HEALTH-SEEKING BEHAVIOR AMONG HIV-INFECTED PATIENTS TREATED FOR TB IN THAILAND

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Abstract. In Asia, patients increasingly seek tuberculosis (TB) treatment in the private sector; however, few private sector practices follow international TB management guidelines. We conducted a study to measure the frequency and predictors of seeking TB diagnosis in the private sector among 756 HIV-infected TB patients in four Thai provinces during 2005-2006. Of enrolled patients, 97 (13%) first sought care at a private provider and 83 (11%) at a pharmacy. In multivariable analysis, the only factor independently associated with seeking care at a private provider was having a high TB stigma score. Factors independently associated with seeking care at a pharmacy included not knowing that TB can be cured and that TB care can be provided close to home. Patients reported that the most influential factor in choosing a provider was confidentiality (468; 62%). Further research is needed to evaluate whether educating the community about the confidentiality, availability, and success of curing TB at government health facilities can promote prompt utilization of public TB treatment services by HIV-infected patients in Thailand.

INTRODUCTION

Tuberculosis is a leading infectious disease cause of death in Asia (WHO, 2008). In Asian countries, one challenge to TB control has been the increasingly complex health sector, in which private sector providers and pharmacies are now burgeoning. Studies conducted in many high-burden TB countries have shown that substantial numbers of patients seek TB treatment in the private sector (Uplekar *et al*, 2001). TB patients in some countries often prefer to seek care at a private provider because they perceive that private providers offer higher quality and greater efficiency than government providers do (Brugha and Zwi, 1998). Unfortunately, most of these private providers do not follow national or international standards for TB diagnosis; meaning that many patients who potentially have TB may not be correctly diagnosed (Uplekar *et al*, 2001).

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Improving private sector TB diagnostic and treatment practices and increasing the quality and efficiency of government TB services are both potential solutions to this problem.

HIV infection has emerged as potent contributor to the TB epidemic in Asia, and TB remains the leading cause of death in HIV-infected patients (WHO, 2004a, b, 2008). HIV-infected patients with TB have a markedly increased risk of dying during TB treatment compared with those who are HIV-negative; the case fatality rate exceeds 25% in many parts of Asia, although this can be reduced substantially with anti-retroviral therapy (ART) (Mukadi *et al*, 2001; Akksilp *et al*, 2007; Cain *et al*, 2007; Trinh *et al*, 2007). Although multiple studies have evaluated the health seeking behavior of TB patients and the private sector, few similar studies have been conducted among HIV-infected TB patients. Such studies are important, because seeking care outside the public sector may be associated with diagnostic delay, and diagnostic delay is thought to be one factor contributing to the high mortality of HIV-associated TB (Lawn *et al*, 1997; WHO, 2006). Social and health system factors that have been postulated to increase diagnostic delay include disease-related stigma, availability of public health services, cost of health services, ability of providers to make a correct diagnosis and provide treatment, and a preference for private practitioners (Ngamvithayapong *et al*, 2000; Thomas, 2002; Bates *et al*, 2004).

Thailand has a severe TB-HIV syndemic (two diseases acting synergistically to produce excess morbidity; Freudenberg *et al*, 2006). An estimated 600,000 people are living with HIV/AIDS and 90,000 TB patients are diagnosed annually; 15-20% of all TB cases are HIV-associated and the case-fatality rate of HIV-associated TB is high (Akksilp *et al*, 2007; UNAIDS, 2007; Nateniyom *et al*, 2008; WHO, 2008). In one survey conducted in multiple provinces, private providers diagnosed approximately 10% of all TB cases, although they were less likely to treat HIV-infected TB patients (Varma *et al*, 2007). Despite the magnitude of this challenge in Thailand, no previous studies have evaluated health-seeking practices among a large cohort of HIV-infected TB patients. We conducted a study to measure the frequency and predictors of seeking TB diagnosis in the private sector among HIV-infected TB patients in Thailand. We also evaluated whether seeking care in the private sector was associated with diagnostic delay.

MATERIALS AND METHODS

Study population

We enrolled HIV-infected TB patients from 32 public TB treatment facilities in Bangkok, Phuket, and Ubon Ratchathani provinces and from the national infectious diseases referral hospital (Bamrasnaradura Infectious Diseases Institute) in Nonthaburi Province. The study population included adults aged ≥18 years with documented HIV infection who were diagnosed with active TB disease according to national TB program guidelines, registered for TB treatment at one of the participating facilities, and who had been receiving anti-TB therapy for <4 weeks before study enrollment. We excluded prisoners and pregnant women.

Study procedures and ethical considerations

At the beginning of TB treatment, patients who provided written informed consent underwent a physical examination and answered questions about where they sought care after illness onset, demographic characteristics, past and present medical histories, knowledge, and attitudes related to TB and HIV, and sex and drug use history. Interviews were conducted by trained nurses and lasted approximately 20-30 minutes. The

questionnaire only employed closed-ended questions. For this study, patients received usual care for TB, HIV, and other diseases, and no health-related interventions were performed. This study was approved by the ethical review committees of the Bangkok Metropolitan Administration (Ref No. na, 2005 Jan 22), the US Centers for Disease Control and Prevention (Ref No. 4479, 2005 Jan 25) and the Thai Ministry of Public Health (Ref No. 35/2005, 2005 Mar 31).

Study definitions

We classified patients as having delayed TB diagnosis if they reported having a cough lasting greater than 28 days before TB diagnosis or reported having other symptoms that lasted longer than 14 days and self-assessed these symptoms as being severe. We used 28 days as the cutoff for duration of cough, because this was twice the duration of cough that international guidelines use to define a "TB suspect" (>14 days; WHO, 2004a).

We measured TB stigma using four questions. An answer consistent with TB stigma was scored with one point. An answer not consistent with stigma or a missing response was scored as zero points. A total stigma score (range 0-4) was created by summing the scores for all questions; the higher the score, the greater the degree of TB stigma. We measured TB knowledge using seven questions that were derived from information routinely provided to patients as part of the national TB program. We measured HIV knowledge using five questions. These questions were recommended by the Joint United Nation's Program on HIV/AIDS (UNAIDS) for monitoring a community's knowledge about HIV transmission and preventive health behaviors (UNAIDS, 2002). For both TB and HIV knowledge, a correct response was scored with one point, and incorrect or missing responses were scored as zero points. A total TB knowledge score (range, 0-7) and a total HIV knowledge score (range, 0-5) were created by summing the scores for the respective questions; the higher the score, the greater the patient's TB or HIV knowledge. Knowledge and stigma scores equal to or greater than the median score of study population were considered high.

A wealth index was created using principal components analysis of items that patients reported having in their household and years of education. Principal components analysis is a statistically validated procedure used to create a single, numeric, composite variable that represents a large number of variables linked by a common theme (Pearson, 1901; Daffertshofer *et al*, 2004). The first component explained 71% of the total variance. Patients were defined as not wealthy if their index was in the 4^{th} or 5^{th} quintile of the study population.

Statistical analysis

We calculated proportions (for categorical variables) and medians (for continuous variables) to describe where patients sought health care and preferences for different providers. To identify factors associated with TB diagnostic delay, seeking healthcare first at a pharmacy, and seeking healthcare first at a private provider, we first determined factors associated with each outcome variable at $p \leq 0.20$ in bivariable analysis, tested them for co-linearity, and then constructed multivariable logistic regression models. Two-way interaction terms were generated as products of covariates and entered in the models. For each multivariable analysis, we fitted two models: a parsimonious model using backward stepwise variable selection and a full model. We assessed model fitness using the Hosmer-Lemeshow goodness-of-fit test. For all analyses, findings from both models were similar, and we chose to report adjusted odds ratios (aOR) and 95% confidence intervals (CI) from the full model. We

defined a two-sided *p*-value of ≤ 0.05 as statistical significance. All analyses were performed with Stata® software (version 8.0; StataCorp LP, USA).

RESULTS

Enrollment and characteristics of patients

From May 2005 to September 2006, 1,096 HIV-infected TB patients were eligible for the study; of these, 849 (77%) enrolled. Reasons for not enrolling were refusal (124; 50%), death before enrollment (21; 8%), visiting during non-operational hours or after completion of enrollment (84; 34%), self-reported to be too ill (14; 6%), and communication problems (4; 2%). After excluding 80 patients who subsequently were diagnosed as not having TB and 13 patients who had missing data about their choice of medical provider, we analyzed data for 756 patients. Table 1 summarizes characteristics of patients enrolled in the study. The median age was 34 years (interquartile [IQR], 30-40), and 528 (70%) were male. Sixty percent were diagnosed with pulmonary TB. Nearly 70% knew that they were HIV-infected before they were diagnosed with TB, and over 80% of patients with available CD4 count result had a CD4 count <200 cells/μl. The median scores for TB stigma, TB knowledge, and HIV knowledge were 1 (IQR, 0-2), 5 (IQR, 5-6), and 5 (IQR, 4-5), respectively.

Health seeking behavior

Of the 756 patients, 576 (76%) reported first seeking care at a public healthcare facility. The remainder first sought care at a private provider (97; 13%) or a pharmacy (83; 11%). Of the 97 patients that sought care at a private provider, 5 (5%) visited a traditional healer. Characteristics of patients stratified by the first facility visited are shown in Table 1. To arrive at the public facility where they eventually began TB treatment, patients reported traveling a median of 30 minutes (IQR, 20-60) and spending a median of USD 1.60 (2008 equivalent; IQR, 0.6-3.4).

In multivariable analysis, the only factor independently associated with seeking care at a private provider, rather than a public provider, was having a high TB stigma score (Table 2). Of 97 patients that sought care at a private provider, 73 (75%) had a high TB stigma score compared with 357 (62%) of 576 patients that sought care at a public provider (aOR, 2.1; CI 1.2-3.6). Factors independently associated with seeking care at a pharmacy rather than a public provider (Table 3) included living in Bangkok (aOR, 4.1; CI 1.7-9.9), ever using a sleeping pill (aOR, 2.2; CI 1.0-4.6), never previously treated for TB (aOR, 3.2; CI 1.0-9.7), not believing that a person with TB can be cured (aOR, 4.4; CI 1.5-13.1), and not knowing that care for TB can be provided close to home (aOR, 4.1; CI 1.4-12.1).

We surveyed patients about their preferences for seeking medical care (Table 4). Most reported that they preferred to seek care at a public hospital (513; 68%) or a public health center/clinic (124; 16%), assuming that fees for clinical services and medications were equal across all facilities. Patients reported that the most influential factors in choosing a medical provider were confidentiality (468; 62%), availability of medicine (436; 58%), and cost of medicine (386; 51%).

Delays in TB diagnosis

A delay in TB diagnosis occurred in 364 (48%) cases. Of these, 252 (69%) met the definition of delayed diagnosis because they had cough lasting more than 28 days. Patients reported the duration of illness for cough, fever, diarrhea, and any other symptoms that they felt were severe. The median number of days between symptom onset and TB diagnosis was 45 days for cough (IQR, 11-45), 11 for fever (IQR, 6-45), 6 for diarrhea (IQR, 4-45), and 15 for any other

Table 1
Characteristics of patients, stratified by choice of medical provider.

Characteristics and clinical features	All patients (*n* = 756) *n* (%)	Place treatment first sought: Pharmacy (*n* = 83) *n* (%)	Private provider (*n* = 97) *n* (%)	Public provider (*n* = 576) *n* (%)
Characteristics				
Age >34 years	373 (49)	42 (51)	46 (47)	285 (49)
Male	528 (70)	58 (70)	67 (69)	403 (70)
Employed	443 (59)	42 (51)	52 (54)	349 (61)
Site registered for TB treatment				
Bangkok	175 (23)	38 (46)	20 (21)	117 (20)
National infectious diseases hospital	225 (30)	19 (23)	39 (40)	167 (29)
Ubon Ratchathani	247 (33)	14 (17)	23 (24)	210 (36)
Phuket	109 (14)	12 (14)	15 (15)	82 (14)
Disease classification				
Pulmonary TB	452 (60)	52 (63)	59 (61)	341 (59)
Smear positive	276 (61)	27 (52)	33 (56)	216 (63)
Extra-pulmonary TB	149 (20)	20 (24)	30 (31)	99 (17)
Both	77 (10)	11 (13)	8 (8)	58 (10)
Finished primary school	298 (39)	30 (36)	45 (46)	223 (39)
Single	234 (31)	27 (33)	31 (32)	176 (31)
Registered as new case	654 (87)	76 (92)	84 (87)	494 (86)
Hospitalized at enrollment	202 (27)	14 (17)	33 (34)	155 (27)
Wealthy	293 (39)	29 (35)	44 (45)	220 (38)
Household has a refrigerator	576 (76)	55 (66)	81 (84)	440 (76)
Household has a motorcycle	461 (61)	42 (51)	60 (62)	359 (62)
Household has a car	184 (24)	10 (12)	29 (30)	145 (25)
Delay in TB diagnosis	364 (48)	46 (55)	46 (47)	272 (47)
Knew someone with TB	278 (37)	35 (42)	31 (32)	212 (37)
Drug use and incarceration history				
Ever injected drug	195 (26)	24 (29)	21 (22)	150 (26)
Ever drank alcohol	531 (70)	66 (80)	63 (65)	402 (70)
Ever used methamphetamine	296 (39)	38 (46)	34 (35)	224 (39)
Ever used sleeping pill	135 (18)	26 (31)	23 (24)	86 (15)
Currently smoke	204 (27)	29 (35)	24 (25)	151 (26)
Ever been in jail	296 (39)	38 (46)	33 (34)	225 (39)
Ever been in prison	212 (28)	31 (37)	28 (29)	153 (27)
Took antibiotics in past 4 weeks	249 (33)	34 (41)	36 (37)	179 (31)
Knowledge, attitude, and beliefs				
High TB stigma	492 (65)	62 (75)	73 (75)	357 (62)
Answered incorrectly on question "a person with TB can be cured"	31 (4)	6 (7)	3 (3)	22 (4)
Answered incorrectly on question "someone who has TB always has HIV/AIDS"	109 (14)	6 (7)	16 (16)	87 (15)
Answered incorrectly on question "you can die from TB if you do not take your drugs regularly"	69 (9)	3 (4)	13 (13)	53 (9)
Answered incorrectly on question "TB treatment usually takes at least one year"	313 (41)	27 (33)	40 (41)	246 (43)

Table 1 (Continued).

Characteristics and clinical features	All patients (*n* = 756) *n* (%)	Place treatment first sought: Pharmacy (*n* = 83) *n* (%)	Private provider (*n* = 97) *n* (%)	Public provider (*n* = 576) *n* (%)
Answered incorrectly on question "you should keep taking your medicine if you develop severe nausea, severe vomiting, or a skin rash during TB treatment"	313 (41)	27 (33)	40 (41)	246 (43)
Answered incorrectly on question "you should stop taking TB drugs as soon as you feel better"	101 (13)	13 (16)	16 (16)	72 (12)
Answered incorrectly on question "you can continue your TB treatment even if you transfer to another hospital closer to your home"	49 (6)	9 (11)	6 (6)	34 (6)
History of present illness				
Cough	547 (72)	65 (78)	73 (75)	409 (71)
Cough more than 2 weeks	324 (59)	37 (57)	41 (56)	246 (60)
Fever	600 (79)	66 (80)	85 (88)	449 (78)
Diarrhea	193 (26)	20 (24)	29 (30)	144 (25)
Self-reported weight loss	604 (80)	64 (77)	82 (85)	458 (80)
Hemoptysis	75 (10)	12 (14)	1 (1)	62 (11)
Difficulty breathing	327 (43)	37 (45)	41 (42)	249 (43)
Diagnosed with HIV before TB diagnosis	505 (67)	40 (48)	70 (72)	395 (69)
Laboratory studies				
CD4 count at enrollment <200 cells/μl[a]	599 (81)	68 (83)	82 (86)	449 (80)
HIV viral load at enrollment ≥50,000 copies/ml[a]	66 (76)	6 (75)	10 (77)	50 (76)
HBsAg reactive	69 (9)	10 (12)	7 (7)	52 (9)
Anti-HCV reactive	235 (31)	36 (43)	34 (35)	165 (29)
HBsAg and anti-HCV reactive	26 (3)	4 (5)	6 (6)	16 (3)
Abnormal chest x-ray[a]	541 (80)	62 (83)	65 (78)	414 (89)
Physical examination				
Body mass index <18.5	435 (58)	51 (61)	53 (55)	331 (57)
Bacille Calmette-Guérin scar present	510 (67)	54 (65)	68 (70)	388 (67)
Treatment outcomes				
Cure/completed	487 (64)	54 (65)	60 (62)	373 (65)
Failed	6 (1)	0 (0)	1 (1)	5 (1)
Defaulted	60 (8)	9 (11)	4 (4)	47 (8)
Died	131 (17)	14 (17)	22 (23)	95 (16)
Transferred out	48 (6)	6 (7)	10 (10)	32 (6)
Other/unknown/missing	5 (1)	0 (0)	0 (0)	5 (1)
Days between onset and medical attention sought[b]	Median (IQR)	Median (IQR)	Median (IQR)	Median (IQR)
Cough	45 (11-45)	25 (5-45)	11 (6-45)	11 (6-45)
Fever	11 (6-45)	25 (5-45)	11 (6-45)	11 (6-45)
Diarrhea	6 (4-45)	6 (4-11)	6 (4-16)	6 (4-45)
Other symptoms	15 (7-30)	14 (7-30)	20 (10-30)	15 (7-30)

TB, tuberculosis; HIV, human immunodeficiency virus; HBsAg, hepatitis B surface antigen; HCV, hepatitis C virus; IQR, interquartile range

[a]Among those with available results

[b]Among those with certain symptoms before TB diagnosis

Table 2
Predictors of seeking TB treatment at private rather than public provider by HIV-infected TB patients.[a]

	OR	95% CI		*p*	AOR	95% CI		*p*
		Lower	Upper			Lower	Upper	
Wealthy[b]	1.34	0.86	2.09	0.20	1.02	0.61	1.69	0.95
Living in Ubon Ratchathani Province	0.55	0.33	0.91	0.02	0.60	0.32	1.13	0.11
High TB stigma	1.84	1.12	3.04	0.02	2.05	1.17	3.62	0.01
Low HIV knowledge	1.43	0.92	2.23	0.11	1.45	0.88	2.39	0.14
Ever used ecstasy	2.09	0.87	5.05	0.10	2.47	0.90	6.78	0.08
Ever used sleeping pill	1.70	0.99	2.92	0.05	1.35	0.69	2.62	0.38
HBsAg reactive	1.38	0.86	2.21	0.18	1.02	0.59	1.79	0.94
Anti-HCV reactive	0.85	0.37	1.94	0.70	0.57	0.21	1.50	0.25
Answered incorrectly on question “you can die from TB if you do not take your drugs regularly”	0.63	0.33	1.22	0.17	0.69	0.33	1.44	0.32
Answered incorrectly on question “TB treatment usually takes at least one year”	1.49	0.91	2.44	0.11	1.56	0.90	2.68	0.11

TB, tuberculosis; HIV, human immunodeficiency virus; HBsAg, hepatitis B surface antigen; HCV, hepatitis C virus; OR, odds ratio; AOR: adjusted odds ratio; CI, confidence interval.

[a]585 (87%) of potentially 673 patients with available data on all variables listed in the table were included in multivariable analysis.

[b]Wealth index score in 4th or 5th quintile. Wealth index score was calculated using principal components analysis; variables included were years of education, employment, literacy, number of person per room in household, location of household in relation to healthcare, hospital and public transportation, and availability of amenities in household (safe drinking water source, electricity, radio, TV, refrigerator, telephone, motorcycle, and car).

Table 3
Predictors of seeking TB treatment at a pharmacy rather than a public provider by HIV-infected TB patients.[a]

	OR	95% CI		*p*	AOR	95% CI		*p*
		Lower	Upper			Lower	Upper	
Living in Bangkok	3.31	2.06	5.34	0.00	4.11	1.70	9.93	<0.01
Hospitalized at enrollment	0.55	0.30	1.01	0.05	0.80	0.33	1.93	0.61
High TB stigma	1.81	1.07	3.05	0.03	1.87	0.94	3.72	0.07
Currently smoke	1.51	0.93	2.46	0.10	1.57	0.79	3.10	0.19
Ever drank alcohol	1.68	0.96	2.95	0.07	1.25	0.62	2.53	0.53
Ever used sleeping pill	2.63	1.57	4.42	0.00	2.15	1.00	4.59	0.05
Ever been in prison	1.64	1.02	2.66	0.04	0.93	0.41	2.08	0.86
Anti-HCV reactive	1.89	1.18	3.04	0.01	1.01	0.42	2.45	0.98
Men who have sex with men risk group	1.39	0.87	2.21	0.16	1.39	0.45	4.29	0.57
Injection drug users risk group	1.80	0.80	4.05	0.15	0.58	0.22	1.53	0.27
Blood procedure risk group	0.90	0.56	1.47	0.69	1.61	0.50	5.12	0.42
Delay in TB diagnosis	1.96	0.77	5.00	0.16	1.16	0.64	2.10	0.63
Registered as new case	0.46	0.19	1.09	0.08	3.17	1.03	9.74	0.04
Wealthy[b]	0.35	0.11	1.16	0.09	0.85	0.45	1.62	0.63
Answered incorrectly on question "a person with TB can be cured"	0.68	0.41	1.12	0.13	4.41	1.48	13.14	0.01
Answered incorrectly on question "someone who has TB always has HIV/AIDS"	1.96	0.90	4.27	0.09	0.41	0.16	1.07	0.07
Answered incorrectly on question "you can die from TB if you do not take your drugs regularly"	1.89	1.18	3.04	0.01	0.34	0.07	1.68	0.19
Answered incorrectly on question "you should keep taking your medicines if you develop severe nausea, severe, vomiting, or a skin rash during TB treatment"	1.39	0.87	2.21	0.16	1.05	0.55	2.01	0.88
Answered incorrectly on question "you can continue your TB treatment even if you transfer to another hospital closer to your home"	1.80	0.80	4.05	0.15	4.12	1.40	12.11	0.01

TB, tuberculosis; HIV, human immunodeficiency virus, HCV, hepatitis C virus; OR, odds ratio; AOR, adjusted odds ratio; CI, confidence interval
[a]499 (76%) of potentially 659 patients with available data on all variables listed in the table were included in multivariable analysis.
[b]Wealth index score in 4th or 5th quintile. Wealth index score was calculated using principal components analysis; variables included were years of education, employment, literacy, number of person per room in household, location of household in relation to healthcare, hospital and public transportation, and availability of amenities in household (safe drinking water source, electricity, radio, TV, refrigerator, telephone, motorcycle, and car).

Table 4
Preferences for health facilities among 756 HIV-infected TB patients.

	N	%
Place sought TB/HIV treatment when first became sick		
This public provider	342	45.2
Other public provider	233	30.8
Private provider	92	12.2
Pharmacy	84	11.1
Traditional healer	5	0.7
Preferred medical provider if fees were equal		
Public hospital	513	67.9
Private hospital	103	13.6
Public health center	124	16.4
Private clinic	11	1.4
Dispensary	2	0.3
Traditional or faith healer	0	0.0
Other (depends on quality of provider)	2	0.3
No answer	1	0.1
Most influential factor in choosing medical provider[a]		
Confidentiality	468	61.9
Availability of medicine	436	57.7
Cost of medicine	386	51.1
Cost of transportation	298	39.4
Waiting time at the facility	286	37.8
Distance	277	36.6
Past experience with provider	257	34.0
Ability to negotiate price	189	25.0
Cost of consultation	167	22.1

TB: tuberculosis; HIV: human immunodeficiency virus
[a]Not mutually exclusive

symptoms (IQR, 7-30). In multivariable analysis, factors independently associated with delayed TB diagnosis included taking antibiotics in the four weeks before TB diagnosis (aOR, 1.5; CI 1.0-2.2) and having a history of incarceration (aOR, 2.0; CI 1.1-3.5).

DISCUSSION

We found that approximately one quarter of HIV-infected patients first sought care for TB at somewhere other than a government facility, and that knowledge and stigma, rather than the availability of health services or individual socio-economic indices, were factors strongly associated with not seeking care promptly at a government facility.

A notable finding of our study was that wealth and demographic characteristics (age, gender, employment, education, etc) did not predict utilization of non-government health facilities. In 2001, Thailand adopted a universal health care system that greatly reduced user fees and resulted in dramatic increases in healthcare utilization across the country (Limwattananon *et al*, 2007). Our study provides reassurance that

the government healthcare system in Thailand provides HIV-infected patients with facilities that are relatively convenient (median travel time was 30 minutes) and in which they have strong confidence (>75% prefer to go to a public healthcare facility). Moreover, the costs of medicine and transportation were only the third and fourth most influential factors in patients' choice of care. Patients' two biggest concerns were confidentiality and availability of medicine. Government health facilities in Thailand may be able to increase utilization of TB services by HIV-infected patients by educating the community about how confidentiality is assured and which medical disorders can be treated without referral to another facility. In fact, a recent national law in Thailand specifically enjoins health facilities to protect the confidentiality of individual medical records (National Health Act, 2007).

Stigma of TB was a major predictor of who sought care at a private practitioner first. We hypothesized that patients who worried about the social stigma of TB sought care in the private sector first, because they perceived private providers to be more accepting or more confidential. Factors that attach stigma to TB and HIV include that both diseases produce severe illness, can be transmitted to others, and occur more frequently in populations perceived to be different or deviant (Bond and Nyblade, 2006; Ngamvithayapong *et al*, 2000). Stigma because of either disease can lead to isolation from friends and family, loss of employment, exclusion from community activities, and fear of seeking out medical care (Khan *et al*, 2000; Long *et al*, 2001; Macq *et al*, 2006; Baral *et al*, 2007; Daftary *et al*, 2007). The association between stigma and healthcare seeking in the private sector further emphasizes the need for government health facilities to educate the public about how they protect the confidentiality of patients' TB and HIV status. In contrast, knowledge deficits about TB were the primary predictors of who sought care at a pharmacy. Seeking care at a pharmacy was associated with receiving antibiotics, and receiving antibiotics was associated with TB diagnostic delay. Efforts at community-wide education, particularly those focused on the fact that TB treatment is available at all health facilities and that TB can be cured, could help promote utilization of TB diagnostic services.

Our study was subject to important limitations. First, we only collected data from patients diagnosed through the public sector. Preferences about medical providers and factors affecting health seeking could have been different if HIV-infected TB patients who exclusively sought care in the private sector were included in this study. Second, we did not record dates when patients interacted with the health system before TB diagnosis; therefore, we could only calculate the period between symptom onset and TB diagnosis, but could not measure what component of delay was attributable to the patient not seeking care or to public or private providers not diagnosing TB. Finally, no "gold standards" exist for measuring TB stigma and TB knowledge. Because this analysis was embedded within a larger study, we used a standardized approach, involving quantitative analysis of a small number of questions. One recent study in Thailand developed a standardized set of questions and scoring system for quantifying TB and HIV stigma among TB patients (Van Rie *et al*, 2008). A more complete assessment of stigma and knowledge in our study population would require use of such standardized, quantitative instruments or of extensive patient interviews and qualitative analysis.

In conclusion, further research is needed to evaluate whether educating the community about the confidentiality of government

health services, the widespread availability of TB services at government health facilities, and the success of curing TB can help promote utilization of public TB treatment services by HIV-infected patients in Thailand.

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