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Predictors of latent tuberculosis infection treatment completion in the United States: an inner city experience

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SUMMARY

BACKGROUND—Few studies have examined predictors of latent tuberculosis infection (LTBI) treatment completion in inner city populations in the United States.

OBJECTIVE—To assess LTBI treatment completion rates and predictors in an inner city cohort.

METHODS—Data from control groups of two sequentially conducted randomized controlled trials of LTBI treatment were analyzed for treatment completion rates. Participants in Study A (*n* = 191), conducted in 1996–1999, self administered daily isoniazid (INH) for 6–12 months, while participants in Study B (*n* = 123), conducted in 2002–2005, self administered daily INH for 9 months.

RESULS—Overall, 44.6% of participants completed therapy, with significantly higher completion rates in Study B than Study A (37.0% vs. 56.1%, *P* = 0.001). Marriage and alcohol use were significant predictors of completion (aOR = 2.153, 95%CI 1.301–3.562) and non-completion (aOR = 0.530, 95%CI 0.320–0.877), respectively; multivariate analysis indicated increased completion among married persons of foreign birth and among alcohol users who were homeless. Knowledge of and attitudes to tuberculosis were not significant predictors.

CONCLUSIONS—The design provided an opportunity to assess predictors of LTBI treatment completion in this inner city population. Social circumstances were the strongest predictors of treatment completion, suggesting that tangible social services may be more effective than educational programs in encouraging treatment completion.

Keywords

latent tuberculosis infection; adherence; treatment completion

AN ESTIMATED 9–14 million persons in the United States have latent tuberculosis infection (LTBI), and are therefore at risk for progression to active tuberculosis (TB) disease.[1] Diagnosis and treatment of LTBI (TLTBI) have been identified by the Centers for

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Disease Control and Prevention (CDC) and the Institute of Medicine as a major strategy for elimination of TB in the United States.[2,3] Approximately 200 000–300 000 individuals are treated annually for LTBI in the United States, with reported TLTBI completion rates in the United States ranging from 20% to 65% for a 6-month course of self-administered treatment, while some studies found higher completion rates.[4] In a national survey, Horsburgh et al. reported 47% completion among patients treated in 2002.[5] Better understanding of factors associated with TLTBI completion rates is essential to efforts to eliminate TB in this country.

The challenge of TLTBI is particularly critical in inner city neighborhoods such as New York City's Central Harlem, where rates of TB greatly exceed the national average (23.2 vs. 4.4/100 000 in 2007, respectively[6]) and elevated rates of human immunodeficiency virus (HIV) infection increase the population vulnerable to TB. Harlem has long been a predominantly African-American community and is home to a growing African immigrant population. Potential barriers to medication adherence in Harlem include poverty, drug and alcohol use, homelessness, fragile or inadequate social support networks, low awareness of available low-cost or free health care services, and a dearth of culturally appropriate health care. TB-related social stigma, which gives rise to fears of discrimination and isolation, may also impede acceptance and completion of TLTBI.

Few studies have examined predictors of adherence and completion of TLTBI, and the few that have been conducted in inner city populations have focused on selected demographic groups[7–11] rather than broader clinic populations.[12–15] Furthermore, few prior studies have given significant attention to TB attitudes.

The objectives of the present study were to assess TLTBI completion rates and predictors of completion, including TB knowledge and attitudes, among an inner-city cohort. Foreign birth, homelessness, and current substance use were hypothesized a priori to be risk factors for TLTBI non-completion.

STUDY POPULATION AND METHODS

Design, setting and sample

This analysis used data from the control arms of two sequential randomized controlled trials evaluating a supportive intervention for TLTBI. In 1996–1999 (Study A) and 2002–2005 (Study B), all patients aged ≥18 years from the Harlem Hospital Chest Clinic diagnosed with LTBI according to CDC guidelines[3] were approached for participation using identical inclusion and exclusion criteria. Both studies were approved by the Columbia University Institutional Review Board.

Providers blinded to study status made a clinical determination of TLTBI completion/non-completion according to CDC guidelines; these data were subsequently abstracted from medical charts by research staff. Datasets from both studies were combined to increase the power for this analysis. Treatment completion and predictor variables were measured in identical fashion in both studies. A variable indicating study of origin was used to adjust for differences between studies.

The studies differed in the use of electronic monitoring devices (EMDs), which recorded opening times of medication bottles in Study B but not in Study A. Furthermore, Study A participants were prescribed 6–12 months of isoniazid (INH; depending on HIV status), while Study B patients received 9 months of INH.

Instruments

Trained research assistants conducted face-to-face interviews using structured questionnaires on demographics, substance use, life stressors, and TB-related knowledge and attitudes at enrollment. Current substance use was defined as any alcohol or illicit drug use in the past month. TB knowledge items included six true/false questions on TB transmission, diagnosis, and treatment. Twelve attitudinal items were measured on a four-point Likert scale, ranging from 'strongly disagree' to 'strongly agree'.

Data analysis

Student's *t*-test was used to compare continuous variables, while χ^2 or Fisher's exact test was used to assess association for categorical variables. Logistic regression was used to evaluate predictors while adjusting for study of origin. Variables significant at ≤0.10 and variables hypothesized a priori to be predictors were candidates for the final multivariate logistic model, which was constructed based on a manual, stepwise assessment of predictors and interactions. Model diagnostics were computed for final models and assessed using the Hosmer and Lemeshow Goodness-of-Fit Test, along with Akaike's Information Criteria (AIC) and Schwartz's Information Criterion (SIC).[16–18] A summary knowledge score was constructed by calculating the proportion of correct answers to knowledge items. Factor analysis was used to develop scale scores for attitudes; scales were produced by taking mean scores for all attitudinal items in a specific factor. Internal consistency and reliability of scales was tested with Cronbach's alpha, using a threshold of >0.6.[19] Attitudinal items were analyzed using the ordinal four-point scale where the response patterns appeared to fit a logistic curve, or categories were collapsed to dichotomous outcomes. Statistical analyses were performed using SAS (version 9.1.3, 2000; SAS Institute Inc, Cary, NC, USA) and SPSS (version 15.0; Statistical Package for the Social Sciences, Chicago, IL, USA).

RESULTS

Study population

Table 1 describes the study population, shown by study of origin (Study B vs. Study A). Overall, participants were more likely to be male (64.3%), African-American or Latino (72.0%), aged <40 years (55.4%), unemployed (68.2%), and not married (70.1%). The majority of participants were foreign-born (52.9%), while substantial proportions reported homelessness (25.2%) or illicit substance use (22.6%) at enrollment. There were significant differences between participants in Studies A and B, with the latter more likely to be male, African, foreign-born, employed, married, and on a 9-month regimen, but less likely to be homeless or report illicit drug use.

LTBI treatment completion rates

Overall, 44.6% of participants completed therapy, with a significantly higher completion rate among Study B than Study A participants (56.1% vs. 37.0%, $P = 0.001$). A higher completion rate was observed in Study B for every demographic subgroup investigated (Table 2).

Age, marriage, current homelessness, and ever having used alcohol were associated with treatment completion, either in the combined sample (age, marriage, homelessness, lifetime alcohol use) or in the Study B population (age, marriage). Race/ethnicity showed significant differences for treatment completion in the combined sample but not in either individual study. Furthermore, the effect of race/ethnicity is inconsistent in the two studies; Latinos had higher completion than African Americans in Study A but lower completion than African Americans in Study B.

Predictors of treatment completion

Table 3 summarizes predictors of treatment completion, after controlling for study of origin. Lifetime alcohol use (adjusted odds ratio [aOR] = 0.530, 95% confidence interval [CI] 0.320–0.877) and marriage (aOR = 2.153, 95%CI 1.301–3.562) were the only strongly significant predictors, with age (aOR = 0.637, 95%CI 0.402–1.008), homelessness (aOR = 0.595, 95%CI 0.344–1.028), and current alcohol use (aOR = 0.649, 95%CI 0.398–1.058) meeting the 0.10 criterion for consideration in multivariate modeling. Foreign birth (aOR = 1.285, 95%CI 0.807–2.046) and current illicit drug use (aOR = 0.783, 95%CI 0.450–1.361) were further considered in the multivariate models because they had been hypothesized a priori to be risk factors for non-completion of LTBI treatment.

Table 4 presents a multivariate model for predicting treatment completion. According to this model, foreign birth (aOR = 0.551, 95%CI 0.304–0.999), current homelessness (aOR = 0.432, 95%CI 0.211–0.887), marriage (aOR = 0.365, 95%CI 0.121–1.098), and current alcohol use (aOR = 0.507, 95%CI 0.281–0.914) were risk factors for non-completion of LTBI treatment; however, all these factors were modified by interaction terms. Unmarried foreign-born TB patients were less likely than US-born patients to complete treatment, while married foreign-born TB patients were substantially more likely than US-born patients to complete therapy (aOR = 10.480, 95%CI 2.858–38.427). Homeless persons who did not use alcohol were significantly less likely than persons with stable living situations to complete therapy; however, homeless persons who did use alcohol were more likely to complete therapy (aOR = 5.127, 95%CI 1.529–17.189). As seen in Table 2, completion rates in the two studies varied significantly, and study of origin was a significant predictor of completion in the multivariate model (aOR = 0.463, 95%CI 0.279–0.770). However, no interactions between potential predictors and study of origin were found. Diagnostic statistics were used to assess the validity of the final model. The Hosmer and Lemeshow Goodness-of-Fit test ($\chi^2 = 4.6043$, $P = 0.87$) confirmed that the final model conforms to statistical assumptions for logistic regression.

TB knowledge and attitudes

Factor analysis of the 12 attitudinal items (Table 5) yielded four factors accounting for 53.2% of the total variation; final factor solution is not shown. Four scales were created but none achieved reliability; therefore, we analyzed the attitudinal data using individual items.

Attitudinal items A1–A5 had response patterns that fit a logistic curve well and were therefore analyzed using the four-point scale. For other attitudinal items (A6–A12), better (or worse) completion rates were observed in the two extreme categories (‘strongly disagree’ and ‘strongly agree’) than in the two middle categories (‘disagree’ and ‘agree’). Neither collapsing a four-point scale nor combining ‘strongly agree’ with ‘agree’ and ‘strongly disagree’ with ‘disagree’ was appropriate for these variables. Depending on the distribution, we either designated the category with most responses as the reference group or collapsed the two middle categories (‘agree’ and ‘disagree’) and used that as the reference group.

Table 5 shows the relationship of TB-related knowledge and attitudes to treatment completion, after controlling for study of origin. Neither individual knowledge items nor the overall knowledge score were significantly associated with completion. However, the attitudinal items ‘no matter what you do, you can get TB’ (A6), ‘you are embarrassed to tell you have TB’ (A7), ‘you believe you have the TB germ’ (A8), and ‘you care about what your family and friends may think of your TB’ (A9) were significantly associated with TLTBI completion ($P < 0.05$).

These variables (A6–A9) were each tested in the multivariate model shown in Table 4. Only ‘you believe you have the TB germ’ (A8; $P = 0.0142$) and ‘you care about what your family and friends may think of your TB’ (A9; $P = 0.0296$) were significant risk factors after adjusting for demographic and other characteristics in the multivariate model. The addition of these attitudinal items did not change the association of other predictors in the model shown in Table 4 with treatment completion, and the Hosmer-Lemeshow statistic indicated reasonable model fit ($P = 0.35$ for A8 and $P = 0.46$ for A9). However, other model fitting criteria (notably SIC) did not indicate that these variables substantially improved the model shown in Table 4.

DISCUSSION

Ensuring completion of TLTBI benefits both the treated individual and society in general by preventing cases of active, infectious disease. Understanding adherence and developing interventions to support it are thus critical to public health policy.[20,21] This US inner city setting provides a valuable opportunity to examine predictors of adherence to LTBI treatment in a clinic population where patients are at increased risk of getting TB and face many barriers to completion of treatment.

Our results suggest that foreign birth, homelessness, marriage, and alcohol or drug use all influence completion of TLTBI through complex interactions. Overall, married persons had better completion, but married foreign-born patients were substantially more likely to complete therapy than unmarried foreign-born patients. Alcohol users were less likely to

complete therapy, but homeless alcohol users were more likely to complete treatment than other homeless patients. The latter is probably an artifact of our clinic population, which includes patients from alcohol and substance abuse rehabilitation programs. Residence in such programs may have a positive effect on treatment completion. Race/ethnicity did not appear to be associated with treatment completion, although the differences between the two study populations made this difficult to assess.

The few recent studies of TLTBI adherence have not found it to be related to age, sex, place of birth or race. Where significant associations are found, studies exhibit inconsistent results.[4] An even smaller number of studies examined predictors of adherence and completion of TLTBI in inner city clinic populations. Our finding of lower completion rates among homeless patients and current alcohol users agrees with the results of Lobue et al. found in San Diego in a general TB clinic population.[13] Regarding foreign birth, our study found higher completion rates among married foreign-born patients. However, Parsyan et al. identified birth in Haiti or the Dominican Republic as a risk factor for non-completion in a Boston Public Health TB clinic,[14] while Lobue et al.[13] and Bock et al.[12] found foreign birth to be associated with higher completion rates.

No knowledge items and few attitudinal items were associated with likelihood of completing treatment. Only two (‘believe you have the TB germ’ and ‘care about what your family and friends may think of your TB’) were significant after adjusting for demographic, social, and other characteristics, and both resist meaningful interpretation. Specifically, respondents who either strongly agreed or strongly disagreed with these statements were less likely to complete therapy than those who moderately agreed or disagreed. The implications of these results are not clear.

Knowledge and attitudes may be less important than social factors in determining treatment completion. If so, educational programs aimed at increasing knowledge and modifying attitudes may be less effective than tangible assistance in encouraging treatment completion. That is, if unmarried persons or those in unstable living conditions have difficulty completing treatment, then outreach programs that address their needs may improve completion rates.

The greatest difference in completion rates was between Study A and B participants. Study B participants were observed to have higher completion rates than Study A participants, regardless of race, ethnicity, sex, education level, age, place of birth, life stressors, alcohol or drug use, employment status, marital status, and stability of housing, despite the longer regimen for Study B participants. A primary difference between the studies was the use of EMDs in Study B for monitoring treatment adherence, suggesting that EMDs may have influenced treatment completion.

Recent work has shown the importance of shortened TLTBI regimens for ensuring treatment completion,[4] with completion ranging from 71.6% to 91.4% with 4 months of rifampin.[22] Further research would be required to determine whether the factors found to predict completion would remain effective predictors among patients on shortened regimens characterized by higher completion rates.

Limitations

Although both studies were conducted in the same clinic, the study population changed somewhat between the time frames for the two studies. Other differences included treatment regimens and the use of EMDs in Study B. While we adjusted statistically for these differences, it would have been preferable to have identical populations and protocols. Another possible limitation is that providers may not have been consistent in their determination of treatment completion; however, the small number of providers making this determination was blinded to study status. Another possible limitation is that self-reporting of some items (e.g., alcohol or drug use) may have been subject to social desirability bias in face-to-face interviews. Finally, as this study was conducted in an inner city setting, the results cannot be rigorously generalized to the general US population, although they have strong implications for similar populations.

CONCLUSIONS

In this study of LTBI treatment completion in an inner city population, homelessness, foreign birth, alcohol use, and marriage predicted success in completing LTBI treatment. We conclude that special efforts to reach patient groups identified with these factors should improve completion rates. The primary intervention for improving LTBI adherence currently consists of educational programs to increase knowledge and modify attitudes. Our findings suggest that tangible assistance would be more effective in encouraging treatment completion.

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Table 1

Patient characteristics of sample*

	Combined (*N* = 314) *n* (%)	Study A (*n* = 191) *n* (%)	Study B (*n* = 123) *n* (%)	*P* value†
Treatment duration, months				
6	184 (58.6)	184 (96.3)	0	<0.001
9	123 (39.2)	0	123 (100)	
12	7 (2.2)	7 (3.7)	0	
Demographics				
Age group, years				
≥40	140 (44.6)	81 (42.4)	59 (48.0)	0.333
<40	174 (55.4)	110 (57.6)	64 (52.0)	
Sex				
Female	112 (35.7)	78 (40.8)	34 (27.6)	0.017
Male	202 (64.3)	113 (59.2)	89 (72.4)	
Race/ethnicity				
Black or African American	162 (51.6)	125 (65.4)	37 (30.1)	<0.001
Latino	64 (20.4)	40 (20.9)	24 (19.5)	
African	60 (19.1)	14 (7.3)	46 (37.4)	
Other	28 (8.9)	12 (6.3)	16 (13.0)	
Place of birth				
US-born	148 (47.1)	106 (55.5)	42 (34.1)	<0.001
Foreign-born	166 (52.9)	85 (44.5)	81 (65.9)	
Social characteristics				
Education: completed high school				
No	131 (43.4)	84 (46.9)	47 (38.2)	0.133
Yes	171 (56.6)	95 (53.1)	76 (61.8)	
Employment				
No	214 (68.2)	142 (74.3)	72 (58.5)	0.003
Yes	100 (31.8)	49 (25.7)	51 (41.5)	
Married				
No	220 (70.1)	143 (74.9)	77 (62.6)	0.021
Yes	94 (29.9)	48 (25.1)	46 (37.4)	
Currently homeless				
No	235 (74.8)	131 (68.6)	104 (84.6)	0.001
Yes	79 (25.2)	60 (31.4)	19 (15.4)	
Life stressors				
0 or 1	131 (41.7)	79 (41.4)	52 (42.3)	0.872
≥2	183 (58.3)	112 (58.6)	71 (57.7)	
Substance use				
Ever alcohol use				
No	91 (29.2)	54 (28.6)	37 (30.1)	0.774
Yes	221 (70.8)	135 (71.4)	86 (69.9)	

	Combined (*N* = 314) *n* (%)	Study A (*n* = 191) *n* (%)	Study B (*n* = 123) *n* (%)	*P* value[†]
Current alcohol use				
No	209 (66.6)	129 (67.5)	80 (65.0)	0.647
Yes	105 (33.4)	62 (32.5)	43 (35.0)	
Ever illicit drug use				
No	130 (41.4)	68 (35.6)	62 (50.4)	0.009
Yes	184 (58.6)	123 (64.4)	61 (49.6)	
Current illicit drug use				
No	243 (77.4)	140 (73.3)	103 (83.7)	0.031
Yes	71 (22.6)	51 (26.7)	20 (16.3)	

[*] *n* of each variable varies due to missing data.

[†] Comparing Study A and Study B.

Table 2

Completion rates by study group

	Combined sample *n/N* (%)	Study A *n/N* (%)	Study B *n/N* (%)
Overall	139/312 (44.6)	70/189 (37.0)	69/123 (56.1)
Age group, years			
≥40	71/139 (51.1)	32/80 (40.0)	39/59 (66.1)
<40	68/173 (39.3)	38/109 (34.9)	30/64 (46.9)
P value	0.0376	0.4699	0.0318
Sex			
Female	48/111 (43.2)	30/77 (39.0)	18/34 (52.9)
Male	91/201 (45.3)	40/112 (35.7)	51/89 (57.3)
P value	0.7298	0.6497	0.6628
Race/ethnicity			
Black or African American	62/161 (38.5)	42/124 (33.9)	20/37 (54.1)
Latino	27/64 (42.2)	16/40 (40.0)	11/24 (45.8)
African	36/60 (60.0)	8/14 (57.1)	28/46 (60.9)
Other	14/27 (51.9)	4/11 (36.4)	10/16 (62.5)
P value	0.0306	0.3746	0.6191
Place of birth			
US-born	58/147 (39.5)	36/105 (34.3)	22/42 (52.4)
Foreign-born	81/165 (49.1)	34/84 (40.5)	47/81 (58.0)
P value	0.0874	0.3812	0.5498
Education: completed high school			
No	62/131 (47.3)	37/84 (44.1)	25/47 (53.2)
Yes	74/169 (43.8)	30/93 (32.3)	44/76 (57.9)
P value	0.5411	0.1063	0.6095
Employment			
No	87/212 (41.0)	51/140 (36.4)	36/72 (50.0)
Yes	52/100 (52.0)	19/49 (38.8)	33/51 (64.7)
P value	0.0691	0.7697	0.1054
Married			
No	84/219 (38.4)	48/142 (33.8)	36/77 (46.8)
Yes	55/93 (59.1)	22/47 (46.8)	33/46 (71.7)
P value	0.0007	0.1095	0.0069
Currently homeless			
No	113/233 (48.5)	53/129 (41.1)	60/104 (57.7)
Yes	26/79 (32.9)	17/60 (28.3)	9/19 (47.4)
P value	0.0160	0.0911	0.4044
Life stressors			
0 or 1	65/130 (50.0)	32/78 (41.0)	33/52 (63.5)
≥2	74/182 (40.7)	38/111 (34.2)	36/71 (50.7)
P value	0.1017	0.3412	0.1590

	Combined sample *n/N* (%)	**Study A *n/N* (%)**	**Study B *n/N* (%)**
Ever alcohol use			
No	50/90 (55.6)	25/53 (47.2)	25/37 (67.6)
Yes	88/220 (40.0)	44/134 (32.8)	44/86 (51.2)
P value	0.0124	0.0671	0.0927
Current alcohol use			
No	99/207 (47.8)	50/127 (39.4)	49/80 (61.3)
Yes	40/105 (38.1)	20/62 (32.3)	20/43 (46.5)
P value	0.1022	0.3418	0.1163
Ever illicit drug use			
No	65/129 (50.4)	30/67 (44.8)	35/62 (56.5)
Yes	74/183 (40.4)	40/122 (32.8)	34/61 (55.7)
P value	0.0816	0.1025	0.9364
Current illicit drug use			
No	112/241 (46.5)	54/138 (39.1)	58/103 (56.3)
Yes	27/71 (38.0)	16/51 (31.4)	11/20 (55.0)
P value	0.2083	0.3269	0.9139

Table 3

Logistic regression analysis of predictors of completion of care, controlling for study of origin

Independent variables	Regression coefficient	Standard error	Adjusted OR	95%CI	*P* value
Demographics					
Age <40 years	−0.4516	0.2342	0.637	0.402–1.008	0.0539
Male	−0.0244	0.2447	0.976	0.604–1.576	0.9204
Race/ethnicity					
African vs. African American	0.3250	0.2436	1.764	0.909–3.423	0.1822
Latino vs. African American	−0.1749	0.2303	1.070	0.588–1.948	0.4476
Foreign-born	0.2509	0.2373	1.285	0.807–2.046	0.2905
Social characteristics					
Completed high school	−0.2192	0.2394	0.803	0.502–1.284	0.3598
Employed	0.3294	0.2503	1.390	0.851–2.270	0.1882
Married	0.7667	0.2570	2.153	1.301–3.562	0.0029
Currently homeless	−0.5200	0.2793	0.595	0.344–1.028	0.0626
Life stressors, 2 or more	−0.3840	0.2356	0.681	0.429–1.081	0.1032
Substance use					
Ever alcohol use	−0.6357	0.2576	0.530	0.320–0.877	0.0136
Current alcohol use	−0.4324	0.2494	0.649	0.398–1.058	0.0830
Ever drug use	−0.3048	0.2372	0.737	0.463–1.174	0.1989
Current drug use	−0.2448	0.2823	0.783	0.450–1.361	0.3857

OR = odds ratio; CI = confidence interval.

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Table 4

Multivariate logistic regression analysis of predictors of completion of care

Independent variables	Regression coefficient	Standard error	Adjusted OR	95%CI	*P* value
Foreign-born	−0.5957	0.3033	0.551	0.304–0.999	0.0495
Married	−1.0080	0.5620	0.365	0.121–1.098	0.0729
Interaction between married and foreign-born	2.3495	0.6629	10.480	2.858–38.427	0.0004
Currently homeless	−0.8389	0.3666	0.432	0.211–0.887	0.0221
Current alcohol use	−0.6798	0.3012	0.507	0.281–0.914	0.0240
Interaction between currently homeless and current alcohol use	1.6345	0.6172	5.127	1.529–17.189	0.0081
Study of origin*	−0.7691	0.2590	0.463	0.279–0.770	0.0030

*Study A = 1, Study B = 0.

OR = odds ratio; CI = confidence interval.

Table 5

Logistic regression analysis of knowledge and attitude predictors of completion of care, controlling for study of origin

Independent variables	Regression coefficient	Standard error	Adjusted OR	95%CI	*P* value
Knowledge items					
K1 Can get TB from crowded conditions	0.3741	0.4149	1.454	0.645–3.278	0.3673
K2 Can get TB through kissing	0.2119	0.2707	1.236	0.727–2.101	0.4337
K3 Can get TB through sharing dishes	−0.2736	0.2483	0.761	0.468–1.238	0.2707
K4 Most TB can be cured with medications	0.6937	0.5729	2.001	0.651–6.151	0.2260
K5 HIV-infected more likely to get TB	−0.2496	0.2845	0.779	0.446–1.361	0.3804
K6 TST + persons may need TB medications	−0.0780	0.5786	0.925	0.298–2.875	0.8928
Knowledge score	−0.0056	0.1215	0.994	0.784–1.262	0.9632
Attitudinal variables					
A1 TB is a disease you have to take seriously	−0.1138	0.2340	0.892	0.564–1.412	0.6266
A2 Taking TB medications is important	−0.3145	0.2476	0.730	0.449–1.186	0.2040
A3 You know better than the doctor when best to stop medications	−0.0899	0.1432	0.914	0.690–1.210	0.5302
A4 Going to appointments more trouble than worth	0.0825	0.1562	1.086	0.800–1.475	0.5974
A5 If you do the right thing, you can avoid getting TB	0.0127	0.1021	1.013	0.829–1.237	0.9012
A6 No matter what you do, you can get TB					0.0442*
Strongly disagree	0.2279	0.2259	2.134	1.143–3.984	0.3130
Disagree	0.2702	0.2949	2.226	0.984–5.037	0.3595
Agree	0.0318	0.2137	1.754	0.977–3.147	0.8816
Strongly agree	Reference				
A7 Embarrassed to tell you have TB†					0.0459*
Strongly disagree	−0.2804	0.1625	0.505	0.290–0.880	0.0844
Strongly agree	−0.1228	0.1732	0.591	0.327–1.068	0.4785
Disagree/agree	Reference				
A8 Believe have TB germ†					0.0142*
Strongly disagree	−0.0480	0.2038	0.630	0.321–1.237	0.8139
Strongly agree	−0.3659	0.1609	0.459	0.272–0.774	0.0230
Disagree/agree	Reference				
A9 Care about what family/friends think†					0.0296*

Independent variables	Regression coefficient	Standard error	Adjusted OR	95%CI	*P* value
Strongly disagree	−0.1740	0.1849	0.547	0.296–1.013	0.3468
Strongly agree	−0.2551	0.1609	0.505	0.296–0.859	0.1128
Disagree/agree	Reference				
A10 As hard as you try, you are going to miss some of your medications					0.1130*
Strongly disagree	0.1208	0.1933	2.386	0.956–5.958	0.5318
Disagree	0.5978	0.2870	3.845	1.290–11.459	0.0372
Agree	0.0304	0.2251	2.180	0.823–5.776	0.8928
Strongly agree	Reference				
A11 TB medications are a hassle†					0.1006*
Strongly disagree	0.0773	0.2314	0.613	0.342–1.098	0.7383
Strongly agree	−0.6447	0.4017	0.298	0.085–1.047	0.1085
Disagree/agree	Reference				
A12 Takes something bad to not take medications					0.4439*
Strongly disagree	−0.1896	0.2123	1.101	0.637–1.904	0.3718
Disagree	0.3991	0.3372	1.984	0.787–4.998	0.2367
Agree	0.0766	0.2556	1.437	0.723–2.858	0.7645
Strongly agree	Reference				

*This *P* value tests for whether all levels of the given item contribute to the model; the *P* values below give the significance for the contribution of individual terms as compared with the reference category.

†These items had significant χ^2 tests of association, but the patterns of response could not be modeled by a logistic response curve. Specifically, the responses showed completion rates that were either higher for ‘strongly agree’ and ‘strongly disagree’ than for ‘agree’ and ‘disagree’, or lower for ‘strongly agree’ and ‘strongly disagree’ than for ‘agree’ and ‘disagree’. In all cases, completion rates were similar for the middle groups (‘agree’ and ‘disagree’). For this reason, we collapsed the middle groups and used them as referents in the logistic regression analysis.

OR = odds ratio; CI = confidence interval; TB = tuberculosis; HIV = human immunodeficiency virus; TST = tuberculin skin test.