

Prevalence of respiratory symptoms and cases suspicious for tuberculosis among public health clinic patients in Afghanistan, 2005–2006: Perspectives on recognition and referral of tuberculosis cases

Yolanda Barberá Lainez¹, Catherine S. Todd², Ahmadullah Ahmadzai¹, Shannon C. Doocy³ and Gilbert Burnham³

¹ International Rescue Committee, Kabul, Afghanistan

² Division of International Health & Cross-Cultural Medicine, University of California San Diego, La Jolla CA, USA

³ Department of International Health, Johns Hopkins Bloomberg School of Public Health, Baltimore MD, USA

Summary

OBJECTIVES To assess diagnosis and management of suspected pulmonary tuberculosis (TB) among patients with respiratory complaints attending Comprehensive Health Centers (CHCs) in Afghanistan. **METHODS** Consecutive consenting patients presenting with respiratory complaints at 24 health centres in eight provinces were enrolled between November 2005 and February 2006. Demographics, health histories, clinic provider and study representative exam findings and diagnoses, and diagnostic test results were recorded. Correlates of TB-suggestive symptoms (defined as cough >2 weeks and/or haemoptysis) were assessed by logistic regression.

RESULTS There were 1401 participants; 24.6% ($n = 345$) were children (age 17 or under). The TB-suggestive symptoms of cough >2 weeks and/or haemoptysis were reported by 407 (31.3%) and 44 (3.3%), respectively, with 39 participants reporting both symptoms. Of 413 participants reporting TB-suggestive symptoms, only 178 (43%) were diagnosed as having suspected TB; 22.0% received no clinical diagnosis. Suspected TB was significantly associated with having a household member residing in a refugee camp within the last 2 years (OR = 6.0; 95% CI: 4.1–8.7), seven or more people sleeping in the same room (OR = 1.9; 95% CI: 1.4–2.6) and cooking with a wood fire in the sleeping room (OR = 1.6; 95% CI: 1.2–2.2) in univariate analysis.

CONCLUSIONS Diagnostic sensitivity by the health worker for possible cases of pulmonary TB was low, as 22% of persons with suspected tuberculosis received no diagnosis. Further, some common/chronic respiratory ailments were under-diagnosed. There is great need for improved practical training and continuing education in pulmonary disease diagnosis for clinical health workers.

keywords Afghanistan, tuberculosis, respiratory symptoms, cough, sputum smear accuracy

Introduction

Globally, respiratory disease accounts for 19% of deaths, many avoidable through risk behaviour reduction and prompt diagnosis and treatment (WHO 2000). Among nine developing countries surveyed, respiratory problems comprised 18% of presenting complaints in primary health clinics (WHO 2004). Most reflect acute respiratory infections, responsible for 25% of infectious disease deaths in developing settings (Scherpbier *et al.* 1998). Pulmonary tuberculosis (TB) is the leading cause of infectious disease mortality globally, with 80% of cases concentrated in 22

low-income countries (Corbett *et al.* 2003, World Health Organization 2004).

Diagnosis of pulmonary TB is a multi-step process, requiring clinical acumen and diagnostic procedures. Criteria for TB-suggestive cases (productive cough >2 weeks and/or haemoptysis) may be non-specific and result in diagnostic delay by either providers or patients in initiating appropriate investigations (Ward *et al.* 2004). Among patients diagnosed with pulmonary TB, mean diagnostic delay after presentation to a clinic ranged from 20 to 120 days, despite 38.3–61.1% of patients seeking initial care from a clinic (Wandwalo & Morkve 2000;

Y. B. Lainez *et al.* Prevalence of respiratory symptoms in Afghanistan

Ouedraogo *et al.* 2006). Most patients presented with symptoms suspicious for TB; thus, lack of diagnostic sensitivity of health workers is of concern (Wandwalo & Morkve 2000).

Afghanistan has the highest TB burden in south Asia (World Health Organization 2007). While health services are expanding and quality improving, gaps in access and deficient quality of some interventions persist. The Ministry of Public Health adopted a Basic Package of Health Services (BPHS) in 2003, which provides standard primary care services for districts covering 77% of the population. However, inequitable service distribution and difficulty motivating access to services make care provision challenging (Waldman *et al.* 2006). Health data from 2006 indicate that respiratory complaints comprised 60.0% of all visits, with 96 076 suspected pulmonary TB cases (based on clinician diagnosis) reported (Ministry of Public Health 2006). Current estimates indicate case detection rates of 54.6% (World Health Organization 2007). There are no data on management of persons with TB-suggestive symptoms presenting to outpatient facilities.

This study assessed prevalence of respiratory symptoms among Comprehensive Health Centre (CHC) attendees, appropriateness of health worker evaluation, TB prevalence among participants having acid-fast bacilli (AFB) smear, and accuracy of health facility AFB microscopy. The information obtained will inform provider training efforts in pulmonary assessment and treatment.

Methods

This assessment was conducted through three comprehensive health centres (CHCs) in the eight provinces (Bamiyan, Hirat, Jawzjan, Kandahar, Kapisa, Khost, Kunduz and Wardak) included in an accompanying survey to permit comparability between tuberculin skin test results and service availability from November 2005 to February 2006 (Doocy *et al.* 2008). CHCs were chosen by prior reported TB cases (indicating presence of diagnostic capacity) and highest mean patient volumes/province for the five previous quarters (HMIS 2006). Eligible participants were patients aged ≥ 5 years with respiratory symptoms able to provide consent or assent (for children 7–17 years).

Sample size was based on the finding of 20% prevalence of respiratory symptoms among patients over 5 years of age (World Health Organization 2004) and attendance for the 24 clinics; a sample size of 1500 patients was sufficient to detect at least 11% difference in any variable between suspected TB cases and those with other respiratory symptoms (power = 80, two-sided alpha = 0.05).

The study was approved by the Ethical Review Board of the Ministry of Public Health, Afghanistan, and the

Institutional Review Boards of the Johns Hopkins Bloomberg School of Public Health and the University of California, San Diego.

Two male–female respiratory survey teams of medical professionals completed competency-based training in Kabul with observed questionnaire administration and examinations at the National Tuberculosis Institute.

A study team went to each clinic for 6 days of enrolment. Participants completed an interview and clinical examination with a representative of the same sex. Study teams recorded medical history, current symptoms, examination findings and clinic staff findings. Study interviews and examinations were separate from consultations with the clinic staff, who managed the patient in the standard fashion for that facility. The survey team could discuss their findings with the clinic staff, but did not prescribe treatment.

For TB-suggestive symptoms (productive cough > 2 weeks or reported haemoptysis), unique identifiers were recorded and the participant followed for sputum sampling. Suspected cases had sputum smears taken by clinic staff daily for 3 days. Three sets were prepared: one for testing at the clinic facility laboratory, one for staining and interpretation by the Kabul-based reference laboratory (German Medical Services, *Darwaze Labori*, Kabul), and the last for cases of loss/breakage. At the time of the study, there was no national reference laboratory for sputum–smear reading; we used the German Medical Services laboratory in Kabul, whose experience as a tuberculosis diagnosis and treatment site has spanned three decades. For those providing sputum samples, unique identifiers were assigned and kept with clinic identifiers. Comparisons between clinic and reference laboratory AFB results were made. Reference laboratory results diverging from local readings were reported to the clinic of origin and local National Tuberculosis Program (NTP) representative.

Analysis was performed using STATA version 8.0 (Stata Corp, College Station, TX), and SPSS Version 14.0 (SPSS Inc., Chicago, IL) using standard statistical tests for comparison of means and proportions. Predictors of TB symptoms and diagnoses were analysed using chi-squared (dichotomous predictors) and univariate logistic regression models (continuous predictors) and agreement between clinic and study personnel assessed using the Kappa statistic.

Results

Respiratory symptoms were the presenting complaint for 11.7 to 52.1% (mean 27.4% of 32 878) of total patients presenting to the two to three clinics from each included province during the entire study period. This

Y. B. Lainez *et al.* Prevalence of respiratory symptoms in Afghanistan

percentage was highly variable within some provinces, particularly Kandahar (11.7%, 152/1300 to 41.7%, 860/2062) and Khost (24.0%, 368/1525 to 52.1%, 730/1401).

Study participant ($n = 1401$) demographic characteristics are described in Table 1. Nearly one-fourth (24.6%) were children (age 17 or under) and many were female, ranging from 45.4% (69/152) in Khost to 76.7% (132/172) in Kunduz.

Participants were asked about risk factors for/exposures to TB; 51.7% ($n = 724/1401$) slept in a room with a wood cooking fire, 14.6% ($n = 204/1401$) were smokers, and 11.7% ($n = 164/1401$) had a household member who lived in a refugee camp in the last 2 years. Few reported having either a household member with TB ($n = 23$) or who had been incarcerated ($n = 19$). Cigarette smoking was reported by males (22%; 114/519) more than females (10%; 88/879) ($P < 0.001$). Participants reported a mean number of 5.9 people sleeping in one room (range: 1–13).

Few (4.6%, $n = 65/1401$) participants reported three or more respiratory ailments in the last year or daily symptoms (0.9–3.1%, $n = 13–48/1401$), such as cough or wheezing. Of those reporting one or more episodes of 'chest problems' (inclusive of cough, sputum production, wheezing and shortness of breath) in the last year ($n = 414$), duration of the worst episode lasted <1 day in 2.9% ($n = 12$), 1–2 days in 57.3% ($n = 238$), 3–7 days in 19.2% ($n = 80$), and >7 days in 20.6% ($n = 85$). Few (1.4%, $n = 20/1401$) participants reported previous TB diagnosis, with none reporting previous diagnosis in three provinces (Kapisa, Khost and Wardak).

Most patients presented with cough and fever; chest pain and wheezing were also frequently reported (Table 2).

Table 1 Descriptive statistics of survey population ($n = 1401$)

	<i>n</i>	Point estimate	95% CI
Sex	(1398)		
Male	519	37.1%	34.6–39.7
Female	879	62.9%	60.3–65.4
Mean age (SD)	1395	29.1 (16.1)	28.3–30.0
Province	1401		
Bamiyan	219	15.6%	13.8–17.6
Herat	157	11.2%	9.6–13.0
Jazjawan	141	10.1%	8.5–11.8
Kandahar	202	14.4%	12.6–16.4
Kapisa	155	11.1%	9.5–12.8
Khost	152	10.8%	9.3–12.6
Kunduz	172	12.3%	10.6–14.1
Wardak	203	14.5%	12.7–16.4
Lived abroad—past 5 years	179	13.0%	11.2–14.8

Cough >2 weeks was reported by 31.3% ($n = 407/1300$) and haemoptysis by 3.3% ($n = 44/1333$). Nearly half of all participants (43.6%, $n = 611/1401$) reported no limitation of daily activities due to symptoms, while 34.8% ($n = 488/1401$) had moderate or severe limitations. Severe limitations ('stops me from doing most or all things') were more likely (87%, $n = 359/414$ vs. 26%, $n = 257/988$ OR = 27.9, 95% CI: 18.0–44.7) among suspected TB cases.

Most (71.6%, $n = 1003/1401$) participants had received previous treatment for the presenting ailment, either from a medical professional (94.0%, $n = 943/1003$) or a non-medical person or self-administered (6.0%, $n = 60/1003$). Nearly one-third (27.9%, $n = 391$) reported prior treatment for similar illnesses, with the majority (97.6%, $n = 381$) receiving antibiotics.

Duration was reported by 92% ($n = 1099/1195$) of patients reporting cough. Nearly one-third (31%, $n = 407/1195$) had a cough >2 weeks, significantly associated with cigarette smoking (OR = 3.1; 95% CI: 2.3–4.1), a household member living in a refugee camp within the last 2 years (OR = 3.2; 95% CI: 2.2–4.7), ≥ 7 persons sleeping in the same room (OR = 2.4; 95% CI: 1.8–3.0), and a wood cooking fire in the sleeping room (OR = 1.3; 95% CI: 1.0–1.7).

One-fourth had a normal examination, while nearly half had increased lobar breath sounds unilaterally or bilaterally (Table 3). Of patients with TB-suggestive symptoms (cough >2 weeks and/or haemoptysis), 42.5% ($n = 175/414$) had abnormal examination findings, most commonly bilateral (45.9%, $n = 81/175$) or unilateral lobar rales/crackles (23.8%, $n = 42/176$) or apical rales/crackles (15.2%, $n = 26/171$).

Most participants were diagnosed with upper or lower respiratory tract infection (Table 3). Only 14% ($n = 196/1401$) were diagnosed with suspected pulmonary TB by the clinicians, with excellent agreement between the study team and clinic staff ($\kappa = 0.97$, $P < 0.001$). There was less agreement for other diagnoses, though level of agreement remained high ($\kappa = 0.84$, $P < 0.001$). When characteristics of patients with TB-suggestive symptoms who received no diagnosis were compared with those receiving any diagnosis, there was no significant difference in sex or age. Suspected TB diagnosis varied significantly by province, ranging from 24% (Bamiyan, $n = 53/219$) to 65% (Jawzjan, $n = 92/141$, $P = 0.038$ for comparison of all provinces).

Participants reporting Bacillus Calmette-Guérin (BCG) vaccination (29% vs. 45%, OR = 0.50, 95% CI: 0.26–0.95) and smokers (26% vs. 49%, OR = 0.37, 95% CI: 0.22–0.61) were significantly less likely to receive any diagnosis for their respiratory complaint from the clinic providers. Those reporting prior TB, family members with

Table 2 Presenting complaints

	<i>n</i> /(total)	Point estimate	95 CI
Previous treatment of current illness			
By medical professional	824(1224)	67.3%	64.6–69.9
By non-medical person/self	60(1210)	4.3%	3.8–6.3
Patients reporting cough	1195(1399)	85.4%	83.4–87.2
Patients reporting chest pain	814(1367)	60.9%	58.2–63.5
Patients reporting stridor or noisy breathing	316(1392)	22.7%	20.5–25.0
Duration of stridor/noisy breathing (days)	301(316)	14	13–15
Occurrence of stridor/noisy breathing			
On exertion	90(307)	29.3%	N/A
At rest	71(307)	23.1%	
Any time	146(307)	47.6%	
Stridor is associated with wheezing	183(290)	63.1%	57.3–68.7
Patients reporting difficulty breathing	602(1387)	43.4%	40.7–46.0
Duration of difficulty breathing (days)	408(602)	57	42–72
Occurrence of difficulty breathing			
On exertion	157(601)	26.1%	N/A
At night	200(601)	33.3%	
When coughing	191(601)	31.8%	
Other times	145(601)	24.1%	
Difficulty is associated with rapid breathing	209	36.0%	32.1–40.1
Patients reporting shortness of breath	188(1395)	13.6%	11.8–15.5
Duration (days)	123(188)	359	308–410
Occurrence of shortness of breath			
On exertion	74(187)	39.6%	N/A
With every day activities	26(187)	13.9%	
At night	42(187)	22.5%	
With coughing	31(187)	16.6%	
Wheezing	424(614)	69.0%	28.6–33.5
Duration of wheezing (days)	405(614)	11	10–12
Occurrence of wheezing			
On exertion	114(415)	27.5%	N/A
At night	200(415)	48.2%	
In the morning	74(415)	17.8%	
Cold weather	61(415)	14.7%	
Other (including emotional excitement)	45(415)	10.8%	
Previous asthma diagnosis	79(1386)	5.7%	4.6–7.1
Patients reporting fever	1089(1389)	78.4%	14.2–18.2
Duration (days)	967(1389)	8	8–9
Accompanied by sweat	518(1068)	48.5%	45.5–51.6
Patients reporting weight loss	222 (1379)	16.1%	14.2–18.2

TB, or recent contact with TB cases were more likely to receive a diagnosis ($P < 0.001$). Suspected TB was associated with a household contact residing in a refugee camp within the last 2 years (OR = 6.0; 95% CI: 4.1–8.7) and ≥ 7 persons (OR = 1.9; 95% CI: 1.4–2.6) or a wood fire in the sleeping room (OR = 1.6; 95% CI: 1.2–2.2).

Of 199 patients classified with suspected pulmonary TB (some of whom did not report cough >2 weeks), 89% ($n = 177/199$) had sputum evaluation by either a local or reference laboratory and 76% ($n = 152/199$) had evalua-

tions by both laboratories. Most prepared slides were read as AFB-negative at both laboratories (88.0%, 403/458). All slides classified as negative by the reference laboratory were also read as negative by health facility laboratories, while, of 55 slides read as positive by the reference lab, 12 were classified as negative by the health facility laboratories. Reading agreement between laboratories was high ($\kappa = 0.76$).

Of the 19 AFB-positive patients, 53% were male and the mean age was 36 years (SD = 14). Cases originated from

Table 3 Results from clinical examinations

	<i>n</i>	Point estimate	95% CI
Survey team examination of lungs (1398)			
Clear to auscultation bilaterally	364/1398	26.0%	23.8–28.4
Increased bronchial breath sounds	186/1398	13.3%	11.6–15.2
Lobar rales/crackles, 1 side	375/1398	26.8%	24.5–29.2
Lobar rales/crackles bilaterally	302/1398	21.6%	19.5–23.9
Apical rales/crackles on 1 side	34/1398	2.4%	1.7–3.4
Apical rales/crackles bilaterally	67/1398	4.8%	3.6–5.9
Absent breath sounds, lobar, 1 side	5/1398	0.4%	0.1–0.8
Absent breath sounds lobar, bilaterally	2/1398	0.1%	0.0–0.5
Absent apical breath sounds, 1 side	1/1398	0.1%	0.0–0.4
Absent apical breaths sounds, bilaterally	0/1398	0	–
Dullness to percussion	8/1398	0.6%	0.2–1.1

Clinical classification	Clinic provider staff		Study representative	
	<i>n</i>	%	<i>n</i>	%
URI/sinusitis	377/1398	27.0%	319	22.8%
Acute bronchitis	408/1398	29.2%	366	26.1%
Chronic bronchitis/bronchiectasis	146/1398	10.4%	419	1.9%
Pneumonia	137/1398	9.8%	27	10.4%
Asthma	75/1398	5.4%	146	5.4%
Emphysema/COPD	54/1398	3.9%	76	2.9%
Probable pulmonary TB	196/1398	14.0%	197	14.1%
Other	7/1398	0.5%	8	0.6%

TB, tuberculosis; COPD, chronic obstructive pulmonary disease; URI, upper respiratory infection.

Jawzjan ($n = 7$), Kandahar ($n = 6$), Kapisa ($n = 4$), Kunduz ($n = 3$) and Hirat ($n = 1$). No smear positive individuals reported prior BCG vaccination.

Discussion

Tuberculosis-suggestive patients comprised 14% of participants, a higher percentage than for most of nine developing countries previously assessed (World Health Organization 2004). TB-suggestive cases were more likely to have significant activity limitations, symptoms unresponsive to prior antibiotics, a household contact residing in a refugee camp within the last 2 years, a greater number of people sleeping in one room, and a wood cooking fire in the sleeping room. Contacts with those previously or currently residing in confined/crowded areas and exposure to wood smoke are known risk factors for pulmonary disease (Scherpbier *et al.* 1998). Prior antibiotic use may represent lack of access to facilities, self-treatment because of economic reasons, or a failure of facilities to provide accurate diagnosis or prescribe correct treatment. Similarly, those with suspected TB may have waited until symptoms severely curtailed daily activity before accessing care, as reported in other settings (Ouedraogo *et al.* 2006).

First site for medical evaluation was not assessed; previous studies in Afghanistan indicate variable preferences for private or public facilities (Johns Hopkins University Third Party Survey 2005; Soeters *et al.* 2005). Health sector provider education on TB recognition and screening is and should continue to be prioritized in Afghanistan, similar to observations from other settings (Wandwalo & Morkve 2000; National Tuberculosis Control Program 2005). Though private sector providers were not evaluated, their number is increasing and should be included in National Tuberculosis Program continuing education endeavours.

Clinical classification of probable pulmonary TB and other respiratory conditions was similar between survey team and regular health facility personnel. There were also fairly high levels of correlation of prior or recent TB exposure with likelihood of diagnosis, indicating elicitation of reasonable patient history and risk factors. However, a substantial portion of participants with TB-suggestive symptoms not receiving any diagnosis, low rates of diagnosis of more common respiratory conditions, and lack of prior treatment for chronic conditions (e.g. asthma) are cause for concern. Prior clinical assessment for the presenting problem was not associated with greater

Y. B. Lainez *et al.* Prevalence of respiratory symptoms in Afghanistan

probability of receiving a diagnosis, indicating that prior care-seeking did not increase clinical suspicion. Providers in five provinces assigned no clinical diagnosis to >50% of TB-suggestive cases, indicating an urgent need for continuing education for diagnosis and recognition of this and other respiratory conditions. While annual risk of tuberculosis infection (ARTI) in Afghanistan is high, most patients with suggestive symptoms will not have TB, and the NTP should adopt a comprehensive approach to clinical training and community awareness. One model for such training is accessible through the Practical Approach to Lung Health strategy of WHO (Ottmani *et al.* 2005).

Only 86% of patients with clinically probable pulmonary TB had sputum smears. Study team presence may have increased both the number and care in preparation and examination of slides at the health facility laboratory. However, there has been a steady national trend towards increasing rates of TB diagnosis based on sputum smears. The larger CHCs probably represent the lowest level in the health system with laboratory capacity for AFB microscopy (World Health Organization 2007). Laboratory diagnostic quality at the health facilities was adequate for negative samples. However, only 87.0% ($n = 47/54$) of true positives (based on reference laboratory interpretation) were identified as positive by the health facility laboratory. This may represent a pattern throughout the country in the absence of a quality control system.

There are limitations that must be considered. First, each team spent only 1 week at each clinic and visits were in the winter, which would not account for seasonal variations in presenting complaint patterns. Next, as only eight provinces were assessed, the results cannot be considered representative of the country. However, the geographic and population density diversity in the selected provinces likely presents a reasonable overview. Last, the surveyed clinics were the largest and, therefore, most likely to have necessary resources for respiratory disease and TB evaluation. It is unlikely that clinics located in less populous regions have sputum smear capacity as many districts reporting TB cases did not actually have diagnostic capacity in that district (Erasmus 2006). Cases reported from that district were persons travelling to the provincial centre for diagnosis and treatment. With worse access to diagnostic capacities in certain districts and limited capacity of some patients to travel for health care, inaccessibility may contribute to under-diagnosis, particularly in provinces where travel is difficult.

Conclusions

This assessment suggests that some aspects of TB screening are being done well, but also indicates a number of gaps,

principally the lack of any diagnosis for 23.8% of patients with TB-suggestive symptoms. A laboratory quality assurance system and continuing education with a practical component for health providers should be considered as means to close these gaps. Accuracy of sputum smear-positive case detection has been improving in Afghanistan; we presume that clinical recognition of TB-suggestive cases will also improve (WHO 2007). A similar assessment should be repeated in several years to determine whether identified gaps have been addressed to ensure continued improvement of quality respiratory care.

Acknowledgments

We are grateful to Hayatullah Ahmadzai for assistance with implementing the study and disseminating its results, and generally to the National Tuberculosis Control Program, as well as Ministry of Public Health of the Islamic Republic of Afghanistan. We thank PacTec and United Nations Humanitarian Air Services for specimen and study material transport and the reference laboratory, German Medical Services, in Kabul. We thank Mr Jamshid Saberi and Mr Jamshid Ludine of the HMIS Department of Ministry of Public Health for provision of national health statistics and Dr Antonino Catanzaro at UCSD for helpful comments during manuscript preparation. Last, we thank the participants for their time and trust. This study was funded by the Global Fund to Fight HIV, Tuberculosis and Malaria.

References

- Corbett EL, Watt CJ, Walker N *et al.* (2003) The growing burden of tuberculosis: global trends and interactions with the HIV epidemic. *Archives of Internal Medicine* **163**, 1009–1021.
- Doocy SC, Todd CS, Lainez YB, Ahmadzai A & Burnham GM (2008) Population-based tuberculin skin testing and prevalence of tuberculosis infection in Afghanistan. *World Health and Population* **10**, 44–53.
- Erasmus P. (2006) *Rural Expansion of Afghanistan's Community Based Healthcare Program: Evaluation of the Refresher Training Program*. United States Agency for International Development, Kabul.
- HMIS Department (2006) *Healthcare Access Statistics: 1385*. Ministry of Public Health, Kabul.
- Johns Hopkins University Third Party Survey (2005) *Health Seeking Behavior, Health Expenditures, and Cost Sharing Practices in Afghanistan*. Johns Hopkins University Office, Kabul, Afghanistan.
- National Tuberculosis Control Program (2005) *Scaling-up DOTS in Post-conflict Afghanistan' National Strategic Plan for Tuberculosis Control: 2006 – 2010*. Ministry of Public Health, Kabul.

Y. B. Lainez *et al.* **Prevalence of respiratory symptoms in Afghanistan**

- Ottmani SE, Scherpbier R, Pio A *et al.* (2005) *Practical Approach to Lung Health. A Primary Health Care Strategy for the Integrated Management of Respiratory Conditions in People Five Years of Age and Over*. WHO, Geneva.
- Ouedraogo M, Kouanda S, Boncounou K *et al.* (2006) Treatment seeking behaviour of smear-positive tuberculosis patients diagnosed in Burkina Faso. *International Journal of Tuberculosis and Lung Disease* 10, 184–187.
- Scherpbier R, Hanson C & Raviglione M (1998) *Report: Adult Lung Health Initiative – Basis for the Development of Algorithms for Assessment, Classification, and Treatment of Respiratory Illness in School-Age Children, Youths, and Adults in Developing Countries – Recommendations of the Consultation, Geneva 4–15 May, 1998*. WHO, Geneva.
- Soeters R, Gibson H & Leerink G (2005) *Report of the Health Seeking Behaviour Survey: Conducted in the Ningarhar Province in 16 Districts*. Health Net International, Jalalabad.
- Waldman R, Strong L & Wali A (2006) *Afghanistan's Health System since 2001: Condition Improved, Prognosis Cautiously Optimistic*. Afghanistan Research and Evaluation Unit (AREU) Briefing Paper Series. Afghan Research & Evaluation Unit, Kabul.
- Wandwalo ER & Morkve O (2000) Delay in tuberculosis case-finding and treatment in Mwanza, Tanzania. *International Journal of Tuberculosis and Lung Disease* 4, 133–138.
- Ward HA, Marciniuk DD, Pahwa P & Hoepfner VH (2004) Extent of pulmonary tuberculosis in patients diagnosed by active compared to passive case finding. *International Journal of Tuberculosis and Lung Disease* 8, 593–597.
- World Health Organization (2000) *The World Health Report 2000. Health Systems: Improving Performance*. WHO, Geneva.
- World Health Organization (2004) *Respiratory Care in Primary Care Services – a Survey in Nine Countries*. WHO, Geneva.
- World Health Organization (2007) *Country Profile: Afghanistan. In: World Health Organization Report 2007: Global Tuberculosis Control*. WHO, Geneva.

Corresponding Author Catherine S. Todd, Division of International Health & Cross-Cultural Medicine, University of California San Diego, 9500 Gilman Drive, Mailstop 0622, La Jolla, CA 92093-0622, USA. Tel.: +18 5882220 55; Fax: +18 5853446 42; E-mail: cstodd@ucsd.edu