NIH-PA Author Manuscript

Latent Tuberculosis Infection in an Urban Cohort: Screening and Treatment for Latent TB in an Urban Setting

Jamie P. Morano, M.D., M.P.H.[1], **Mary R. Walton, M.H.S, PA-C**[2], **Alexei Zelenev, Ph.D.**[3], **R. Douglas Bruce, M.D., M.A., M.Sc.**[4], and **Frederick L. Altice, M.D., M.A.**[5]

[1]Postdoctoral Clinical Fellow; Yale University School of Medicine, Department of Medicine, Section of Infectious Diseases, AIDS Program, New Haven, CT, 06510 USA (for the Latent Tuberculosis Determinant and Treatment Adherence Project, LTBDATA)

[2]Former Clinical Director, Community Health Care Van; Assistant Medical Director, Multicultural Ambulatory Addictions Services; Yale University School of Medicine, Department of Medicine, Section of Infectious Diseases, AIDS Program, New Haven, CT, 06510 USA

[3]Postdoctoral Associate; Yale University School of Medicine, Department of Medicine, Section of Infectious Diseases, AIDS Program, New Haven, CT, 06510 USA

[4]Assistant Professor of Medicine (AIDS) and of Epidemiology (Microbial Diseases); Former Medical Director, Community Health Care Van; Medical Director South Central Rehabilitation Center, Medical Director Multicultural Ambulatory Addiction Services, Division Chief HIV/AIDS Cornell Scott-Hill Health Center; Yale University School of Medicine, Department of Medicine, Section of Infectious Diseases, AIDS Program and Yale School of Public Health, Division of Epidemiology of Microbial Diseases, New Haven, CT, 06510 USA

[5]Professor of Medicine (Infectious Diseases) and of Epidemiology (Microbial Diseases); Director, Community Health Care Van; Director, Clinical and Community Research; Director, HIV in Prisons Program; Professor of Epidemiology and Public Health, Division of Epidemiology of Microbial Diseases; Icon Professor of Medicine, University of Malaya-Centre of Excellence for Research in AIDS (CERiA); Yale University School of Medicine, Department of Medicine, Section of Infectious Diseases, AIDS Program and Yale School of Public Health, Division of Epidemiology of Microbial Diseases, New Haven, CT, 06510 USA

Abstract

Background—Despite its benefit for treating active tuberculosis, directly observed therapy (DOT) for latent tuberculosis infection (LTBI) has been largely understudied among challenging inner city populations.

Methods—Utilizing questionnaire data from a comprehensive mobile healthcare clinic in New Haven, CT from 2003 to July 2011, a total of 2523 completed tuberculin skin tests (TST's) resulted in 357 new LTBIs. Multivariate logistic regression correlated covariates of the two outcomes 1) initiation of isoniazid preventative therapy (IPT) and 2) completion of 9-months IPT.

Results—Of 357 new LTBIs, 86.3% (n=308) completed screening CXRs: 90.3% (n=278) were normal and 0.3% (n=1) with active tuberculosis. Of those completing CXR screening, 44.0% (n=135) agreed to IPT: 69.6% (n=94) selected DOT, and 30.4% (n=41) selected SAT. Initiating IPT was correlated with undocumented status (AOR=3.43; p<0.001) and being born in a country of highest and third highest tuberculosis prevalence (AOR=14.09; p=0.017 and AOR=2.25;

Contact: Jamie P. Morano, M.D., M.P.H., Address: Yale University AIDS Program, 135 College Street, Suite 323, New Haven, CT 06510, USA., Mobile: +1-203-687-7162, Facsimile: +1-203-737-4051, jpmorano@alumni.princeton.edu.

p=0.005, respectively). Those selecting DOT were more likely to be Hispanic (83.0% vs 53.7%; p<0.0001), undocumented (57.4% vs 41.5%; p=0.012), have stable housing (p=0.002), employed (p<0.0001), uninsured (p=0.014), no prior cocaine or crack use (p=0.013) and no recent incarceration (p=0.001). Completing 9-months of IPT was correlated with no recent incarceration (AOR 5.95; p=0.036) and younger age (AOR 1.03; p=0.031). SAT and DOT participants did not significantly differ for IPT duration (6.54 vs 5.68 months; p=0.216) nor 9-month completion (59.8% vs 46.3%; p=0.155).

Conclusions—In an urban mobile healthcare sample, screening completion for LTBI was high with nearly half initiating IPT. Undocumented, Hispanic immigrants from high prevalence tuberculosis countries were more likely to self-select DOT at the mobile outreach clinic, potentially because of more culturally, linguistically, and logistically accessible services and self-selection optimization phenomena (SSOP). Within a diverse, urban environment, DOT and SAT IPT models for LTBI treatment resulted in similar outcomes, yet outcomes were hampered by differential measurement bias between DOT and SAT participants.

Keywords

Latent Tuberculosis; Immigrant; Foreign-Born; Directly Observed Therapy; Self-Administered Therapy; Mobile Health Care

BACKGROUND

Despite active tuberculosis (TB) being highly prevalent and contributing to high morbidity and mortality worldwide,[1] the US remains a low-burden country.[2] Since 2001, TB incidence among foreign-born exceeded US-born persons in the US[2] Despite this low TB incidence, identification and treatment of latent tuberculosis infection (LTBI) remains the cornerstone of TB elimination yet continues to be a public health challenge due to being an asymptomatic, mainly non-reportable disease, and adherence challenges to a 9-month course of isoniazid preventive therapy (IPT).

Despite the World Health Organization's (WHO) recommendation to treat LTBI using 9 months of IPT,[3] numerous challenges remain, including convincing patients with an asymptomatic disease to accept treatment, regimen non-adherence or default, concerns about adverse side effects, and the inability to enforce treatment for a non-communicable infection that may remain latent lifelong.[3] Though directly observed therapy (DOT) is the standard of care for treating active TB, adherence to treatment and completion rates for LTBI remain low, particularly for medically and socially vulnerable patient populations and for newly arrived immigrants.[4],[5] With a 10% lifetime reactivation risk of progression to active TB, and with most active TB cases occurring in foreign-born populations within five years after arrival to the US,[6] it is imperative to maintain effective LTBI testing and treatment strategies.

In addition to treatment of active TB, DOT has been effectively used in the treatment of other diseases, including HIV[7-9] and HCV.[10] Despite its benefit for treating active TB, directly observed therapy (DOT) for LTBI has been largely understudied among challenging inner city populations. To determine the extent to which patients screened positive for TB using tuberculin skin testing (TST), we examined clinical data on active TB screening, followed by the acceptance of IPT for the treatment of those with LTBI. Among those with LTBI, we examined LTBI treatment outcomes for patients opting to receive medications as DOT or self-administered therapy (SAT) for a disease that is clinically silent and may never result in active disease within a mobile healthcare clinic that provided free comprehensive services in an urban setting.

METHODS

Setting

New Haven, Connecticut, the seventh poorest US city for its size with approximately 130,000 persons with a median income of $39,920[11] has exceedingly high rates of poverty, unemployment, and problems with substance abuse and HIV/AIDS. The Community Health Care Van (CHCV), a free, mobile healthcare clinic operating since 1993 provides a number of free clinical services, including healthcare, screening for HIV and other sexually transmitted infections,[12] screening and vaccination for preventable infections,[13] buprenorphine treatment for opioid dependence,[14-17] tuberculosis screening,[18] syringe and condom distribution, directly administered antiretroviral therapy (DAART),[7,19-21] and a variety of case management[22] and post-prison release services. [23] In 2003, the CHCV began a routine TB screening program and offered DOT to support New Haven's undocumented and underserved community. Dedicated medical, case management and counseling staff are bilingual and bicultural in Spanish and provide weekday services in four distinct impoverished neighborhoods within New Haven, CT.

Clinical Procedures

All CHCV patients undergo a standardized baseline clinical encounter questionnaire, and the data are maintained in an electronic medical record. TST positivity is defined using standard criteria: induration 10mm for HIV negative and 5mm for HIV-positive individuals. All TST+ clients undergo an additional brief symptom assessment (cough/dyspnea, fever/night sweats, weight loss, fatigue, and hemoptysis) recommended by the WHO[24] and are referred for chest radiograph (CXR). For TST+ clients without evidence for active tuberculosis or hepatic transaminase levels greater than five times the upper limits of normal, they are offered 9 months of IPT as: 1) DOT, where IPT is observed twice-weekly (900 mg) along with vitamin B6 (100mg); or 2) SAT, with referral to a free, hospital-based TB specialty clinic that provides outpatient IPT with 90 day allotments of daily prescribed isoniazid and B6. DOT provides twice-weekly observed doses while SAT does not monitor adherence to therapy. Hepatic transaminases are monitored at baseline and again between 4-6 weeks at no cost at both sites. No monetary incentives were given either for testing or treatment, and a certificate was provided to each client upon completion of the DOT program. Monthly progress and completion reports were provided to the Connecticut Department of Public Health. This study was reviewed and approved by the Yale University School of Medicine Institutional Review Board.

Data Analysis

Two clinically relevant dependent variables were selected, including correlates of: 1) initiating IPT; and 2) completing IPT with stratified analysis for those selecting DOT or SAT. Independent variables were chosen on the clinical relevance to LTBI. Stable housing was defined as living in one's own apartment, one's own house, or with one's family. Unstable housing was defined as living in a shelter, halfway house, hotel, or a public place. Committed relationship was defined as being married or living together. Non-committed relationship was defined as being divorced, separated, widowed, or single. Foreign-born was defined by being born outside of the US or Puerto Rico. Recent incarceration and recent emergency room visits were defined within six months of completing the questionnaire. Interpersonal violence was defined by self-reported history of domestic violence, sexual assault, or both. Cocaine use was inclusive of all forms: powdered, smoked (crack cocaine), or injected either singly or in combination with heroin. "Speedball" is known as an injected mixture of cocaine and heroin. Hazardous alcohol use was defined as more than two drinks daily for men and more than one drink daily for women. Sex solicitation was defined as ever having paid money for sexual intercourse. Exchange for sex was defined as ever having

exchanged sex for money, drugs, or protection. Countries of origin among the foreign-born were organized into five categories of tuberculosis prevalence based on first (least prevalent) to fifth (most prevalent) as defined by the WHO.[25,26]

Fisher's Exact Test and the chi-square distribution were used to discern differences between the two groups according to sample size for categorical variables. The t-test was used to compare averages of continuous variables (age, months of therapy completed) between the two groups. Total months DOT therapy were recorded in the central database and confirmed with hand-tallied medical records from the CHCV. Total months of SAT therapy were confirmed with electronic TB clinic records; for those not completing therapy, a midpoint calculation of 1.5 months was set from the last date of prescription for the 90-day medication supply.

As a safeguard against measurement error, each medical record from all New Haven hospitals and affiliated clinic systems were reviewed to confirm chest-x-ray date, results, and doses received. After provision of release of medical information by patients, the Yale IRB approved a search of medical records. Date of birth was used to confirm patient identify for those with name changes or name discrepancies. The two dependent variables of initiation of IPT and completion of either SAT or DOT therapy at nine months were observed completely, and the covariates relating to predisposing factors were missing at a varying percentage (0-10%). Using a set of two dependent variables (i.e. initiation of IPT; completion of 9 months of IPT) and multiple imputations using standardized approaches of covariates,[3] we conducted several logistic regressions. The covariates that were found to be significant at $p<0.05$ level in the bivariate models were entered into a multivariate logistic model for initiation of IPT. Regression referents are the complement of dichotomous variables, unless otherwise specified for race/ethnicity and WHO category. WHO category was defined from least prevalent (WHO category 1) to most prevalent (WHO category 5) from WHO Stop TB country specific calculations.[26]

Covariates significant at the $p<0.20$ level were entered into the multivariate logistic model for completion of nine months of therapy.

Akaike Information Criteria (AIC) as well as Pearson's Chi-squared test were used to assess the relative goodness-of-fit and to discriminate among various multivariate models. The best model fit contained the lowest AIC with Pearson's Chi-square test indicating no better model existed (p-value >0.05). All analyses were carried out using intention to treat analysis using STATA 12.1 IC.[27]

RESULTS

From 2003 to July 2011, a total of 3158 TSTs were placed with 2523 TSTs read (representing 1325 unique, eligible individuals) resulting in 357 newly positive TST's. Of the 357 TST-positive patients, 308 (86.3%) completed recommended screening CXR: 278 (90.3%) were normal, 29 (9.4%) had a nodule, and 1 had active tuberculosis (Figure 1). Of the 135 initiators of isoniazid preventative therapy (IPT), 69.6% (n=94) initiated DOT, and 30.4% (n=41) initiated SAT, representing an average 44.0% initiation overall. Isoniazid completion rates at 9 months were 59.6% for DOT (n=56) and 46.3% for SAT (n=19). For those completing 6 months of IPT, 70.0% (n=62) of the DOT group and 61.0% (n=25) of the SAT group were successful. Symptom inventory among those newly positive TST individuals receiving DOT revealed that 57.14% reported loss of appetite, 50.8% had prior BCG vaccination, 23.0% had known prior contact with tuberculosis, 11.6% reported cough, 11.4% reported weight loss, and 11.1% reported sweats. No patients reported hemoptysis. Mexico was the most prevalent country of origin (n=32; 23.7%) for those initiating IPT

followed by Ecuador (n=27; 20.0%), USA/Puerto Rico (n=23; 17.0%), Guatemala (n=7; 5.2%), with <3% each from Peru, Ghana, Colombia, and the Dominican Republic.

The self-selected DOT group statistically differed from the SAT group by self-identifying as being Hispanic (83.0% vs 53.7%; p=0.001), undocumented (57.4% vs 41.5%; p=0.012), older age (41.2 vs 36.4 years; p=0.039), having stable housing (59.6% vs 39.0%; p=0.002), being employed (p<0.0001), being uninsured (p=0.014), having no prior cocaine use (p=0.013), and not having been recently incarcerated (p=0.001). The SAT group was more likely to be of African descent (p=0.012), to have health insurance (p=0.014), to have had recent incarceration (p=0.001), and to have ever used any form of cocaine (p=0.013). The groups were similar with respect to educational level, recent drug use in the past 30 days, recent emergency room utilization, and baseline HIV (9.6%) or Hepatitis C (0 to 4.3%) infection. (Table 1)

Of the 357 individuals with a newly diagnosed TST+, those choosing IPT (n=135) compared to those who declined IPT (n=172) were statistically more likely to be of Asian descent (p<0.0001), foreign-born (p<0.0001), undocumented (p<0.0001), and have a high school education (p=0.021). Those declining IPT reported recent incarceration (p=0.022), recent emergency room visitation (p=0.029), had previously injected drugs (p=0.001), and previously used cocaine (p=0.001) or marijuana (p<0.0001) (Table Not Shown).

IPT initiation was correlated in final multivariate models with undocumented status (AOR=3.43; p<0.001) and being born in a country of highest and third highest tuberculosis prevalence (AOR=14.09; p=0.017 and AOR=2.25; p=0.005, respectively). (Table 4)

Completing the full 9 months of IPT correlated in final multivariate models with not having being incarcerated within six months of diagnosis (AOR 5.95; p=0.036) and younger age (AOR 1.03; p=0.031). (Table 4)

Attrition from LTBI treatment is presented as Kaplan-Meier curves (Figure 2). Though usually reserved for variable time to event analysis, this format is helpful to visualize the relatively high percentage of adherence to completion as well as to compare the DOT and SAT groups visually, though ultimately found to be nonsignificant using the Cox Proportional Hazard testing (p=0.497).

DISCUSSION

The is the first study to our knowledge that successfully documents directly observed therapy (DOT) for latent tuberculosis infection (LBTI) in a multicultural, predominately foreign-born, urban, poor population with completion rates above national averages despite low levels of education and history of drug use.[28] The average treatment IPT duration was not significantly higher in the DOT group (p<0.216), and the total 9-month IPT completion of the DOT group did not statistically differ from the SAT group (p=0.155).

As the CHCV staff was bilingual with several having a Hispanic background, there was an important cultural trust that was established on the CHCV for foreign-born clients. This successful cultural and social affinity within the DOT group was reflected in the significant difference of being of Hispanic origin and foreign-born among those selecting DOT. Further, CHCV staff promoted bilingual education for each client on tuberculosis transmission, importance of therapy adherence, and the risk of reactivation tuberculosis without therapy and created a weekly social support network for those completing DOT.

Our intention-to-treat analysis included all clients in both the DOT and SAT groups who initiated nine months of therapy for the bivariate and multivariate logistic regression

analyses. By this method of combining all individuals who initiated therapy in both treatment arms for analysis, bias between the two treatment locations was reduced. As evidence suggests that 6 months of IPT is adequate for HIV negative LTBI, an exceptionally high completion rate for 6 months was reached at 70.0% (n=66) for the DOT group and 61.0% (n=25) for the SAT group, respectively, though not found to be statistically different. Though these findings did not show any statistical differences, measurement bias was likely introduced by the differential methods by which retention on treatment and completion was measured. For example in the DOT, all doses were measured and an exact date of discontinuation could be determined. For the SAT group, however, besides electronic clinical notes documenting patient report of taking IPT, no objective measurement of adherence was recorded except pharmacy prescription records documenting increments of 90-day allotments. One had to therefore make assumptions not only in adherence, but also in the date of completion by choosing a mid-point date between the 3-month prescription dispensations.

Another limitation of the study includes selection bias as patients were not randomized to either the DOT or SAT treatment groups and instead freely chose 1) whether to initiate therapy at all and 2) by differential approach to providing medications. Patients could have self-selected the treatment approach based on location, convenience, and possible cultural affinity to either clinic. On one hand, patients may have perceived that they were getting more "specialized" care if treated in a specialty TB clinic, whereas others might have preferred the casual and user-friendly atmosphere provided on the mobile health clinic, where they had been previously screened. As SAT was not also offered within the mobile clinic setting, it is difficult to separate a cultural affinity preference of twice weekly DOT on the CHCV from an every three-month SAT preference at the specialized TB clinic. The IPT completion rate parity between DOT and SAT groups may reflect patients optimizing their own choices for successful treatment.

Such treatment arm equivalence may be explained by what we describe as the self-selection optimization phenomenon (SSOP) in which demographic groups will self-sort according to cultural/linguistic affinity and logistic/financial convenience that they perceive would optimize their own self-interest for successful health outcomes. We observe that a mainly uninsured, undocumented Hispanic demographic would gravitate towards a free, bilingual clinic that is sensitive to preserving undocumented status in a confidential manner. Similarly, those patients who are primarily English-speaking, indoctrinated with the notion that care should be specialized, may perceive themselves to have great self-efficacy and preferring medication prescription every three months, and not needing a high degree of anonymity, resulting in self-selecting the traditional TB specialty clinic to optimize their own health outcome. Having both clinic options is shown to be valuable models for IPT care with diverse demographics within this urban setting. Irrespective of how patients self-selected, when given the option, treatment outcomes were excellent.

Of the 357 new cases, 67.2% (n=240) did not have health insurance, 58.3% (n=208) were foreign-born, and 35.6% (n=127) were undocumented. The large percentage of foreign-born individuals in this study is testament of the importance of continuing community outreach work to reach those clients at the highest risk for reactivation tuberculosis who may not seek care in traditional care settings and who largely do not have health insurance.

Though only one active case of tuberculosis was found, this individual was traced to a large family of more than ten close contacts who subsequently underwent timely evaluation and prophylaxis by the public health department and thus potentially averted many other active cases in the Hispanic community. This mobile clinic outreach program collectively tested and facilitated care for 91 persons at 6 months and 75 persons at 9 months without financial

or other reward incentives[29] and thus played a key public health prevention and potentially cost-saving role in averting many potential active tuberculosis cases.

Those more likely both to initiate IPT and to complete the 9-month IPT course had no recent incarceration, underscoring that reducing or eliminating the need for incarceration though alternative sentencing or enhanced community-based mental health and substance use interventions may serve to decrease disruption in urban community-based health initiatives. Alternatively, there might have been a detection bias against inclusion of this demographic because of the routine TB screening procedures deployed in prisons and jails in Connecticut.

The finding that the majority of patients completed at 6 months of IPT has important implications from new approaches to IPT. Recently, CDC has recommended a three-month "weekly" treatment strategy with rifapentine and isoniazid, potentially providing even greater opportunity to improve medication compliance and completion rates for LBTI.[30] Culturally appropriate TST screening among immigrant, undocumented, and other high-risk groups, however, continues to be a vital cornerstone to avert future infections, and despite structured public health efforts, community outreach remains central to future TB prevention efforts.

CONCLUSIONS

This study demonstrates clinical outcome parity of directly observed therapy (DOT) compared to self-administered therapy (SAT) both at six and nine months for isoniazid prevention therapy (IPT) for latent tuberculosis infection (LTBI). DOT within a mobile clinic model is a feasible alternative for especially high-risk populations who may otherwise avoid traditional sites for healthcare (e.g., foreign-born, undocumented, and uninsured populations). Moreover, it results in similar outcomes as traditional TB clinic approaches that do not include such marginalized populations who appear to prefer integrated services with culturally and linguistically appropriate educational support. The reason for high percentage completion rates within both DOT and SAT treatment groups may partially be ascribed to the self-selection optimization phenomenon (SSOP) in which demographic groups gravitate towards the clinic model that is perceived to maximize their own health outcomes.

This study provides empirical evidence that a culturally and geographically accessible mobile healthcare clinic like the CHCV is an integral factor for the high percentage of screening and completion for LBTI and would serve as successful future models of LBTI. Such clinical strategies that contain either a DOT or SAT regimen for treating LTBI, especially the newer 12-week strategies, is promising for higher screening, adherence, and completion rates in foreign-born and undocumented urban populations with or at risk for LTBI.

Acknowledgments

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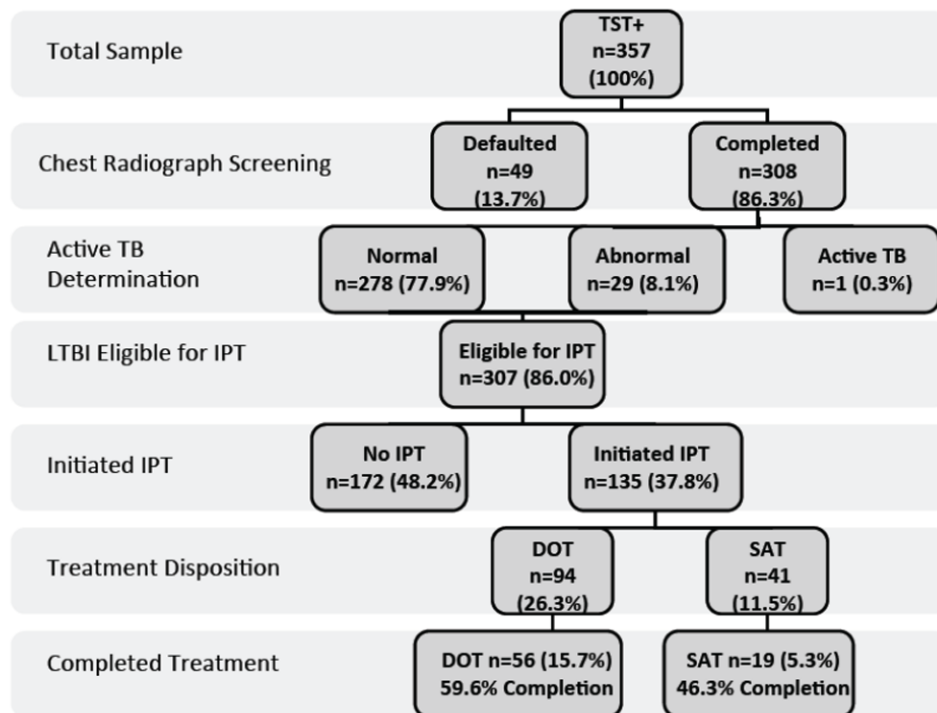
Figure 1.
Latent tuberculosis screening and treatment allocation algorithm (n=357). The one case of active tuberculosis completed the four drug regimen.
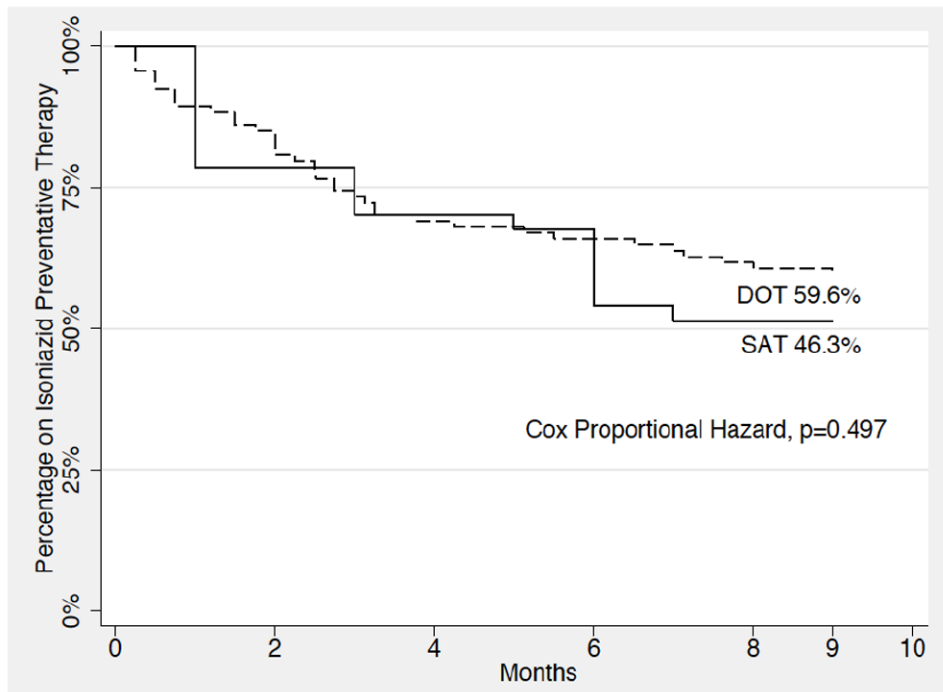
Figure 2.
Kaplan-Meier survival curve of months completion of isoniazid preventative therapy
illustrating directly observed therapy (DOT) vs self-administered therapy (SAT) (n=135).

Table 1

Characteristics of patients starting isoniazid preventative therapy (IPT) stratified by method of treatment delivery (n=135).

	Total n=135 n (%)	DOT n=94 n (%)	SAT n=41 n (%)	p-value
Age (mean years)	39.8	41.2	36.4	0.039
Treatment duration (mean months)	6.28	6.54	5.68	0.216
Completion of 9-month IPT	75 (55.6)	56 (59.8)	19 (46.3)	0.155
Male gender	84 (62.2)	58 (61.7)	26 (63.4)	0.850
Race/ethnicity:				
White	6 (4.4)	2 (2.1)	4 (9.8)	0.023
Black	27 (20.0)	12 (12.8)	15 (36.6)	0.012
Asian/Other	2 (1.5)	2 (2.1)	0 (0.0)	0.176
Hispanic	100 (74.1)	78 (83.0)	22 (53.7)	<0.0001
Foreign-born	106 (78.5)	79 (84.0)	27 (65.9)	0.147
Undocumented immigrant	71 (52.6)	54 (57.4)	17 (41.5)	0.012
Number people in house (average)	6.68	4.28	13.14	0.047
Completed high school	65 (48.1)	43 (45.7)	22 (53.7)	0.898
Stable housing	72 (53.3)	56 (59.6)	16 (39.0)	0.002
Committed relationship	54 (40.0)	41 (43.6)	13 (31.7)	0.057
Employed	85 (63.0)	73 (77.7)	12 (29.3)	<0.0001
Health insurance	24 (17.8)	11 (11.7)	13 (31.7)	0.014
Injection drug use history	4 (3.0)	2 (2.1)	2 (4.9)	0.585
Drug use last 30 days:				
Any injected drug	1 (0.7)	1 (1.1)	0 (0.0)	1.000
Heroin	3 (2.2)	2 (2.1)	1 (2.4)	1.000
Speedball	0 (0.0)	0 (0.0)	0 (0.0)	n/a
Cocaine	5 (3.7)	3 (3.2)	2 (4.9)	0.639
Marijuana	6 (4.4)	3 (3.2)	3 (7.3)	0.368
Drug use ever:				
Heroin	10 (7.4)	6 (6.4)	4 (9.8)	0.491
Speedball	6 (4.4)	3 (3.2)	3 (7.3)	0.368
Cocaine	23 (17.0)	11 (11.7)	12 (8.9)	0.013
Marijuana	40 (29.6)	24 (25.5)	16 (39.0)	0.151
Hazardous alcohol use	67 (49.6)	48 (51.1)	19 (46.3)	0.614
Transactional sex:				
Sex solicitation	21 (15.6)	14 (14.9)	7 (17.1)	0.748
Exchange for sex	2 (1.5)	0 (0.0)	2 (4.9)	0.091
Interpersonal violence victim	8 (5.9)	4 (4.3)	4 (9.8)	0.245
Sexually transmitted infection	24 (17.8)	14 (14.9)	10 (24.4)	0.222
Mental health diagnosis	19 (14.1)	11 (11.7)	8 (19.5)	0.283
HIV monoinfection	13 (9.6)	9 (9.6)	4 (9.8)	1.000

	Total n=135	DOT n=94	SAT n=41	p-value
	n (%)	n (%)	n (%)	
Hepatitis C monoinfection	4 (3.0)	4 (4.3)	0 (0.0)	0.314
Incarceration recent	10 (7.4)	2 (2.1)	8 (19.5)	0.001
Emergency room recent	19 (14.1)	11 (11.7)	8 (19.5)	0.238

DOT: directly observed therapy; SAT: self-administered therapy; Speedball: injected mixture of cocaine and heroin; IPT: isoniazid preventive therapy

Table 2

Initiation of isoniazid preventive therapy by bivariate and multiple logistic regression correlates (n=357).

	Bivariate Analysis			Multivariate Analysis		
	Crude OR	95% CI	p-value	Adjusted OR	95% CI	p-value
Age (years)	1.00	0.98-1.02	0.940			
Male gender	0.87	0.56,1.36	0.555			
Race/Ethnicity:						
White	referent					
Black	1.62	0.60,4.32	0.340			
Asian	9.33	0.72,120.41	0.087			
Hispanic	4.06	1.61,10.20	0.003	1.36	0.67,2.76	0.401
Foreign-born:	4.36	2.61,7.30	0.001	1.23	0.46,3.28	0.676
Undocumented:	3.97	2.49,6.34	0.001	2.17	1.04,4.53	0.039
WHO category:						
First	referent					
Second	1.98	0.64,6.13	0.235			
Third	3.54	2.08,6.04	<0.0001	2.36	1.21,4.58	0.011
Fourth	0.66	0.21,2.09	0.480			
Fifth	13.88	1.64,117.60	0.016	12.55	1.16,135.79	0.037
Not completing high school	1.41	0.90,2.20	0.130			
Stable housing	2.13	1.34,3.37	0.001	1.54	0.87,2.72	0.139
Committed relationship	1.97	1.23,3.14	0.004	1.28	0.71,2.28	0.412
Employed	2.59	1.67,4.02	<0.0001	1.33	0.73,2.41	0.349
Uninsured	3.09	1.83,5.21	<0.0001	1.09	0.46,2.60	0.834
Injection drug use ever	0.20	0.07,0.58	0.003	0.41	0.10,1.71	0.220
Drug use last 30 days:						
Any injected	0.23	0.03,1.88	0.170			
Heroin	0.21	0.06,0.70	0.012	0.40	0.08,1.90	0.250
Speedball*	n/a					
Cocaine	0.32	0.12,0.85	0.023	0.78	0.19,3.20	0.726
Marijuana	0.42	0.27,0.67	<0.0001	1.80	0.53,6.16	0.348

| | Bivariate Analysis | | | Multivariate Analysis | | |
	Crude OR	95% CI	p-value	Adjusted OR	95% CI	p-value
Drug use ever:						
Heroin	0.29	0.14,0.60	0.001	1.78	0.45,6.98	0.408
Speedball	0.40	0.16,1.01	0.054			
Cocaine	0.39	0.23,0.67	0.001	0.72	0.24,2.14	0.557
Marijuana	0.43	0.27,0.67	<0.0001	1.51	0.66,3.46	0.335
Hazardous alcohol use	1.12	0.73,1.72	0.610			
Sex solicitation	0.86	0.48,1.54	0.622			
Exchange for sex	0.32	0.07,1.48	0.144			
Interpersonal violence victim	0.45	0.19,0.98	0.047	1.04	0.40,2.72	0.933
Sexually transmitted infection	1.12	0.64,1.98	0.680			
Mental health diagnosis	0.88	0.48,1.60	0.666			
HIV monoinfected	2.04	0.89,4.70	0.093			
Hepatitis C monoinfected	0.53	0.17,1.69	0.286			
Incarceration recent	0.47	0.22,0.98	0.045	1.44	0.56,3.89	0.466
Emergency room recent	0.58	0.32,1.04	0.068			

OR: odds ratio; WHO: World Health Organization; IPT: isoniazid preventive therapy

*
Speedball: injected mixture of cocaine and heroin

Table 3

Correlates of completing the 9-month course of isoniazid preventive therapy (n=135).

	Bivariate Analysis			Multivariate Analysis		
	Crude OR	95% CI	p-value	Adjusted OR	95% CI	p-value
DOT (vs SAT)	1.70	0.81,3.57	0.157			
Age (years)	0.98	0.95,1.00	0.088	0.97	0.94,0.997	0.031
Male gender	1.53	0.76,3.08	0.235			
Race/ethnicity:						
White	referent					
Black	0.93	0.16,5.45	0.935			
Asian	1	1	1			
Hispanic	1.33	0.25,6.89	0.738			
Foreign-born	0.55	0.22,1.38	0.201			
Undocumented	1.20	0.58,2.46	0.621			
WHO category:						
First	referent					
Second	0.34	0.06,2.01	0.235			
Third	0.99	0.47,2.16	0.984			
Fourth	0.23	0.02,2.31	0.211			
Fifth	0.68	0.13,3.66	0.657			
High school completion	1.59	0.78,3.28	0.204			
Stable housing	1.02	0.48,2.15	0.964			
Committed relationship	1.05	0.50,2.18	0.899			
Employed	1.43	0.71,2.88	0.320			
Uninsured	1.41	0.57,3.47	0.454			
Injection drug use ever	0.79	0.11,5.81	0.821			
Drug use last 30 days[||]						
Cocaine	0.52	0.08,3.22	0.483			
Marijuana	1.63	0.29,9.23	0.579			
Ever drug use						
Heroin	1.21	0.33,4.53	0.769			

	Bivariate Analysis			Multivariate Analysis		
	Crude OR	95% CI	p-value	Adjusted OR	95% CI	p-value
Speedball[*]	4.21	0.48,37.09	0.195	11.07	0.89,138.0	0.062
Cocaine	0.69	0.28,1.69	0.414			
Marijuana	1.29	0.61,2.74	0.501			
Hazardous alcohol use	0.60	0.30,1.19	0.145	0.58	0.28,1.18	0.134
Sex solicitation	1.08	0.42,2.76	0.873			
Interpersonal violence victim	1.36	0.31,5.92	0.685			
Sexually transmitted infection	1.31	0.52,3.27	0.564			
Mental health diagnosis	0.80	0.30,2.14	0.658			
HIV monoinfected	0.66	0.21,2.07	0.475			
Hepatitis C monoinfected	2.45	0.25,24.26	0.441			
Incarceration recent	0.32	0.08,1.27	0.106	0.17	0.03,0.89	0.036
Emergency room recent	0.53	0.20,142	0.208			

OR: odds ratio; DOT: directly observed therapy; SAT: self-administered therapy; WHO: World Health Organization

[*]
Speedball: injected mixture of cocaine and heroin

[¶]
Bivariate analysis was indeterminate for the following due to small sample size: injection drug use last 30 days, heroin use last 30 days, speedball (injected mixture of heroin and cocaine) last 30 days, and ever exchanging sex for money, drugs, or protection.

Table 4

Best-Fit Models with Correlates of Accepting (Initiating) and Completing Isoniazid Preventive Therapy.

				Isoniazid Preventive Therapy			
	Initiating (Accepting)			Completing 9 Months			
	AOR	95% CI	p-value		AOR	95% CI	p-value
WHO category 5	14.09	1.60,123.71	0.017	Younger age	1.03	1.003,1.06	0.031
Undocumented immigrant	3.43	2.08,5.65	<0.001	No recent Incarceration	5.95	1.12,31.62	0.036
WHO category 3	2.25	1.28,3.96	0.005	Speedball* ever injected	11.07	0.89,138.07	0.062
				Hazardous alcohol use	0.58	0.28,1.18	0.134
AIC	425.29				181.93		
Pearson X² p-value	0.86				0.36		

WHO: World Health Organization; AOR: Adjusted Odds Ratio; AIC: Akaike Information Criteria

*
Speedball: injected mixture of heroin and cocaine