

How many patients with a sexually transmitted infection are cured by health services? A study from Mwanza region, Tanzania

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Summary

OBJECTIVES To estimate the proportion of symptomatic patients with a bacterial sexually transmitted infection (STI) cured by primary health care services in Mwanza Region, Tanzania, and to compare the cure rate achieved by health centres before and after the introduction of improved STI treatment services.

METHODS A model was used that describes the different hurdles patients with an STI take before they can be considered cured by the health services. The values for the input parameters for the model were taken from different studies. Data from an intervention trial as well as from a population-based study on male urethritis were used to estimate the proportion of symptomatic patients with an STI who seek care from a health centre. An observational study in four health centres where improved STI treatment services had been introduced provided estimates of the proportions of patients with an STI correctly diagnosed and treated. Patients who returned to the health centres after 1 week were interviewed about compliance. An estimate of the efficacy of treatments prescribed for STIs in health centres before the introduction of improved STI services was obtained from a study on prescription patterns for genital discharge syndrome (GDS) and genital ulcer disease (GUD).

RESULTS It was estimated that in the catchment area of health centres offering improved STI services, 51–72% of patients with STI symptoms sought care from those health centres. About 76–85% of cases were correctly diagnosed, and of these 69–80% received efficacious treatment. Compliance with full treatment was estimated at 84%. The estimated overall cure rate achieved by the health centres offering improved STI services ranged between 23 and 41%. The proportion of symptomatic STI patients who attended a health centre before improved STI services were introduced was estimated at 39%. The estimated efficacy of the treatments prescribed was 28%. The overall cure rate achieved by these health centres was less than 10%.

CONCLUSIONS When assessing the performance of STI case detection and management all steps have to be taken into account that are taken by patients with an STI before they can be considered cured by the health services. The intervention to improve STI services in Mwanza Region has resulted in an improvement of the cure rate of STIs achieved by primary health care centres.

keywords cure rate, primary health care services, sexually transmitted infections, Tanzania

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Introduction

The basic reproductive number of sexually transmitted infections (STIs), i.e. the average number of secondary cases of STI generated in the population by a single case, is a function of the rate of partner change, the probability of transmission of the STI during sexual intercourse and the duration of the infection (Anderson 1999). Sexually transmitted infections control programmes aim to reduce the basic reproductive number by a combination of strategies, including behaviour change, increased condom use and STI case detection and treatment. The latter component of STI control programmes aims to interrupt the chain of transmission by reducing the duration of infectivity of individuals with an STI, as well as to alleviate individual suffering.

The success of a programme of case detection and management of STIs should be measured in terms of the proportion of cases of STI occurring in the population that is successfully treated. However, the evaluation of STI case detection and management is usually limited to an assessment of the proportion of patients with an STI that is correctly diagnosed and treated (Global Programme on AIDS 1994; Saidel *et al.* 1998). This ignores the fact that patients with an STI have to overcome a series of hurdles before they can be considered cured (Buvé *et al.* 1993; Rao *et al.* 1998; Aral & Wasserheit 1999). Not all men and women who contract an STI are aware of their infection and are worried enough to seek care. Not all attend a health facility. Not all those who attend are correctly diagnosed, get a prescription for an efficacious treatment, obtain the drugs prescribed and comply with the full treatment. An evaluation of STI case detection and management that is limited to an assessment of the proportion of STI patients who are correctly diagnosed and treated in a health facility is bound to overestimate cure rates. A more relevant evaluation would also take into account the obstacles and decisions that need to be made (and losses in case detection and management) before STI patients reach the health facility and after they leave it.

Our objective was to estimate the cure rate for the most common bacterial STIs (gonorrhoea, chlamydial infection, syphilis and chancroid) that was achieved by primary health centres in Mwanza Region, Tanzania. Between 1991 and 1994 a community intervention trial was conducted in this region to assess the impact on HIV incidence of improved case detection and management of STIs (Grosskurth *et al.* 1995). The intervention consisted of training of health staff in the syndromic management of STIs, the regular supply of antibiotics that are efficacious against the most common treatable STIs and regular supervision of health units. Our study was conducted in the

health centres offering improved STI services after the trial had ended. The cure rate achieved by these health centres was compared with the cure rate achieved by the health centres before improved STI services were introduced.

Methods

The framework for the estimation of the cure rate is presented in Figure 1. This framework was adapted from a model developed to evaluate case finding and treatment in tuberculosis control programmes (Piot 1967). The cure rate is defined as the number of cases cured over the number of cases of STI occurring in the population. Rather than measuring this directly by counting the number of effectively cured patients out of those with an STI in the community, various sources of information are used to estimate the proportion of patients taking each hurdle on the way to cure. The product of these (estimated) proportions (P) corresponds to the cure rate. However, as it was not possible to collect data on the proportion of symptomatic *vs.* asymptomatic cases occurring in the community, this study only estimated the cure rate of symptomatic patients.

Cure rate achieved by the health centres offering improved STI treatment services

Two methods were used to assess the proportion of men and women with a symptomatic STI who attended a health centre. These methods are described in more detail by Grosskurth *et al.* (2000). The first method was based on interviews of participants in the intervention trial. In this trial 12 537 adults aged 15–54 years were randomly selected from the general population and followed up for 2 years (Grosskurth *et al.* 1995). The 8845 cohort members who were successfully traced after 2 years were interviewed about any episode of STI syndrome (genital discharge and genital ulcer) in the past 2 years and about any care they sought for the most recent episode. The interviews took place in 1993–1994. The data from these interviews provided an estimate of the proportion of men and women with genital discharge syndrome (GDS) and genital ulcer disease (GUD) who sought care from one of the health centres.

The second method used estimates of the population in the catchment area of the health centres, the annual incidence of GDS and GUD, as estimated from the questionnaire data, and the yearly numbers of STI syndromes treated at the health centres, as recorded in the patient registers.

In May and June 1997 an observational study was conducted in four health centres randomly selected from the 16 health centres offering improved STI treatment

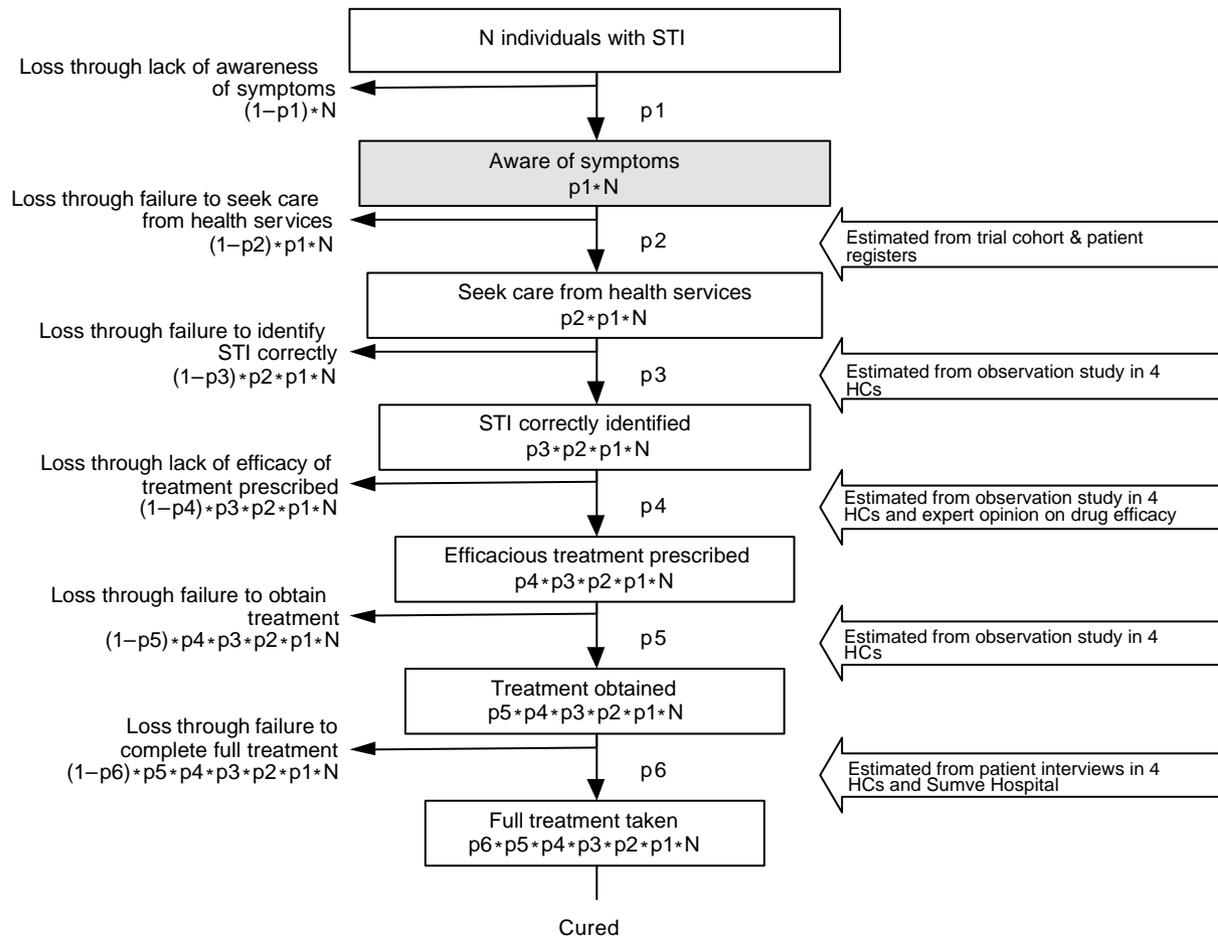
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Figure 1 From infection to cure through case detection and treatment: the model for estimating cure rates and the data sources.

services in Mwanza Region. The research teams spent 2 weeks in each of the health centres. A first research clinician was posted inside the consultation room and directly observed the management of patients, including patients presenting with STI-related complaints. A second research clinician was posted in another room of the health centre and interviewed consenting patients at exit. The interview included questions about type of complaints, duration of symptoms, actions taken before reaching the health centre, satisfaction with the services provided, drugs received and counselling messages remembered. The clinician at exit also took any corrective actions in case a patient with an STI syndrome was missed by the health centre staff or was incorrectly treated.

Laboratory facilities for the diagnosis of STIs do not exist in primary health care centres and patients presenting with symptoms and signs suggestive of an STI are treated according to syndromic management guidelines based on

national guidelines, WHO recommendations (WHO 1994) and studies of the aetiology of STI syndromes in Mwanza Region (Grosskurth *et al.* 2000). The guidelines were constructed in such a way that all cases of gonorrhoea, chlamydial infection, syphilis and chancroid which presented with typical symptoms were treated. For instance, according to the guidelines, women with a vaginal discharge that was not curd-like were treated for gonorrhoea, chlamydial infection and trichomoniasis. In this study cases of bacterial STIs would be missed if typical syndromes would not be recognized by the health centre staff.

The assessment of patients by the research clinicians was taken as the 'gold standard diagnosis' against which the performance of the health centre staff was evaluated. The treatment given by the health centre staff was compared with the treatment guidelines. The treatment that was given was labelled as 'correct' or 'right drug but wrong

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dose' or 'wrong drug' or 'no STI treatment given'. The recommended treatment for gonorrhoea was cotrimoxazole after an antibiotic susceptibility study had established that it had 95% efficacy against gonorrhoea in Mwanza Region (West *et al.* 1995). The correct treatment for the other bacterial STIs – doxycyclin for *C. trachomatis* infection, benzathin penicillin for syphilis and cotrimoxazole and erythromycin for chancroid – was also considered to have an efficacy of 95%.

All patients with an STI syndrome were routinely requested to report back after 1 week. As part of the observational study so-called returners were interviewed by the research staff about the intake of the drugs they had received. Some returners had initially been seen by the research staff, but most had been seen by the health centre staff before the arrival of the research team. Patients were considered compliant if they reported that they had taken the full course of treatment.

A second source of data on compliance was a study at the outpatient clinic of Sumve District Hospital, in the same region. The methods of data collection were basically the same as in the health centres study, i.e. returning STI patients were interviewed about the intake of their drugs.

Comparison with health centres where improved STI treatment services had not yet been introduced

It was not possible to make a full comparison with health centres where improved STI treatment services had not yet been introduced. Data were available for two steps only: the proportion of symptomatic STI patients who sought care from a health centre; and the proportion of patients who were prescribed efficacious treatment for the most common bacterial STIs.

Data on health seeking behaviour, collected during the trial, were used to estimate the proportion of symptomatic STI patients who sought care from health centres where improved STI services had not yet been introduced. In 1995–1996 a population-based study was also conducted on male urethritis in five villages near one such health centre, Missungwi Health Centre. All men in the area were interviewed about symptoms suggestive of an STI and examined. Men with complaints were asked about any action that they had taken to get treatment. The methods of this study are described in more detail by Watson-Jones *et al.* (2000).

In 1993, before the programme of improving STI treatment services in health centres was started, a study was conducted on prescription patterns in 17 primary health units. Prescriptions issued for the different syndromes, GDS and GUD and the frequency with which they were issued were recorded. According to the registers,

roughly 75% of the STI syndromes seen in the health centres were GDS or lower abdominal pain suggestive of pelvic inflammatory disease, and 25% were GUD (Grosskurth *et al.* 2000). Among the patients with GDS who had gonorrhoea or chlamydial infection, roughly 75% had gonorrhoea and 25% had chlamydial infection (Mayaud *et al.* 1992). Among the patients with GUD and excluding patients with genital herpes, an estimated 70% had syphilis and 30% had chancroid (P. Mayaud, personal communication). The different prescriptions were sent to a panel of four experts in the management of STIs with the request to assess their efficacy in curing gonorrhoea and chlamydial infection, and syphilis and chancroid. For each expert the efficacy of the prescriptions for gonorrhoea, chlamydial infection, syphilis and chancroid was averaged after weighting the different prescriptions by the number of times they were used. The efficacy rates estimated by the four experts were then averaged (E_{GC} , E_{CT} , E_S , E_{HD}). The overall efficacy of the prescriptions against the four most common bacterial STIs was computed by adding up the efficacy rates against the different infections after weighing them by the proportions of patients seen in the health centres who had gonorrhoea, chlamydial infection, syphilis and chancroid ($E_{GC} \times 0.56 + E_{CT} \times 0.19 + E_S \times 0.175 + E_{HD} \times 0.075$).

The studies were approved by the regional and district health authorities as well as by the ethical committees of the National AIDS Control Programme, the London School of Hygiene and Tropical Medicine and the Institute of Tropical Medicine in Antwerp. The studies were conducted with the permission of the staff of the health units and the patients who were informed about the purpose of the studies.

Results**Cure rate achieved by the health centres offering improved STI treatment services**

During follow up interview, 51% of study participants in the intervention areas who reported GDS or GUD in the past 2 years stated that they sought care from a health centre for their most recent episode of STI syndrome. From the same interview data it was estimated that the annual incidence of GDS and GUD was 7.0 and 2.1%, respectively, in the intervention areas. Assuming that study participants who reported that they had suffered from an STI syndrome only had one episode per year, the expected yearly number of GDS and GUD in the catchment population of the six intervention health centres was estimated at 6825. The average yearly number of GDS and GUD treated at the intervention health centres was

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estimated at 4930. This represents 72% of the expected number of these STI syndromes. The discrepancy between this latter figure and the 51% obtained from the interviews could at least in part be explained by the assumption that study participants who reported that they had suffered from an STI syndrome in the past year only had one episode in that year, whereas in fact some of them had suffered more than one (Grosskurth *et al.* 2000).

A total of 702 patients (437 women and 265 men) were seen in the four health centres. Of these, 67 patients (9.5%) were considered 'likely' STI patients by the research clinicians and another 17 patients (2.4%) were considered 'possible' STI cases. The latter patients presented complaints that could not immediately be identified as STI-related, but on further questioning it seemed they were suggestive of an STI. Of the 84 STI patients, 57 were women and 27 men.

Of the 67 likely STI cases, 10 (six men and four women) were missed by the clinic staff, of the 17 possible STI cases 10 (four men and six women) were missed (Table 1). When only considering the likely STI cases, a correct diagnosis was made in 85% of cases. When the possible cases were included, a correct diagnosis was made in only 76% of cases.

There were large variations in the proportion correct diagnoses between health centres. In one (D) only 36% (5 of 14) of patients were correctly diagnosed, in the other three, A, B and C, the proportions of patients correctly diagnosed were 70% (23 of 33), 93% (13 of 14) and 100% (23 of 23). When health centre D was excluded from analysis, the proportion of patients that was correctly diagnosed was 84%.

Of the 64 patients who were correctly diagnosed 47 (73%) received the right drugs in the correct dose; seven (11%) received the right drugs in the wrong dose and 10 (16%) received the wrong drugs or no drugs at all (Table 1). If we assume that only the right drug in the

correct dose is a 95% efficacious treatment, then $(0.73 \times 0.95 =)$ 69% of patients with a correct diagnosis would be cured if they were compliant. If we assume that the right drug in the wrong dose is also 95% efficacious, then $(0.84 \times 0.95 =)$ 80% of patients with a correct diagnosis would be cured if compliant. Again there were large variations in this proportion between health centres: those that performed less well on diagnosis also did on treatment.

During the observational study in the four health centres, 43 returners were interviewed. Of these, 36 (84%) stated that they took all the drugs within the time prescribed by the health centre staff. At the outpatients clinic of Sumve District Hospital 230 returning STI patients were interviewed. Of the 114 men who were interviewed, 111 (97%) said they took the full treatment. Of the 116 women only 80 (69%) said that they were fully compliant. The combined compliance rate of men and women was 83%.

Table 2 presents the cure rate achieved by the health centres offering improved STI services, assuming different scenarios. The difference between scenarios 1 and 2 is the difference in the estimates of the proportions of men and women that sought care from the health centres. When the possible cases of STI were excluded and it was assumed that the right drug in the wrong dose was 95% efficacious, the overall cure rate was 29% or 41% depending on the proportion of patients with symptoms suggestive of an STI that sought care from a health centre. When health centre D was excluded from the analyses and assuming that 72% of patients with an STI syndrome sought care from a health centre and the right drug in the wrong dose was 95% efficacious, the overall cure rate was 40%. With an excellent performance by the health staff, i.e. 90% correct diagnosis, 100% correct treatment given and 90% compliance by the patients, still only 55% of the symptomatic patients with an STI would be cured by the health services ($P2 \times P3 \times P4 \& 5 \times P6 = 0.72 \times 0.9 \times 0.95 \times 0.9$).

Table 1 Proportions of patients in the health centres offering improved sexually transmitted infections (STI) treatment services, that are correctly diagnosed and obtained the right medication

	'Likely' STI (%)	'Possible' STI (%)	All cases (%)
Correct diagnosis (%)			
Men	71 (15/21)	33 (2/6)	63 (17/27)
Women	91 (42/46)	45 (5/11)	82 (47/57)
Men and women combined	85 (57/67)	41 (7/17)	76 (64/84)
Treatment given [Percentage of cases correctly diagnosed]			
Right treatment	77 (44/57)	43 (3/7)	73 (47/64)
Right drug, wrong dose	7 (4/57)	43 (3/7)	11 (7/64)
Wrong treatment	4 (2/57)	–	3 (2/64)
No treatment	12 (7/57)	14 (1/7)	13 (8/64)

Table 2 Cure rate achieved by the health centres in Mwanza region

	Health centres offering improved STI services				Before the improvement of STI services (%)
	Scenario 1: low percentage seeking treatment from HC (%)	Scenario 2: high percentage seeking treatment from HC (%)	Scenario 3: low percentage seeking treatment from HC, the 'possible' cases are excluded & the wrong dose is still efficacious (%)	Scenario 4: high percentage seeking treatment from HC, the 'possible' cases are excluded & the wrong dose is still efficacious (%)	
P2: sought care from health centre	51	72	51	72	39
P3: correct diagnosis made	76	76	85	85	85
P4 & P5: efficacy of treatment obtained	$73 \times 95 = 69$	$73 \times 95 = 69$	$84 \times 95 = 80$	$84 \times 95 = 80$	28
P6: compliance	84	84	84	84	84
Overall cure rate (= P2 × P3 × P4 & P5 × P6)	23	32	29	41	8

All the values are given in percentages.

Cure rate achieved by the health centres before improved STI services were introduced

In the catchment area of the health centres where improved STI services were not yet available, 39% of study participants in the trial reported that they attended a health centre for STI related symptoms. In Missungwi area 1004 men were interviewed of whom 116 had symptoms suggestive of an STI and provided information about their care seeking behaviour. Altogether 42 men (36% of 116) sooner or later had sought care from a modern health facility (a health centre, hospital or private dispenser).

A total of 235 prescriptions for GDS and 80 prescriptions for GUD were collected from the health centres before improved STI services were introduced, and analysed. There were 26 different prescriptions for GDS and 15 different prescriptions for GUD. These prescriptions all had as their components penicillin (procain penicillin or oral penicillin) and/or tetracyclin in different doses. The most commonly prescribed treatment for GDS was procain penicillin 1.2 MU daily for 5 days, which was received by 53% of patients. The most commonly prescribed treatment for GUD was procain penicillin 0.8 MU daily for 10 days, which was received by 36% of patients. Table 3 presents the estimated proportions of patients with one of the four bacterial STIs that are suffering from gonorrhoea, chlamydial infection, syphilis and chancroid; the average efficacy of the prescriptions for these infections; and the overall efficacy of the treatments prescribed. This overall efficacy was estimated at 28%.

The last column of Table 2 presents an estimate of the overall cure rate of the health centres before STI services were improved. This estimate has to be considered as a maximal estimate, as P3 and P6 were assumed to be equal to the P3 and P6 in the health centres offering improved STI services, and it was assumed that all patients received the drugs that were prescribed. The maximal estimate of the cure rate achieved by the unimproved health centres was considerably less than the low estimate of the cure rate achieved by the health centres offering improved STI services, 8 *vs.* 23%.

Discussion

We estimated how many symptomatic patients with a bacterial STI were cured by primary health care services in Mwanza Region. We implicitly assumed that the higher the cure rate achieved by the health services, the lower the average duration of infectivity would be of individuals suffering from an STI. We took into account not only the performance at health centres, as is usually done in studies on the quality of STI care (Global Programme on AIDS

A. Buvé *et al.* **Control of sexually transmitted infections****Table 3** Efficacy of treatments prescribed in health centres before improved sexually transmitted infection (STI) services were introduced

	No. patients with particular infection per 100 patients with bacterial STI	Average efficacy of treatment prescribed (%)	No. cured by treatment prescribed
Gonorrhoea	56	16	9/56
Chlamydial infection	19	21	4/19
Syphilis	17.5	85	15/17.5
Chancroid	7.5	0	0/7.5
Estimated percentage patients with bacterial STIs cured by the treatments prescribed			28%

1994; Saidel *et al.* 1998) but also considered health seeking behaviour and compliance of patients. We assessed the cure rate achieved by health services, not by following up patients, but by using a model and estimating the model parameters from different studies. The cure rate achieved by health centres offering improved STI services was estimated at 23–41%. The estimated cure rate achieved by the health centres before STI services were improved was less than 10%. These cure rates are most probably overestimates, as they do not take into account the proportion of incident cases of STI that remains asymptomatic. Data on the incidence of asymptomatic STIs in Mwanza Region were not available and are virtually non-existent in the literature. Most studies on asymptomatic STIs are prevalence studies, which tend to be biased towards the detection of asymptomatic infections as many of those with symptoms will have sought treatment and been cured. For example, two population-based studies on urethritis in men in Mwanza Region found that 65% of men with laboratory confirmed gonorrhoea and/or chlamydial infection did not have any symptoms or signs (Grosskurth *et al.* 1996; Watson-Jones *et al.* 2000). However a study among US naval personnel found that only 2% of incident infections of *N. gonorrhoeae* remained asymptomatic (Harrison *et al.* 1979).

There are several aspects of the study design that call for some caution in the interpretation of the results. Firstly, the estimate of the cure rate achieved by the health centres offering improved STI services was based on data taken from several studies carried out in different years. The proportion of patients with STI syndromes seeking care from a health centre was estimated in 1993–1994, whereas the proportions of patients correctly diagnosed and correctly treated were taken from a study carried out in 1997. It cannot be excluded that changes in health seeking behaviour and/or changes in practices at the health centres have taken place between 1993–1994 and 1997. Secondly, the proportion of patients correctly diagnosed and treated was estimated in four health centres only and on 84 patients. One health centre performed rather badly and influenced the overall performance. However when this

health centre was excluded from the analyses, the cure rate was still only 40%. Thirdly, there was uncertainty about the value of several model parameters and assumptions had to be made. As routine laboratory diagnosis of STIs is not available in primary health care centres, the 'gold standard' diagnosis of STIs was the judgement of the two research clinicians. Different scenarios were worked out in which all the cases of STI were analysed or only the likely cases of STI, i.e. the cases that were obvious to both research clinicians. The efficacy of the treatments with the right drugs in the wrong dose is unknown. In scenarios 1 and 2 the efficacy was assumed to be 0%, in scenarios 3 and 4 it was assumed to be 95%. The real efficacy was probably somewhere between these two extremes. Patients who were not fully compliant were assumed not to have been cured. This assumption may be too stringent but the compliance rate of 84% is probably an overestimate as it was assessed on patients who returned to the health centre, as they were told. Under the above assumptions the overall cure rate achieved by the health centres offering improved STI services was estimated at 29–41% depending on the proportion of patients with an STI who sought care from one of the health centres. A last scenario assumed an excellent performance of the health staff and 90% compliance. With this scenario the cure rate was 55%. Any further, substantial increase in cure rate could only be achieved by better health seeking behaviour, which underscores the importance of this first step.

The cure rate achieved by the intervention health centres during the intervention trial was probably higher than the estimates we obtained. This study took place several years after the end of the trial. One important component of the intervention during the trial was the regular supervision of health centre staff. Unfortunately it was impossible to maintain the tight and effective supervision of the STI services that happened during the trial, when it was integrated into the general supervision of health services by the district health management teams. This may have caused the disappointingly low proportions of patients who were correctly diagnosed and treated and underscores once more the importance of regular supervision, which a

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study from South Africa also identified as an essential activity to ensure continued good quality STI care (Harrison *et al.* 1998).

The estimate of the cure rate achieved by the health centres before STI services were improved probably reflects the situation during the trial. This low cure rate is not exceptional. Studies from South Africa, Senegal and India have also reported low rates of correct diagnosis and treatment (Van der Veen *et al.* 1994; Harrison *et al.* 1998; Mertens *et al.* 1998). The scope for improvement is thus big which may explain why the relatively low-tech intervention that was tested in the Mwanza trial had such a considerable impact on the cure rate of STIs and on the incidence of HIV infection in the population.

In conclusion, when evaluating the performance of health services in STI control, several hurdles have to be considered which patients with an STI take before they can be considered cured. If all these factors are taken into account the cure rate of STIs achieved by health services gives a more sobering (and realistic) picture of the performance of STI case detection and management than if the evaluation were restricted to what happens inside the health services. In addition, using a model such as ours is useful to identify bottlenecks and plan for interventions that are most likely to have a large impact on the cure rate.

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