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Delays to treatment and out-of-pocket medical expenditure for tuberculosis patients, in an urban area of South America

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Short delays to treatment are important for the control of tuberculosis (TB). National Tuberculosis Programmes provide free diagnosis and treatment for smear-positive patients, so that the patients' out-of-pocket medical expenditure could be almost nil. The factors associated with delays in starting treatment, and the pre-treatment out-of-pocket medical expenditure for TB patients, have now been investigated in the Bolivian city of Cochabamba. Bolivia is the Latin American country with the highest incidence of TB. It is covered by a national TB programme that provides free diagnosis and free treatment for smear-positive patients. Structured interviews with 144 smear-positive patients enrolled in this programme revealed median patient, provider and total delays of 3.6, 6.2 and 12.9 weeks, respectively. The total delays were longer for the female patients than for the male, and for patients who consulted private doctors than for the other patients. When the first healthcare provider was a doctor, the median provider delay was 4.9 weeks in the public sector but 7.2 weeks in the private. The median out-of-pocket medical expenditure per patient, which was U.S.$13.2 overall, was much higher for those who consulted a private doctor than for those who did not (U.S.$21.9 *v.* U.S.$5.4, respectively; $P<0.001$). It appears that interventions targeting doctors (in both the private and public sectors) are likely to have a larger impact on the shortening of delays in TB treatment than interventions targeting patients. They could also reduce unnecessary out-of-pocket expenditure.

Delays in the diagnosis and treatment of tuberculosis (TB) increase the severity of the illness and are associated with poorer outcomes for the patient (Lienhardt *et al.*, 2001; Rieder, 1999). Since cases remain contagious until effective chemotherapy is instituted, long delays also increase the transmission of the causative agent, *Mycobacterium tuberculosis*. A major objective of TB-control programmes is to identify and treat patients suffering from smear-positive pulmonary tuberculosis (who are the main sources of infection) as early as possible. For most such patients, diagnosis requires no more than the examination of a sputum smear for 'acid-fast' bacilli (AFB). Also, as national TB programmes (NTP) in developing countries usually provide free smear examination for TB suspects and free treatment for the identified cases, TB (which is notoriously a disease of the poor) could be diagnosed and treated without patients incurring any out-of-pocket medical expenditure, in theory at least.

Bolivia has a higher TB incidence than any other country in Latin America [estimated at 234 cases/100,000 in 2002 (WHO, 2004)], a well organized NTP, and a large private health sector. In Cochabamba, the

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third largest city in the country (with about 600,000 inhabitants), some of the smear-positive TB patients enrolled in the NTP were recently surveyed. The objectives of the survey, which is described below, were to estimate the delays to treatment of TB and their determinants (in particular the role of the private health sector), to explore some aspects of patient management, and to evaluate the out-of-pocket, pre-treatment, medical expenditure of the patients.

SUBJECTS AND METHODS

According to the guidelines of the Bolivian NTP, every patient who presents at a health facility with a history of cough of more than 3 weeks' duration should be tested for TB, by the collection of a sputum sample and its examination, as a smear, for AFB. Treatment of every patient found smear-positive should begin immediately the patient returns to collect the results of the TB test. In the area of the present study — the city of Cochabamba — most public health centres are equipped with the laboratory facilities necessary for testing sputum samples for AFB.

The aim of the present study was to interview every individual who was aged >14 years and who was registered as a new, smear-positive patient in the NTP, in the city of Cochabamba, between March 2001 and March 2002. Patients who declined to give their informed consent, those who were being re-treated after treatment failure or for a relapse, those who were being treated after failing to comply with a scheduled (initial) treatment, and those who twice failed to meet the interviewer for a pre-arranged appointment were excluded.

To minimize recall bias, each subject was interviewed within 2 months of the initiation of treatment. All subjects were interviewed by the same clinician (RD), either in Spanish or, if necessary, in Quechua. For each interviewee, the date when the first symptom was noticed and the date of the first contact with a health provider were estimated, during the interview, using a calendar of local events, whereas the date treatment began was taken from the relevant TB register. 'Patient delay' was defined as the time between the onset of symptoms and the first contact with a health provider, 'provider delay' as the time elapsed between first contact with a health provider and the start of treatment, and 'total delay' as the sum of the patient and provider delays. A health provider was defined as a medical doctor, a pharmacist or anybody who prescribed, gave or sold treatments. This definition included traditional healers, medical doctors working in public services (including the social-security system) or private health facilities (for profit or not for profit), and those working in private pharmacies. Each interviewee was asked to estimate his or her 'medical out-of-pocket expenditure', which was defined as the money spent by the patient on consultation fees, medical examinations (laboratory, X-ray or other), and any medicines taken before registration and treatment in the NTP. Expenditure was recorded in the local currency (bolivianos) and subsequently converted into United States dollars, using the then current exchange rate of 7.2 bolivianos/U.S.$1.00.

The data recorded were analysed using the Stata 8.0 software package (StataCorp, College Station, TX). Cox's proportional-hazards regression model was used to model the delays to TB treatment (in days), with the results expressed as hazard (risk) ratios. The higher the hazard ratio, the less time it took for a patient to be treated, so the shorter the delay. To avoid a 'search for significance', only four variables (age, gender, time spent in formal education, and having consulted a doctor in the private sector) were investigated. Cox's proportional-hazards model was first applied, for the univariate analysis. A multivariate model that included all the variables was then developed, and reduced until the likelihood ratio-test statistic

TABLE 1. *Delays to treatment for the 144 smear-positive tuberculosis patients enrolled in the national tuberculosis programme*

	Delay (weeks)			
Type of delay	Range	Mean	Median	Interquartile range
Patient	0–166.6	9.0	3.6	0.9–8.0
Provider	0–150.1	14.2	6.2	1.5–14.7
Total	0.3–167.0	23.2	12.9	6.4–27.5

became significant, indicating that the model could not be reduced further. The assumption of proportional hazard was also tested. The non-parametric, Mann–Whitney, rank-sum test was used to compare the out-of-pocket expenditure of the patients who did and did not consult a private doctor.

RESULTS

Overall, 60 female and 84 male patients (together representing 70% of the 207 eligible patients who were enrolled in the NTP during the study period) were interviewed. The female and male interviewees had median ages of 29 and 27 years, respectively, and had spent medians of 5 and 9 years in formal education, respectively.

Delays

Provider delay was generally longer than patient delay (Table 1).

At some time between the onset of their symptoms and the start of their treatment in the NTP, 84 (58%) of the subjects had consulted a medical doctor in the private sector. Table 2 summarizes the healthcare providers first consulted by the subjects, the associated provider delays, and the type of healthcare providers who diagnosed the TB. The median provider delay for the 37 patients who had first consulted a medical doctor in a private hospital was not statistically different from the corresponding

TABLE 2. *The type of healthcare provider initially consulted, the type of provider who eventually made the diagnosis, and the provider delay, for each of the 144 smear-positive cases of tuberculosis*

	No. and (%) of cases		
	First healthcare provider	Provider who made the diagnosis	Median provider delay and (interquartile range) (weeks)
MEDICAL DOCTOR IN THE PRIVATE SECTOR			
Private hospital	37 (25.7)	22 (15.3)	5.3 (2.0–11.3)
Private practice	18 (12.5)	12 (8.3)	9.6 (4.1–32.0)
Private, not-for-profit institution	7 (4.9)	1 (0.7)	15.4 (11.1–114.4)
Sub-total	62 (43.1)	35 (24.3)	7.2 (2.7–17.6)
MEDICAL DOCTOR IN THE PUBLIC SECTOR			
Social-security system	4 (2.7)	6 (4.2)	2.9 (0.6–6.4)
Public health facility	39 (27.1)	103 (71.5)	5.0 (0.6–5.4)
Sub-total	43 (29.9)	109 (75.7)	4.9 (0.6–10.6)
OTHER PROVIDER			
Pharmacy	32 (22.2)	0 (0.0)	6.8 (1.9–13.1)
Other	7 (4.9)*	0 (0.0)	18.6 (4.3–25.7)
All sources	144 (100)	144 (100)	6.2 (1.5–14.7)

*Five cases consulted a traditional healer, and the provider for two other cases could not be determined.

TABLE 3. *Risk factors associated with a longer total delay to treatment, for the 144 smear-positive cases of tuberculosis (the higher the hazard ratio, the shorter the delay)*

	No. of cases	Median provider delay and (interquartile range) (weeks)	Hazard ratio and (95% confidence interval)			
			Unadjusted	*P*	Adjusted*	*P*
CATEGORICAL VARIABLE						
Gender						
Female	60	13.9 (8.1–35.9)	1		1	
Male	84	11.1 (5.9–19.7)	1.5 (1.0–2.0)	0.03	1.5 (1.1–2.2)	0.024
Contacts with private doctor						
None	57	10.3 (4.6–17.0)	1		1	
At least one	87	15.3 (7.4–34.1)	0.64 (0.45–0.90)	0.01	0.58 (0.41–0.82)	0
CONTINUOUS VARIABLE						
Age		–	0.99 (0.98–1.0)	0.04	0.99 (0.98–1.0)	0.13
Years of schooling		–	1 (0.99–1.1)	0.11	0.99 (0.94–1.0)	0.75

*For the variables shown in this table.

value for the 43 patients who had first consulted a medical doctor in the public sector (5.3 *v.* 4.9 weeks; $P=0.06$; Table 2). Ninety-five (66%) of the interviewees, including 43 (72%) of the 60 who only attended public facilities, were given a chest X-ray during the diagnosis process.

With the Cox's proportional hazards, the full model (Table 3) indicated that the number of years spent in formal education ($P=0.75$) and age ($P=0.0993$) were not significantly associated with longer total delays but gender ($P=0.024$) and having consulted a private doctor ($P=0.002$) were. Gender ($P=0.018$) and having consulted a private doctor ($P=0.001$) were retained in the final model. The proportional-hazards assumption was not violated ($P=0.6223$).

Expenditure

Almost all (>90%) of the patients interviewed claimed to have incurred some medical expenditure, with those who contacted a private doctor during the course of their illness generally spending much more than those who only used the public sector (Table 4). Expenditure on medicines was, however, almost exclusively for non-TB medicines, with only four (2.8%) of the interviewees reporting that they had bought anti-TB drugs before entering the NTP. Although the median expenditure for the

TABLE 4. *Out-of-pocket medical expenditure, before their enrollment in the national tuberculosis programme, for the 144 smear-positive patients, 84 of whom consulted a private doctor at some stage*

Item	No. and (%) of patients paying*	Median expenditure (U.S.$) for patients who:		
		Were investigated	Did not consult a private doctor	Consulted a private doctor
Consultation fees	114 (79)	1.4	1.4	2.8†
Complementary examinations‡	95 (66)	3.5	0.7	6.1†
Medicines	113 (78)	6.8	2.8	9.8†
Any expenditure	134 (93)	13.2	5.4	21.9†

*In some circumstances (i.e. because of exemptions, in the public sector, for the most destitute), the item was free-of-charge for the patient.
†Significantly greater than the corresponding value for the patients who did not consult a private doctor ($P<0.001$).
‡All examinations other then the microscopical examination of a sputum smear for acid-fast bacilli.

male interviewees was higher than that for the female (U.S.$17 *v.* U.S.$11), the difference was not statistically significant (P=0.11).

DISCUSSION

The median total delay to TB treatment was worryingly long (12.6 weeks overall, with the largest component being at the service-provider level), longer for the female patients than for the male, and longer for those consulting private doctors than the other patients. The limitations of the present study mean, however, that these observations on treatment delays have to be considered with some caution. Firstly, the data analysed came from just 70% of the eligible patients. Although the age and gender distributions of the patients interviewed were similar to those of the total eligible population (data not shown), it remains possible that the delays to TB treatment were significantly different for the 'missing' patients than for the interviewees. If such a bias occurred, however, it is more likely that the delays for the missing patients, who failed to keep pre-arranged appointments, were generally longer than those recorded for the interviewees (and that, therefore, the median delays presented here are under-estimates of the true delays). The second limitation of the present study is the difficulty in producing accurate estimates of the various components of the delays to treatment for a TB patient. Attempts were made to minimise recall bias by conducting interviews within a few weeks of the initiation of treatment and using a calendar of local events to link the interviewees' memories to particular dates. The symptoms attributed to TB by the patients were simply assumed to be caused by *M. tuberculosis*, although this assumption may not always have been correct, especially for the interviewees who reported particularly long delays. A wide-ranging definition of 'health provider' was employed but some providers might be remembered better than others (e.g. clinicians might be remembered better than pharmacists) or intentionally under-reported (which might be the case for traditional healers). A pharmacist cannot really be expected to initiate the diagnostic process. Since such effects and shortcomings could create a differential bias when analysing provider delay, the most detailed data analysis in the present study was focused on the total delays to diagnosis. The estimation of out-of-pocket expenditure is also vulnerable to recall bias. With these limitations in mind, only the most robust results of the present study, and their most important implications, are discussed below.

It is particularly disturbing to find a long, median, total delay to treatment of about 3 months in an urban setting such as Cochabamba, given the city's dense network of public and private health services and its coverage, for many years, by an apparently well organized NTP. Since the present study appears to be the first attempt to estimate TB treatment delays in South America, it is impossible to say if this delay is typical of an urban area of South America. The median delays to treatment for other smear-positive cases of pulmonary TB living in urban environments have, however, been estimated at 6.3 weeks in Vietnam (Lonnroth *et al.*, 1999), 8 weeks in The Gambia (Lienhardt *et al.*, 2001), 9 weeks in India (Rajeswari *et al.*, 2002) and 16 weeks in Ghana (Lawn *et al.*, 1998). Although definitions of 'health providers' are not always comparable (leading to ambiguity in the interpretation of patient and provider delays), the median patient delays recorded in these studies are rather short (around 3 weeks), as seen in the present study. That TB cases are likely to seek medical care sooner rather than later is the assumption underlying the strategy of 'passive' case-finding for TB control (Enarson *et al.*, 2000). Patient delay cannot be always attributed entirely to 'patient factors', however. In a study in urban Zambia, for

example, delays in seeking care for cough were related to accessibility and to a generally poor perception of the quality of the local health services, with socio–economic status, stigma and knowledge of TB having no significant impact (Godfrey-Faussett *et al.*, 2002).

In theory, since it is generally recommended that all patients who have been coughing for 2 or 3 weeks be screened for TB (Enarson *et al.*, 2000), the patient delay should be no longer than 3 weeks. The provider delay, at least for those consulting doctors, could be just a few days, if the sputum test is requested and processed rapidly. In many studies, however, although the observed median patient delay approximated the target of 3 weeks, the median doctor delay far exceeded the few days that diagnosis could take (Liam and Tang, 1997; Lawn *et al.*, 1998; Steen and Mazonde, 1998; Rajeswari *et al.*, 2002). Those who make first contact with a provider in the public health sector generally get treated faster for TB than those who make first contact with a private health provider (Lawn *et al.*, 1998; Lonnroth *et al.*, 1999; Lienhardt *et al.*, 2001; Rajeswari *et al.*, 2002; present study). It appears that interventions to speed up the treatment of TB could have a much larger impact if focused on healthcare providers — particularly clinicians and those responsible for checking sputum samples for AFB — than if targeted at the general population. Even if clinicians are not the first healthcare providers to be consulted, they are ultimately responsible for making the diagnosis; the delays to treatment for those patients who initially visit a pharmacy or a traditional healer necessarily include clinician delays.

For most patients suffering from smear-positive TB, a chest X-ray provides no significant benefit in the diagnosis process, and medicines other than anti-TB drugs, such as cough syrups, are at best useless. Nonetheless, most of the TB cases interviewed during the present study, including most of those who only attended public facilities, had been given a chest X-ray and had bought medicines that have no effect on TB. In consequence, despite the promise of 'free diagnosis and treatment' that forms the cornerstone of the NTP in Bolivia, most of the interviewees incurred significant and unnecessary out-of-pocket expenditure. About one in every two had paid in excess of U.S.$13 before being provided with free TB treatment. Such expenditure cannot be considered slight when, according to the United Nations Development Programme (http://hdr.undp.org/statistics/data), 34% of Bolivians have less than U.S.$2 to spend each day. Also, such expenditure represents only part of the costs that have to be met by TB cases, since it takes no account of non-medical expenditure (such as the costs of transport) or income lost while the patient is too ill to work or seeking treatment. In their study of TB cases in Zambia, Needham *et al.* (1998) found that direct medical expenditure represented only 17% of the total pre-treatment costs. In the present, Bolivian study, the out-of-pocket medical expenditure of the TB cases who consulted healthcare providers in the private sector was relatively high largely because such patients spent more on medicines and complementary examinations (and not because of higher consultation fees).

At least in terms of treatment, Bolivia seems to be running a reasonably successful TB-control programme largely without the involvement of the country's large private health sector (Lambert *et al.*, 2004). Unlike the situation in various Asian countries, such as India and Pakistan (Uplekar *et al.*, 2001), very few cases of TB in Bolivia appear to be treated outside the NTP. Most cases of TB in Bolivia, as in many other countries, do, however, seek medical attention in the private health sector before taking advantage of the free TB treatment available in the NTP. For these mostly poor patients, use of the private sector results in relatively high out-of-pocket medical expenditure and relatively long delays to diagnosis. An important observation made in

the present study area, and elsewhere (Lonnroth *et al.*, 1999), was, however, that inadequate patient management (e.g. the use of unnecessary X-rays and long provider delays) was not confined to the private sector but also occurred in public health facilities. Attempts to shorten delay to TB treatment, in settings where geographical accessibility is not a problem, should thus focus on the health providers (in the private **and** public health sectors). This could also reduce unnecessary out-of-pocket medical expenditure for patients who are often already poor.

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