinics in Banteay Meanchey province. High rates of syphilis (14%), gonorrhoea and chlamydial infections (39%), and HIV-1 infection (41%) had been found among female sex workers living in the province (14). Factors contributing to the high prevalence were that a large proportion of the population is highly mobile; there is widespread sex work; and the STI treatment provided through public and private providers is of poor quality. The MSF clinics were opened in the provincial capital Sisophon and in Poipet, a town on the border with Thailand. Together, these towns host 400–600 brothel-based female sex workers. The MSF project initially aimed to offer STI clinical services and outreach on HIV/AIDS prevention and condom distribution to these sex workers and their clients. Both clinics were located near red-light districts and marketplaces to facilitate access for clients. The clinics also accepted patients presenting with non-STI related complaints as well as members of the general population.

There were limited alternatives to the MSF clinic available to sex workers seeking STI treatment. The MSF Sisophon clinic targeted female sex workers specifically because they did not like to use the district hospital where they encountered

negative attitudes from staff and the opening hours were inconvenient. Other alternative providers were private pharmacies and a few private doctors. In Poipet, the only alternatives to the MSF clinic were private pharmacies and private practitioners, such as midwives. The existing government health centre was barely operational — that is, it was open but staff were not being paid; there were unreliable supplies of medicines, etc.

STI case management at the MSF clinics included taking a detailed history and assessing the risk of being infected with an STI, clinical examination (including a speculum examination for women), health education, promotion of condom use, and treatment using the syndromic approach. STI index patients were provided with a contact slip to allow them to notify their sexual partners; these partners were treated in accordance with the patient's syndrome, irrespective of the presence of symptoms. The services cost the equivalent of US\$ 0.25 per visit but were free for sex workers who could not afford the charge.

### Outcome measures

Clinical outcome measures were obtained retrospectively from patients' records from July 1997 for Sisophon and October 1997 for Poipet through to December 1999. Patients were categorized by their reason for consulting the clinic as an "index patient seeking care for an STI", the "sexual partner of index patient with an STI" or a "patient seeking care for non-STI-related complaints". Each disease episode comprised the initial visit and subsequent follow-up visits related to the initial complaint or complaints. Patients were also categorized by population group as men from the general population, women from the general population, or as female sex workers. The main STI syndromes analysed were genital discharge syndrome and genital ulcer syndrome. Other STI-related pathologies, such as lower abdominal pain, inguinal bubo, genital warts, and labial or scrotal swelling, were grouped under the category "Other STI syndromes". Patients could receive treatment for multiple STI syndromes during a single disease-episode.

Index patients living in town were requested to come for follow-up after 7 days. At each visit, the treatment outcome was ascertained clinically. Patients were considered cured if they had no symptoms and no clinical findings evocative of the original STI syndrome; they were considered to be improved if they had markedly decreased symptoms or clinical findings. If there was no change in severity their condition was considered to be not improved; or if their signs or symptoms had worsened since their previous visit their condition was classified as being worse. The outcome at the last recorded follow-up visit was included in the clinical effectiveness evaluation, which is called the assessed effectiveness. We also estimated the extrapolated effectiveness by applying the same rates of cure or improvement noted among those assessed at follow-up to those who did not return for assessment. This provided an effectiveness range that was then used to estimate the cost-effectiveness range. We grouped data on syndrome distribution and syndromic outcomes for both clinics since no differences were seen when data were disaggregated by clinic.

### Economic analysis

Annual costs were retrospectively estimated for 1997–99 using standard methods (18). Costs were estimated by combining the "ingredients approach", in which the total quantity of goods and services used are estimated and then multiplied by their respective unit prices, and the "step-down approach", in which

the total project costs are allocated to consultation type. We estimated financial costs, which represent the actual project expenditures, and economic costs, which represent the value of all resources used in the project including donated goods and services. Annual financial capital costs were estimated using straight-line depreciation — that is, dividing the cost of capital items by their expected years of use. Annual economic capital costs were annualized using a 3% discount rate.

Full costs were collected from the provider's perspective (MSF–Holland). Data were taken from MSF's annual financial reports and interviews with project staff. Contributions from the MSF country office were allocated to the intervention according to the proportion of expatriates working on the project. It was not possible to include the costs of field supervision and shipping goods paid for by MSF's headquarters. Costs recovered from patients' fees and condom sales were also collected. Expenses incurred in local currencies (Khmer riel and Thai baht) were converted to US\$ using the average exchange rates during the relevant period (e.g. range of 31–42 Thai baht = US\$ 1.00). All costs have been adjusted to 2002 dollars as recommended by UNAIDS costing guidelines (19). Costs were estimated jointly for both clinics since many of the costs were shared (e.g. costs of expatriate staff, initial training, vehicle purchase, supervision, medicine and equipment procurement), and there was insufficient information to allocate these resources by centre.

The total economic costs of the project, excluding medicine and medical supplies, were allocated proportionately by the number of disease episodes per syndrome. Costs of medicine and medical supplies were estimated by syndrome on the basis of the treatment received and added to the consultation costs to obtain total costs by syndrome and patient category. The "cost per syndrome cured" and the "cost per syndrome cured or improved" by patient category were estimated by dividing the total annual category costs by the annual category outcomes and then estimating these for the duration of the project. Since there have been few economic analyses of health interventions in Cambodia (20), it was not possible to use an alternative facility-based comparator; the cost-effectiveness results can

be interpreted relative to a do-nothing comparator given the limited STI treatment alternatives available. Our costs were compared with the limited data on health-care costs available in Cambodia.

A sensitivity analysis was used to explore the impact of the discount rate (varied to 1% and 6%) and assumptions about staff time (increased and decreased by 10% and replacing expatriate salaries with local salaries).

### Participants and ethical considerations

The people who took part in this study presented at routine clinics and agreed to have their anonymized personal data recorded: they all received treatment. No special laboratory investigations were undertaken during the course of this project. The study was approved by the Management Board of MSF–Holland and the Ethics Committee of the London School of Hygiene and Tropical Medicine.

## Results

### Patients' characteristics

Over the 30 months, 11 330 patients were seen at the MSF clinics; they presented with 15 269 disease episodes and there was a total of 30 488 visits (Table 1). Index patients accounted for 69% (7776) of all patients. Nearly 13% of patients (1426) were partners of index patients. Men represented 86% (1226/1426) of referred sexual partners and were almost exclusively the spouses of women treated for an STI. Most of these men did not have STI-related symptoms or signs. Conversely, 90% of the 200 presenting female partners of male index patients had clinical signs suggestive of an STI. Women from the general population made up the largest group of index patients (70%; 5437/7776) while female sex workers, the intended target group, accounted for only 13% (1012/7776) of index patients (Table 1). However, female sex workers were more likely than other groups to attend more than three times during the study period (15% versus 3%,  $P < 0.001$ ) (data not shown). Of the 10 541 disease episodes among index patients, treatment for 11 406 STI syndromes was given. Genital discharge syndrome

Table 1. Number of patients, disease episodes, and sexually transmitted infection (STI) syndromes treated in study clinics in Banteay Meanchey province, Cambodia, 1997–99, by patient category

Category of patient	No. of patients <sup>a</sup>	No. disease-episodes	STI syndromes treated <sup>b</sup>			
			GDS <sup>c</sup>	GUS <sup>d</sup>	Other <sup>e</sup>	Total no. syndromes <sup>a</sup>
All categories	11 330	15 269				
Non-STI patients	2 128 (19)	3 302				
Partners of patients with STI	1 426 (13)	1 426				
STI index patients	7 776 (69)	10 541	9757 (86)	573 (5)	1076 (9)	11 406 (100)
<i>Of whom:</i>						
Men from the general population	1 327 (17) <sup>f</sup>	1 739	1331 (66)	301 (15)	391 (19)	2 023 (100)
Women from the general population	5 437 (70) <sup>f</sup>	6 843	6711 (96)	73 (1)	190 (3)	6 974 (100)
Female sex workers	1 012 (13) <sup>f</sup>	1 959	1715 (71)	199 (8)	495 (21)	2 409 (100)

<sup>a</sup> Figures in parentheses are percentage of total.

<sup>b</sup> Figures in parentheses are percentage of syndromes by category of index patient.

<sup>c</sup> GDS = genital discharge syndrome.

<sup>d</sup> GUS = genital ulcer syndrome.

<sup>e</sup> This category includes all other syndromes (e.g. lower abdominal pain, buboes, genital warts).

<sup>f</sup> Figures in parentheses are percentage of index patients.

was the most frequent syndrome in all categories of patients (66–96%); genital ulcer syndrome accounted for 1–15% of syndromes, being most prevalent among men from the general population (Table 1).

### Clinical effectiveness of syndromic management

Our analysis was limited to 10 330 reported episodes of genital discharge syndrome and genital ulcer syndrome. Assessment of cure was completed for only 57% of syndromes (5895) because few patients attended for follow-up visits (Table 2). The follow-up rate for both syndromes combined was significantly higher among women and men in the general population than among female sex workers (61.3% for women, 52.5% for men and 45.8% for female sex workers,  $P < 0.001$ ).

Average cure rates among men were better than among women, although this varied by year, individual syndrome and patient category (Fig. 1). Cure rates were highest among men in the general population with genital discharge syndrome (74%) and lowest among female sex workers with genital ulcer syndrome (39%). When the categories of those classified as “cured” or “cured or improved” were combined, 94% of men in the general population were considered to have had a favourable outcome from treatment compared with 88% of women in the general population and only 84% of female sex workers ( $P < 0.001$ ). The corresponding rates for cure or improvement of genital ulcer syndrome were 92% among men in the general population, 86% among women in the general population, and 85% among female sex workers; these results were not statistically significant. The variation in rates over time of those categorized as “cured” and “cured or improved” are shown in Fig. 1. These rates remained fairly constant for men for both syndromes, with marked decreases in annual cure rates among women in the general population and female sex workers with genital ulcer syndrome.

### Costs

Total economic costs for the 30-month programme were US\$ 766 046 (Table 3). (A more detailed version of Table 3

is available on the web version: <http://www.who.int/bulletin>.) Total financial costs were US\$ 731 863, the difference being primarily due to condoms being donated. Personnel costs accounted for about 48% of total costs (US\$ 368 489). The costs of medicine and medical supplies (US\$ 87 314) represented 11% of total costs. Between 1997 and 1999 cost recovery raised US\$ 25 633, of which 28% was from patients' fees and 72% from condom sales, thus covering 4.4% of recurrent costs.

Sensitivity analysis showed that with the most optimistic scenario (using the smallest staff input with a 1% discount rate) there would be a 4.4% drop in total costs (to US\$ 731 965); using the highest staff input and a 6% discount rate led to a 5.6% increase in total costs (to US\$ 808 850). The cost results were robust to our assumptions — that is, when the assumptions were changed, the costs did not change that much. Replacing expatriate staff salaries with their local equivalent led to a 21.6% drop in total costs.

### Annual unit costs and cost–effectiveness

Unit costs are presented by year in Table 3. In year one, the costs per STI syndrome treated were high (US\$ 90.04). A steep drop in these costs (to US\$ 41.65) was seen in the second year as attendance tripled but costs increased only by 42%. During the third year, unit costs decreased only slightly (to US\$ 41.57 per STI syndrome treated).

Table 4 presents the total and unit costs and cost–effectiveness indicators. (A more detailed version of this table is available on the web version: <http://www.who.int/bulletin>.) The cost of treating STI disease-episodes among index patients (US\$ 52.40) were on average nearly US\$ 10.00 more expensive than consultations for non-STI disease-episodes (US\$ 42.77) and US\$ 1.60 more than partner consultations (US\$ 50.79). Cost–effectiveness estimates are presented by syndrome as cured, or cured or improved among those who returned for follow-up and were assessed; this yields conservative estimates that assume that those who don't return are not cured or improved. By extrapolating similar rates of cure or improvement to those who did not return we obtain more

Table 2. Effectiveness of treatment for sexually transmitted infections (STIs) for index patients with genital discharge and genital ulcer syndromes attending study clinics in Banteay Meanchey province, Cambodia, 1997–99

	No. of men from the general population <sup>a</sup>		No. of women from the general population <sup>a</sup>		No. of female sex workers <sup>a</sup>	
	GDS <sup>b</sup>	GUS <sup>c</sup>	GDS	GUS	GDS	GUS
No. STI syndromes treated	1331	301	6711	73	1715	199
No. patients assessed at follow-up	693 (52)	164 (54)	4118 (61)	43 (59)	778 (45)	98 (49)
No. non-returning patients	638 (48)	137 (46)	2593 (39)	30 (41)	937 (55)	101 (51)
<b>Assessed effectiveness<sup>d</sup></b>						
No. assessed patients cured	516 (74)	85 (52)	2096 (51)	20 (47)	332 (43)	38 (39)
No. assessed patients improved	142 (20)	66 (40)	1523 (37)	17 (40)	324 (42)	45 (46)
No. assessed patients cured or improved	658 (95)	151 (92)	3619 (88)	37 (86)	656 (84)	83 (85)
<b>Extrapolated effectiveness<sup>e</sup></b>						
Total no. cured	991 (74)	156 (52)	3416 (51)	34 (47)	732 (43)	77 (39)
Total no. cured or improved	1264 (95)	277 (92)	5898 (88)	63 (86)	1446 (84)	168 (85)

<sup>a</sup> Figures in parentheses are percentages.

<sup>b</sup> GDS = genital discharge syndrome.

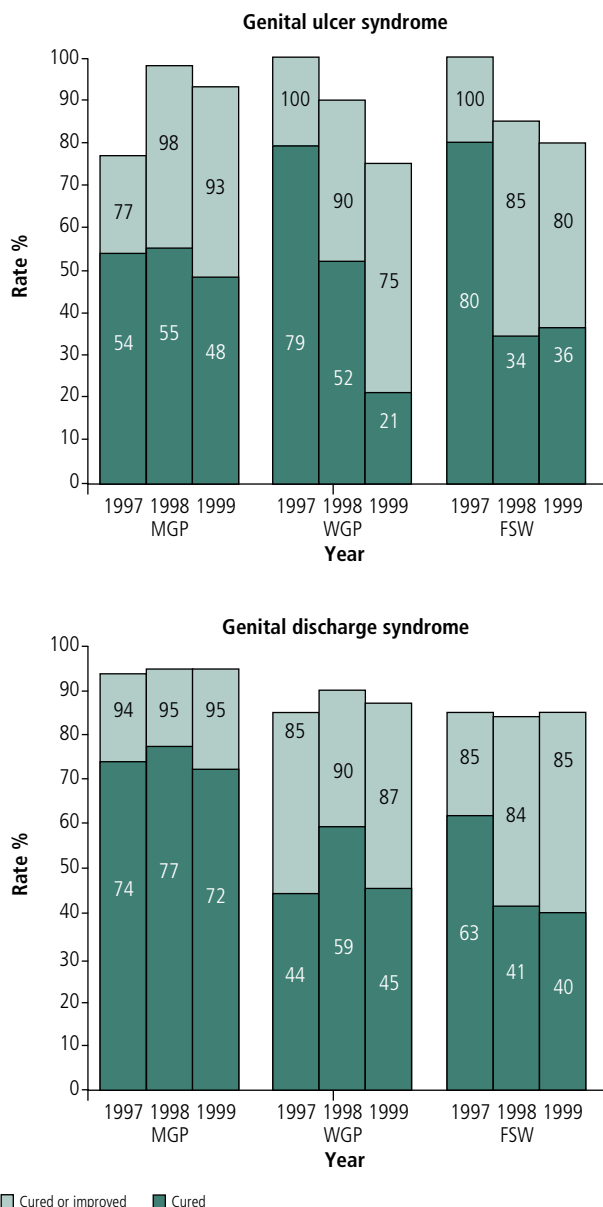
<sup>c</sup> GUS = genital ulcer syndrome.

<sup>d</sup> Based only on patients who returned for follow-up.

<sup>e</sup> Based on applying the same rates of “cure” or “cure or improvement” as observed among patients who returned for follow-up to those who did not return.



Fig. 1. Annual cure rates by syndrome and population at study clinics in Banteay Meanchey province, Cambodia, 1997–99



Cured or improved  
 Cured  
 MGP = men from the general population.  
 WGP = women from the general population.  
 FSW = female sex workers.

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optimistic estimates. The costs per syndrome cured were lowest among men with genital discharge syndrome (range US\$ 48.45–118.68) and highest among female sex workers with genital discharge syndrome (range US\$ 57.85–251.98).

## Discussion

This study is the first to report on the actual implementation of an NGO model for delivering STI services outside a pilot or trial setting and to include an economic analysis and an explicit presentation of the costs of treating partners. It is one of few studies presenting data on health-care costs in Cambodia. We found that although the intervention was reasonably effective, unit costs were high. The cost per syndrome “cured” or “cured or improved” ranged from around US\$ 47.00 to US\$ 252.00.

## Limitations

This study had a number of limitations. The effectiveness analysis relied on clinical outcomes rather than on biological tests of cure and was also subject to interobserver biases. Combining the rates of people “cured or improved” may lead to an overestimate of overall cure rates. Extrapolating cure rates from patients who attended for follow-up to those who did not return may give an overly optimistic view of effectiveness, while our conservative estimates (which only counted syndromes in people who returned for follow-up) may be pessimistic. Another limitation is that inputs from other MSF offices to the intervention were estimated using an allocation factor based on staff inputs rather than direct contributions.

## Impact of clinic services

Some useful information can, however, be derived from this real-life situation study. This project was unique because it provided services for both a high-risk group and the general population. About one-third of the estimated number of female sex workers living in the catchment areas attended for STI services. Outreach education activities in the brothel zones together with the involvement of brothel owners and the non-discriminatory attitudes of clinic staff all contributed to this encouraging uptake. Targeting services towards female sex workers is an important facet of STI/HIV control in Cambodia where HIV and STI rates among female sex workers have been shown to be high even in rural areas (21). As shown elsewhere, comprehensive interventions targeting high-risk groups have had large impacts on STI and HIV rates among female sex workers (5–7, 22, 23) and sometimes also among their male sexual partners (6, 24). In Thailand, the national 100% Condom Programme (which enforces the use of condoms in commercial sex establishments) has been linked with an increased adoption of safer sex measures by men and a decrease in the number of men attending STI clinics nationwide (16).

The utilization of STI services by women from the general population was unexpectedly successful and probably resulted from the female-friendly nature of the services. This pattern of use by a presumably low-risk population was assumed to affect the cost-effectiveness of services, as has been reported in Bangladesh (10). However, this was not the case in our study since the upper range of the cost per syndrome cured was lower among women in the general population than among female sex workers for both genital discharge syndrome and genital ulcer syndrome. This reflects the greater number of women from the general population whose cure rates had been assessed compared to sex workers. It is important to note that cure or improvement rates noted among women were similar to those noted among sex workers.

The low attendance of men was disappointing and may have been influenced by the perception that the MSF clinics were primarily offering health services for women or by the fact that many men seek treatment in the private sector or use self-medication for STIs. Men who attended the clinics mainly worked in the military or police force or as taxi drivers or motorcycle taxi drivers, populations known to be at risk for HIV and STIs (25). To better target this epidemiologically important bridge population, more appealing comprehensive sexual health services need to be offered, such as male-friendly environments, special opening hours or separate access to services, particularly in areas where men tend to seek treatment in the informal sector (10).

Table 3. Annual economic costs, cost recovery, and unit costs of the MSF sexually transmitted infections (STIs) project in Banteay Meanchey province, Cambodia, 1997–99 by year of programme implementation. (A more detailed version of this table is available on the web at <http://www.who.int/bulletin>.)

Cost category	Year of implementation <sup>a</sup>		
	1997	1998	1999
<b>Economic<sup>b</sup></b>			
Total capital	58 603	62 024	65 290
Total recurrent	131 730	207 938	240 461
<b>Total costs</b>	<b>190 333</b>	<b>269 962</b>	<b>305 751</b>
Non-STI complaints	24 433	48 423	68 390
STI treatment for partner	21 295	27 503	23 635
STI index patient disease-episodes	144 605	194 036	213 726
<b>Cost recovery</b>			
Patients' fees	1 396	2 905	2 950
Condom sales	2 604	7 706	8 072
Total cost recovery	4 000	10 611	11 022
% of recurrent costs	3.0	5.1	4.6
<b>Clinical outputs</b>			
No. of visits	4 369	12 793	13 326
No. of STI partners treated	231	642	553
No. of syndromes treated in STI index patients	1 606	4 659	5 141
<b>Unit costs per:<sup>a</sup></b>			
Visit	43.56	21.10	22.94
Partner treated for STI	92.18	42.84	42.73
Syndrome treated in STI index patients	90.04	41.65	41.57

<sup>a</sup> All costs are given in 2002 US\$.

<sup>b</sup> Capital costs included start-up costs, buildings, capital equipment items, vehicles and initial training. Start-up costs included all the resources used in the start-up period of the project before patients were seen. This included all costs related to setting up and furnishing buildings, staff time and activities such as training that were undertaken during the start-up period. Key staff who worked at both clinics were the midwife supervisor, doctor, midwife in charge of prevention (e.g. training of condom sellers) and a health educator. In addition, there were midwives who worked exclusively at each of the clinics.

Treatment rates for sexual partners were not high in these clinics (13%), and referred partners consisted mostly of spouses of index cases. It was encouraging, however, that many men were brought to STI services in this way. Our study is the first to provide an estimate of the cost of treating these men. At US\$ 50.79 per partner treated, this strategy may appear relatively inexpensive. However, since the infection status of these partners was not ascertained, it is difficult to know whether it was a cost-effective way of limiting STI transmission in the community. More research should be done to evaluate the impact and cost-effectiveness of partner notification in low-income settings using the syndromic approach.

In this study syndromic cure rates for STIs appear to be relatively low: the highest average cure rate was obtained for men with genital discharge syndrome (74.5%). Even under the more favourable assumption of combining the outcomes of those who were cured and those whose condition improved,

the 85–95% cure rates obtained for each syndrome remain lower than the 95% threshold recommended by WHO (26) or those observed under trial conditions in the United Republic of Tanzania (27). In the absence of baseline research it is difficult to determine the underlying reasons for these findings; they may include differences in the etiological composition of syndromes, the efficacy of selected antimicrobials, a lack of compliance with treatment regimens, reinfection or recurrence of infection, and the real-life nature of this study, which may give rise to less optimal results than those observed in carefully monitored research settings. Furthermore, we noted a decrease in cure rates for genital ulcers among all women over time. It may be that an increasing proportion of ulcers have been caused by genital herpes in an evolving HIV epidemic, as has happened elsewhere (28). Alternatively, resistant strains of *Haemophilus ducreyi* or concurrent HIV infection may have caused an increase in treatment failure. These results highlight the need for appropriate STI surveillance and etiological investigation when observed cure rates start to fall (26).

### Economic analysis

Our economic analysis revealed important features of the programme. Between 1997 and 1999 the cost per visit was on average US\$ 25.12 and the cost per STI disease episode treated in the clinics was US\$ 52.40, which was high relative to the average costs for a variety of health treatments (29). The total cost of medicine was also relatively high at US\$ 4.92 per STI-related disease episode (data not shown) compared with other settings, such as Mwanza, United Republic of Tanzania, where medicine for syndromic treatment cost US\$ 2.80 (9); however, MSF chose to use more expensive antimicrobials anticipating that there might be widespread resistance to cheaper antibiotics for gonorrhoea (30).

Generally, services are expected to become cheaper when run by the public sector because recurrent (staff) costs will be lower, but in our model the cost of medicines would still be unacceptably high, surpassing Cambodia's 2001 annual per capita public sector health expenditure of US\$ 1.50 (31). We found that expatriate involvement raised costs by about 21%. Even if local staff were available, the costs of this intervention are relatively high. Implementing cost recovery or cost sharing through user fees may be an attractive alternative, although it proved to have a counterproductive effect on STI clinic attendance in Nairobi (32). Investment in STI services is expensive, and donor support will need to be sustained if STI control is to be achieved (4). Given the lack of behavioural and biological data and the routine nature of service implementation in this study, the cost per HIV infection averted could not be measured. To measure this would require a randomized study design and/or the use of modelling. However, a review has confirmed that STI treatment along with blood-safety measures and targeted condom distribution still represent the most cost-effective intervention to prevent HIV/AIDS in developing countries, particularly when compared to the costs of antiretroviral treatment (4). There is substantial evidence that STI interventions may be beneficial to populations. Improved STI case management using the syndromic approach offered at primary health care centres has been shown to reduce the incidence of HIV by nearly 40% (33) and has lowered the prevalence and incidence of some key STIs by 30–50% (34). Similarly, in Uganda improved syndromic management of STIs at the primary health

Table 4. Cost-effectiveness of the MSF sexually transmitted infections (STIs) programme in Banteay Meanchey province, Cambodia, 1997–99, by population group and syndrome. (A more detailed version of this table is available on the web at <http://www.who.int/bulletin>.)

	No. of outputs	Effectiveness <sup>a</sup>		Total costs <sup>b</sup>	Unit costs	Cost-effectiveness <sup>c</sup>	
		Extrapolated	Assessed			Extrapolated	Assessed
<b>Visits</b>	30 488			766 049	25.12		
<b>Disease episodes</b>	15 269			766 049	50.17		
Non-STI disease episodes	3 302			141 248	42.77		
STI disease episodes among partners	1 426			72 433	50.79		
STI disease episodes among index patients	10 541			552 368	52.40		
<b>No. syndromes treated among index patients</b>	11 406			552 368	48.42		
GDS and GUS <sup>d</sup>	10 330			496 532	48.06		
Other STI syndromes	1 076			55 836	51.89		
<b>Men from the general population</b>							
GDS	1 331	1 264	658	61 238	46.00	48.45	93.06
GUS	301	277	151	13 005	43.21	46.95	86.12
<b>Women from the general population</b>							
GDS	6 711	5 898	3 619	326 685	48.68	55.39	90.27
GUS	73	63	37	3 181	43.56	50.49	85.97
<b>Female sex workers</b>							
GDS	1 715	1 446	656	83 656	48.79	57.85	127.52
GUS	199	168	83	8 767	44.05	52.18	105.62

<sup>a</sup> Extrapolated effectiveness was obtained by calculating the rates of patients classified as "cured" or "cured or improved" among those who returned for follow-up and applying these to those who did not return. Assessed effectiveness was based only on those who returned for follow-up and assumes those who did not return were not improved or cured. The first figure in this column is the extrapolated effectiveness; the second is assessed effectiveness.

<sup>b</sup> Costs are given in 2002 US dollars.

<sup>c</sup> Figures in this column were derived by dividing total costs of number of patients classified as "cured" or "improved" by both extrapolated and assessed effectiveness. The first figure in this column is the extrapolated cost-effectiveness; the second is assessed cost effectiveness.

<sup>d</sup> GDS = genital discharge syndrome; GUS = genital ulcer syndrome.

care level led to significant reductions in the prevalence and incidence of bacterial STIs, although the intervention did not have an effect on HIV incidence (35).

## Conclusion

MSF–Holland set up this programme on the basis of its analysis of the severity of the expanding HIV and STI epidemics in Cambodia. After 3 years, we found that this project was accepted by the local population. However, despite improving cost-effectiveness indicators over time, there may be concerns about overall cost-effectiveness. The general population may be attracted by the better health services offered at the clinics but further efforts need to be made to attract the intended target populations, namely female sex workers and their male clients. One way forward may be for MSF to support government initiatives to provide quality STI care for the general population by providing training and attachment of local health staff to the MSF–STI clinics and by helping to evaluate treatment guidelines. ■

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**Competing interests:** VC was an employee of MSF–Holland in Banteay Meanchey during 1997–99.

## Résumé

**Évaluation opérationnelle et économique d'une intervention contre les infections sexuellement transmissibles menée par une ONG au nord-ouest du Cambodge**

**Objectif** L'organisation non gouvernementale Médecins Sans Frontières Hollande a proposé des services destinés à contrer les infections sexuellement transmissibles (IST) dans la province du Banteay Meanchey, au Cambodge, de 1997 à 1999. Ces services visaient les prostituées, mais étaient aussi à la disposition de la population générale. Il a été procédé à une évaluation des performances opérationnelles et des coûts de ce projet en situation réelle.

**Méthodes** On a obtenu des résultats mesurant l'efficacité de l'intervention (taux de guérison syndromique des IST) en analysant rétrospectivement les dossiers des patients. On a aussi estimé les coûts financiers et économiques du point de vue du prestataire. Les coûts unitaires utilisés pour l'analyse coût-efficacité incluaient les coûts par visite, par partenaire traité et par syndrome traité et guéri.

**Résultats** Sur 30 mois, 11330 patients se sont rendus au dispensaire, dont 7776 (69 %) cas initiaux d'IST et seulement 1012 (13 %) prostituées. Au total, les responsables du projet ont enregistré 15 269 épisodes pathologiques et 30 488 visites. Les taux de guérison syndromique allaient de 39 % chez les prostituées présentant des

ulcères génitaux à 74 % chez les hommes souffrant d'écoulement génital, avec des variations au cours du temps. Les taux cumulés de syndromes classés comme guéris ou améliorés se situaient autour de 84 à 95 % pour l'ensemble des syndromes. Le coût économique total du projet s'élevait à US \$ 766 046. Sur les 30 mois, le coût moyen par visite était de US \$ 25,12 et le coût par partenaire traité pour une IST se montait à US \$ 50,79. Le coût moyen par syndrome de type IST traité était de US \$ 48,43, dont US \$ 4,92 pour le traitement médicamenteux. Le coût par syndrome guéri ou amélioré allait de US \$ 46,95 - 153,00 pour un homme présentant un ulcère génital à US \$ 57,85 - 251,98 pour une prostituée souffrant d'écoulement génital.

**Conclusion** Ce programme n'a réussi que partiellement à atteindre la population cible constituée par les prostituées et leurs partenaires masculins. Globalement, la diminution des taux de guérison parmi les prostituées a amené le rapport coût/efficacité à une valeur relativement médiocre, malgré la baisse des coûts unitaires.

## Resumen

**Evaluación operacional y económica de una intervención contra las infecciones de transmisión sexual dirigida por una ONG en el noroeste de Camboya**

**Objetivo** Entre 1997 y 1999 la organización no gubernamental Médicos Sin Fronteras de Holanda ofreció servicios contra las infecciones de transmisión sexual (ITS) en la provincia camboyana de Banteay Meanchey. Aunque dirigidos a las profesionales del sexo, los servicios estaban disponibles también para la población general. Realizamos una evaluación del rendimiento operacional y de los costos de este proyecto aplicado a la vida real.

**Métodos** Los resultados de eficacia (tasas de curación sindrómica de las ITS) se obtuvieron analizando retrospectivamente los historiales de los pacientes. Los costos financieros y económicos anuales se estimaron desde la perspectiva del proveedor. Los costos unitarios para el análisis de la costoeficacia incluyeron el costo por visita, el costo por pareja tratada, y el costo por síndrome tratado y curado.

**Resultados** A lo largo de 30 meses, asistieron a los consultorios 11 330 pacientes; de éstos, 7776 (69%) eran pacientes índice de ITS, y sólo 1012 (13%) eran trabajadoras sexuales. Se registraron en total 15 269 episodios de enfermedad y 30 488 visitas. Las tasas de curación sindrómica se situaron entre un 39% en las profesionales

del sexo con úlceras genitales y un 74% en los hombres con exudado genital; hubo variaciones a lo largo del tiempo. Las tasas combinadas de síndromes clasificados como curados o mejorados fueron de aproximadamente 84%-95% para todos los síndromes. El costo económico total del proyecto fue de US\$ 766 046. El costo medio por visita durante los 30 meses fue de US\$ 25,12, y el costo por pareja tratada de una ITS, de US\$ 50,79. El costo medio por síndrome de ITS tratado fue de US\$ 48,43, cantidad de la cual US\$ 4,92 se destinó a tratamiento farmacológico. Los costos por síndrome curado o mejorado oscilaron entre US\$ 46,95-153,00 para los hombres con úlceras genitales y US\$ 57,85-251,98 para las profesionales del sexo con flujo vaginal.

**Conclusión** El programa consiguió sólo parcialmente su objetivo de llegar a toda la población destinataria prevista de prostitutas y sus parejas. La disminución de las tasas de curación entre las profesionales del sexo conllevó unos resultados generales relativamente decepcionantes en términos de costoeficacia pese a la disminución de los costos unitarios.

## ملخص

**التقييم الاقتصادي والعملي لأحد التدخلات التي تقودها منظمة غير حكومية لمكافحة العدوى المنقولة جنسياً: شمال غرب كمبوديا**

وكانت تكاليف كل وحدة استخدمت في تحليل المردودية تشتمل على تكلفة كل زيارة، ولكل قرين تلقى المعالجة، ولكل متلازمة تم معالجتها وشفائها. **الموجودات:** لقد راجع العيادات الخارجية في فترة استمرت ثلاثين شهراً 11330 مريضاً، منهم 7776 مريضاً يشكلون 69% من المرضى الذين على العدوى بمرض منقول جنسياً، ومن بينهم كان عدد البغايا لم يزد على 1012 ويشكل 13% فقط وقد سجل خلال هذه الفترة 15269 هجمة مرضية و30488 زيارة. وتراوح معدلات الشفاء للمتلازمات من 39% بين البغايا المصابات بقرحات تناسلية و74% من الرجال الذين يشتكون من إفرازات

**الهدف:** قدمت منظمة أطباء بلا حدود، وهي إحدى المنظمات غير الحكومية من هولندا، خدمات مكافحة العدوى المنقولة جنسياً في مقاطعة بانتي منيشي، في كمبوديا، خلال الفترة بين عامي 1997 و1999. واستهدفت خدماتها البغايا مع توافر هذه الخدمات لعموم الناس. وقد أجرينا تقييماً للأداء العملي وللتكاليف لهذا المشروع الحيوي.

**الطريقة:** تم الحصول على حصائل الفعالية (معدلات الشفاء للمتلازمات للعدوى المنقولة جنسياً) من خلال التحليل الاستعادي لسجلات المرضى. وقد قدرت التكاليف الاقتصادية والمالية السنوية من وجهة نظر مقدم الخدمات؛



أمريكياً تكلفة المعالجة الدوائية. وقد تراوحت التكاليف على كل متلازمة شفيت أو تحسنت بين 46.95 و153 دولاراً أمريكياً للرجال المصابين بقرحات تناسلية وبين 57.85 و251.98 دولاراً أمريكياً للبغايا المصابات بإفرازات تناسلية.

**الاستنتاج:** لقد حقق هذا البرنامج نجاحاً جزئياً في الوصول إلى المستهدفين من البغايا وأقربائهم الذكور. إن نقص معدلات الشفاء بين البغايا أدى إلى حصائل إجمالية سيئة المردود رغم نقص تكاليف كل وحدة على حدة.

تناسلية، مع وجود تفاوت واضح باختلاف الزمن. وقد كانت معدلات المتلازمات التي صنفت على أنها قد شفيت أو تحسنت مجتمعة تتراوح بين 84 و95% في جميع المتلازمات. وكانت التكاليف الاقتصادية الإجمالية للمشروع 766046 دولاراً أمريكياً، فيما بلغت التكلفة الوسطية للزيارة خلال الأشهر الثلاثين 25.12 دولاراً أمريكياً وتكاليف القرين المعالج لإصابة بعدوى منقولة جنسياً 50.79 دولاراً أمريكياً، وكانت التكلفة الوسطية للعلاج المنقولة جنسياً والتي عولجت كمتلازمة 48.43 دولاراً أمريكياً، منها 4.92 دولاراً

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Table 3. Annual economic costs, cost recovery, and unit costs of the MSF sexually transmitted infections (STI) project in Banteay Meanchey province, Cambodia, 1997–99, by year of programme implementation

Cost category	Year of implementation <sup>a</sup>			Total cost <sup>b</sup>
	1997	1998	1999	
<b>Economic<sup>c</sup></b>				
Capital				
Start-up	13 096	13 096	13 096	39 288 (5.1)
Buildings	35 605	27 357	29 604	92 566 (12.1)
Equipment	3 330	7 628	8 399	19 357 (2.5)
Vehicles	6 545	13 090	13 090	32 725 (4.3)
Training (initial)	27	853	1 101	1 981 (0.3)
<i>Total capital costs</i>	<i>58 603</i>	<i>62 024</i>	<i>65 290</i>	<i>185 917 (24.3)</i>
Recurrent				
Personnel	86 066	128 292	154 131	368 489 (48.1)
Medical supplies	13 142	34 465	39 707	87 314 (11.4)
Other supplies	5 047	10 232	8 955	24 234 (3.2)
Condoms (donation)	5 884	8 572	11 430	25 886 (3.4)
Vehicle operation and maintenance	8 239	8 617	9 791	26 647 (3.5)
Building operation and maintenance	3 878	5 842	5 906	15 626 (2.0)
Information, education and communication materials	6 037	7 244	6 659	19 940 (2.6)
Other	3 437	4 674	3 882	11 993 (1.6)
<i>Total recurrent costs</i>	<i>131 730</i>	<i>207 938</i>	<i>240 461</i>	<i>580 129 (75.7)</i>
<b>Total costs</b>	<b>190 333</b>	<b>269 962</b>	<b>305 751</b>	<b>766 046 (100.0)</b>
<i>Of which for</i>				
Non-STI complaints	24 433	48 423	68 390	141 246
STI treatment for partner	21 295	27 503	23 635	72 433
STI index patient disease-episodes	144 605	194 036	213 726	552 367
<b>Cost recovery</b>				
Patients' fees	1 396	2 905	2 950	7 251
Condom sales	2 604	7 706	8 072	18 382
Total cost recovery	4 000	10 611	11 022	25 633
% of recurrent costs	3.0%	5.1%	4.6%	4.4%
<b>Clinical outputs</b>				
No. of visits	4 369	12 793	13 326	30 488
No. of partners treated for STIs	231	642	553	1 426
No. of syndromes treated in STI index patients	1 606	4 659	5 141	11 406
<b>Unit costs per:<sup>a</sup></b>				
Visit	43.56	21.10	22.94	25.12
Partner treated for STI	92.18	42.84	42.73	50.79
Syndrome treated in STI index patients	90.04	41.65	41.57	48.43

<sup>a</sup> All costs are given in 2002 US\$.

<sup>b</sup> Figures in parentheses are the percentage of the total cost.

<sup>c</sup> Start-up costs included all the resources used in the start-up period of the project before patients were seen. This included all costs related to setting up and furnishing buildings, staff time and activities such as training that were undertaken during the start-up period. Key staff who worked at both clinics were the midwife supervisor, doctor, midwife in charge of prevention (e.g. training of condom sellers) and a health educator. In addition, there were midwives who worked exclusively at each of the clinics.

Table 4. Cost-effectiveness of the MSF sexually transmitted infections (STIs) programme in Banteay Meanchey province, Cambodia, 1997–99, by population group and syndrome

	No. of outputs	Effectiveness <sup>a</sup>		Total costs <sup>b</sup>	Unit costs	Cost-effectiveness <sup>c</sup>	
		Extrapolated	Assessed			Extrapolated	Assessed
<b>Visits</b>	30 488			766 049	25.12		
<b>Disease-episodes</b>	15 269			766 049	50.17		
Non-STI disease episodes	3 302			141 248	42.77		
STI disease episodes among partners	1 426			72 433	50.79		
STI disease episodes among index patients	10 541			552 368	52.40		
<b>No. syndromes treated among index patients</b>	11 406			552 368	48.42		
GDS <sup>d</sup> and GUS <sup>e</sup>	10 330			496 532	48.06		
Other STI syndromes	1 076			55 836	51.89		
<b>Men from the general population</b>							
GDS treated	1 331			61 238	46.00		
Cured		991	516			61.79	118.68
Cured or improved		1 264	658			48.45	93.06
GUS treated	301			13 005	43.21		
Cured		156	85			83.36	153.00
Cured or improved		277	151			46.95	86.12
<b>Women from the general population</b>							
GDS treated	6 711			326 685	48.68		
Cured		3 416	2 096			95.63	155.86
Cured or improved		5 898	3 619			55.39	90.27
GUS treated	73			3 181	43.56		
Cured		34	20			93.56	159.05
Cured or improved		63	37			50.49	85.97
<b>Female sex workers</b>							
GDS treated	1 715			83 656	48.78		
Cured		732	332			114.28	251.98
Cured or improved		1 446	656			57.85	127.52
GUS treated	199			8 767	44.05		
Cured		77	38			113.86	230.71
Cured or improved		168	83			52.18	105.62

<sup>a</sup> Extrapolated effectiveness was obtained by calculating the rates of patients classified as "cured" or "improved" among those who returned for follow-up and applying these to those who did not return. Assessed effectiveness was based only on those who returned for follow-up and assumes those who did not return were not improved or cured. The first figure in this column is the extrapolated effectiveness; the second is assessed effectiveness.

<sup>b</sup> Costs are given in 2002 US\$.

<sup>c</sup> Figures in this column were derived by dividing total costs of number of patients classified as "cured" or "cured or improved" by both extrapolated and assessed effectiveness. The first figure in this column is the extrapolated cost effectiveness; the second is assessed cost effectiveness.

<sup>d</sup> GDS = genital discharge syndrome.

<sup>e</sup> GUS = genital ulcer syndrome.