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Tuberculosis incidence and treatment completion among Ugandan prison inmates

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SUMMARY

BACKGROUND—The Uganda Prisons Service (UPS) is responsible for the health of approximately 32 500 inmates in 233 prisons. In 2008 a rapid UPS assessment estimated TB prevalence at 654/100 000, three times that of the general population (183/100 000). Although treatment programs exist, little is known about treatment completion in sub-Saharan African prisons.

METHODS—We conducted a retrospective study of Ugandan prisoners diagnosed with TB from June 2011 to November 2012. We analyzed TB diagnosis, TB-HIV comorbidity and treatment completion from national registers and tracked prison transfers and releases.

RESULTS—A total of 469 prisoners were diagnosed with TB over the 1.5-year period (incidence 955/100 000 person-years). Of 466 prisoners starting treatment, 48% completed treatment, 43% defaulted, 5% died and 4% were currently on treatment. During treatment, 12% of prisoners remaining in the same prison defaulted, 53% of transfers defaulted and 81% of those released were lost to follow-up. The odds of defaulting were 8.36 times greater among prisoners who were transferred during treatment.

CONCLUSIONS—TB incidence and treatment default are high among Ugandan prisoners. Strategies to improve treatment completion and prevent multidrug resistance could include avoiding transfer of TB patients, improving communications between prisons to ensure treatment follow-up after transfer and facilitating transfer to community clinics for released prisoners.

Keywords

TB; prisons; Uganda

TUBERCULOSIS (TB) remains a persistent global health problem. While some countries are making progress towards the Millennium Development Goal of reversing the overall

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rates and numbers of TB by 2015, progress remains limited in other countries.[1] More than 80% of the world's TB cases are found in 22 countries, with 40% of cases in China and India alone.[1] Although it contains only 11% of the world's population, the African continent makes up 24% of global TB cases and 34% of TB-related deaths.[1,2] The high occurrence of TB continues to be driven by the ongoing human immunodeficiency virus (HIV) epidemic, weak health care systems and a lack of laboratories.[3]

TB disease is estimated to be the leading cause of death of prisoners worldwide.[4] TB is also more prevalent among prisoners than among the general population in most countries,[5–7] with a worldwide incidence in prisons 20 times higher than in the general population.[8,9] According to a 2008 rapid situation assessment in Ugandan prisons, TB prevalence among prisoners was 654 per 100 000 population,[10] three and a half times the prevalence estimate in the general Ugandan population of 183/100 000.[11] Overcrowding, poor hygiene and diet, indoor confinement and limited access to health care leave prisoners at increased risk for TB and HIV.[8,12] Multidrug-resistant TB (MDR-TB) is identified more frequently in prisoners and prison staff, and remains an emerging threat to national TB programs.[13–17]

In sub-Saharan Africa, TB remains one of the fastest growing epidemics in prison populations,[10,18,19] while HIV prevalence among prisoners is estimated to be 2–50 times that among non-prison populations.[8] In Uganda, HIV prevalence among prison inmates is estimated at 11% among males and 13% among females, one and a half times the national prevalence of 7.3%.[10]

The Uganda Prisons Service (UPS) is responsible for the welfare, health and security of both prison inmates and staff. The UPS is divided into 14 administrative regions and manages 233 prisons countrywide, of which 63 have health units, while the remaining prisons use public health facilities operated by the Ministry of Health (MOH) in neighboring communities. Prisoners diagnosed with TB are transferred to one of 10 TB treatment administering regional centers for initiation of anti-tuberculosis treatment.

The average Ugandan prison population during our study period was 32 724, with male prisoners comprising 96% of the prison population. Remand prisoners awaiting trial comprise approximately 55% of the prison population. Annual turnover is estimated at approximately 100 000 inmates. With the high turnover of prisoners, the risk of TB transmission both within prisons and to community members is a matter of concern. TB screening is offered at entry into prison, and annually at larger prison health units under a mass TB screening program. HIV testing strategies include both voluntary counseling and testing and provider-initiated HIV counseling and testing. Both TB and HIV treatment are available to prisoners through the prison health system.

In the present study, we sought to determine TB incidence among Ugandan prison inmates, and to analyze TB treatment outcomes and risk factors for treatment default to assist the UPS in strengthening TB surveillance, treatment and referral systems.

METHODS

We calculated person-years (py) of TB incidence using recorded TB cases in the registers. Ugandan health facilities, including prison health facilities, utilize the national Health Management Information System (HMIS) registers to track various patient outcomes, including HIV and TB. We collected HMIS unit TB registers from each of the 10 regional Uganda prison health centers offering anti-tuberculosis treatment. All patients were prisoners aged ≥18 years diagnosed with TB between June 2011 and November 2012, and had a TB treatment outcome recorded by June 2013, the last treatment month for those initiating treatment in November 2012. All prisoners with a TB diagnosis recorded in the HMIS TB register during the above time period were included in the analysis. Duplicate patient entries were removed before analysis.

Seven variables were collected from the registers and analyzed: sex, age, disease class, case definition, transfer/release status, sputum examination results, and treatment outcomes. The HMIS registers use standard Uganda MOH TB case definitions and treatment outcomes adopted from the World Health Organization (WHO) which are outlined in the National Tuberculosis and Leprosy Program guidelines.[20] However, prison staff do not consistently distinguish between ‘cured’ and ‘treatment completed’ when assigning treatment outcomes, instead often defining all successful treatment outcomes as ‘treatment completed’. To account for this, we chose to use the standard WHO outcome, ‘treatment success,’ defined as ‘a sum of cured and completed treatment’ (Table 1).[21] Furthermore, HMIS registers list ‘prison transfer’ as a treatment outcome. As we were able to track transferred inmates between prisons, we defined ‘prison transfer’ as a prisoner transferring prison locations, and ‘released’ for those prisoners released from the prison system while still on anti-tuberculosis treatment.

Extracted data were entered into Epi-Info (Centers for Disease Control and Prevention [CDC], Atlanta, GA, USA) and analyzed using SAS 9.3 (Statistical Analysis Software Institute, Cary, NC, USA). We conducted bivariate and multivariate logistic regression analyses to determine associations with treatment default within the prison system. All variables collected were entered into the multivariate analysis, and adjusted odds ratios (aORs) and 95% confidence intervals (CIs) are presented for default treatment outcomes.

Ethical approval for this study was obtained from the CDC, the Uganda Virus Research Institute, Entebbe, and the Uganda National Council of Science & Technology, Kampala, Uganda.

RESULTS

A total of 469 TB cases were recorded among prisoners in the HMIS registers in UPS facilities between June 2011 and November 2012, resulting in an observed incidence rate of 955/100 000 py. Males, who comprised 98% (n=460) of the population, had a higher incidence rate (976/100 000) than females (452/100 000). Although more than half of patients (57%) were co-infected with HIV, only 176 (66%) were on antiretroviral therapy (ART) (Table 2).

Almost all of the 469 TB diagnosed patients (91%) (*n* = 424) were newly diagnosed (Table 2); 18% had extra-pulmonary TB. Similar proportions of HIV-positive and HIV-negative TB patients were sputum smear-negative. No statistically significant demographic differences in treatment outcomes were found. Of 466 prisoners starting anti-tuberculosis treatment, 48% (*n*=222) achieved treatment success, 43% (*n* =202) defaulted, 5% (*n* =22) died, 4% (*n* = 18) were still on treatment and 0.4% (*n* = 2) had treatment failure as of June 2013 (Table 2). Among the 466 starting treatment, 199 remained in the same prison throughout their anti-tuberculosis treatment, 137 prisoners transferred prison locations during treatment and 130 prisoners were released during treatment. During treatment, 12% of the 199 prisoners remaining in the same prison defaulted, whereas 53% of the 137 prisoners who were transferred defaulted. Among those defaulting while in prison, 77% defaulted after transfer. Of the 130 prisoners released during treatment, 81% (*n* = 105) were lost to follow-up and were considered to have defaulted by UPS health staff.

In multivariate analysis, the odds of anti-tuberculosis treatment default were 8.4 times greater (aOR 8.36, 95%CI 4.69–14.91) among transferred prisoners than among prisoners who were not transferred during treatment (Table 3). There was no evidence of association between default and sex, age, HIV status and disease class.

DISCUSSION

The results of our analysis show that TB incidence among Ugandan prisoners is five-fold higher than in the general population, with TB incidence among males more than twice that among females. Treatment default is high among prisoners transferred during the course of their treatment, and the vast majority of prisoners released during anti-tuberculosis treatment are lost to follow-up.

Screening new prison inmates and periodic screening of prisoners and staff enables early detection of TB[22,23] and reduces TB among prison populations.[24] Although UPS has robust programs to screen all incoming prisoners for TB and an annual mass TB screening program for high-volume facilities where all inmates and staff are screened, poor rates of treatment completion facilitate TB transmission and the development of drug resistance in the prison setting.

Co-infection with HIV was high: more than half (58%) of the prisoners diagnosed with TB were HIV-positive. HIV infection is a major risk factor for the development of active TB,[25] and it is possible that the high rates of TB within the UPS are driven in part by the high prevalence of HIV infection. HIV screening is offered voluntarily on entry into prison, and is available routinely at prisons with health units, and through outreach camps to smaller facilities. Ugandan laws, which criminalize homosexuality, prevent the distribution of condoms to inmates, hampering HIV prevention in prisons.[26] Persons living with HIV should be screened at least annually for TB, and certainly at every clinical care or treatment encounter; prisoners diagnosed with HIV should be screened for TB as soon as possible after their diagnosis. Prompt initiation of ART within 8 weeks of TB diagnosis among eligible patients co-infected with TB and HIV may reduce the risk of TB transmission as well as TB-associated morbidity and mortality.[27]

TB treatment success rates are lower (48% vs. 67%) in Ugandan prisons than among the general population.[11] Among those defaulting from treatment while in prison, the majority (77%) did so after prison transfer. Prisoners are transferred within the prison system for one of four reasons: security, health, assignment from a reception center, or before release, when they are moved close to their home region. The high proportion of defaulters among transferred prisoners highlights an urgent need to improve treatment completion rates to prevent the development of drug resistance. While the majority of prisoners defaulted after transfer, 12% defaulted while remaining in the same prison. Further research should be conducted to better understand factors influencing default among these prisoners and actions that can be taken by the prison system to address the problem.

There is currently no consistent screening program for multidrug-resistant TB (MDR-TB) in Ugandan prisons. Studies have shown that patients who have to be retreated for TB due to default or initial treatment failure are more likely to develop drug resistance, and retreatment outcomes are generally poor, with higher default rates.[25,28,29] MDR-TB has been shown to occur 5–10 times more frequently in previously treated TB patients,[30] and mortality is higher among MDR-TB patients.[11] Drug-resistant TB remains a threat in sub-Saharan Africa, where HIV-TB comorbidity remains high and limited resources constrain the ability to conduct ongoing TB and anti-tuberculosis drug surveillance.[31] In 2011, 1.4% of new TB cases and 12% of retreatment TB cases in Uganda were suspected MDR-TB cases.[11,32]

Strategies to prevent treatment default could include halting prison transfers for inmates on anti-tuberculosis treatment except when necessary for security or other health conditions. Opportunities exist to strengthen communication, documentation and reporting of prisoners on anti-tuberculosis treatment whose transfer is deemed a necessity. For example, ongoing medical treatment regimens for TB should be included in prisoner transfer records, including a detailed TB treatment completion plan. A treatment completion report should be sent back to the regional unit where treatment was initiated to improve tracking and reporting.[33] Improved follow-up, through brief phone calls from the sending TB clinic to the receiving clinic, could greatly improve the continuation and completion of TB treatment after prison transfer.[34]

Although default is a highly possible treatment outcome among this group, 81% of prisoners released while on anti-tuberculosis treatment were lost to follow-up, preventing knowledge and documentation of their treatment outcomes. A continuum of care should be established for prisoners nearing release through improved linkage to public clinic facilities.[21,33] Prisoners released while on treatment should, moreover, be given at least 1 week of TB drugs to help facilitate adherence.[33] Released prisoners could also be presented with the option to return to a prison health clinic to finish their anti-tuberculosis treatment.

A cell phone-based system with the provision of airtime to prison health unit staff, and directions to update treatment registers a minimum of once per month, including transferees, would improve patient tracking and allow better monitoring of treatment outcomes.[35]

The benefits of TB prevention in prisons extend beyond the prison walls.[9,35] Prisoners, prison staff and visitors are all at risk for acquiring TB in prisons. Prison staff and visitors,

as well as prisoners who default from treatment after release from prison, can transmit TB to their family and other contacts in the community.[35] Furthermore, community members access prison health facilities at some prison locations, putting non-institutionalized persons at risk for TB acquisition. The threat of TB transmission from the prison system to the wider community can be prevented by aggressively controlling the spread of TB within the prison system.

This study has limitations, including those common to retrospective designs (namely reliance on historical records and inability to add variables of interest). As registers did not differentiate between cure and treatment completion, we were only able to calculate rates for these two outcomes combined as treatment success. For the purposes of understanding treatment practices and completion in UPS, these data were sufficient. We did not have date of entry into the prison system in the TB registers; prisoners who had been in prison for <3 months may therefore have been included in the analysis. It has been argued that these cases should be defined as prevalent cases at entry rather than incident cases in prison.[36]

Our findings clearly demonstrate that TB is a pressing concern in Ugandan prisons. Although TB screening and active case-finding programs exist, the majority of prisoners do not complete treatment, due either to prison transfer or loss to follow-up on prison release. Strategies to improve treatment completion rates among prisoners through reduced transfers, better follow-up when transfer is necessary, and facilitated linkage to public health facilities for released prisoners, are critical to prevent TB transmission and the development of drug resistance.

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References

1. Kompala T, Shenoi SV, Friedland G. Transmission of tuberculosis in resource-limited settings. Curr HIV/AIDS Rep. 2013; 10:264–272. [PubMed: 23824469]
2. Chaisson RE, Martinson NA. Tuberculosis in Africa–combating an HIV-driven crisis. N Engl J Med. 2008; 358:1089–1092. [PubMed: 18337598]
3. Reid SE, Topp SM, Turnbull ER, et al. Tuberculosis and HIV control in sub-Saharan African prisons: 'thinking outside the prison cell'. J Infect Dis. 2012; 205(Suppl 2):S265–S273. [PubMed: 22448015]
4. Nolan CM, Blumberg HM, Taylor Z, et al. Controlling tuberculosis in the United States. Am J Respir Crit Care Med. 2005; 172:1169–1227. [PubMed: 16249321]
5. Baussano I, Williams BG, Nunn P, et al. Tuberculosis incidence in prisons: a systematic review. PLOS MED. 2010; 7:e1000381. [PubMed: 21203587]
6. Angie, B.; Ann, A.; Malgosia, G., et al. Tuberculosis control in prisons: a manual for programme managers. Geneva, Switzerland: World Health Organization; 2000.
7. Dara, M.; Grzemska, M.; Kimerling, ME.; Reyes, H.; Zagorskiy, A. Guidelines for control of tuberculosis in prisons. Washington DC, USA: The Global Health Bureau, Office of Health, Infectious Disease and Nutrition (HIDN), US Agency for International Development; 2009.

8. Todrys KW, Amon JJ. Criminal justice reform as HIV and TB prevention in African prisons. PLOS MED. 2012; 9:e1001215. [PubMed: 22589705]
9. Johnstone-Robertston S, Lawn SD, Welte A, Bekker LG, Wood R. Tuberculosis in a South African prison – a transmission modeling analysis. S Afr Med J. 2011; 101:809–813. [PubMed: 22272961]
10. United Nations Office on Drugs and Crime (UNODC). Persisting challenges and emerging strengths: findings and recommendations. Vienna, Austria: UNODC; 2009. Report on the UNODC prisons assessment mission to Uganda.
11. World Health Organization. Global tuberculosis report. Geneva, Switzerland: WHO; 2012. WHO/HTM/TB/2012.6
12. Todrys KW, Amon JJ, Malembeka G, Clayton M. Imprisoned and imperiled: Access to HIV and TB prevention and treatment and denial of human rights in Zambian prisons. J Intl AIDS Soc. 2011; 14:1–11.
13. O'Grady J, Hoelscher M, Atun R, et al. Tuberculosis in prisons in sub-Saharan Africa – the need for improved health services, surveillance, and control. Tuberculosis. 2011; 91:173–178. [PubMed: 21251881]
14. Ferrari MJ. Eleven million adults co-infected with AIDS, TB. Can Med Assoc J. 2004; 171:437. [PubMed: 15337715]
15. Dheda K, Shean K, Zumla A, et al. Early treatment outcomes and HIV status of patients with extensively drug-resistant tuberculosis in South Africa: a retrospective study. Lancet. 2010; 375:1798–1807. [PubMed: 20488525]
16. United Nations Office on Drugs and Crime. HIV and prisons in sub-Saharan Africa: opportunities for action. Geneva, Switzerland: UNODC; 2007.
17. Habeenzu C, Mitarai S, Lubasi D, et al. Tuberculosis and multidrug resistance in Zambian prisons, 2000–2001. Int J Tuberc Lung Dis. 2007; 11:1216–1220. [PubMed: 17958984]
18. Coninx R, Maher D, Reyes H, Grzemska M. Tuberculosis in prisons in countries with high prevalence. BMJ. 2000; 12:440–442. [PubMed: 10669453]
19. O'Grady J, Mwaba P, Bates M, Kapata N, Zumla A. Tuberculosis in prisons in sub-Saharan Africa – a potential time bomb. S Afr Med J. 2011; 101:107–107. [PubMed: 21678734]
20. Ministry of Health, Republic of Uganda. Manual of the National Tuberculosis and Leprosy Programme. 2. Kampala, Uganda: MoH; 2010.
21. World Health Organization. Treatment of tuberculosis guidelines. Geneva, Switzerland: WHO; 2010. WHO/HTM/TB/2009.420
22. Dara M, Chadha SS, Melchers NV, et al. Time to act to prevent and control tuberculosis among inmates. Int J Tuberc Lung Dis. 2013; 17:4–5. [PubMed: 23231999]
23. Vinkeles-Melchers NVS, van Elsland SL, Lange JMA, Borgdorff MW, van den Hombergh J. State of affairs of tuberculosis in prison facilities: a systematic review of screening practices and recommendations for best TB control. PLOS ONE. 2013; 8:e53644. [PubMed: 23372662]
24. Winetsky DE, Negoescu DM, DeMarchis EH, et al. Screening and rapid molecular diagnosis of tuberculosis in prisons in Russia and Eastern Europe: a cost-effective analysis. PLOS MED. 2012; 9:e1001348. [PubMed: 23209384]
25. Beyene M, Amare B, Asfaw F, et al. Prevalence of smear-positive pulmonary tuberculosis among prisoners in North Gondar zone prison, northwest Ethiopia. BMC Infect Dis. 2012; 12:352. [PubMed: 23241368]
26. Kyomya M, Todyrs KW, Amon JJ. Laws against sodomy and the HIV epidemic in African prisons. Lancet. 2012; 380:310–312. [PubMed: 22819651]
27. World Health Organization. Policy on collaborative TB/HIV activities: guidelines for national programmes and other stakeholders. Geneva, Switzerland: WHO; 2012. WHO/HTM/TB/2012.1. WHO/HIV/2012.1
28. Becerra MC, Freeman J, Bayona J, et al. Using treatment failure under effective directly observed short-course chemotherapy programs to identify patients with multidrug-resistant tuberculosis. Int J Tuberc Lung Dis. 2000; 4:108–114. [PubMed: 10694087]
29. Chiang C-Y, Hsu CJ, Huang RM, Lin TP, Luh KT. Anti-tuberculosis drug resistance among retreatment tuberculosis patients in a referral center in Taipei. J Formos Med Assoc. 2004; 103:411–415. [PubMed: 15278183]

30. Zignol M, Hosseini MS, Wright A, et al. Global incidence of multidrug resistant tuberculosis. J Infect Dis. 2006; 194:479–485. [PubMed: 16845631]

31. Hafkin J, Gammino VM, Amon JJ. Drug-resistant tuberculosis in sub-Saharan Africa. Curr Infect Dis Rep. 2010; 12:36–45. [PubMed: 21308497]

32. Lukoye D, Adatu F, Musisi K, et al. Anti-tuberculosis drug resistance among new and previously treated sputum smear-positive tuberculosis patients in Uganda: results of the first national survey. PLOS ONE. 2013; 8:e70763. [PubMed: 23936467]

33. Public Health England Health Protection Services Prison Network. Management of tuberculosis in prisons: guidance for prison healthcare teams. London, UK: Public Health England; 2013.

34. West D. How mobile devices are transforming healthcare. Issues in Technology Innovation. 2012; 18:1–14. [Accessed April 2014] http://www.insidepolitics.org/brookingsreports/mobile_health_52212.pdf.

35. Reyes H, Coninx R. Pitfalls of tuberculosis programmes in prisons. BMJ. 1997; 315:1447–1450. [PubMed: 9418098]

36. Anderson C, Dara M, Hauer B, et al. Methodological issues in quantifying the magnitude of the tuberculosis problem in a prison population. Int J Tuberc Lung Dis. 2011; 15:662–667. [PubMed: 21756519]

Table 1

Uganda TB treatment outcome definitions

Treatment outcome	
Treatment success	Sum of cured and completed treatment
Cure	TB patient whose sputum smear or culture was positive at the beginning of the treatment but who was smear- or culture-negative in the last month of treatment and on at least one previous occasion
Treatment completed	TB patient who completed treatment but who does not have a negative sputum smear or culture result in the last month of treatment and on at least one previous occasion
Failure	TB patient who remains/turns sputum smear- or culture-positive at ≥5 months of anti-tuberculosis treatment
Died	TB patient who dies from any cause while still on anti-tuberculosis treatment
Transferred	TB patient already registered for anti-tuberculosis treatment in one district/prison who transfers to another prison during anti-tuberculosis treatment
Defaulted	TB patient who completed >1 month of treatment and interrupted it for ≥2 consecutive months

TB = tuberculosis.

Table 2

Demographic and TB case characteristics of HIV-positive (n=268) and HIV-negative (n= 192) prisoners diagnosed (n = 469) with TB in Ugandan prisons, June 2011–November 2012

Characteristic	HIV-positive *n* (%)	HIV-negative *n* (%)	Total* *n* (%)
Age, years			
18–29	101 (22)	75 (16)	179 (38)
30–39	111 (24)	58 (12)	172 (37)
≥40	53 (11)	48 (10)	102 (22)
Unknown	3 (1)	11 (2)	16 (3)
Sex			
Male	261 (56)	190 (41)	460 (98)
Female	7 (1)	2 (.04)	9 (2)
Currently taking cotrimoxazole preventive therapy			
Yes	250 (53)	—	254 (54)
No	9 (2)	192 (4)	197 (42)
Unknown	9 (2)	0 (0)	18 (4)
Currently on antiretroviral therapy			
Yes	176 (38)	—	176 (38)
No	36 (8)	192 (40)	228 (48)
Unknown	56 (12)	0 (0)	65 (14)
Disease class			
Sputum smear-positive	98 (21)	101 (22)	203 (43)
Sputum smear-negative	86 (18)	56 (12)	143 (31)
Extra-pulmonary	59 (13)	22 (5)	83 (18)
No sputum detected	23 (5)	13 (3)	38 (8)
Unknown	2 (0.2)	0 (0)	2 (0.4)
Case definition			
New	246 (53)	172 (37)	424 (91)
Relapse	12 (3)	4 (1)	17 (4)
Failure	0 (0)	2 (0.4)	2 (0.4)
Previous default	8 (2)	13 (3)	23 (5)
Unknown	2 (0.2)	1 (0.1)	3 (0.5)
TB treatment outcome†			
Success	136 (29)	81 (17)	222 (48)
Failure	0 (0)	2 (0.4)	2 (0.4)
Died	17 (4)	5 (1)	22 (5)
Defaulted	104 (22)	95 (20)	202 (43)
Ongoing	9 (2)	8 (2)	18 (4)

*Includes HIV status unknown (n = 9).

†Three persons diagnosed with TB did not begin treatment.

TB = tuberculosis; HIV = human immunodeficiency virus.

Table 3

Risk factors for TB treatment default among Ugandan prisoners (n = 466)

Factors	Unadjusted OR (95%CI)	Adjusted OR (95%CI)
Transferred	8.95 (5.17–15.48)	8.36 (4.69–14.91)
Age, years		
18–29	Reference	Reference
30–39	0.70 (0.45–1.06)	0.66 (0.38–1.16)
≥40	0.58 (0.35–0.95)	0.64 (0.35–1.19)
Male	0.94 (0.24–3.53)	1.32 (0.27–6.43)
HIV-positive	0.88 (0.61–1.28)	0.82 (0.50–1.33)
Disease class		
Sputum smear-positive	Reference	Reference
Sputum smear-negative	0.62 (0.40–0.96)	0.77 (0.43–1.36)
Extra-pulmonary	0.69 (0.41–1.17)	0.96 (0.50–1.84)
No sputum detected	0.76 (0.38–1.54)	1.40 (0.55–3.56)

TB = tuberculosis; OR = odds ratio; CI = confidence interval; HIV = human immunodeficiency virus.