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Factors Related to the Offer of HIV Testing and Known HIV Status in Persons with

Tuberculosis

By Rajita R. Bhavaraju

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ABSTRACT OF THE DISSERTATION

Factors Related to the Offer of HIV Testing and Known HIV Status in Persons with
Tuberculosis

by RAJITA RATNAM BHAVARAJU

Dissertation Directors: Professors Cristine Delnevo and Marian Passannante

Objective: Describe how year of report, substance use, residential setting, demographic characteristics, and provider type are related to the offer of HIV testing and known HIV status in persons with tuberculosis (TB) in New Jersey.

Methods: 1) Surveillance data (2000-2013) were analyzed for persons with TB, and associations with offer of HIV testing and known HIV status by the study variables.

Models, stratified by provider type, were developed with two HIV outcomes. Interactions by year were added. 2) Thirty-one providers were interviewed about HIV testing in persons with TB. Transcripts were coded and themes identified.

Results: 1) HIV testing was offered to 70.4% and HIV status was known in 62.7% of individuals with TB. The odds of HIV testing offer and known HIV status increased two-four times ($p < 0.0001$) after 2006, when opt-out HIV testing was recommended. Differences in HIV testing offer and known HIV status were identified in all age groups compared to 25-44 year olds ($OR = 0.11-0.81$; $p < 0.0010$). Females had lower odds of

HIV testing offer and known HIV status than males (OR=0.67-0.73; $p<0.0002$).

Substance users had greater odds of HIV testing offer and known HIV status than non-users (OR=1.85-2.62; $p<0.0001$). Homeless persons had higher odds of known HIV status (OR=2.49; $p=0.0432$) than non-homeless person under community care. Black, non-Hispanics (OR=2.07-3.13; $p<0.0001$) had higher odds of HIV testing offer and known HIV status than White, non-Hispanics. Hispanics under community care (OR=1.62; $p=0.0026$) had higher known HIV status and Asians under community care had lower odds of known HIV status and offer of HIV testing (OR=0.69-0.71, $p\leq 0.0051$) compared to White, non-Hispanic.

2) Interview codes fell under four themes: basis of provider's testing decision, perceived patient barriers, provider testing barriers, and provider testing opportunities. Providers corroborated that the opt-out recommendation has made it easier for offering HIV testing. Barriers to HIV testing included limited time, patient stigma, low access to testing facilities, not knowing/remembering to test, and hesitation to test all persons with TB without risk factors.

Conclusion: Interventions are needed to educate providers about HIV testing recommendations for all persons with TB, as well as training on patient support for the process and results.

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I dedicate this dissertation to my parents - my father, Murty Bhavaraju, who instilled in me the love of education, inquiry, and hard work regardless of age, ability, and obstacles. And to my mother, Bharati Bhavaraju, for her strong support, listening to all my detailed thoughts patiently during my years as student, and for taking care of my children while I was studying and writing. Completion of my degree would certainly not have been possible without her being my cheerleader.

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DEFINITIONS OF KEY TERMS AND ACRONYMS

There are a number of terms that will be used throughout this dissertation report. These are explained below and are related to tuberculosis (TB), human immunodeficiency virus (HIV), and the medical management of those with TB disease and HIV infection.

Human immunodeficiency virus (HIV)/Acquired immune deficiency syndrome (AIDS) – HIV is passed from person to person through certain body fluids. It is present in the body for a lifetime and, if left untreated, can cause a person's immune system to become weak, making it difficult to fight opportunistic infections like TB. HIV causes acquired immune deficiency syndrome (AIDS), a condition defined by specific criteria, related to a person's low level of immunity (CD4 count) and a high level of HIV (viral load) in the body.

TB infection – The presence of a small number of TB bacteria in one's body without causing symptoms or spread to others. Persons can be tested for TB with a skin or blood test, but other tests (e.g., x-ray) will be normal.

TB disease – The presence of a large number of TB bacteria in the body which can be spread to others depending on what type of TB a person has (e.g., lung/pulmonary TB). The disease starts as TB infection and can progress to TB disease with rapidity based on various risk factors, the greatest of which is HIV infection. Skin and blood tests for TB can be positive for TB infection. Chest x-rays can be used to make an empiric diagnosis

of TB. Sputum smear microscopy and culturing of sputum are tests that can be used to make a laboratory diagnosis of TB disease. A person with pulmonary TB disease also has symptoms, like cough and fever.

Verified TB Case – A person with TB disease that is counted as part of health statistics and meets all of the following criteria for a clinical case: 1. A positive tuberculin skin test result or positive interferon gamma release assay for *Mycobacterium tuberculosis* (*M. tuberculosis*) 2. Signs and symptoms compatible with TB (e.g., abnormal chest radiograph, abnormal chest computerized tomography scan or other chest imaging study, or clinical evidence of current disease) 3. Treatment with two or more anti-TB medications 4. A completed diagnostic evaluation AND/OR laboratory confirmation via the isolation of *M. tuberculosis* complex from a clinical specimen identified (Centers for Disease Control and Prevention [CDC], 2009a).

Note that “case” is a term used in TB surveillance programs. The term “person” or “individual” with TB is used in this dissertation report and not the word “case.”

Infectious – The ability to spread bacteria or viruses. A person with TB disease of the lungs can be infectious if he or she has a large number of bacteria, has a cough, and is not being treated. Persons with TB infection are NOT infectious.

Contact –The term used for a person who has been exposed to a person with TB disease who may have spread TB bacteria. The contact, if infected recently, has a high chance of progressing from TB infection to disease particularly if he or she has a weakened immune

system, which could be a result of HIV infection or other medical conditions (e.g., poorly controlled diabetes) or certain medications (e.g., cancer chemotherapy).

Opt-in testing – Diagnostic testing which requires written or verbal consent of the patient.

Opt-out testing – Diagnostic testing which does not require written or verbal consent of the patient. It is often part of routine or the standard of care and may not require counseling or education prior to administering. Opt-out testing is recommended by CDC for all persons in the general population being tested for HIV infection, including for all persons with TB. However, not all states, health care institutions, or providers follow this recommendation.

Offer of HIV testing – When a health care worker asks a patient if he or she wishes to have HIV testing done as part of an opt-in policy, or administers an HIV test while informing the patient as part of an opt-out policy.

Known HIV status – Documentation, report, or record of an HIV test having been administered and recognized by an HIV test result (negative or positive) being noted in a medical record. Unknown, missing, or indeterminate HIV status is NOT considered to be known HIV status.

Universal HIV testing - Screening for HIV infection being recommended or practiced for all persons, regardless of the presence of risk factors.

Antiretroviral (ARV) therapy – (also known as ART) Drugs used to reduce the burden of HIV in the body. Early initiation of ART is recommended for people with TB also diagnosed with HIV to reduce mortality and increase the chance of successful treatment outcomes for TB. Some ARV drugs interact with TB drugs requiring adjustments for both types of medications.

Note that health care worker and provider will be used interchangeably. These terms both refer to physicians, nurses, and disease investigators (lay health workers) in health departments, private practices, hospitals, and/or community health centers.

CHAPTER 1 – INTRODUCTION

BACKGROUND OF THE PROBLEM AND CHAPTER OVERVIEW

Tuberculosis (TB) is an opportunistic infection, caused by *Mycobacterium tuberculosis* (*M. tuberculosis*), that most commonly affects the lungs. Initial infection occurs after exposure to an infectious person with TB disease and is called TB infection. According to the World Health Organization (WHO), 5-10% of those with TB infection will progress to TB disease, most within the first five years after infection. Certain medical conditions, such as human immunodeficiency virus (HIV) infection, increase the risk of progressing from TB infection to TB disease (World Health Organization [WHO], 2009). The estimated annual risk for TB disease among persons infected with *M. tuberculosis* in the general population is 12.9 per 1,000 person-years. However, rates of progression to active TB among HIV-infected persons with TB infection have ranged from 35 to 162 per 1,000 person-years of observation (Centers for Disease Control and Prevention [CDC], 2000; CDC, 2009a).

Among people living with HIV (PLHIV), TB is the leading cause of death (WHO, 2009; CDC, 2009b). The dual occurrence of TB and HIV infection causes complex clinical management issues. Both are the leading causes of infectious disease deaths worldwide (WHO, 2016). Moreover, PLHIV have a higher rate of progression to TB disease once infected with TB bacteria than persons with other known risk factors for progression such as diabetes, organ transplantation, kidney failure, and certain types of cancer (CDC, 2000a; CDC, 2010a). Additionally, persons with both TB disease and HIV have a five to six times higher rate of death compared to persons with TB disease not infected with HIV

(CDC, 2007a; Perfura Yona, Kuaban, & Kengne, 2012). This global public health issue is rooted in both medical and behavioral causes which require not just clinical interventions such as treatment, but changes in provider knowledge and practice.

This study explored factors associated with the testing for HIV among persons with TB. Chapter one will provide a brief review of the burden of TB, with emphasis on the burden of dual occurrences of TB and HIV infections. This chapter will also address the important consequences of HIV testing recommendations in persons with TB and challenges related to testing. Additionally, it will introduce the study's aim and research questions.

TB burden

In 2015, there were an estimated 10.4 million people with TB worldwide including 9557 individuals (rate = 3.0 per 100,000) in the United States (US) (WHO, 2016; CDC, 2016). TB rates in the US continue to be highest among foreign-born persons (66.4%) (15.1 cases per 100,000) the majority of whom are of Asian race (47.8%). The majority of US-born persons with TB (35.9%) were of Black race (CDC, 2016).

While it is key to understand whom TB most affects, the co-morbidity of TB and HIV is also significant. In 2015, an estimated eleven percent (11%) of persons with TB worldwide were also infected with HIV. It is also estimated that during 2015, 1.5 million non-HIV-infected persons died from TB and there were 390,000 deaths among people with both TB disease and HIV (WHO, 2015). At the height of the most recent increase in

TB rates in the US, HIV positive status among persons with TB of all ages was estimated to be 48.2% overall and 68.5% in the 25-44-year age group. More recently, HIV infection in the US has been reported to have occurred in 5.5% of individuals with TB(CDC, 2016).

However, while the reported reduction in co-occurrence of TB disease and HIV infection is significant, the estimate of HIV prevalence in persons with TB is not likely to be accurate, as offer of HIV testing can vary substantially. What is known about HIV status is reflective of who has been offered testing as well as where they are receiving treatment. In the Technical Notes from CDC's "Reported Cases of Tuberculosis in the United States, 2015," it is stated that:

Data regarding the HIV-infection status of persons reported with TB should be interpreted with caution because these data are not representative of all TB patients with HIV infection...TB patients who are tested anonymously might choose not to share HIV testing results with their health care provider. TB patients managed in the private sector can receive confidential HIV testing, but results might not be reported to the health department's TB program. Additionally, certain factors can influence HIV testing among TB patients, including the extent to which testing is targeted or routinely offered to specific groups (e.g., males aged 25–44 years, injection-drug users, or homeless persons) and the availability of and access to HIV testing services. These data might overrepresent or underrepresent the proportion of TB patients known to be HIV-infected in a reporting area (CDC, 2016).

Known HIV status

The US Centers for Disease Control and Prevention (CDC) established the National TB Indicators Project (NTIP) with benchmarks for measuring the performance of federally-funded health department TB programs. The assessment of benchmarks is generated using surveillance data of individually reported cases of TB disease reported on an annual basis. The NTIP specific benchmark for HIV is for 98% of persons with TB to have a

known HIV status by 2020 (CDC, 2010b; CDC, 2015b). The NTIP indicator raises the importance of ensuring that all people with TB have a known HIV status.

On US state TB reporting forms, HIV status can be characterized with a test result (negative, positive, or indeterminate), not offered, refused, or unknown (or blank). The data that follow below clearly indicate in various settings how much HIV status information is known or reported, how much HIV testing is offered, and the differences in various groups of people with TB. While the percentage of people with TB with reported HIV status has been increasing in the US, only 89.5% had HIV status information included on their TB surveillance report form in 2015 (Table 1) (CDC, 2016). This number represents known HIV status in aggregate for the country. However, based on publicly available data from individual states which have consistently reported individual HIV data, the range of unreported HIV status in persons with TB from 2000 to 2014 was between 5.6% and 53.9% with a mean of 25.9% (Table 2) (Online Tuberculosis Information System [OTIS], 2016).

Table 1. Reported HIV status on surveillance forms in persons with TB in the US (2000-2015)

Year	Number of Persons with TB with Reported HIV Status¹	Total Number of Persons with TB	% of total	Year	Number of Persons with TB with Reported HIV Status¹	Total Number of Persons with TB	% of total
2000	7990	15888	50.3	2008	8166	12642	64.6
2001	8007	15567	51.4	2009	7337	11269	65.1
2002	7924	14725	53.8	2010	7436	10912	68.1
2003	8037	14509	55.4	2011	8711	10268	84.8
2004	8415	14208	59.2	2012	8433	9726	86.7
2005	8150	13767	59.2	2013	8343	9339	89.3
2006	8231	13412	61.4	2014	8269	9212	89.8
2007	8266	12993	63.6	2015	8366	9349	89.5

Source: CDC. Reported Tuberculosis in the United States, 2015.

¹Includes persons with positive, negative, or indeterminate HIV test results and persons from California with co-diagnosis of TB and AIDS for the period 2000–2004, and those persons not dead at diagnosis. HIV test results for Vermont are not included for years 2007–2015. HIV test results for California are not included for years 2005–2010.

²California began reporting HIV test results to CDC in 2011.

Table 2. Unreported HIV status in persons with TB by US state (2000-2015)

States^{*, +}	Unreported HIV status information (percent of total number of cases in each state)
District of Columbia, Mississippi, Nevada	<10%
Alabama, Colorado, Florida, Georgia, Kansas, Maryland, Minnesota, New Hampshire, North Carolina, North Dakota, Oregon, South Carolina, Tennessee, Utah, Washington	10-20%
Alaska, Arizona, Arkansas, Connecticut, Delaware, Kentucky, Maine, New Mexico, Montana, New York, Oklahoma, Ohio, Rhode Island, Texas, Virginia, Wisconsin	21-30%
Illinois, Iowa, Michigan, Missouri, Nebraska, New Jersey, Pennsylvania, Wyoming	31-40%
Idaho, Indiana, Massachusetts, South Dakota	41-50%
Hawaii, Idaho, West Virginia	>50%

*California is not listed due to incomplete reporting nationally over the time period. Louisiana and Vermont are not listed due to values too small to report for confidentiality reasons.

+Includes metropolitan areas for which reporting is done separately

This variability in HIV testing by geographic location (Table 2) is not unique to the US.

A survey with responses from 25 of the 30 countries of the European Union/European Economic Area found similar variability. There was an estimated five to 90% of persons with TB tested for HIV infection despite an up to 15% HIV prevalence in some areas (Kruisjshaar et al, 2011). Interestingly, the percentage of people with TB with reported HIV status in the US is lower than that of several high-burden TB countries such as Mozambique (96%), Burkina Faso (96%), Togo (97%), Swaziland (97%), and Rwanda (99%) (WHO, 2015).

In addition to geographic variation, the percentage of unreported HIV status in persons with TB also varied among certain groups in the US. In 2014, females with TB (14.4%) had higher unknown HIV testing results compared to males with TB (11.8%); persons of White race, had the highest rates (17.8%) of unknown HIV status compared to other

race/ethnicities followed by persons of multiple races (16.0%), Asians (14.9%), Hispanics (10.8%), Native Americans (9.3%), Blacks (9.1%), and Native Hawaiian or other Pacific Islander (8.7%); and younger persons, 0-14 years of age (35.9%) had the highest unknown HIV status compared to other age groups followed by persons 65 years and older (24.2%), 45-64 year olds (9.0%), 25-44 year olds (6.8%), and 15-24 year olds (4.6%) (OTIS, 2016).

Consequences of unknown HIV status in persons being diagnosed with TB

There are notable consequences of unknown HIV status in persons being diagnosed with TB. First, PLHIV may present with TB disease differently than people not infected with HIV. In the US, TB is generally diagnosed based on a physical exam, symptom history, chest x-ray and/or other radiologic imaging, and bacteriologic testing (smear and culture) on sputum (from the lungs) or other bodily specimens to check for the presence TB bacteria. The presentation of TB in PLHIV can vary from non-HIV-infected persons and, therefore, knowledge of HIV status is critical for the accurate diagnosis of TB (CDC, 2003). Research has suggested that persons with pulmonary (lung) TB and HIV/AIDS were less likely to have an abnormal chest x-ray and present with less cavitory disease than non-HIV-infected persons with TB (Moore, McCray, & Onorato, 1999). These two findings, abnormal chest x-ray and cavitory disease, are common in pulmonary TB disease, but among those with HIV infection, the radiological presentation can be atypical. In addition, the bacteriological findings in sputum smear in persons with TB/HIV is also more likely to be negative, as the diagnostic tools used are less sensitive in PLHIV. The gold-standard for diagnosis of TB is to perform microbiological culture

of sputum or other specimens (e.g., lymph node aspirate). TB culture often uses a traditional solid medium (Lawn & Wood, 2011; Padmapriyadarshini, Narendran, & Swaminathan, 2011). This solid medium, however, is less sensitive in PLHIV leading to the need for liquid media that is costlier overall, and less available in low-resource countries (Achanta et al, 2012).

Benefits of known HIV status among people with TB

Just as there is evidence that failure to test for HIV in persons with TB can have negative impacts, there is also evidence that proactive testing can provide benefits for both persons with TB and their contacts. A contact is a person who has been exposed to TB bacteria by frequently sharing air space, over a prolonged period of time, with a person who has TB disease and is infectious. Recent contacts of people with TB disease are at high risk of TB infection progressing to TB disease and HIV increases this risk further (Schalkwyk et al, 2014; CDC, 2005a). Reichler and colleagues looked at the proportion of contacts who had an HIV risk assessment done while being evaluated for TB infection or disease during a one-year period. Of the 1169 contacts for whom data were assessed, 349 (30%) were diagnosed with pulmonary TB. Of the people with pulmonary TB, 64% had HIV testing done; however, only 19% of their 1169 contacts had an HIV assessment performed (i.e., were asked about risk factors for HIV infection). Eighty percent (80%) of the 1169 contacts were associated with a person with TB disease and known HIV status; if a person with TB was HIV positive, the contact was also more likely to be HIV positive. The authors not only recommended that HIV risk assessments be done for TB contacts and that HIV testing be offered to them, but that future research be done to

assess adherence to and barriers interfering with the recommendation to provide HIV testing for all people diagnosed with TB and their contacts. This included the identification of the reasons that contacts are not offered HIV testing or reasons they may refuse testing (Reichler et al, 2003).

Once diagnosed, the treatment of TB among PLHIV is similar to that of treatment for non-HIV-infected persons. However, if a PLHIV is on anti-retroviral treatment (ART) or if a person newly diagnosed with HIV will be started on ART, the TB medications may be altered to allow for more effective ART (Kwange & Budambula, 2010; Crampin et al, 2010). Persons with TB and HIV who are placed on ART have better TB treatment outcomes than PLHIV who are not on ART while on TB treatment, particularly if their immune status (CD4 count) is low and both TB and HIV treatments are started early (Korenkamp, Scano, Williams, Dye, & Nunn, 2003; Blanc et al, 2011; Karim et al, 2010). For those with TB, the knowledge of HIV status can be beneficial in optimizing TB treatment protocols. Additionally, PLHIV are at higher risk for re-infection with TB and can benefit from preventive treatment if exposed to TB again in the future (Lambert, Hasker, Van Deun, Robberfroid, Baele, Van der Stuyft, 2003; Sanders et al, 2005; Uhler et al, 2011). In high-burden settings where exposure to TB is assumed, 36-month preventive treatment has been shown to reduce incidence of TB disease in PLHIV (Samandari et al, 2011).

In summary, when considering TB diagnosis, knowledge of HIV status is imperative so that clinicians do not miss atypical presentations of TB, perform a better assessment of

symptoms, use appropriate diagnostic algorithms, and intervene early with appropriate treatment (Naik et al, 2012; CDC, 2013; Panel on Antiretroviral Guidelines for Adults and Adolescents, 2015). This includes an assessment of a patient's immune status to initiate ART early to increase TB treatment success (WHO, 2011).

The importance of HIV testing: recommendations and challenges

As mentioned earlier in this chapter, TB infection is the presence of *M. tuberculosis* in the body without signs or symptoms. TB disease is the presence of *M. tuberculosis* bacteria in the body, with signs or symptoms, and potential risk of transmission to others. In most states, only TB disease is reportable, therefore, national TB surveillance data cannot be used to determine rates of TB infection in the United States. Knowledge of HIV status is recommended prior to or during a medical evaluation for persons with both TB infection and TB disease (CDC, 2007a). However, due to the limits of the surveillance data, this dissertation was limited to assessing HIV status only in persons with TB disease.

Many efforts have been undertaken to improve HIV testing for individuals with TB. In 1989, CDC recommended offering HIV testing for all persons who are being evaluated for TB and, universally, opt-out HIV testing to all persons in 2006 (CDC, 2007a). Opt-out HIV testing occurs where HIV testing is performed as a routine part of a medical exam, with patients required to decline if they do not wish to be tested for HIV. This is in contrast to opt-in testing where HIV testing is not routine and patients have to consent to

be tested for HIV (CDC, 2006a; Sendagire, Schreuder, Mubiru, van der Loeff, Cobelens, & Konde-Lule, 2010).

Since 2006, CDC has recommended universal HIV testing within the general population, and the opportunity to counsel and test for HIV in the TB setting adds to fulfilling this recommendation. In a Markov model of costs, Sanders and colleagues showed that even with a low background prevalence of HIV (0.05%), there is a benefit to testing for HIV in the general population. This would help to initiate ART for PLHIV and prevent some transmission of HIV (Sanders et al, 2005). A cost-effectiveness study was conducted in India looking at persons with co-infection and various models of referral for HIV testing based on risk factors versus universal testing. It was shown that with universal testing, there is an increase in life expectancy if persons with TB and HIV were identified early and treated with ART. Furthermore, HIV testing and treatment can help to control the spread of TB, as HIV and TB exacerbate the others' development within individuals (i.e., ART among PLHIV can reduce the risk of progressing from TB infection to TB disease) (Fausett-Godfrey, Maher, Mukadi, Nunn, Perriens, & Raviglione, 2002; Perfura Yone, Kuaben, & Kengne, 2012, Geldmacher, Zumla, & Hoelscher, 2012).

PURPOSE OF THE DISSERTATION STUDY

As evidenced by the data above, known HIV status in persons with TB in the US remained below the 2020 NTIP target of 98% as of 2015. There was a wide range in unreported HIV data in persons with TB in individual states from 2000 to 2015. This led

to the examination of TB data from the state of New Jersey (NJ) to assess the situation related to known HIV status and offering of HIV testing in persons with TB.

In NJ, the proportion of people with TB and known HIV testing status (negative or positive) ranged from 40.2% to 80.8% (mean=57.9%) between the years 2000 and 2013.

In looking at HIV status in terms of whether HIV testing was offered, as determined by the HIV status being negative, positive, indeterminate, or refused, the percent ranged from 60.7% to 84.6% of people (mean=70.4%) being offered an HIV test over this 14-year period (New Jersey Department of Health, TB Surveillance Data¹).

Based on the aforementioned outcomes, the aim of this study was to identify factors that are associated with and influence the decision to offer and document HIV testing to persons being managed for TB disease. While this study only focused on health department data from the NJ State TB program, the findings may be applicable to other state TB programs in the US working to reach the NTIP target of having 98% of people with TB having known HIV status or the WHO's goal of all people with TB having known HIV status. The three research questions in this mixed methods study were:

Research question 1: Is the decision to offer HIV testing among persons with TB disease associated with the characteristics of the patients, providers, and clinical settings in which the persons with TB are receiving treatment?

Research question 2: Is known HIV status among persons with TB disease associated with the characteristics of the patients, providers, and clinical settings in which the persons with TB are receiving treatment?

¹ This NJ-specific data was available from the Department of Health for the purpose of this study.

Research question 3: How are factors related to the decision to offer HIV testing to patients arriving for medical management of TB infection or disease influenced by providers' self-reported behaviors and attitudes?

These questions were rooted in behavioral science theory. In order to make an assessment about why HIV testing practices exist as they have, theoretical constructs that incorporate one's internal and external influence factors were taken into consideration. This includes the environment and organization in which one works.

The remainder of this dissertation report describes the process used to answer the research questions. Chapter 2 collates findings from relevant literature on the topic of HIV testing in persons with TB. In Chapters 3 and 4, there is a description of the methods used in this research as well as the results. And finally, in Chapter 5 is a synthesis of the research results, including a discussion of the implications based on the findings and recommendations on the issue of HIV testing in persons with TB.

CHAPTER 2 – REVIEW OF THE LITERATURE

INTRODUCTION

As noted in Chapter 1, knowledge of HIV status is important in the diagnosis and treatment of persons with TB and was recommended by CDC in 1989. Nationally, as well as in the state of NJ, known HIV status has been lower than the 2020 National TB Indicator Project target of 98%. There are also important differences in the groups receiving HIV testing in both the national and state data on HIV testing among people with TB.

This chapter will focus on literature, guidelines, and background theories that have guided the development of this research. The first part will include a description of the theoretical framework for the formulation of the research questions as well as guiding the methodology. The second part will describe both domestic and globally published peer-reviewed literature and expert recommendations to examine more deeply the recommendations on HIV-testing practices for persons with TB. This literature review is focused on documented factors that create barriers and disparities in HIV testing for persons with TB. However, it also includes a broad overview of health care workers' practices around recommended screening guidelines in other communicable disease fields to provide additional context to the issues around HIV testing in the TB setting. The background documentation will be presented around various themes and, therefore, the literature from the US and abroad will be presented together along the thematic lines.

Adapting a theoretical framework

This section notes the behavioral science theories that were a basis for this study and its methods and materials, namely Social Cognitive Theory, Diffusion of Innovations Model, and Organizational Change Theory. These are very briefly described below along with their general relation to this study. The constructs and applications of these theories are described in detail in Table 3.

The first, Social Cognitive Theory, is an intrapersonal theory dealing with how individuals behave as a result of interacting with their environments. It takes into account the people, rewards, self-confidence, and perceptions of the environment around an individual and how these influence performance of, or a change in behavior (Bandura, 1998; Baranowski, Perry, & Parcel, 2002). With regards to this study, the behavior being performed was HIV testing in persons with TB in relation to a health care workers' views of the value of testing, ability to offer testing and manage the results, and what system, protocols, and barriers are in place to make offering HIV testing and/or reporting HIV test results able to be performed in the TB-care setting. In using Social Cognitive Theory, the focus on various characteristics related to offer and documentation of HIV testing and testing status included availability of HIV-testing resources, existence of HIV-testing policy, provider communication skills, understanding the value HIV testing in persons with or at risk for TB, opportunities for offering HIV testing, confidence to ask about HIV status and offer HIV testing as well as preparedness to deliver test results, and the role of peers, colleagues, and supervisors regarding HIV testing.

The second theoretical framework used in this study is Diffusion of Innovations.

‘Diffusion’ is the process of dissemination of certain behaviors and practices through various channels. ‘Innovations’ are behaviors and practices which may be perceived as new to individuals and/or groups. There are a number of attributes which help to gauge the perceived ease, understanding, and convenience of an innovation to be included or added to current practices or routines (Rogers, 2002; Oldenburg & Parcel, 2002; Rogers 2001). As applied to this research, HIV testing in persons with TB was the “new” practice being studied. Additionally, the concept of HIV testing as part of policy and regular practice was also examined in the literature. Specifically, the theory helped to guide the idea of how the opt-out recommendation may have affected changes to the frequency of offering and documenting of HIV testing including fitting HIV testing into TB providers’ existing practices, challenges of offering, providing, and reporting HIV testing and its results, and how much the practice of HIV testing permeates existing practices and with what permanency.

Finally, it is important to note that as behavior change can also be influenced by the organization of which an individual is a part. Organizational Change Theory encompasses how such environments can go through the adaptation of new practices (Steckler, Goodman, & Kegler, 2002). With regards to this study’s questions, the effect of the TB clinical setting on health care workers’ HIV testing practices is key. It may involve awareness of recommended guidelines, application of guidelines to protocols, and the ability for a health care setting to incorporate testing practices. The personnel in the organization can drive much of the way in which behaviors can change.

Table 3. Application of Theoretical Framework

Theory/ Model	Construct/Attribute	Application to provider practices around offering HIV testing and documenting HIV status in persons with TB
Social Cognitive Theory	Environment	Availability of rapid HIV tests and educational materials on HIV testing Existence of a policy that supports HIV testing in the clinical setting
	Behavioral capability	Communication skills to provide education on TB and HIV infection
	Outcome expectations	Understanding the value of knowing the HIV test result
	Outcome expectancies	Value placed on HIV testing and knowledge of HIV status in persons being examined for TB
	Self-control	Presence of opportunities by the provider for offering HIV testing
	Self-efficacy	Confidence to ask about HIV status and offer HIV testing Preparedness to deliver the HIV test results to patients
	Observational learning	Presence of peers or colleagues to model behavior after for asking patients about HIV status and offering testing
	Reinforcement/ Reciprocal determinism	Feedback the provider obtains from supervisors and peers about offering HIV testing If HIV testing for persons with TB considered an institutional standard of care The presence of cues to remind the provider to offer HIV testing and report its results
	Emotional coping response	Attendance at training to become comfortable with how to talk about HIV testing or deliver testing results
Diffusion Theory	Compatibility	How HIV testing in persons with TB fits into providers' existing clinical assessment for TB
	Complexity Communicability Risk & uncertainty level	Difficulty of offering, providing, and reporting HIV testing and its results
	Trialability Commitment Reversibility Modifiability	Assessment that HIV testing needs to be universal when first tried, (i.e., Do all patients with TB need to be offered HIV testing at first?)
	Time	Time available to offer HIV testing when examining and treating a patient for TB
	Relative advantage	Benefit of offering HIV testing or knowing the HIV status of the person with TB over not offering testing/not knowing the status
	Observability	Seeing HIV testing in persons with TB in practice by other providers.
	Impact on social relations	How offering HIV testing will affect patient-provider relationships

Theory/ Model	Construct/Attribute	Application to Provider Practice around offering HIV testing and documenting HIV status in persons with TB
Organizational Change Theory	Stages of change	What a clinic or practice must do to offer HIV testing to persons with TB
	Problem definition	Health department or practice recognition of HIV testing recommendations in persons with TB
	Initiation of Action Implementation of Change	Human resources available and trained in HIV counseling and testing in a clinical setting
	Institutionalization of change	Integration of HIV testing practice and reporting into policy and procedures of a clinic or practice The ability of a health care facility to not use a consent process (per opt-out recommendation) for HIV testing
	Organizational development, climate, and culture	Support for HIV testing among higher management in a clinic or practice that serves people with TB
	Organizational capacity	Creating or maintaining an environment where there is access to HIV testing, testing supplies, privacy, and patient educational materials

Research and practices surrounding offering HIV testing and reporting HIV status in persons with TB

How and whether HIV testing and reporting of HIV status occurs is impacted by many elements including the patient-initiated versus provider-initiated approach. For HIV, voluntary counseling and testing (VCT) consists of a person actively seeking and/or initiating HIV testing in a community-based setting. The decision to be tested is placed on that person. The provider counsels and educates the patient on HIV testing and risk factors for HIV, and then initiates testing. TB programs have more recently opted for provider-initiated testing and counseling (PITC) which places the responsibility of HIV testing with the provider and not the person seeking medical care. This approach is recommended by the World Health Organization and the Joint United Nations Program on HIV/AIDS (Joint United Nations Programme on HIV/AIDS, Reference Group on HIV and Human Rights, 2007). Application of this “opt-out” approach assumes that HIV testing is the normal standard of care and that the person seeking care needs to actively refuse testing. The PITC approach also requires that the provider is willing to test for HIV first and then provide counseling about the results, and assumes that the provider has the skills to do both (Bock et al, 2008; Williams et al, 2008; WHO, 2012a).

It is relevant that the PITC approach has yielded increased testing in numerous locations. A study in Zambia showed that the PITC model, in conjunction with onsite trained staff using rapid HIV testing, is more successful at increasing HIV testing rates in persons with TB than the VCT model with either referral for offsite HIV testing or onsite testing

(CDC, 2008a). Similarly, in a study in South Africa, training providers in PITC increased HIV testing rates over VCT rates (Pope et al, 2008). A randomized control trial in 18 TB clinics with a staggered introduction of universal HIV testing policy in London, England, also showed that education of providers about HIV testing was an impetus to offering testing, in addition to universal versus selective testing as part of clinic policy (Roy et al, 2013). Similarly, Thomas and colleagues reported that based on interviews with persons with TB, that PITC is well accepted over VCT (Thomas et al, 2009).

Integrated communicable disease programs have also contributed to testing and follow-up initiatives. In a white paper from the CDC's National Center for HIV/AIDS, Viral Hepatitis, Sexually Transmitted Diseases (STD), and TB Prevention, it was recommended that health department programs that cover the aforementioned infectious diseases engage in Program Collaboration and Service Integration (PCSI). Individuals with HIV/AIDS, viral hepatitis, STDs, and TB share many common social and behavioral determinants and some risk factors. The diseases occur as a "syndemic," and services for at-risk patients should be collaborative in nature. The recommendations specifically indicate that integration of HIV and TB program services are "appropriate" because persons with TB should universally receive HIV testing. TB program staff should be cross trained to recognize risk factors for both TB and HIV, be accountable for testing, and be willing to test and counsel persons with suspected or diagnosed TB. This is particularly true for areas where the risk of HIV and TB is high (CDC, 2009b).

The mentioned PCSI criteria should also apply to HIV programs where PLHIV should be routinely screened for TB infection and/or disease with appropriate follow-up treatment or medical evaluation based on the screening result (CDC, 2009; WHO, 2012b). Such integration can assist with better sharing of information. However, precautions regarding confidentiality are needed and similar data collection fields for integrated matching are required (Fujita, 2012). In the CDC white paper, it was recommended that PCSI should be adopted at a city or state level and that there should be shared best practices as well as discussions between programs about systemic barriers that may pose challenges to integration (CDC, 2009). Additionally, patients may be more willing to undergo testing and treatment for multiple communicable diseases under one system of practice or clinic (Goswami, Heacker, & Holland, 2011; WHO, 2012b).

Disparities in HIV status information and testing

As discussed in Chapter 1, geographic disparities exist for known HIV status in persons with TB both within the US and throughout the world. Additionally, there are differences by race and sex for those persons with TB to whom HIV testing is being offered. There are numerous examples in the scientific literature of cross-sectional studies in which HIV testing, while universally recommended, was being selectively offered or reported.

Several studies indicated that HIV testing was being offered to persons with TB based solely on HIV infection risk factors perceived by the provider. In an anonymous seroprevalence study in London, England, Bowen and colleagues reported that actual rates of HIV in minority groups with TB were almost double that of known results via

reported testing with consent of the patient. They concluded that providers should encourage HIV testing in all patients with TB (Bowen, Rice, Cooke, Whitfield, & Rayner, 2000). Another study in London, that looked at a cohort of people with TB since 2003, showed that individuals more likely offered HIV testing were between 20 and 49 years of age, had smear-positive pulmonary TB, and understood English well. However, persons more likely to have had both TB and HIV were actually female, foreign-born, had TB of the central nervous system, required treatment directly observed by a health care worker, and/or had poorer TB treatment outcomes. There were also variations in offering testing between TB clinics, despite the presence of an existing standard of universal HIV testing for persons with TB. In only one TB clinic was testing offered to more than 80% of patients; about half of the clinics offered HIV testing to less than 50% of patients (Rodger, Story, Fox, & Hayward, 2010).

In Thailand, Anuwatnonthakate and colleagues reported factors associated with *not* being *counseled* on HIV testing among patients with TB which included: female sex, age less than 14 years or greater than 45 years, being migratory, and having had a cough for less than 2 weeks. Factors associated with not being *tested* for HIV were the same as the aforementioned factors. However, if a patient with TB was not a user of injection drugs, there was no significant association with HIV testing being done. There were also variations in HIV testing by the clinic in which the person was being treated. The authors recommended training of health care workers on HIV counseling and changing workers' perceptions about the importance of testing. Although not shown as significant in their study, they recommend that HIV counseling services be available in the TB clinic to

promote better testing rates as opposed to sending individuals elsewhere for HIV testing (Anuwatnonthakate et al, 2010).

Perfura Yone and colleagues in Cameroon showed similar variations as well in a study which included patients diagnosed with TB over a year's time in one hospital. There were higher rates of patients tested for HIV who were younger, female, and had smear positive TB. However, among those who were tested for HIV, positivity rates were higher in older persons and in those with smear-negative or non-pulmonary TB. The authors, in assessing outcomes of treatment in all patients in the study after adjusting for age and sex, found that persons who had not been tested for HIV had higher rates of death, treatment failure, and transfer out of the TB program compared to persons who were tested for HIV. Persons who tested positive for HIV infection had higher odds of mortality compared to persons without HIV infection (Perfura Yone, Kuaban, & Kengne, 2012). The data in this study show some variation in offer of testing compared to the Thai study above, however, both demonstrate disparities in HIV testing in persons with TB by demographic and clinical factors.

When focusing on data on HIV testing among people with TB in the US, persons with TB born outside of the US were less likely to have a known HIV status. In a study looking at characteristics for South Asian persons with TB in the US between 1993 and 2004, Asghar and colleagues found that HIV infection was less common in this group than in other foreign-born persons with TB. However, 62.7% of South Asians with TB and 64.3% of other foreign-born persons with TB were never tested for HIV or had

unknown or unreported results. Foreign-born persons had fewer risk factors for HIV compared to US-born persons; these characteristics included less homelessness, less substance abuse, and less unemployment which may have led to a perception by providers that HIV testing is not important in these individuals. The study authors suggested that providers may be reluctant to talk about HIV with those who are foreign-born, particularly South Asians, due to perceived cultural barriers (Asghar, Pratt, Kammerer, & Navin, 2008).

Cited barriers to HIV Testing

There have been a number of studies looking at barriers to HIV testing both in persons with and without TB. The majority of studies have reported findings related to barriers for obtaining or accepting HIV testing. Studies about provider barriers for offering HIV testing were mostly related to testing in the general population. Limited work has been done on looking at barriers to testing from the provider perspective in TB-care settings.

In the London study by Rodger et al., HIV testing was not offered to all persons with TB. However, when offered testing, individuals were very likely to accept it. The authors suggested that barriers to testing may be related to the failure of providers to offer HIV testing rather than acceptance by their patients if offered HIV testing (Rodger, Story, Fox, & Hayward, 2010). Interviews of patients in South Africa also indicated that patients with TB who did not get HIV testing, would have done so if offered, or if the provider was more supportive (Kigozi, Heunis, Wouters, & van den Berg, 2011).

Examining which patients accept testing can also shed light on possible interventions for providers to improve the receipt of HIV testing among people with TB. In a case-control study in Ethiopia looking at patient factors, patients who clearly understood the importance of HIV testing and the link between TB and HIV were more likely to be tested. These patients also had high levels of formal education. This indicates that providers should not only counsel on HIV where testing may be lacking or refused, but also make specific efforts with persons with low-educational levels (Ayenew, Leykun, Colebunders, & Deribew, 2010). Also, related to patient factors, a knowledge-based study in Eastern Ethiopia found negative associations between HIV testing and distance from adequate health services, knowledge about TB and HIV, and fear of HIV testing. The authors concluded that providers, in line with PITC, should take more initiative to encourage testing in persons with TB who are less likely to access testing due to both distance and understanding of the relationship between TB and HIV (Seyoum & Legesse, 2013).

Outside of assessing data related to HIV testing in persons with TB, the health care worker perspective on testing practices is also important. In two separate studies, providers in Rwanda and Indonesia were interviewed about HIV testing for persons with TB and reasons for not conducting testing. Providers stated numerous barriers, the majority of which included lack of training, little privacy in which to conduct counseling and testing, and perceived stigma for the patient. The study in Rwanda was part of an evaluation of the initiation of better collaborative TB and HIV activities at the country

level (Pevzner, Vandebriel, Lowrance, Gasana, & Finley, 2011). In Indonesia, the study was a look at barriers to scale up HIV testing (Mahendradhata, Ahmad, Lefèvre, Boelaert, & van der Stuyft, 2008).

The review of the literature also revealed a number of opportunities and barriers within health care settings and systems, which have affected healthcare workers' abilities to test for HIV in persons with TB. One opportunity is the availability of HIV testing, including rapid HIV testing methods which are quicker, easier, and provide a result in the same visit. Additionally, in a study on HIV testing in contacts of persons with infectious TB, Person and colleagues suggested greater use of QuantiFERON-TB Gold® (one of two US Food and Drug Administration approved blood tests for the detection of TB infection). This blood test allows for patients to come just one time into the clinic as opposed to two times for the traditional tuberculin skin test which requires one clinical encounter for administration of the test and a second encounter for measurement and interpretation of the test (Person et al, 2010). As with rapid HIV testing, one blood draw for TB and HIV infection may reduce barriers for having both tests completed.

In a review article by Burke and colleagues on recognized barriers to HIV testing in the general population, physician hesitation to test was identified as the cause of low rates of HIV testing in the US. Common to all settings evaluated, providers reported barriers including: lack of time, cost/inadequate reimbursement, competing priorities, fear of having to report a positive test result, lack of knowledge and training on counseling, challenges in completing the pre-test counseling requirements including paperwork (i.e.,

consent forms), and providing standard educational messages. Additional barriers reported in some settings included: fear of offending the patient, inability to care for or refer a patient who tests positive for HIV, language, cultural, or gender barriers, and a perception that a patient does not have the risk factors to warrant HIV testing (Burke, 2007). Similar findings were reported from interviews with nurses in TB clinics in Democratic Republic of Congo. In this latter study, however, there was an acknowledgement of the importance of HIV testing of persons with TB and that the testing should be incorporated within the TB care setting (Corneli et al, 2008). Also, while PITC is an effective approach, it requires that providers receive training in communication and that there is the provision of appropriate educational materials for persons being managed for TB and/or HIV, privacy for counseling, adequate testing supplies, supervision of providers, and the ability to refer or manage persons with positive HIV-test results (Williams, et al., 2008; Bock, et al, 2008; Bishnu et al, 2013).

In looking at HIV testing and counseling in the general population, Burke and colleagues mentioned that in many studies, patients are generally accepting of HIV testing, but that providers may be resistant to testing, resulting in lower rates. The authors suggest several interventions in response to these findings from their review of the literature. They recommend standardized educational materials and scripts which can be used by providers to deliver consistent messages to patients. They also point out several systematic changes such as better reimbursement for HIV counseling and testing services, legally requiring simplified pre-counseling protocols, and the presence of dedicated counseling and testing staff (Burke et al, 2007). A review article of PITC policies in

select African countries has also shown that general acceptability of HIV testing by patients has increased with the increase in universal, routine testing policies (Baggaley et al, 2012).

Research on testing practices for diseases other than HIV

The concern over selective screening or offering of testing in patients is not unique to the field of TB. Several health conditions have clinical recommendations for testing, but do not have high adherence to these recommendations by providers. Reasons for non-adherence can be similar to those associated with testing for HIV infection in persons with TB. Aberegg and Terry have described the “heuristics” or mental shortcuts that physicians make in their decision-making process about testing or screening, specifically, stereotyping. There are a number of non-clinical factors that contribute to how physicians treat and counsel patients. These may lead to bias in application of accepted clinical guidelines based on factors such as the race or sex of the patient (Aberegg & Terry, 2004).

As mentioned earlier, it has been recommended that TB programs integrate with communicable disease programs in addition to HIV/AIDS programs, including those for viral hepatitis and sexually transmitted diseases/infections (STD/STI) (CDC, 2009). Literature on these integrated programs was reviewed to determine if there are similar or different barriers related to provider screening of individuals at greater risk of infectious diseases than the general population.

Several studies have suggested that lack of awareness of testing guidelines can cause testing practices to occur with low frequency. For example, CDC has recommended screening for hepatitis B virus (HBV) and hepatitis C virus (HCV) in persons who inject drugs, men who have sex with men (MSM), and PLHIV (CDC, 2008b; CDC, 1998).

Several studies have noted inadequate screening for viral hepatitis as recommended, with similar barriers as reported for HIV testing in persons with TB. Foster and colleagues reported that specialists (e.g., hepatologists), were more likely than primary care providers to have a better knowledge of guidelines related to hepatitis screening. This may suggest that for health care workers who may initially examine a person with TB, but may not be the final health care provider who treats this patient, awareness of diagnostic and treatment guidelines may not be readily apparent.

While awareness of testing guidelines is important, comfort in applying them is also key. This was seen in several papers on STD/STIs. Foster et al have reported provider factors related to comfort in taking a sexual history. In the Foster study, as well as that of Fiscus and colleagues on STD testing in young females, authors found that comfort with taking a sexual history for risk factors was greater for obstetrician/gynecologists, US medical college graduates, female physicians, and non-private providers compared to other types of physician specialists, foreign-medical graduates, and private providers (Fiscus, Ford, & Miller, 2004; Foster, Hon, Kanwal, & Spiegel, 2011).

In relation to recommendations for STD screening in high-risk groups, Taylor and colleagues also reported similar conclusions regarding practitioner comfort levels when

interacting with patients. They also noted that certain types of providers have varying comfort with such history taking and that private providers are less likely to ask about risk factors that are deemed stigmatizing due to familiarity with their patients. Therefore, community-based organization or health department clinic providers were almost two times more likely to ask about sexual behaviors than private providers who have continuity with their patients (Taylor et al, 2005). Hence, comfort in asking sensitive questions by provider type is also likely key in asking about HIV status in persons with TB.

As Burke et al described practice-setting-related barriers for HIV testing, private providers as well as others, including emergency department (ED) staff, cited time as a constraint for other communicable disease risk assessments as well as counseling related to the testing for these diseases. Private providers and ED staff have also identified other barriers to appropriate testing, such as not having staff to counsel and refer patients and their contacts for appropriate medical follow up for STD, hepatitis, and HIV screening results. Also noted was that private providers and ED staff reported that they did not receive adequate reimbursement for conducting screening tests which are not directly related to the primary reason the patient sought medical care (Gift & Hogben, 2006; Sena, Mertz, Thomas, Wells, Costa, & Levine, 2005).

Like in the TB field, other communicable disease literature has shown disparities in health care screenings in several racial and ethnic groups as well. Asian Americans have the highest rate of HBV infection in the United States (6-15%), yet, in a prevalence study

using data from health fair screenings for HBV and HCV in Asian Americans, the majority of those who were found positive for either infection, did not know they were infected or had never been tested. The patient sample was mostly those uninsured for medical and pharmaceutical coverage (Hwang, Mohseni, Gor, Wen, Guerro, & Vierling, 2010). Differences in hepatitis A screening in men having sex with men (MSM) with HIV have been reported by Hoover et al. Hispanics (55%) were screened at a higher rate compared with White (45%) and Black (48%) MSM patients (Hoover, 2012). Several authors have suggested that universal testing may be a better option rather than using a risk assessment process which may cause discomfort or pose other barriers for providers (e.g., time constraints) (Hoover et al, 2010).

In looking at the aforementioned non-TB studies cited here, provider characteristics may indeed affect a whole host of patient outcomes. This could be due to providers' perceptions about screening patients despite recommendations to the contrary, or patients refusing screenings due to perceptions of the provider's attitude toward a specific medical condition or recommendation (CDC, 2008b; CDC, 1998; Fiscus, Ford, & Miller, 2004; Foster, Hon, Kanwal, & Spiegel, 2011; Taylor et al, 2005; Gift & Hogben, 2006; Sena, Mertz, Thomas, Wells, Costa, & Levine, 2005; Hwang, Mohseni, Gor, Wen, Guerro, & Vierling, 2010; Hoover, 2012; Hoover et al, 2010). Providers in an environment where patients with multiple risk factors may be managed should be cross trained to increase comfort with unfamiliar communication messages or different types of medical exams (Hoover et al, 2010).

SUMMARY

Based on a review of the TB and communicable disease literature, there are a number of reasons for low rates of HIV testing and other types of recommended screening. In understanding the factors involved in offering and documenting HIV testing in persons with TB, a multifaceted approach is needed. It is important to characterize the extent to which HIV testing is offered and documented by looking at current surveillance data, not just to describe the rates of testing, but to assess in whom rates of testing and documentation are lower and through which providers this is the case. While this descriptive data is key, it will not provide the reasons for testing practices. Therefore, qualitative approaches are needed to assess providers' approaches to testing to gain a fuller understanding of HIV testing practices for persons with TB as well as shed some light on potential interventions for increasing known and offered HIV testing in TB care settings.

CHAPTER 3 – METHODOLOGY

OVERVIEW OF DATA SOURCES, METHODS AND CHAPTER

To better understand the overall trends in HIV testing in persons with TB, an assessment of information about persons with TB and the persons who cared for them is useful. TB is a reportable disease, in that it is mandated by law that the occurrence of TB be reported to public health authorities for surveillance purposes (CDC, 2010c). HIV status in persons with TB is also reported as part of this process (CDC, 2016). Reporting is done by health care providers in a variety of settings, with the ultimate responsibility being on the public health authority in the state, county, or city (CDC, 2010c). This facilitates the collection of information about the practices of health care workers and the characteristics of patients for whom they care (Bryman, 2006; Onwuegbuzie & Leech, 2005). This chapter will describe the methods used in this study to determine what influenced the offer of HIV testing and documentation of HIV status in persons with TB in the state of NJ.

A mixed methods design, both quantitative and qualitative, was used to complete this research about provider-related characteristics for offering HIV testing to persons with TB as well as documenting HIV status in persons with TB. The influences on the offer of HIV testing and known HIV status were determined in two ways: 1) A secondary analysis of the presence of associations and predictors of the HIV status variable in the NJ TB surveillance data and 2) completion of semi-structured provider interviews to describe the reasons for the associations and predictors of HIV status. While both are

valuable methods on their own, together they provided a deeper understanding into what challenges exist to HIV testing in persons with TB.

TB surveillance data from the NJ Department of Health between 2000 and 2013 was analyzed to examine associations and predictors of factors related to the offer of HIV testing and documentation of HIV status in persons with TB. The purpose of this analysis was to address the research questions 1 and 2:

Research Question 1. Is the decision to offer HIV testing to persons with TB disease associated with the characteristics of the patients, providers, and clinical settings in which persons with TB are receiving treatment?

Research Question 2. Is known HIV status among persons with TB disease associated with the characteristics of the patients, providers, and clinical settings in which persons with TB are receiving treatment?

As cited in the literature and based on the theoretical framework described in Chapter 2, offering and documenting HIV testing varied based on provider knowledge, attitudes, and perceptions. These are ideally clarified through primary sources, the providers themselves. Therefore, semi-structured interviews with providers were performed to address HIV testing practices in persons with TB to answer research question 3.

Research question 3: How are factors related to the decision to offer HIV testing to persons arriving for medical management of TB disease influenced by providers' self-reported attitudes and behaviors?

The semi-structured interview process was selected to explore views and provider practices which could not be elicited from merely reviewing surveillance data nor from only a structured interview or survey. A focus group process could also have been used to explore such information; however, there was a concern with asking about providers' knowledge regarding guidelines and comfort with asking about a sensitive topic in a group setting. Additionally, focus group participants may influence others' responses. Therefore, individual interviews were used to collect this information.

Surveillance data analysis

Data Sources

The 50 US states, territories, and federally-determined municipalities collect data on each person with a confirmed diagnosis of TB via the Report of a Verified Case of Tuberculosis (RVCT) form; these data include a number of items about the patient in addition to treatment-related information (Appendix A). The information collected from the RVCT is the basis of state and national surveillance data and is summarized by CDC on an annual basis. Verification of a diagnosis of TB can be done by a number of methods including laboratory specimen confirmation or through a non-specimen confirmation based on clinical findings. Although the RVCT form fields changed in 2009, the relevant fields were in place for the entire study period.

Existing cross-sectional TB surveillance data for the state of NJ were analyzed to identify the characteristics of patients arriving for medical management of TB disease and how the HIV status field on the form was completed. The HIV status field on the RVCT form

was to be completed after a patient is counseled on HIV testing and provided consent, or simply, when the test was done by the provider. However, the test status may have been missing or noted as ‘unknown,’ if a patient was tested anonymously or through a provider who was not treating the patient for TB, or chose not to share this status (CDC, 2015a).

TB surveillance data for 2000-2013 was requested from the NJ Department of Health TB Program. Prior to receipt, this study was approved by the respective Institutional Review Boards of the NJ Department of Health and Rutgers University. After approval, individual-level data for all persons presumed to have TB was received from the NJ Department of Health in an electronic format. The data did not include identifiers (i.e., names, case report numbers, Medicaid numbers, dates of birth, ages, addresses, and counties of report). A subset of the data was sorted by “count date,” i.e., when a person with TB was confirmed to have the disease. This remaining subset was used for the analysis.

Variables

Variables from the dataset used in the analysis included: age group, sex, birthplace, correctional facility residency, injection drug use, non-injection drug use, alcohol use, long-term facility residency, homelessness, race, ethnicity, type of provider, year of report, and HIV status. Several variables were recoded based on factors described below:

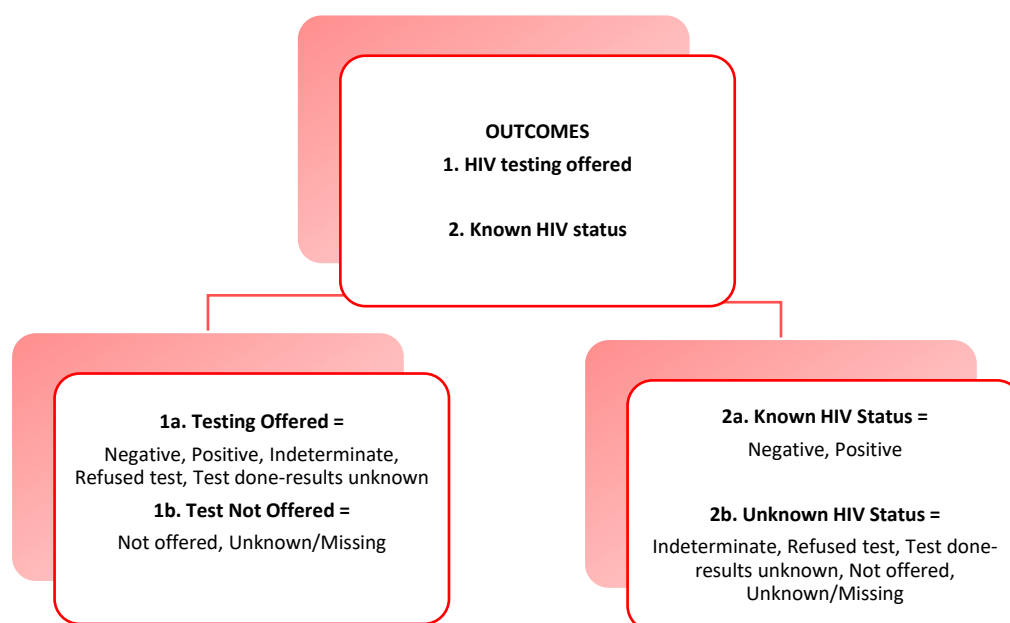
1. Age group: Data were received with five-year increment age groups. These were recoded based on the CDC broad age groups from aggregate reporting (0-14, 15-

24, 25-44, 45-64, 65+ years). This was done to facilitate comparisons with national data.

2. Race and ethnicity: Race and ethnicity information was reported separately on the RVCT form, but for this analysis, a combined race/ethnicity variable was created. An individual identified as Hispanic was labeled as “Hispanic.” Non-Hispanics were labeled with their identified race (Asian, Black, and White). As with age group, this recoding was done for consistency with national aggregated reporting for race/ethnicity.
3. Year of report: Year remained as a 14-level (2000-2013) ordinal variable. However, an additional two-level categorical variable for report year was created; year was dichotomized as years 2000-2006 and years 2007-2013. Since opt-out for HIV testing was recommended at the end of 2006, the intention in creating the two-level variable was to assess any effect of the opt-out recommendation on known HIV status and/or the offer of testing. This variable will be further referred to as “Opt-out year.”
4. HIV status: The outcome variables were created using HIV status as reported on the RVCT form. The first outcome variable on offering of HIV testing was dichotomized as ‘HIV test offered’ and ‘HIV test not offered.’ HIV test offered included responses: *positive*, *negative*, *indeterminate*, *refused*, and *test done-result unknown*. HIV test not offered included responses: not offered and unknown. Missing responses were recoded as ‘unknown.’
5. The second outcome variable on HIV testing was dichotomized as ‘Known HIV status’ and ‘Unknown HIV status.’ Known HIV status included responses:

positive and negative. Unknown HIV status included responses: indeterminate, refused, and test done-result, not offered, and unknown (Figure 1). Missing responses were recoded as ‘unknown.’

Figure 1. Outcome variables



All study variables were analyzed as categorical or ordinal. In pairs, all variables underwent bivariate analyses using the Chi-Square and Fisher’s Exact tests to assess for association. The Cramer’s V value was reviewed for strength of association between

pairs of nominal-level variables (Rea & Parker, 2005). The Gamma value was used for the pairs containing ordinal-level variables (i.e., age group and report year) (Frankfort-Nachmias & Leon-Guerrero, 2011). Using Cramer's V, variables with associations of 0.4 and greater, and for Gamma, values less than or equal to -0.4 or greater than 0.4 were considered to have a strong association and, therefore, combined (Rea & Parker, 2005; Frankfort-Nachmias & Leon-Guerrero, 2011). There was a moderate to strong association between the following variables as indicated below along with the Cramer's V value:

- a. Injection drug use and non-injection drug-use: 0.468
- b. Injection drug-use and alcohol use: 0.308
- c. Non-injection drug-use and alcohol use: 0.409
- d. Place of birth and race/ethnicity: 0.631

Given the values listed above, a combined substance-use variable was created that indicated the presence or absence of any drug or alcohol use as defined by the RVCT Instructions. Place of birth and race-ethnicity were used in the univariate and bivariate analyses as is, noting there may be need to eliminate one of these variables in the multivariable analysis. Strength of association for the remaining variables was weak (between -0.3 and 0.3).

Analysis plan

The analysis was conducted using JMP 11 (SAS Institute, Cary, NC, 2013) and SAS 9.4 (SAS Institute, Cary, NC, 2014). This process was performed in three steps. First, a univariate analysis was done to describe the data. Next, a bivariate analysis was conducted to identify relationships between the outcome and independent variables in the

datasets. All of the variables were categorical or ordinal, therefore, the Chi-Square and Fisher's Exact test was used to determine significance of relationships at an alpha level of 0.05. As mentioned above, the strength of association of all variables was assessed to determine whether variable could be combined and if strongly associated, if one variable in the pair could be eliminated in the multivariable analysis given little or no change in the Hosmer-Lemeshow chi-square value for the model.

Finally, all variables were entered in a binomial logistic regression model for each outcome variable, given the significant association between independent and dependent variables. Stepwise regression, the process of systematically removing and entering predictors in various combinations from a model with all variables entered to start with, was used, retaining the variables providing the best model fit. The independent variables which were not significant were removed from the models. Reference groups were selected as those with the largest numbers of individuals. The exception was race/ethnicity where *White* race was selected as the reference group. The odds were calculated of having an HIV test offered compared to the odds of not having been offered an HIV test as well as for known HIV status vs. unknown status for each of the remaining independent variables. Odds ratio confidence intervals were set at 95%.

The models were stratified by provider type grouped into 2 categories: health department and community/combination of health department and community, resulting in two models for each outcome variable. Here, provider types will be referred to as 'health department' and 'community/combination.' This decision to stratify was based on two

sources. First, the literature contained evidence that provider type may affect practice around screening for various communicable infections. Second, the provider interviews strongly suggested that non-health department providers collect HIV status information and offered HIV testing less frequently than health department providers. Additionally, new models were run including all variables with interactions by time period as a dichotomous, nominal variable for years 2000-2006 and 2007-2013 (opt-out year). This was done to assess whether there was a difference in odds of the outcome for the time periods before and after the transition to the opt-out HIV testing recommendation introduced at the end of 2006. These models were also stratified by provider type. The models were also assessed for interactions by all variables looking across opt-out year (two-levels). In addition, interactions were assessed for multilevel variables including race, age, substance use, birthplace, and sex. The interaction between sex and substance use was also separately analyzed. All significance testing in the multivariable analysis was done at the alpha 0.05 level.

Semi-structured interviews

Recruitment

Using purposive sampling, providers who cared for persons with TB on a regular basis and had multiple opportunities to offer HIV testing were recruited for in-person interviews (Devers & Frankel, 2000). There were 31 providers interviewed. The settings in which interviews occurred were classified as ‘health department’ and ‘community’ and are described below (Table 4).

As indicated, one set of interviewees was from health department-based TB clinics with staff experienced in HIV testing. Ten clinics were recommended by the State TB Nurse Consultants; these were selected as clinics which serve the majority of persons with TB, as characterized by a regional and/or county TB clinic designation by the NJ Department of Health took place. These clinics' managers were contacted by the Principal Investigator (PI) by email using Institutional Review Board (IRB)-approved recruitment text and an information sheet summarizing the study's purpose, use of interview data, and protection of privacy. Formal signed consent for persons being interviewed was waived by the Rutgers University IRB which provided human subjects approval for the study; however, the information sheet was shared with all recruits as required, without the need for signature. Of the ten TB clinic managers contacted, six clinic managers provided written permission for interviews. The clinic managers shared the interview information sheet with staff meeting the inclusion criteria and requested optional participation. The State TB Program Manager was also approached to provide the names of staff who also met the interview criteria. Those identified as working for the Department of Health and meeting the study criteria were contacted by the PI. Twenty physicians, nurses, and disease investigators were interviewed at these health department TB clinics out of a possible 24 people. This number also included staff from the State TB program.

The remaining semi-structured interviews were with community providers (non-health department) consisting of persons working in private practices, federally qualified health centers, or hospitals. These providers were recruited by recommendations from the TB clinic staff and other providers through snowball sampling. An attempt was made to

recruit only specialty (pulmonary and infectious diseases) physicians who had a greater likelihood of treating persons with TB in their practices. This was also to match the health department physicians, who were all specialists. However, this attempt was not successful, and several primary care (internal medicine and family medicine) physicians were recruited in place of the specialists. Sixteen community providers were contacted and 11 completed the interview process; all were physicians, four were specialists, and six were primary care providers. Since about 30% of persons with TB since 2000 were managed by community providers, this number of interviewees was deemed adequate.

Table 4. Provider Settings and Types (total providers = 31)

		Frequency
Provider Setting		
Public (TB clinic, health department)		20
Community (private practice, hospital, or federally qualified health center)		11
Provider Type		
Physician		15
Nurse		14
Disease Investigator		2

Questions development

An interview guide was developed and used for consistent questioning in each provider interview (Appendix B). The guide included questions about HIV testing and reporting practices among providers who care for persons with TB. In addition to the literature, Social Cognitive Theory, Diffusion of Innovations Model, and Organizational Change Theory were used to develop the interview questions (see Chapter 2). Questions were open-ended and revolved around knowledge of HIV testing recommendations in persons with TB, HIV testing practices including risk factor assessment, and, if any, challenges to and opportunities for HIV testing in persons with TB. The questions were pilot tested with three providers not from the State of NJ who matched the inclusion criteria for interviews. Minor wording changes were made and the final questionnaire was submitted as a modification to the IRB.

Interview process

Each semi-structured interview was conducted face-to-face, and by a single researcher for consistency. The questions were used to guide the interview process, however, some deviations were made to explore topics related to HIV testing in persons with TB that were not in the original questions (Gill, Stewart, Treasure, & Chadwick. 2008). The interviews were audio recorded, transcribed, and entered into ATLAS.ti 7.5.6 (Scientific Software Development GmbH, 2014).

Analysis

Prior to the interviews, codes were developed deductively, based on the preliminary results of related surveillance data analysis, the literature review, and the theoretical framework. After the interviews, codes were refined inductively, following repeated readings of the transcripts. Some codes were added. The PI coded the transcripts along with a trained, additional researcher who coded the transcripts independently using the existing codes. Any coded quotes for which there was disagreement between the two researchers, were discussed and resolved. The agreed upon codes were placed into families based on common themes related to the barriers and opportunities for HIV testing (Appendix C) (Babbie, 2004). There were 26 codes and four themes which will be described in “Chapter 4 - Research Findings.”

SUMMARY

A mixed method process was undertaken as the surveillance data and semi-structured interview analyses on their own had inherent limitations. In summary, this process included the analysis of 14 years of TB surveillance data from the state of NJ as well as

interviewing of providers to assess knowledge, attitudes, and practices around HIV testing in persons with TB. The literature drove the selection of variables for the surveillance data analysis, as well as the recoding of certain variables. The literature, results of the surveillance data analysis, and a behavioral theory framework were the basis for the provider interview questions. The interviews were conducted to provide context and plausible explanations for the actual trends, associations, and predictors in HIV testing practices.

CHAPTER 4 - RESEARCH FINDINGS

OVERVIEW OF THE STUDY POPULATION, RESEARCH FINDINGS, AND CHAPTER

This chapter will present a description of the study population and findings by research question. In order to provide context for the research questions, the first section will describe the persons represented in the surveillance part of the study. Following that, associations with the study's independent variables and the two outcome variables, offer of HIV testing and known HIV status, will be explored by presenting the bivariate analysis results. Next, a description of the predictors of the two outcome variables by provider type and when the patient was under TB care will be presented. Finally, the outcomes of provider interviews will be defined by common themes. Select quotes representing these themes will be used to describe both health department and community providers' attitudes, self-reported behaviors, and perceptions of the practice of HIV testing in persons with TB. These will all be done via the research questions.

DESCRIPTION OF STUDY POPULATION: PERSONS WITH TB IN NEW JERSEY, 2000-2013

During the years, 2000-2013, there were 6222 persons with TB in New Jersey (NJ) reported to the CDC as verified cases (see Table 5). Most persons with TB were in the 25-44-year age group (39.6%), followed by 45-64 year olds (25.5%), persons 65 years and older (18.6%), 15-24 year olds (11.8%), and persons 14 years of age and younger

(4.6%). The majority of persons with TB were male (56.5%) and 72.2% were born outside of the United States. About a third were Hispanic (30.8%) and another third were Asian (32.6%), a quarter were Black, non-Hispanic (23.2%), and 13.4% were White, non-Hispanic. The demographics of people with TB in NJ mirrors the national picture of high rates of TB in foreign-born persons and non-White persons (CDC, 2015a).

Other variables which were in the surveillance dataset indicated persons who may have been at higher risk for HIV infection (i.e., correctional inmates, homeless persons, and substance users) or at risk of being less healthy than other persons with TB (e.g., long-term care facility residents). A small number of persons with TB were residents of a correctional facility (0.8%) or long-term care facility (1.6%) at the time of diagnosis or were homeless (2.6%). Substance use at the time of diagnosis included excess injection drug use, non-injection drug, or excess alcohol use. Ten percent (10.4%) of persons with TB were engaged in substance use.

The type of providers caring for persons with TB were classified as health department providers, exclusively, or community/combination of providers. This latter category also included health department providers in combination with others. The majority of persons with TB (64.1%) were cared for by health department providers exclusively and the others (35.9%) were cared for by community providers or a combination of providers. HIV testing was offered to 4534 (72.8%) people with TB and HIV status was known in 3898 (62.7%) of persons with TB. The number of cases decreased over time, starting with 566 cases in 2000 and declining to 313 in 2013. For comparison to US incidence,

national cases rates for the same time period are included in Table 5a along with rates for NJ.

Table 5. Description of persons with TB in New Jersey, 2000-2013 (n=6222)

Variable	Count (%)
Age group in years	
0-14	288 (4.6)
15-24	731 (11.8)
25-44	2463 (39.6)
45-64	1586 (25.5)
65+	1154 (18.6)
Sex	
Male	3518 (56.5)
Female	2704 (43.5)
Birthplace	
US	1730 (27.8)
Non-US	4486 (72.2)
Race/ethnicity	
Hispanic	1908 (30.8)
Asian	2022 (32.6)
Black, non-Hispanic	1440 (23.2)
White, non-Hispanic	830 (13.4)
Correctional facility resident at time of diagnosis	49 (0.8)
Long-term care facility resident at time of diagnosis	100 (1.6)
Homeless at time of diagnosis	159 (2.6)
Substance user at the time of diagnosis	645 (10.4)
Type of provider	
Health department	3888 (64.1)
Community/combination	2178 (35.9)

HIV testing offered	4534 (72.8)
HIV status known	3898 (62.7)

Table 5, continued

Year of report*	No. of persons with TB/year
2000	566
2001	516
2002	538
2003	497
2004	474
2005	507
2006	496
2007	454
2008	419
2009	401
2010	406
2011	338
2012	297
2013	313

*Incident cases confirmed as TB by February of the following year.

Table 5a Rates of TB in NJ and the US (2000-2013) per 100,000 population

Year	NJ Rate per 100,000 population	US Rate per 100,000 population
2000	6.70	5.78
2001	6.24	5.60
2002	6.20	5.23
2003	5.75	5.11
2004	5.58	4.95
2005	5.61	4.76
2006	5.86	4.60
2007	5.38	4.41
2008	4.84	4.24
2009	4.63	3.76
2010	4.59	3.61
2011	3.74	3.37
2012	3.40	3.16
2013	3.59	3.02

Source: Online Tuberculosis Information System (OTIS), National Tuberculosis Surveillance System, United States, 1993-2014

OFFER OF HIV TESTING AS RELATED TO CHARACTERISTICS OF PERSONS WITH TB

Research Question 1. Is the decision to offer HIV testing among persons with TB

disease associated with the characteristics of the patients, providers, and clinical settings in which persons with TB are receiving treatment?

The results of the bivariate analysis examining the relationship between patient, provider, and clinical setting variables and whether an offer of HIV testing was made are presented in Table 6. Offer of HIV testing was shown to have an association with all but one variable, in the data set. A number of demographic characteristics were associated with the offer of HIV testing. The largest proportion of patients offered HIV testing was in the 24-44-years age group (81.8%), followed closely by the 15-24-years age group (81.5%), and 45-64-years age group (76.0%). HIV offer was lowest in the 65 years and older age group (50.2%) and 0-14-years age group (48.3%) ($\chi^2=523.40$; $p<0.0001$). By sex, 75.5% of males were offered HIV testing compared to 69.4% of females ($\chi^2=28.87$; $p<0.0001$), a relatively small, but significant difference.

There was a small difference in the proportion of patients offered HIV testing when comparing US-born (69.9%) and foreign-born (74.0%) persons ($\chi^2=10.44$; $p=0.0012$). By race/ethnicity, Black, non-Hispanic persons were offered HIV testing the most (83.5%), followed by Hispanics (77.4%), Asians (67.2%) and White, non-Hispanic persons (59.0%) ($\chi^2=216.76$; $p<0.0001$).

During the time period of the study, a small number of persons with TB lived in non-traditional circumstances. HIV testing was frequently offered to individuals who were in correctional facilities, long-term care settings, or were homeless. Persons with TB living in correctional facilities (85.7%) ($\chi^2=4.13$; $p=0.0422$) or were homeless (85.5%) ($\chi^2=13.03$; $p=0.0003$) were offered HIV testing more than those not in such facilities

(72.8% and 72.5% respectively). A smaller proportion of persons in long-term care settings were offered HIV testing (49.0%) compared with those not in long-term care settings (73.3%) ($\chi^2=29.28$; $p<0.0001$). Therefore, the direction of the association varied by setting of residence.

Substance use was another characteristic observed for association with HIV testing. As reported previously, during the time period of the study, 10.4% of persons with TB engaged in substance use. Substance use included use of excess alcohol, injection drug use, and/or non-injection drug use within the past 12 months of TB diagnosis. This was associated with the offer of HIV testing in persons with TB. Eighty-nine percent (89.2%) of persons who engaged in substance use were offered HIV testing compared to 71.1% of those who did not engage in substance use ($\chi^2=95.89$; $p<0.0001$).

Provider type was examined in this study, comparing persons cared for by health department providers versus community or a combination of providers. Provider type was significantly associated with the offer of HIV testing. About two-thirds of all patients were cared for by health department providers exclusively and these persons had the highest percentage of the offer of HIV testing (80.9%). Only 60.1% of persons not exclusively cared for by health department providers were offered HIV testing ($\chi^2=311.30$; $p<0.0001$).

Finally, this outcome was associated with year of report both as a 14-level ordinal variable (2000-2013) as well as a two-level variable, opt-out year (pre-2007 and 2007 and

later). Over time, on average, the offer of HIV testing to persons with TB increased each year from 63.6% in 2000 to 80.5% in 2013 ($\chi^2=229.20$; $p<0.0001$). There was fluctuation in rates of the offer of HIV testing between 2009 and 2013. When looking at opt-out year, 81.7% of persons diagnosed with TB after opt-out testing was recommended were offered HIV testing compared to 66.4% before opt-out was recommended ($\chi^2=519.84$; $p<0.0001$).

Table 6. Associations between select factors and offer of HIV testing in persons living with TB, 2000-2013 (n=6222)

Factor	HIV testing offered (count/% of sub-group)	Chi-Square¹	p-value²
Overall HIV testing offered=70.4%			
Age group in years		523.40	<0.0001
0-14	139 (48.3)		
15-24	596 (81.5)		
25-44	2014 (81.8)		
45-64	1206 (76.0)		
65+	579 (50.2)		
Sex		28.87	<0.0001
Male	2657 (75.5)		
Female	1877 (69.4)		
Birthplace		10.44	0.0012
US	1210 (69.9)		
Non-US	3320 (74.0)		
Race/ethnicity		216.76	<0.0001
Hispanic	1477 (77.4)		
Asian	1359 (67.2)		
Black, non-Hispanic	1203 (83.5)		
White, non-Hispanic	490 (59.0)		

Table 6, continued

Factor	HIV Testing Offered in group (%)	Chi- Square ¹	p-value ²
Corrections residency at time of diagnosis			
Resident	42 (85.7)	4.13	0.0422
Not a resident	4490 (72.8)		
Homeless at the time of diagnosis			
Homeless	136 (85.5)	13.03	0.0003
Not homeless	4387 (72.5)		
Long-term facility resident at time of diagnosis			
Resident	49 (49.0)	29.28	<0.0001
Not a resident	4484 (73.3)		
Substance user at time of diagnosis			
User	575 (89.2)	95.89	<0.0001
Not a user	3941 (71.1)		
Type of provider			
Health department	3146 (80.9)	311.30	<0.0001
Community/combination	1308 (60.1)		

Table 6, continued

Factor	HIV testing offered in group (%)	Chi-Square ¹	p-value ²
Year of report		229.20	<0.0001
2000	360 (63.6)		
2001	348 (67.4)		
2002	347 (64.5)		
2003	303 (61.0)		
2004	309 (65.2)		
2005	365 (72.0)		
2006	354 (71.4)		
2007	336 (74.0)		
2008	345 (82.3)		
2009	350 (87.3)		
2010	339 (83.5)		
2011	273 (80.8)		
2012	253 (85.2)		
2013	252 (80.5)		
Opt-out year		519.84	<0.0001
2000-2006	2386 (66.4)		
2007-2013	2148 (81.7)		

¹Pearson's chi-square² $\alpha \leq .05$

The final step in looking at the offer of HIV testing to persons with TB was to identify predictors by provider type through a multivariable logistic regression analysis. As mentioned previously, the models were stratified by provider type (health department and community/combination) because the literature suggested that provider type may affect practice around screening for various communicable infections.

After listwise deletion, 3875 individuals were included in the logistic regression model for those patients cared for by health department providers only (Table 7). Significant differences were observed by age group for the offer of HIV testing in persons being cared for by health department providers. All age groups, except for 15-24 year olds, experienced significantly lower odds of being offered HIV testing when compared to the age group 25-44 years, ranging from 46% to 89% lower ($p < 0.0001$). By sex, there was a 28% lower odds of the offer of HIV testing for females compared to males ($OR = 0.72$; $p = 0.0002$).

With regards to race/ethnicity, in persons cared for by health department providers, Black, non-Hispanic persons had approximately three times the odds of being offered HIV testing compared to White, non-Hispanic persons ($OR = 3.28$; $p < 0.0001$). Being of Asian race or Hispanic ethnicity was not a significant predictor of the offer of HIV testing, when compared to White, non-Hispanics. Substance users had greater odds than non-substance users of being offered HIV testing, regardless of provider type. Substance users compared to non-users had about two times the odds of being offered HIV testing ($OR = 1.85$; $p = 0.0013$).

Finally, opt-out year, as a two-level categorical variable, was predictive of the offer of HIV testing for those cared for by health department providers. Persons treated in 2007 and later had about 3-1/2 times the odds of being offered HIV testing compared to those treated prior to 2007 (OR=3.40; $p<0.0001$).

The model for persons cared for by community/combination of providers had 2149 individuals. With backwards stepwise regression, the remaining significant predictors for both the provider models included: age group, sex, race/ethnicity, substance use, and opt-out year (Table 8).

Like the health department provider model, significant differences between groups being offered HIV testing in persons being cared for by community/combination of providers included all age groups with the exception being 15-24 year olds compared to the age group of 25-44 years. For the other groups, the odds of HIV testing being offered was between 46%-74% lower than the reference group ($p<0.0001$ and $p=0.0003$).

The odds of offer of HIV were 29% less for females (OR=0.71; $p=0.0003$) than males. By race-ethnicity, there were significant differences between Asians, who were 31% less likely to be offered HIV testing (OR=0.69; $p=0.0051$) and Black, non-Hispanic persons who had double the odds of offer of HIV testing (OR=2.07; $p<0.0001$), compared to White, non-Hispanic persons. In those being cared for by community/combination

providers offer of HIV testing was double the odds than that for non-substance users (OR= 2.33; p=0.0003).

Lastly, in those treated by community/combination providers, persons diagnosed with TB 2007 and later were 76% more likely to have been offered HIV testing compare to those treated prior to 2007 (OR=1.76; p<0.0001). Therefore, there was a greater increase in the odds of testing following the implementation of the opt-out testing policy in health department providers compared to community/combination of providers.

Table 7. Logistic regression for outcome of HIV testing offered to persons with TB stratified by provider type, 2000-2013 (n=3875)¹

Provider type: Health department

Term (reference group)	Estimate	Standard Error	Odds Ratio²	95% Confidence Interval for Odds Ratio	Prob> Chi Square³
Age group (25-44 years)					
0-14 years	-1.10	0.09	0.11	0.08-0.15	<0.0001
15-24 years	-0.11	0.07	0.81	0.62-1.07	0.1295
45-64 years	-0.31	0.06	0.54	0.43-0.68	<0.0001
65+ year	-0.75	0.07	0.22	0.17-0.29	<0.0001
Sex (male)	-0.17	0.05	0.72	0.60-0.86	0.0002
Race/ethnicity (White, non-Hispanic)					
Hispanic	0.12	0.08	1.28	0.95-1.73	0.1068
Asian	-0.02	0.08	0.96	0.71-1.29	0.7909
Black, non-Hispanic	0.60	0.90	3.28	2.32-4.66	<0.0001
Substance user (non-user)	0.31	0.10	1.85	1.29-2.72	0.0013
Opt-out year 2007 and later (before 2007)	0.61	0.05	3.40	2.82-4.10	<0.0001

¹Result of listwise deletion for missing responses

²For the log of odds HIV test offered vs not offered

³ $\alpha \leq .05$

Table 8. Logistic regression for outcome of HIV testing offered to persons with TB stratified by provider type 2000-2013 (n=2149)¹

Provider type: Community/combination of providers

Term (reference group)	Estimate	Standard Error	Odds Ratio²	95% Confidence Interval for Odds Ratio	Prob> Chi Square³
Age group (25-44 years)					
0-14 years	-0.57	0.13	0.32	0.19-0.54	<0.0001
15-24 years	0.02	0.11	1.04	0.68-1.61	0.8732
45-64 years	-0.22	0.06	0.64	0.50-0.82	0.0003
65+ year	-0.68	0.06	0.26	0.20-0.33	0.0003
Sex (male)	-0.17	0.05	0.71	0.59-0.85	0.0003
Race/ethnicity (White, non-Hispanic)					
Hispanic	0.07	0.08	1.14	0.84-1.56	0.4120
Asian	-0.19	0.07	0.69	0.53-0.89	0.0051
Black, non-Hispanic	0.36	0.08	2.07	1.54-2.79	<0.0001
Substance user (non-user)	0.42	0.12	2.33	1.49-3.76	0.0003
Opt-out year 2007 and later (Before 2007)	0.28	0.05	1.76	1.44-2.16	<0.0001

¹Result of listwise deletion for missing responses

²For the log of odds HIV test offered vs not offered

³ $\alpha \leq .05$

Since year of report was associated with offer of HIV testing, the two-level variable for year (opt-out year) was tested for interactions across all variables in each of the regression models described above. A fully-loaded model with interactions for all significant predictors was run initially, and then various combinations of interactions run for the best fit provider-type models. For persons being cared for by health department providers, report year was a significant effect for birthplace and age group (Table 9). Persons born in the US had two times the odds of HIV testing being offered compared to foreign-born persons before 2007 (OR=2.10; p=0.0019). By age group, however, report year only had a unique effect for persons of 0-14 years of age, with about 85% lower odds of HIV testing offered compared to persons 25-44 years of age prior to 2007 (OR=0.15; p=0.0030). Interaction effects by year were not significant for other levels of age group in this model (i.e., the odd ratios for other levels of age group for persons pre-2007 and 2007 and later were not statistically different).

Table 9. Logistic regression for outcome of HIV testing offered to persons with TB stratified by provider type, interaction by opt-out year and age group and birthplace, 2000-2013 (n=3888)¹

Provider type: Health department

Term (reference group)	Estimate	Standard Error	Odds Ratio²	95% Confidence Interval for Odds Ratio	Prob> Chi Square³
Age group (25-44 years)					
0-14 years	-1.91	0.22	---	---	<0.0001
15-24 years	-0.15	0.16	---	---	0.3392
45-64 years	-0.49	0.14	---	---	0.0004
65+ year	-0.15	0.17	---	---	<0.0001
Birthplace (not US)	0.74	0.14	---	---	<0.0001
Opt-out year (before 2007)	1.67	0.19	---	---	<0.0001
Opt-out year*Birthplace (Before 2007, not US-born)	-0.74	0.24	2.10	1.59-2.76	0.0019
Opt-out year*0-14 years (Before 2007, 25-44 years)	-1.14	0.38	0.15	0.10-0.23	0.0030
Opt-out year*15-24 years (Before 2007, 25-44 years)	-0.32	0.33	0.86	0.63-1.17	0.3334
Opt-out year*45-64 years (Before 2007, 25-44 years)	-0.34	0.27	0.61	0.47-0.81	0.2005
Opt-out year*65+ years (Before 2007, 25-44 years)	-0.47	0.28	0.24	0.17-0.33	0.0974

¹Result of listwise deletion for missing responses.

²For the log of odds HIV test offered vs not offered

³ $\alpha \leq .05$

In the model for the stratum of community/combination of providers, the effect of report year and only age group was significant (Table 10). There was a unique effect of report year in persons 65 years and older ($OR=0.36$; $p=0.0027$) having 64% less odds of being offered HIV testing compared to 25-44-year olds, pre-2007. Age group by report year was not a predictor of offer of HIV testing for other age groups (i.e., the odds ratios for persons in the remaining age groups pre-2007 and 2007 and later were not different).

Interactions between other variables were assessed as well. However, for offer of HIV testing, the joint effects of other variables as predictors were not significant for either provider model. This also included the interaction by sex and substance use.

Table 10. Logistic regression for outcome of HIV testing offered to persons with TB stratified by provider type, interaction by opt-out year and age, 2000-2013 (n=2481)¹
Provider type: Community/combination of providers

Term (reference group)	Estimate	Standard Error	Odds Ratio²	95% Confidence Interval for Odds Ratio	Prob> Chi Square³
Age group (25-44 years)					
0-14 years	-0.90	0.29	---	---	0.0017
15-24 years	0.07	0.23	---	---	0.7503
45-64 years	-0.24	0.13	---	---	0.0850
65+ year	-1.03	0.14	---	---	<0.0001
Opt-out year 2007 and later (before 2007)	0.76	0.19	---	---	<0.0001
Opt-out year*0-14 years (Before 2007, 25-44 years)	-0.71	0.53	0.41	0.23-0.71	0.1788
Opt-out year*15-24 years (Before 2007, 25-44 years)	-0.08	0.57	1.08	0.68-1.70	0.8846
Opt-out year*45-64 years (Before 2007, 25-44 years)	-0.19	0.27	0.79	0.60-1.03	0.4938
Opt-out year*65+ years (Before 2007, 25-44 years)	-0.76	0.25	0.36	0.27-0.47	0.0027

¹Result of listwise deletion for missing responses.

²For the log of odds HIV test offered vs not offered

³ $\alpha \leq .05$

KNOWN HIV STATUS AS RELATED TO CHARACTERISTICS OF PERSONS WITH TB

Research Question 2. Is known HIV status among persons with TB disease related to the characteristics of the patients, providers, and clinical settings in which persons with TB are receiving treatment?

Known HIV status was assessed in a similar fashion to that of the offer of HIV testing. The results of the bivariate analysis for known HIV status were similar to the analysis for offer of HIV testing (Table 11). Most demographic characteristics were associated with known HIV status in persons with TB. Patients with the highest percentages of known HIV status were in the 25-44 years of age group (71.9%) followed by the 15-24 years of age group (70.9%), and 45-64 years of age group (65.9%). Least known HIV status was in the 0-14 years of age group (41.3%) and 65 years of age and older age group (38.6%) ($\chi^2=460.48$; $p<0.0001$). While the difference was not too large, known HIV status was greater in males (66.0%) than in females (58.3%) ($\chi^2=38.9$; $p<0.0001$). Known HIV testing status was similar in US-born (61.4%) and foreign-born (58.3%) persons ($\chi^2=1.662$; $p=0.1974$). By race/ethnicity, Black, non-Hispanic persons had the highest known HIV status percentage (76.5%) followed by Hispanics (69.3%), Asians (53.9%) and White, non-Hispanic persons (45.8%) ($\chi^2=322.50$; $p<0.0001$). Therefore, birthplace was the only demographic factor looked at in this study that did not show a significant association with known HIV status.

As mentioned previously, persons in non-traditional living circumstances, made up a small proportion of persons with TB in the time frame studied. Of persons with TB in correctional facilities, 77.6% had a known HIV status, compared to 62.5% of those who were non-corrections residents ($\chi^2=4.69$; $p=0.0303$) and 84.9% of persons who were homeless compared to 62.0% were not homeless ($\chi^2=34.61$; $p<0.0001$) had a known HIV status. Only 41.0% of persons in long-term care settings had known HIV status compared to 63.0% for non-long-term-care setting residents ($\chi^2=20.34$; $p<0.0001$). So, once again, the direction of association for known HIV status varied with residential status as it did for offer of HIV testing. Like the offer of HIV testing, substance use was associated with known HIV status. Persons involved with substance use had a known HIV status in 83.9% of cases compared to those without substance use (60.3%) ($\chi^2=137.57$; $p<0.0001$).

There was an association between provider type and known HIV status during this time period. Seventy-two percent (72.2%) of persons cared for by health department providers had a known HIV testing status while only 46.8% of persons cared for by community or a combination of providers had a known HIV testing status ($\chi^2=386.54$; $p<0.0001$).

Finally, like the offer of HIV testing, known HIV status was associated with year of report (14-level ordinal variable for years 2000-2013) as well as an opt-out year (two-level variable, pre-2007 and 2007 and later). Over time, known HIV status in persons with TB increased each year from 43.3% in 2000 to 78.9% in 2013 ($\chi^2=519.84$; $p<0.0001$), with some minor fluctuations. The highest year of known HIV testing status

was 2012 (83.8%). The proportion of persons with HIV testing known increased from 52.2% before 2007 to 76.9%, 2007 and later ($\chi^2=395.03$; $p<0.0001$). This suggests that over time, there were less missing data and fewer responses indicating ‘unknown,’ ‘refused,’ or ‘indeterminate’ HIV status responses.

Table 11. Associations between select factors and known HIV status in persons with TB, 2000-2013 (n=6222)

Factor	HIV testing known in group (count/% of sub-group)	Chi-Square ¹	p-value ²
Overall known HIV status=62.7%			
Age group in years		460.48	<0.0001
0-14	119 (41.3)		
15-24	518 (70.9)		
25-44	1771 (71.9)		
45-64	1045 (65.9)		
65+	445 (38.6)		
Sex		38.9	<0.0001
Male	2322 (66.0)		
Female	1576 (58.3)		
Birthplace		1.662	0.1974
US	1062 (61.4)		
Non-US	3833 (58.3)		
Race/Ethnicity		322.500	<0.0001
Hispanic	1323 (69.3)		
Asian	1090 (53.9)		
Black, non-Hispanic	1102 (76.5)		
White, non-Hispanic	380 (45.8)		

Table 11, continued

Factor	HIV testing known in group (count/% of sub-group)	Chi-Square¹	p-value²
Corrections resident at time of diagnosis		4.69	0.0303
Resident	38 (77.6)		
Not a resident	3858 (62.5)		
Homeless at the time of diagnosis		34.61	<0.0001
Homeless	135 (84.9)		
Not homeless	3754 (62.0)		
Long-term facility resident at time of diagnosis		20.34	<0.0001
Resident	41 (41.0)		
Not a resident	3856 (63.0)		
Substance user at time of diagnosis		137.57	<0.0001
User	541 (83.9)		
Not a user	3344 (60.3)		
Type of provider		386.54	<0.0001
Health department	2808 (72.2)		
Community/combination	1020 (46.8)		

Table 11, continued

Factor	HIV testing known in group (count/% of sub-group)	Chi-Square ¹	p-value ²
Year of report		519.84	<0.0001
2000	245 (43.3)		
2001	234 (45.4)		
2002	268 (49.8)		
2003	232 (46.7)		
2004	279 (58.9)		
2005	314 (61.9)		
2006	305 (61.5)		
2007	300 (66.1)		
2008	306 (73.0)		
2009	333 (83.0)		
2010	321 (79.1)		
2011	265 (78.4)		
2012	249 (83.8)		
2013	247 (78.9)		
Year of report (opt-out testing)		395.03	<0.0001
2000-2006	1877 (52.2)		
2007-2013	2021 (76.9)		

¹Pearson's chi-square² $\alpha \leq 0.05$

As with offer of HIV testing, predictors of known HIV status were assessed for individuals cared for by health department providers only (n=3875) and for persons cared for by community/combination of providers (n=2145). With backwards stepwise regression starting with all variables, the remaining predictors for the model with health department providers included: age group, sex, race/ethnicity, substance use, and opt-out year (Table 12).

Demographic characteristics including age, sex, and race/ethnicity were significantly associated with having a known HIV status for health department providers. Significant differences between groups for known HIV status included all age groups compared to the age group 25-44 years for all persons cared for by health department providers. The odds of known HIV status was between 27% to 86% lower (OR=0.14-0.73; $p<0.0001$) in these age groups compared to the reference group. As with the offer of HIV testing, females had a lower odds of known HIV status compared to males. The odds of known HIV status were 33% lower for females (OR=0.67; $p<0.0001$). By race/ethnicity in persons cared for by health department providers, Black, non-Hispanics had three times the odds of known HIV status (OR=3.13; $p<0.0001$) compared to White, non-Hispanic persons.

As with the offer of HIV testing, substance use was also a predictor of known HIV status. Substance users had about two times the odds of known HIV status compared to non-users who were cared for by health department providers (OR=1.83; $p=0.0001$). With regards to time, in persons cared for by health department providers, the odds of known

HIV status from 2007 onwards was more than four times that of the pre-2007-time frame (OR=4.71; $p<0.0001$).

Remaining predictors for the model with community/combination of providers included the same variables as in the health department provider model with the addition of homelessness (Table 13). In persons being cared for by a community/combination of providers all age groups except for 15-24 years old had a significant difference in known HIV status compared to the 25-44-year-old age group. This ranged from 37% to 74% lower odds (OR=0.26-0.63; $p<0.0001$). The odds of known HIV status were 27% lower for females than for males (OR=0.73; $p=0.0010$).

In persons cared for by community/combination of providers, there were significant differences in the odds of known HIV status between all race/ethnicities and White, non-Hispanic persons. Black, non-Hispanic persons had almost three times the odds (OR=2.85; $p<0.0001$), those of Hispanic ethnicity had 1-1/2 times the odds (OR=1.62; $p=0.0026$). On the contrary, Asians had about one-third less odds (OR=0.71; $p=0.0147$) of known HIV testing status compared to White, non-Hispanic persons.

The only setting of residence variable that was included in the final model for community/combination or providers after backwards stepwise regression was homelessness. Persons who were homeless and cared for by these providers had about 2-1/2 times the odds of known HIV status compared to non-homeless persons (OR=2.49; $p=0.0432$). Therefore, among community/combination providers, being homeless was a

significant predictor of having a known HIV status and this was not the case for those being treated in a health department setting.

Substance users who were cared for by community/combination providers and about 2-1/2 times the odds of known HIV status compared to non-users (OR=2.62; $p<0.0001$).

Finally, in the odds of known HIV status was almost three times higher in the 2007 and later time period compared with the pre-2007-time period (OR=2.88; $p<0.0001$) for persons being cared for by community/combination providers. These odds were a bit lower than in the health department model.

Table 12. Logistic regression for outcome of known HIV status in persons with TB, by provider type, 2000-2013 (n=3875)¹

Provider type: Health department

Term (reference group)	Estimate	Standard Error	Odds Ratio²	95% Confidence Interval for Odds Ratio	Prob> Chi Square³
Age group (25-44 years)					
0-14 years	-0.99	0.09	0.14	0.10-0.20	<0.0001
15-24 years	-0.16	0.06	0.73	0.46-0.69	0.0070
45-64 years	-0.29	0.05	0.56	0.46-0.69	<0.0001
65+ year	-0.75	0.06	0.23	0.18-0.29	<0.0001
Sex (male)	-0.20	0.04	0.67	0.57-0.78	<0.0001
Race/ethnicity (White, non-Hispanic)					
Hispanic	0.19	0.07	1.32	1.00-1.75	0.0519
Asian	-0.09	0.07	0.84	0.63-1.11	0.2104
Black, non-Hispanic	0.57	0.08	3.13	2.29-4.27	<0.0001
Substance user (non-user)	0.30	0.08	1.83	1.36-2.51	0.0001
Opt-out year 2007 and later (Before 2007)	0.78	0.04	4.71	3.98-5.59	<0.0001

¹Result of listwise deletion for missing responses.

²For the log of odds known vs unknown HIV status

³ $\alpha \leq .05$

Table 13. Logistic regression for outcome of known HIV status in persons with TB, by provider type, 2000-2013 (n=2145)¹

Provider type: Community/combo

Term (reference group)	Estimate	Standard Error	Odds Ratio²	95% Confidence Interval for Odds Ratio	Prob> Chi Square³
Age group (25-44 years)					
0-14 years	-0.50	0.14	0.37	0.21-0.62	0.0002
15-24 years	0.12	0.11	1.27	0.84-1.92	0.2618
45-64 years	-0.23	0.06	0.63	0.50-0.81	0.0002
65+ year	-0.68	0.07	0.26	0.20-0.33	<0.0001
Sex (male)	-0.16	0.05	0.73	0.60-0.88	0.0010
Race/ethnicity (White, non-Hispanic)					
Hispanic	0.24	0.08	1.62	1.19-2.23	0.0026
Asian	-0.17	0.07	0.71	0.54-0.94	0.0147
Black, non-Hispanic	0.52	0.77	2.85	2.12-3.85	<0.0001
Homeless (not homeless)	0.46	0.23	2.49	1.08-6.51	0.0432
Substance user (non-user)	0.48	0.11	2.62	1.74-4.05	<0.0001
Report year 2007 and later (Before 2007)	0.53	0.05	2.88	2.34-3.55	<0.0001

¹Result of listwise deletion for missing responses.

²For the log of odds known vs unknown HIV status

³ $\alpha \leq .05$

As with the offer of HIV testing, interaction effect by year as a dichotomous variable (pre-2007 and 2007 or later) was assessed for all variables in both provider models looking at known HIV status as the outcome. The effect of report year was significant only by place of birth and age group in the health department model (Table 14). Persons aged 0-14 years of age had 82% less odds of known HIV testing in 2007 and later compared to those 25-44 years of age before 2007 (OR=0.18; p=0.0043). There were no significant effects by year for other age groups (i.e., the odds ratios for persons in the remaining age groups pre-2007 and 2007 and later were not statistically different). For birthplace, persons in 2007 and later born in the US had 2-1/2 times the odds of know HIV status compared to foreign-born persons before 2007 (OR=2.46; p=0.0002).

For persons cared for by community/combination of providers, the interaction by opt-out year and place of birth was significant (Table 15). As with persons cared for by health department providers, persons in 2007 and later born in the US had 2-1/2 times the odds of know HIV status compared to foreign-born persons before 2007 (OR=2.52; p=0.0041).

Additionally, interactions by other variables were assessed. The joint effects of age group, race/ethnicity, and birthplace as predictors for known HIV status were significant. With regards to age group, for persons cared for by health department providers, those between the ages of zero and 14 and those 65 years and older born in the US, had about 90% less odds of known HIV testing status compared to persons 25-44 years of age who were foreign born (OR=0.08; p=0.0162 and OR=0.09; p<0.0001). By race/ethnicity, Black non-Hispanic persons born in the US had over two times the odds of known HIV

status compared to foreign-born, White non-Hispanic persons (OR=2.27; $p=0.0002$) (Table 16).

For persons cared for by community/combination of providers, patients who were 0-14 years and 65 years and older who were US born had almost 90% less HIV testing (OR=0.13; $p=0.0003$ and OR=0.12; $p<0.0001$) than those 25-44 years of age who were foreign born. Persons 15-24 years of age had more than half the odds of known HIV status (OR=0.40; $p=0.0163$). By race/ethnicity, black persons born in the US had three times the odds of known HIV status of White, non-Hispanic persons not born in the US (OR=2.96; $p<0.0001$) (Table 17).

And finally, interaction by sex and substance used was also assessed. The interaction was not significant for either provider type model for the outcome of known HIV status.

Table 14. Logistic regression for outcome of known HIV status in persons with TB, by provider type, interaction by report year and age group and birthplace 2000-2013 (n=3888)¹
Provider type: Health department

Term (reference group)	Estimate	Standard Error	Odds Ratio²	95% Confidence Interval for Odds Ratio	Prob> Chi Square³
Age group (25-44 years)					
0-14 years	-1.70	0.22	---	---	<0.0001
15-24 years	-0.25	0.14	---	---	0.0637
45-64 years	-0.47	0.12	---	---	<0.0001
65+ year	-1.65	0.18	---	---	<0.0001
Birthplace (not US)	0.90	0.13	---	---	<0.0001
Opt-out year (Before 2007)	1.80	0.16	---	---	<0.0001
Opt-out year*0-14 years (Before 2007, 25-44 years)	-1.04	0.36	0.18	0.12-0.28	0.0043
Opt-out year*15-24 years (Before 2007, 25-44 years)	-0.24	0.27	0.78	0.60-1.01	0.3689
Opt-out year*45-64 years (Before 2007, 25-44 years)	-0.25	0.22	0.63	0.49-0.80	0.2572
Opt-out year*65+ years (Before 2007, 25-44 years)	-0.03	0.26	0.19	0.14-0.27	0.9087
Opt-out year*Birthplace (Before 2007, not US)	-0.79	0.21	2.46	1.92-3.15	0.0002

¹Result of listwise deletion for missing responses

²For the log of odds known vs unknown HIV status

³ $\alpha \leq .05$

Table 15. Logistic regression for outcome of known HIV status in persons with TB, by provider type, interaction by report year and birthplace 2000-2013 (n=3888)¹

Provider type: Health department

Term (reference group)	Estimate	Standard Error	Odds Ratio²	95% Confidence Interval for Odds Ratio	Prob> Chi Square³
Birthplace (not US)	0.93	0.13	---	---	<0.0001
Opt-out year (before 2007)	0.94	0.17	---	---	<0.0001
Opt-out year*Birthplace (Before 2007, not US)	-0.67	0.23	2.52	1.97-3.24	0.0041

¹Result of listwise deletion for missing responses.

²For the log of odds known vs unknown HIV status

³ $\alpha \leq .05$

Table 16. Logistic regression for outcome of known HIV status in persons with TB, by provider type, interaction by report birthplace and age group and race/ethnicity, 2000-2013 (n=3879)¹

Provider type: Health department

Term (reference group)	Estimate	Standard Error	Odds Ratio²	95% Confidence Interval for Odds Ratio	Prob> Chi Square³
Age group (25-44 years)					
0-14 years	-1.46	0.31	---	---	<0.0001
15-24 years	-0.31	0.12	---	---	0.0077
45-64 years	-0.44	0.11	---	---	<0.0001
65+ years	-1.03	0.13	---	---	<0.0001
Birthplace (not US)	0.20	0.29	---	---	0.4819
Birthplace*0-14 years (Not US, 25-44 years)	-1.05	0.44	0.08	0.05-0.15	0.0162
Birthplace*15-24 years (Not US, 25-44 years)	-0.54	0.40	0.43	0.20-0.89	0.1741
Birthplace*45-64 years (Not US, 25-44 years)	-0.28	0.30	0.49	0.28-0.85	0.3543
Birthplace*65+ years (Not US, 25-44 years)	-1.41	0.33	0.09	0.05-0.16	<0.0001
Birthplace*Hispanic (not US, White, non-Hispanic)	0.13	0.30	1.14	0.64-2.03	0.6687
Birthplace*Asian (not US, White, non-Hispanic)	-0.54	0.48	0.58	0.23-1.48	0.2545
Birthplace*Black (not US, White, non-Hispanic)	0.82	0.22	2.27	1.48-3.47	0.0002

¹Result of listwise deletion for missing responses

²For the log of odds known vs unknown HIV status

³ $\alpha \leq .05$

Table 17. Logistic regression for outcome of known HIV status in persons with TB, by provider type, interaction by report birthplace and age group and race/ethnicity, 2000-2013 (n=2163)¹

Provider type: Community/combination

Term (reference group)	Estimate	Standard Error	Odds Ratio²	95% Confidence Interval for Odds Ratio	Prob> Chi Square³
Age group (25-44 years)					
0-14 years	0.30	0.50	---	---	0.5492
15-24 years	0.36	0.22	---	---	0.0947
45-64 years	-0.32	0.13	---	---	0.0163
65+ years	-0.97	0.15	---	---	<0.0001
Birthplace (not US)	0.52	0.26	---	---	0.0460
Birthplace*0-14 years (Not US, 25-44 years)	-2.33	0.65	0.13	0.06-0.30	0.0003
Birthplace*15-24 years (Not US, 25-44 years)	-1.29	0.54	0.40	0.15-1.04	0.0163
Birthplace*45-64 years (Not US, 25-44 years)	-0.45	0.29	0.47	0.28-0.78	0.1307
Birthplace*65+ years (Not US, 25-44 years)	-1.17	0.30	0.12	0.07-0.20	<0.0001
Birthplace*Hispanic (not US, White, non-Hispanic)	0.57	0.38	0.60	0.29-1.24	0.1339
Birthplace*Asian (not US, White, non-Hispanic)	-0.31	0.78	0.74	0.16-3.41	0.6957
Birthplace*Black (not US, White, non-Hispanic)	1.09	0.18	2.96	2.08-4.23	<0.0001

¹Result of listwise deletion for missing responses

²For the log of odds known vs unknown HIV status

³ $\alpha \leq .05$

PROVIDER INTERVIEW FINDINGS

Research question 3: How are factors related to the decision to offer HIV testing to persons arriving for medical management of TB disease influenced by providers' self-reported behaviors and attitudes?

Review of the methods

Thirty-one (31) provider interviews were conducted based on the interview guide. By profession, 15 physicians with specialization in the following fields: family practice (3), internal medicine (4), infectious diseases (2), and pulmonary medicine (6) were interviewed. The remaining interviewees were with public health nurses (14) and disease investigators (2). Twenty persons were health department providers (HDP) and eleven were community providers (CP).

As indicated in the Methods chapter, a review of the transcripts resulted in 26 codes under four broad themes: 1) *Basis of provider's HIV testing decision*; 2) *Perceived patient barriers*; 3) *Provider testing barriers*; and 4) *Provider testing opportunities*. There were 513 quotes in the transcripts coded, some classified by multiple codes.

Selected quotes are shared in this section, which represent both health department and community providers' (specialists and primary care) perspectives under each theme. The quotes in this section were selected as representing the four themes. Below are the descriptions of general findings for each theme, with excerpts of quotes to illustrate these findings.

1. Basis of provider's HIV testing decision

When asked about testing protocols, most interviewees stated that they offered testing to all of their patients. However, later comments in the interviews suggest that testing was not consistently offered in many settings or by all providers. Providers might not offer testing based on several examples offered which included assessment of a patient's risk, noting information such as age, where they live, and country of origin.

There was a feeling of general discomfort about offering HIV testing, particularly in providers in the community who may have a long-term relationship with their patients. This was touched upon by a health department provider with regards to observations about community providers:

[Health Department Provider (HDP)] I would say that broaching the idea of testing would be more of a challenge for a private practice physician where there is a different relationship between the doctor and the patient...By testing, it's thought of as a presumption of a negative lifestyle.

One community specialist, who also sees patients as a primary care provider, stated when discussing HIV testing, it could be uncomfortable as it would be assuming the patient had risk factors for HIV infection:

[Community Provider (CP)] For me, the patients I have are both inner city and kind of suburban. Different populations. Certainly, if I had to talk about testing in somebody who has no risk, it gets a little uncomfortable. It's hard to make a patient understand why we want to [test] when there are clearly no traditional risk factors.

Country of origin and race was also cited as a reason for HIV testing or for not testing a patient with TB, particularly in making assumptions about HIV prevalence in specific groups of people:

[HDP)] ...you may have someone from Haiti who's coming in. What do we do? We go through the HIV [counseling] with them more often than not. But someone from Asia, we will not even think that's what it is. We're guilty of it.

[HDP]: I mean we get a lot of suspected TB with Asians. I don't think race is [an issue] but probably it is because you just tend to assume that elderly Asian people are not exposed to HIV. I think they might have a higher rate, but we never ask.

Finally, age as a factor was also of concern to providers as they identified biases for HIV testing in older persons with TB. This was at times, also coupled with race or ethnicity.

[CP] I believe in [HIV] testing everyone, but certainly not if an eighty-year-old was in my office!

[HDP] I think the smaller mom and pop kinds of doctors don't wanna do [HIV testing]. Don't know why. Especially if [the patient is] an older, sixty, seventy, eighty-year old, they won't do it.

As indicated above, both HDPs and CPs admitted they did not universally test for HIV in persons with TB. There was also a perception by HDPs that CPs tended to offer HIV testing less than recommended. One primary care community provider stated that knowing HIV testing was universally recommended for all persons, regardless of whether TB is being considered does not make asking about it easier.

[CP] I really think that that's the problem, just getting them to understand why we're doing it. Just saying that it's another factor that we're looking at. And most of our

patients are older. They're older immigrants. Once in a while we get a young person. I think it's just the overload and that you have to tell them they have TB and now HIV.

2. Perceived patient barriers

Several providers indicated that HIV testing may be refused when offered, due to patient-related barriers and not because of the provider's behavior. Stigma associated with TB and with HIV was the main barrier that was mentioned by both health department and community providers.

[HDP]...to actually ask a person about HIV is very difficult...I remember when I first started asking this question. People would get angry. And then automatically, the [interaction] stopped.

[HDP] ...you mention HIV to people, it's worse than when you tell them they have TB.

HIV stigma was also noted as the cause for patients not obtaining HIV testing when prescribed, and testing could only be done in another facility, not then and there at the time of the testing offer. This is particularly true in settings where HIV testing or lab testing is not done on site as one primary care community provider indicated:

[CP]: Maybe there's not that follow through on the part of the patient, as well. They don't want to know...

Some providers also stated that patients had come to the TB clinic with a family member which could pose privacy concerns inhibiting discussions about the importance of HIV testing in persons with TB. This was noted with quotes about spouses coming for medical visits with patients as well as entire nuclear or joint families.

[HDP] ...one lady, one that had refused [HIV testing] had her husband with her. And that was a big issue...one time she came herself and we asked her, and we did it. And it was negative, but you know, we still got it in there.

There was much discussion about the stigma associated with HIV testing. However, many providers stated that HIV testing in general was easier to discuss than in previous years. They felt that stigma related to HIV infection had lessened as people are now living with HIV longer. This was consistent among all providers interviewed regardless of whether HIV testing was discussed in the context of TB medical management or not.

[CP] We can all remember when AIDS was such a big issue...and nobody knew what they were doing. And now I think it's more controlled... people have more acceptance of it...they don't feel like it's a plague that's spreading uncontrollably.

[CP] At first, probably when I was a resident, there was always hesitation. Because HIV was limited to mostly homosexual behavior. But I think probably in this day and age it's more comfortable.

Therefore, while stigma was overwhelmingly thought of as a patient barrier for accepting HIV testing, reduction in stigma has likely made providers more comfortable to offer HIV testing.

Additionally, a number of providers mentioned specific ethnic or religious groups refusing HIV testing. Therefore, even if HIV testing was offered by the provider, the patient would refuse based on cultural practices or beliefs. According to these providers, this refusal resulted in the lack of HIV status information in the TB medical record.

[HDP] Honestly, I find it [refusing HIV testing] more in the Asians, you know, Asian Indians. They don't wanna talk about it and I even see it here with staff. It's on our TB Patient Assessment Form that we do, you know, their HIV status and it's just blank. It's always blank.

[HDP] I shouldn't say this, but I find Muslim patients, they refuse.

3. Provider testing barriers

There were a number of barriers to offering HIV testing of persons with TB and/or documenting HIV status that were acknowledged to be practical, provider-related barriers. There was a general perception by HDPs that persons with TB being cared for in community settings were not frequently offered HIV testing. This perception was based on missing or “unknown” HIV status in TB medical records, HIV testing not being readily available in community settings, or HIV status information not being shared with the health department clinics. Two providers discussed

[HDP] I’m responsible for the [TB surveillance form] and it’s like pulling teeth [to get CPs to provide HIV status]...I’ll call the office. Sometimes I have to say, “I’m the public health person...nothing has been done in terms of the HIV testing. This patient has been on medicine for a month and a half. This is required for reporting to the State...” I mean I try and push a little like that.

[HDP] And the biggest headache ever, is getting information from a [community] doctor’s office...So it’s constantly requesting and clarifying [my] role...

In so much as there was much critique about lower HIV testing rates and documentation of testing in the community, both health department providers and community providers had common thinking about several barriers to testing. They attributed lower HIV testing rates and documenting of testing among community providers to lack of time, little access to rapid, in-office HIV testing, and simply not thinking about HIV testing guidelines for persons with TB.

The ability to do HIV testing on site, whether it is by blood draw or rapid oral testing, was acknowledged to be challenging to set up in many providers’ settings. This was mostly the case for community primary care and pulmonary providers. Community

infectious disease and health department settings appeared to have more need for HIV testing, therefore, the impetus to have HIV testing capability on site.

[HDP] It's not like they [CPs] don't send [the HIV test results] to us. It's just organizing and making sure you get everything. Because a lot of time they're sending patients out to a lot of labs.

[HDP] It's very simple to just do a finger stick, run the [HIV] test. [But] we have to be certified. I had to go to all these trainings about how to counsel people. We have to keep logs...fax everything in, do controls every week. So maybe in the [community] physician's office they don't want to be bothered with all that stuff. It's just easier to write a prescription for an HIV test. Maybe they do order it and the [patient] just doesn't go for the blood work.

Time as a barrier to offering HIV testing was of particular concern as expressed about and by community providers. This was especially true for primary care community providers with multiple areas to cover during a patient encounter.

[CP] You're seeing them [patients] for the first time, it's a brief encounter often. You want to get a lot of things accomplished in that first visit. Unfortunately, counseling them about HIV is not a priority. But the worst thing in the world is that you think of something to do the day after you see the patient. It's really hard to get in touch with them again. To get them to take time off from work. You know, to contact them. Even if you have staff, it's really hard to do that.

[HDP] I have friends in private practice. We think about them as just sitting in their office with all of these tools at their disposal and, "Why aren't they just doing the right thing?" From their point of view, in order to pay their overhead, and their nurse and their staff and answer the phones, they have to see 40 patients a day.

There were additional barriers to HIV testing in persons with TB that were mentioned in the interviews. These included that providers who do not see TB frequently in their practices may not be familiar with HIV testing guidelines as well as standards for reporting the results. In fact, a few community primary care providers did not realize the importance of HIV testing in persons with TB; this came across in one interview where

the provider realized that knowledge of HIV status in a person with pulmonary symptoms will assist in a diagnosis of TB or referral to a specialist.

Moreover, there were comments by both community and health department providers about physician specialty, beyond knowledge of the role of HIV testing in the management of TB. Generally, interviewees felt that infectious disease physicians were more comfortable with HIV testing than pulmonary physicians and recall more frequently that it is important to test for HIV in persons with TB.

[HDP] Well, if they're [the patient] going to an infectious disease doctor, [the physician] should be aware of TB. They might not have a lot of experience with TB but, HIV, they treat probably more. They might not know how to treat HIV and TB as far as the medication interactions. That's what we keep an eye on. But they should know what to do with the HIV status. Now, if you're going to a pulmonologist, *if* they remember to test for HIV, they probably have to refer them out.

While type of specialty was attributed to comfort with HIV testing, experience with the management of TB in general, was also seen as a potential influencing factor in obtaining documentation of HIV status in persons with TB.

[HDP]...how TB is seen...in North Jersey is a lot different in South Jersey 'cause the incidence is lower so they don't have a lot of experience. Here, [in Northern New Jersey] we have a relationship with all the hospitals' infection control nurses, so we get information really easily. But again, if you go down to a hospital that doesn't see a lot of TB and now you're asking for a patient's records, it might be a little more difficult.

General comfort with offering HIV testing has been discussed through several examples in this chapter. However, comments surfaced about fear of reporting a positive HIV test result to the patient as well as part of the medical record. Fear of such reporting could affect whether HIV testing is even offered to persons with TB.

[HDP] What happens if this is a man or woman who's married and faithful to their husband or wife? And you're asking them to do this [HIV] test. I mean not that it would come back positive but even so, it's like, "If it does..." I really think it would be better if they're gonna do that to have somebody in the clinic who knows to counsel them more.

[CP] I feel uncomfortable doing it only because I keep in the back of my head, "What happens if this person comes back positive." I don't have the training to counsel them... You can't just tell someone they're HIV positive without having some kind of emotional support for them.

4. Provider testing opportunities

In most cases, provider success in having HIV testing completed and reported related to organizational policies and standards of care. Most providers approached HIV testing as being routine, and a part of regular bloodwork.

[HDP] Well, what kind of makes it easier is we just say that this is the protocol...for record keeping [otherwise] they think that we're accusing them of being a drug addict or sexually promiscuous or something...

[CP] So it's so much easier when they're inpatient. 'Just go up to the floor and say, "...make sure you get that HIV before they're discharged."

In addition to routine standards for HIV testing in persons with TB, providers talked about HIV testing in general being easier to deal with in the present, since just educational information but no consent was required (opt-out) in the majority of settings:

[CP] I feel like [opt-out testing] made a huge difference. I wish that had been in place from the beginning. It would have saved lives. Because all that perception in the 80s and the 90s that we're going to be discriminating by doing...it made testing harder.

Education came up multiple times, particularly as suggested by health department providers for community providers. Similarly, primary care community providers talked

about the challenges with keeping up with various guidelines and reporting standards given the variety of care they need to provide.

[HDP] [Community providers are] not only treating TB so they're probably a pulmonary doctor and they know nothing about HIV. I think education's a big thing.

There was much discussion about interventions to increase the offer of HIV testing and documentation of HIV status. Suggestions included brief educational tools, State Health Department visits to providers to explain guidelines, utilizing NJ's nurse case management system to pursue documentation from community providers more frequently, providing HIV communication training, and increasing access to rapid HIV testing kits.

[HDP] In this county, as soon as an [infectious diseases (ID)] doctor or the ID nurse has a [person with a presumptive TB diagnosis], I get out the [HIV reporting form] here - she has a copy there. But it's so much easier because every line has to be filled out and it's easier for the two of us to do it on the telephone.

SUMMARY OF RESEARCH FINDINGS

In this chapter, results of the surveillance data analysis and the provider interviews were presented. Both sets of analyses were conducted simultaneously with some refinement based on preliminary findings of both methods. The results should be considered together, even though the surveillance data is a representation of actual trends in the TB data over time versus perceptions of provider practices and self-reported behaviors of a sample of providers at a later date.

In summary, over the 14-year period under study, the number of people with TB on an annual basis had steadily decreased while the offer of HIV testing and known HIV status

in persons with TB yearly had increased overall. Associated with both the offer of HIV testing and known HIV status were age, sex, facility of residence, substance use, race/ethnicity, and type of provider of care. All four provider-type models were different from each other. The provider interviews shed light on the surveillance data analysis with details on perceived reasons for the offer of HIV testing and documentation of HIV status in both health department and community care settings. Interview data provided information on the basis of clinical decision making for HIV testing barriers and opportunities.

Demographics of the patients and risk factors seemed to play a key role as well as patient and provider comfort with HIV testing, provider knowledge of TB care protocols, and access to HIV testing at TB care sites. The opt-out HIV testing recommendation was perceived to have made an important difference in easing the offer of HIV testing – this was indicated in the interviews but shown in the surveillance data results as well.

The results presented in this chapter have begun to address this study's three research questions. The next chapter will provide a synthesis of these findings. There will also be a discussion about the implications for the study results as well as how these may affect future TB care in the State of NJ.

CHAPTER 5 – DISCUSSION, RECOMMENDATIONS, AND CONCLUSION

OVERVIEW OF CHAPTER

This study characterized the state of HIV testing in persons with TB in NJ from 2000 to 2013. It highlighted to whom HIV testing was being offered, in whom HIV status was known, and possible reasons for such findings. The analysis of TB surveillance data provided information on associations between demographics, setting of residence, year of report, risk factor status, and provider type with the offer of HIV testing and known HIV status for persons with TB. Additionally, the factors that together predicted these outcomes as well as sub-group differences were also identified.

The provider interviews revealed the information behind the numbers – the frame of mind among providers while having made decisions about whom to offer HIV testing as well as their rationale as to why HIV status is not documented as part of medical records. The results of these interviews in combination with the surveillance data results helped elucidate the matter of HIV testing in persons with TB in NJ.

In this chapter, research findings from Chapter 4 will be reviewed as they relate to the three research questions. Second, the results of all levels of analyses will be synthesized comparing various study outcomes and the differences between the two provider regression models. Next, the implications of the research findings will be discussed. This will include descriptions of the possible causes for the findings as related to not only the surveillance data, but other work on the topics of HIV testing in persons with TB as

well as the theoretical basis for the study. Finally, the ways in which the study findings can inform provider practices and policies and recommendations around HIV testing in persons with TB will be discussed. Where relevant, the application of the theoretical constructs and concepts will be noted.

REVIEW OF RESEARCH FINDINGS

Research question 1: Is the decision to offer HIV testing among persons with TB disease associated with the characteristics of the patients, providers, and clinical settings in which the persons with TB are receiving treatment?

The offer of HIV testing to persons with TB in NJ increased over the 14-year study period. There was a significant association with all of the study variables with the offer of HIV testing. The odds of the offer of HIV testing status in most age groups was less compared to 25-44 year olds. This was not the case with 15-24 year olds, however, where no difference in odds of offer was shown. When stratifying age group by opt-out year, there were some differences in the odds of offer of HIV testing in both provider groups but it was not very different than in the non-interaction models.

For the additional significant predictors, by sex, females had lower odds of the offer of HIV testing compared to males, and persons with a history of substance use had greater odds of the offer of HIV testing compared to non-substance users. With the steady increase in the offer of HIV testing, it is of no surprise that the odds of this outcome was greater in 2007 and later than in persons with TB diagnosed pre-2007. Between the two

provider models, this is the one predictor with the greatest difference. For persons cared for by health department providers, there was a 3-1/2 times odds difference in offer of HIV testing from before 2007 to after 2007. For community/combination of providers, the odds was less than two times greater.

Race/ethnicity was predictive of the offer of HIV testing for both provider types. Persons of Black, non-Hispanic race had greater odds of the offer of HIV testing in both provider models compared to White, non-Hispanic persons. Asians had lower odds of the offer of HIV testing in persons cared for by community/combination of providers compared to White, non-Hispanic persons.

Birthplace was a predictor of offer of HIV testing only when stratified by opt-out year. Persons born in the US had higher odds of HIV testing offer than foreign-born persons prior to 2007. Corrections and long-term care residency were not significant single predictors of offer of HIV testing.

Research question 2: Is known HIV status among persons with TB disease associated with the characteristics of the patients, providers, and clinical settings in which the persons with TB are receiving treatment?

Known HIV status in persons with TB in NJ increased over the 14-year study period. There was a significant association with all of the study variables with the known HIV status with exception of birthplace.

There were similarities in the models for known HIV status and provider type as with offer of HIV testing. In both models, the odds of known HIV status was lower for all age groups, (except for 15-24 year olds in the community/combination provider model), compared to 25-44 year olds. In an interaction model by opt-out year, age group remained significant but not very different from the single effects models. In looking at age group interacting with birthplace, US-born patients who were zero to 14 years or 65 years and older had a far lower odds of known HIV status compared to 25-44 year olds who were foreign born.

By sex, females had a lower odds of known HIV status compared to males. Persons with a history of substance use had a greater odds of known HIV status compared to non-substance users. And, as with the offer of HIV status, with the increase in known HIV status over time, the odds of known HIV status outcomes were greater in 2007 and later than in persons with TB diagnosed pre-2007. As with the offer of HIV testing, the difference between provider types for opt-out year was quite pronounced (odds ratios of 4.71 for health department providers vs. 2.88 for community/combination of providers).

Setting of residence was a predictor of known HIV status, with higher odds of known status in homeless versus non-homeless persons in the community/combination of providers' model only. Race/ethnicity also was predictive of known HIV status in both provider models. Consistently, persons of Black, non-Hispanic race had a greater odds of known HIV status in both models compared to White, non-Hispanic persons. The odds

was about the same when race/ethnicity was stratified by birthplace. Additionally, in patients cared for by community/combination or providers, Hispanics had higher odds of known HIV status in persons while Asians had lower odds, compared to White, non-Hispanic persons. In looking at interaction by year, Hispanics cared for by health department providers only, had a higher odds of known HIV status in 2007 and later, compared to White, non-Hispanics before 2007.

Birthplace was not significant as a single effect for known HIV status. However, when interacting with opt-out year, the result was that US-born persons had higher odds of known HIV status 2007 and later that foreign-born persons diagnosed with TB before 2007.

Research question 3: How are factors related to the decision to offer HIV testing to patients arriving for medical management of TB infection or disease influenced by providers' self-reported behaviors and attitudes?

With regards to the 31 provider interviews, transcript codes fell into four broad themes:

1) *Basis of provider's HIV testing decision*; 2) *Perceived patient barriers*; 3) *Provider testing barriers*; and 4) *Provider testing opportunities*. These themes were assessed as a whole, looking at the basis of both offer of HIV testing to persons with TB as well as perceptions of HIV testing and recommendations for known HIV status in persons with TB by and about both health department and community providers.

Overall, health department providers felt that community providers were less likely to offer HIV testing based on race, age, and other demographic factors. Community providers stated they were comfortable with offering HIV testing to all persons, however, some statements revealed that demographic factors, particularly age and place of residence, played a role in offering HIV testing. Selective offer of testing was not unique to community providers, however, as some health department providers admitted some bias and discomfort in offering HIV testing to patients. It was clear that providers' expectancies of the value of HIV testing in the outcome of care for persons with TB was low or lacking (Social Cognitive Theory).

There were common barriers to HIV testing in persons with TB noted by both types of providers. These barriers included a lack of time to offer HIV testing, less access to on-site HIV testing, privacy concerns over sharing HIV status information between providers, and a lack of knowledge about HIV testing recommendations in persons with TB as well as better education needed for patients about HIV and TB. HIV testing was not compatible with existing practices and self-control of the circumstances in which testing could be offered was not available to many providers (Diffusion of Innovations and Social Cognitive Theory).

In discussing opportunities for HIV testing, most providers stated that what has made offering HIV testing easier over time was less stigma associated with HIV infection compared to when HIV infection became first publicly known, as well as the introduction of recommendations within NJ for opt-out HIV testing. Both less stigma, and no need for

consent for HIV testing, allowed providers to tell patients that HIV testing is a routine part of TB medical management; this made offering HIV testing easier than having to convince the patient to be tested. Even for the few providers who worked for facilities that required HIV testing consent, this was not noted as a major barrier in convincing persons with TB to accept HIV testing. The opt-out recommendation as well as the reduction over time in the stigma associated with HIV infection has made offering HIV testing less complex, reducing the risk and uncertainty and impact on social relations between patient and providers (Diffusion of Innovations).

DISCUSSION AND SYNTHESIS OF RESEARCH FINDINGS

The findings indicated a number of issues related to the offer of HIV testing and known HIV status in persons with TB, as well as clarified what providers felt as related to these areas. Providers' thoughts added to the surveillance data results in many cases but was contradictory in other cases, perhaps due to misperceptions of actual trends. Additionally, reflection back to the national and international literature on this topic has shed some light on this research data from NJ, as described below.

Trends and disparities in the offer of HIV testing and known HIV status

The rates of offering HIV testing and known HIV status in persons with TB increased over time. Should the trend continue, the State of NJ may reach the National TB Indicators Project (NTIP) target of 98% of persons with TB having a known HIV status by the end of 2020 (CDC, 2010; CDC, 2015). Still, with the recommendation for HIV testing in all persons with TB having existed for more than two decades, rates of HIV

testing could have increased more rapidly. Based on the findings by year, persons with TB in 2007 and later had 3.40 times the odds of offer of HIV testing with care by health department providers and 1.76 the odds with care by community/combination of providers compared to persons pre-2007 diagnosed with TB. For known HIV status, health department provider care indicated 4.71 times the odds and community/combination or providers had 2.88 the odds compared to persons with TB pre-2007. This suggests that opt-out HIV testing recommendation may have made a difference in changing the rates of the offer of HIV testing, hence, higher rates of known HIV status. However, this increase could also be a result of other factors including providers' increased comfort with HIV testing and better access to HIV testing facilities or onsite testing, as well as for patients, a better acceptance of HIV testing. Several providers in their interviews, suggested similar reasons as well. Incidentally, during the same period, case rates of new HIV diagnoses in New Jersey fluctuated a bit (range=16.9 to 21.4 per 100,000) with a jump in diagnosis from 16.8 to 21.4 per 100,000 from 2006 to 2007, around the time of the opt-out testing recommendation. Together, the TB surveillance data, provider interview findings, and HIV diagnosis data supports the effectiveness of the opt-out policy on NJ. The number of people living with HIV also jumped at the same time with case rates from 146.8 to 484.0 per 100,000 which also may suggest that the opt-out policy may have affected HIV infection reporting (CDC, 2000b; CDC, 2001; CDC, 2002; CDC, 2004; CDC, 2005b; CDC, 2007b; CDC, 2008c; CDC, 2009c; CDC, 2017).

Nevertheless, beyond the overall trends, there were still disparities in HIV testing in persons with TB in NJ even after the opt-out HIV testing recommendation was implemented. These differences were identified by age, sex, race, birthplace, homelessness, and substance use in individuals being medically managed for TB. This suggests a number of processes may have occurred, and that certain groups were being offered HIV testing at higher rates because of specific characteristics, or enablers within the providers' setting. Based on the provider interviews, barriers to testing included provider discomfort, risk assessment as opposed to testing all persons with TB, and, in particular in the community, not thinking or knowing to ask about HIV status or offer HIV testing to persons suspected of having TB. This is supported by the literature, in which several studies mentioned significant disparities in HIV testing in persons with various factors, similar to those mentioned above including less testing in women, non-substance users, and less testing by location of clinical care (Anuwatnonthakate et al, 2010; Perfura Yone, Kuaban, & Kengne, 2012; Njoaing, Miguel, Tuh, & Hurtig, 2010).

Age and HIV testing

The offer of HIV testing and known HIV status in persons with TB by age was in line with the literature and with providers' perceptions from the interviews. In comparison to the 25-44 year age group, the highest risk age group for HIV infection, the surveillance data generally showed that for all age ranges, rate of having been offered HIV testing and having known HIV status were lower. The provider interview findings mentioned older age as a self-reported and observed deterrent to offering HIV testing in persons with TB.

This is confirmed by the data, and in fact, the oldest and youngest age groups had less known HIV status and offer of HIV testing.

Race/ethnicity and HIV testing

Race/ethnicity was a factor consistent for HIV testing for persons with TB for all providers. In NJ, Black, non-Hispanics consistently had higher odds of the offer of HIV testing and known HIV status over time for both types of providers. As expected, based on the literature and provider interviews, the surveillance data showed that Asians had lower odds of offer of HIV testing compared to White, non-Hispanics. Asghar and colleagues showed similar findings in foreign-born South Asians. Similarly, Hwang et al showed less testing for hepatitis B and C virus in Asian Americans (Asghar, Pratt, Kammerer, & Navin, 2008; Hwang, Mohseni, Gor, Wen, Guerro, & Vierling, 2010). In this dissertation research, several provider interviewees also stated that Asian Indian (South Asian) persons with TB either frequently refused HIV testing or that nurses and physicians refused to talk about HIV with them. In looking at the research data and literature in tandem, it appears that despite the opt-out recommendation, increase in comfort with HIV testing was not the case with Asian patients. Perhaps the lower HIV case rates in Asians promoted less testing in this group. However, for both Hepatitis C and HIV status in South Asians with TB, the literature actually showed missing data for both health conditions.

Additional surveillance data variables could provide some clarity on the above point. Perhaps Asians were not living in communities with high rates of HIV, lowering

suspicion of HIV infection by providers practicing in such areas. Additionally, it is possible that HIV testing was offered but refused, and nothing documented, including that HIV testing was even offered. Finally, country of origin data (only US or foreign-birth status was available for this study) could shed some light on Asian persons with TB and HIV testing. The literature cited above divides communicable disease screening by South Asians and persons from East and South Asia. However, for all Asians, communicable disease screening appears to be low.

HIV testing and provider type

The difference in provider type and offer of HIV testing as well as known HIV status is similar to that of the findings described for other communicable diseases screening protocols, regarding comfort of health department physicians compared to community providers with certain topics, such as a sexual history for sexually transmitted infections (Fiscus, Ford, & Miller, 2004; Foster, Hon, Kanwal, & Spiegel, 2011; Taylor et al, 2005). Provider interviews in this study suggested that infectious disease physicians may have been more comfortable with HIV testing than pulmonologists, although both specialties commonly cared for persons with TB. Unfortunately, the proportion of pulmonary and infectious diseases physicians in the community for the study interviews was too small to evaluate whether the comfort with HIV testing by provider specialty was indeed a real perception. Given that community providers see patients for a variety of reasons other than TB, this could explain the lack of familiarity with universal HIV testing for TB medical management, hence, discomfort with simply offering HIV testing to all persons with TB.

Regarding known HIV status and provider type, the surveillance data showed that there was less *known* HIV status information associated with persons not cared for by health departments exclusively. However, generally, for all provider types, the odds of known HIV status in specific demographic and risk-factor groups was variable. As indicated in the provider interviews, there may have been a lack of shared medical records between community and health department programs. Therefore, even if HIV testing was completed, this fact was not recorded for reporting and surveillance purposes.

Additionally, if a patient is offered testing but refuses, or does not get tested at an offsite facility, no information about this missed test may be recorded at all, hence, HIV status would still be listed as ‘unknown’ or missing.

LIMITATIONS

There are a number of limitations in this study. First, in the TB surveillance dataset, the HIV status variable does not indicate whether HIV testing was done as part of the TB exam or elsewhere, at an earlier time or in another setting. Therefore, this makes it difficult to indicate whether a person’s HIV status was determined prior to being diagnosed with TB or not. Despite this lack of specificity, it is key to note that HIV status not being reported is more of a concern than the precise time at which HIV testing was completed.

For the interviews, recruitment of providers was done to make the interviews most reflective of the role of providers who care for persons with TB. However, there was

limited representation of specialist community providers (e.g., infectious disease physicians, pulmonologists) who cared for persons with TB. In later years of the time period studied (2000-2013), the number of patients being managed by health department providers increased significantly, therefore, when contacted, several specialist community providers felt they were not qualified to discuss the care of persons with TB. The majority of community providers in this study worked in primary care. Hence, many used their experience with HIV testing in the general population to reflect on the interview questions about HIV testing decisions; thus, their responses may not have been specific to HIV testing in persons with TB. These providers' interview transcripts were analyzed separately.

As with any interview process, self-report, recall, and social desirability biases could have been present. Interviewees were relied on to accurately report on their behaviors and practices. There may have been a bias when providers were being asked about a practice as sensitive as HIV testing and reporting as well as knowledge of and/or alignment with recommended practices. Additionally, with the numbers of persons with TB diminishing in the US, recalling practices could have been challenging, particularly for providers in low-prevalence settings or limited for those who may have been managing TB only in recent years. However, providers who had been working in the field for many years, reflected on changes in practice related to historical factors such as the introduction of new clinical recommendations.

RECOMMENDATIONS FOR HIV TESTING IN PERSONS WITH TB

Taking the research findings into consideration, several recommendations can be made about increasing the offer of HIV testing and known HIV status among persons with TB. These efforts are well needed as rates of TB in the US are on the decline, resulting in the waning of expertise and experience in the management of TB in general. The recommendation for offering HIV testing to persons with TB as well as to all persons, was, and still is, not to assess for risk, but to offer testing as part of routine care. Therefore, distinct disparities are a result of providers not having adopted this practice. As indicated by providers in the interviews and well as by the surveillance data analyses, there are a number of actions which can assist in sustaining the trend toward greater offering of HIV testing and documentation of HIV status.

Interventions for HIV testing in persons with TB, are related to the theoretical constructs introduced in Chapter 2. As a reminder, with Social Cognitive Theory, behavior changes resulting from an individual's interaction with his/her environment are accounted for, in this case, how offering HIV testing and reporting its results are affected by factors like the confidence to perform such behaviors, and the expectations resulting from knowledge of HIV status. Diffusion of Innovations describes how new practices are adopted – here, this pertains to which factors affect the offering of HIV testing and the reporting of HIV status such as ease, less complexity, and routinization. Finally, Organizational Change Theory encompasses the processes that health department and community practices as a need to incorporate HIV testing as a routine. This includes the institution of HIV testing as part of policy, access to onsite testing, and capacity to offer HIV testing and report results more easily. Recommended actions in line with the theoretical framework and

described in more detail below, include educational interventions, prompts for reporting of HIV status, developing communication skills for providers, increasing rapid HIV testing, and instituting shared communicable disease surveillance systems.

Educational interventions

Efforts should be made to update clinicians on the TB and HIV testing guidelines.

Providers in interviews suggested that perhaps thinking about offering HIV in the context of a TB-related medical examination is not apparent to them or their colleagues, especially those who see little TB or for those who do not think about HIV infection regularly. The positive expectation resulting from HIV testing should be apparent to promote change in behavior. In one interview, a nurse mentioned that training in counseling for HIV and providing results was needed to best provide HIV testing services for persons with TB. This type of training also increases self-efficacy in discussing HIV testing with patients (Social Cognitive Theory).

While training and education are important, they should be provided in ways that are accessible and easily understood and applied (complexity and communicability). In the provider interviews, it was asked where physicians and nurses obtained information on the latest clinical guidelines. A number of resources were mentioned including electronic email alerts, online periodicals, and short checklist prompts to be kept in a lab coat pocket. The State and local health departments which manage more TB than in the community practices could provide additional educational outreach to community

providers, particularly those who see persons with TB or those at risk for TB using some of these media.

Prompting and easing reporting of HIV status

Several providers in the interviews mentioned that the local and county health departments have the responsibility for completing the Report of a Verified Case of TB (RVCT) form. This process should prompt and reinforce the collection of HIV testing and status information whether it be from a community or health department provider. Having this accountability placed on the health department makes sense, as more persons with TB may over time continue to be managed in the health department setting as indicated by the surveillance data. A collaborative management approach of persons with TB could perhaps assist and simplify the process of obtaining the most complete RVCT information. However, several health department providers mentioned that even when asking for HIV status information from community providers, there were some barriers to having medical records shared. Provider education could enhance the sharing of information, within legal requirements, when a patient's care may be co-managed. This could even be done legally through public health legislation regarding the case management of patients.

Developing providers' communication skills to offer testing

While most providers who were interviewed stated that they were comfortable with discussing HIV testing, later probing revealed levels of discomfort. This related to asking patients about HIV despite not having risk factors, fear of offending the patient,

and concern about revealing positive test results to patients. HIV testing should be explained to the patient as being routine and as part of TB diagnosis and management. Technically, this level of explanation is not required and testing can be done without consent (in most settings). Providers should be sensitized to communication skills which appear non-judgmental, an emotional coping response, and should understand that patients are to be educated about the importance of HIV testing and not counseled about whether they want to be tested (Williams, et al., 2008; Bock, et al, 2008; Bishnu et al, 2013).

Additionally, several providers stated that HIV testing is easier to talk about in the current health care climate, than it was in the early years of the HIV epidemic. Reasons included better treatment and improved outcomes for persons with HIV. It is clear, however, that despite this positive trend, there was still some hesitation about offering HIV testing. Providers, even in the later years, still had concerns about effects on the patient-provider relationship. The concept of HIV testing should be perceived as being compatible with an existing medical exam and patient history, and not out of the norm. Within the facility context, managerial/organizational support of HIV testing of persons with TB via institutionalization of change will benefit individual providers (Organizational Change Theory).

Increasing rapid HIV testing

The advent of rapid HIV testing has certainly increased access to testing onsite in health care facilities where blood drawing for HIV testing is not done or where quick, initial

results for testing are needed. However, rapid HIV testing kit use has some specific requirements for implementation, which may not be practical for all providers, particularly those in the community. If HIV testing is offered, providers need the time and staffing resources to follow through in coaching the patient to follow-up with testing in another setting. This is particularly true for health care settings where HIV testing is not done on site.

The presence of onsite HIV testing is a large resource allocation change in a health care setting. First, there needs to be a recognition, i.e., problem definition, at the facility level of the importance of HIV testing for persons with TB. This may not be readily available for all providers or can be incorporated in their clinical environments. Therefore, any alternative access to HIV testing should be communicated to providers and subsequently passed on to patients to increase HIV testing being completed or a staged change to increase rapid HIV testing (Organizational Change Theory).

Shared communicable disease surveillance systems

Communicable disease surveillance data should be shared between providers to the patient identifier level. One area that is not clear in this research is whether lack of documentation about HIV status means the test was not offered or done, or whether the HIV test results simply have not been shared with whomever is reporting a case of TB. If a patient has a previous HIV test result that is available and is reported within an acceptable time frame, this can be used for documenting HIV status. These types of strategies are indicated in the Program Collaboration and Service Integration guidelines

(CDC, 2009). Additionally, shared laboratory records for blood-based HIV tests can also assist in gaining testing results for completing reporting requirements for HIV testing. As with previously suggested interventions, integration of health services eases the organizational and individual capacity to offer and access HIV testing and report its results (Organizational Change Theory).

CONCLUSION

The importance of known HIV status in persons with TB has been substantiated through research and resulted in national and international recommendations. This has been enhanced by guidance supporting no need for consent to routinize HIV testing as part of medical care. The rates of TB in NJ have declined as rates of known HIV status and offered HIV testing increased during the study period. However, the surveillance data results and provider interviews suggest that there are still significant disparities in which persons with TB being offered HIV testing and in whom we have known HIV status. These disparities simply should not exist. Differences include known HIV status and offer of testing by age group, sex, homelessness, substance use status, race/ethnicity, and provider of TB care. The findings tell us that recommendations for universal screenings or testing may not always be followed due to lack of knowledge, discomfort, or not feeling testing is only warranted in certain people.

The trends in offer of HIV testing and known HIV status over time along with the factors associated with and predictive of offer of HIV testing and known HIV status tell us that HIV testing in persons with TB is not universal. This leads to incomplete information

about individual patients and incomplete public health data for certain groups of people. Changes need to be made at the individual, organizational, and health systems' levels. Recommendations were made in the previous section, based on the research findings and the literature as well as how they fit with the models of behavior change, including provider confidence to offer HIV testing, changing the process for provider access to HIV testing and reporting, and understanding the advantages of known HIV status for better patient care outcomes.

These recommendations broadly included educating providers about current TB care recommendations and providing training in communication about HIV testing, enhancing the ability of shared communicable disease data, and increasing access to HIV testing services. The results of this research can help to fashion needed changes to policy as well as guide the development of education and training for TB providers around NJ. Nationally, HIV testing in persons with TB is an important need. Therefore, the results of this study can contribute to the American picture of barriers related to HIV testing in persons with TB or other conditions for which knowledge of HIV status is important. The information obtained here can guide the expansion of HIV testing in all persons being managed for TB so that the rates of offered HIV testing in these individuals will increase leading to a clearer picture of communicable disease data.

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APPENDIX A: REPORT OF A VERIFIED CASE OF TUBERCULOSIS

Patient's Name _____		REPORT OF VERIFIED CASE OF TUBERCULOSIS	
Street Address _____ <small>(Last) (First) (M.I.)</small>		<small>(ZIP CODE)</small>	



Centers for Disease Control and Prevention
National Center for HIV/AIDS,
Viral Hepatitis, STD, and
TB Prevention

FORM APPROVED OMB NO. 0920-0026 Exp. Date 03/31/2017

REPORT OF VERIFIED CASE OF TUBERCULOSIS

1. Date Reported Month Day Year <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 40px; height: 20px;"></div> </div>	3. Case Numbers Year Reported (YYYY) State Code Locally Assigned Identification Number State Case Number <div style="border: 1px solid black; width: 40px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 40px; height: 20px;"></div> City/County Case Number <div style="border: 1px solid black; width: 40px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 40px; height: 20px;"></div> Linking State Case Number <div style="border: 1px solid black; width: 40px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 40px; height: 20px;"></div> Reason <div style="border: 1px solid black; width: 20px; height: 20px;"></div> Linking State Case Number <div style="border: 1px solid black; width: 40px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 40px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div>
2. Date Submitted Month Day Year <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 40px; height: 20px;"></div> </div>	

4. Reporting Address for Case Counting City <div style="border: 1px solid black; width: 100px; height: 20px;"></div> Within City Limits (select one) <input type="checkbox"/> Yes <input type="checkbox"/> No County <div style="border: 1px solid black; width: 100px; height: 20px;"></div> ZIP CODE <div style="border: 1px solid black; width: 40px; height: 20px;"></div> — <div style="border: 1px solid black; width: 40px; height: 20px;"></div>	8. Date of Birth Month Day Year <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 40px; height: 20px;"></div> </div>
5. Count Status (select one) Countable TB Case <input type="checkbox"/> Count as a TB case Noncountable TB Case <input type="checkbox"/> Verified Case: Counted by another U.S. area (e.g., county, state) <input type="checkbox"/> Verified Case: TB treatment initiated in another country Specify _____ <input type="checkbox"/> Verified Case: Recurrent TB within 12 months after completion of therapy	11. Race (select one or more) <input type="checkbox"/> American Indian or Alaska Native <input type="checkbox"/> Asian: Specify _____ <input type="checkbox"/> Black or African American <input type="checkbox"/> Native Hawaiian or Other Pacific Islander: Specify _____ <input type="checkbox"/> White

6. Date Counted Month Day Year <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 40px; height: 20px;"></div> </div>	10. Ethnicity (select one) <input type="checkbox"/> Male <input type="checkbox"/> Female <input type="checkbox"/> Hispanic or Latino <input type="checkbox"/> Not Hispanic or Latino 12. Country of Birth "U.S.-born" (or born abroad to a parent who was a U.S. citizen) (select one) <input type="checkbox"/> Yes <input type="checkbox"/> No Country of birth: Specify _____ 13. Month-Year Arrived in U.S. Month Year <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 40px; height: 20px;"></div> </div>
7. Previous Diagnosis of TB Disease (select one) <input type="checkbox"/> Yes <input type="checkbox"/> No If YES, enter year of previous TB disease diagnosis: <div style="border: 1px solid black; width: 40px; height: 20px;"></div>	

14. Pediatric TB Patients (<15 years old) Country of Birth for Primary Guardian(s): Specify Guardian 1 _____ Guardian 2 _____ Patient lived outside U.S. for >2 months? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown (select one) If YES, list countries, specify: _____	16. Site of TB Disease (select all that apply) <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"> <input type="checkbox"/> Pulmonary <input type="checkbox"/> Pleural <input type="checkbox"/> Lymphatic: Cervical <input type="checkbox"/> Lymphatic: Intrathoracic <input type="checkbox"/> Lymphatic: Axillary <input type="checkbox"/> Lymphatic: Other <input type="checkbox"/> Laryngeal </div> <div style="width: 50%;"> <input type="checkbox"/> Bone and/or Joint <input type="checkbox"/> Genitourinary <input type="checkbox"/> Meningeal <input type="checkbox"/> Peritoneal <input type="checkbox"/> Other: Enter anatomic code(s) (see list): <input type="checkbox"/> Site not stated </div> </div> <div style="margin-top: 10px;"> <div style="float: right; text-align: center;"> 1 <div style="border: 1px solid black; width: 20px; height: 20px;"></div> 2 <div style="border: 1px solid black; width: 20px; height: 20px;"></div> 3 <div style="border: 1px solid black; width: 20px; height: 20px;"></div> </div> </div>
15. Status at TB Diagnosis (select one) <input type="checkbox"/> Alive <input type="checkbox"/> Dead If DEAD, enter date of death: Month Day Year <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 40px; height: 20px;"></div> </div> If DEAD, was TB a cause of death? (select one) <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown	

Public reporting burden of this collection of information is estimated to average 35 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. An agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to CDC, Project Clearance Officer, 1601 Clifton Road, MS D-74, Atlanta, GA 30333; ATTN: PRA (0920-0006). Do not send the completed form to this address.

Information contained on this form which would permit identification of any individual has been collected with a guarantee that it will be held in strict confidence, will be used only for surveillance purposes, and will not be disclosed or released without the consent of the individual in accordance with Section 308(d) of the Public Health Service Act (42 U.S.C. 242m).

Patient's Name _____ (Last) (First) State Case No. _____ (M.I.)

REPORT OF VERIFIED CASE
OF TUBERCULOSIS

REPORT OF VERIFIED CASE OF TUBERCULOSIS

17. Sputum Smear (select one) <input type="checkbox"/> Positive <input type="checkbox"/> Not Done <input type="checkbox"/> Negative <input type="checkbox"/> Unknown		Date Collected: Month Day Year <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> </div>	
18. Sputum Culture (select one) <input type="checkbox"/> Positive <input type="checkbox"/> Not Done <input type="checkbox"/> Negative <input type="checkbox"/> Unknown		Date Collected: Month Day Year <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> </div>	
19. Smear/Pathology/Cytology of Tissue and Other Body Fluids (select one) <input type="checkbox"/> Positive <input type="checkbox"/> Not Done <input type="checkbox"/> Negative <input type="checkbox"/> Unknown		Date Collected: Month Day Year <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> </div>	
20. Culture of Tissue and Other Body Fluids (select one) <input type="checkbox"/> Positive <input type="checkbox"/> Not Done <input type="checkbox"/> Negative <input type="checkbox"/> Unknown		Date Collected: Month Day Year <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> </div>	
21. Nucleic Acid Amplification Test Result (select one) <input type="checkbox"/> Positive <input type="checkbox"/> Not Done <input type="checkbox"/> Negative <input type="checkbox"/> Unknown <input type="checkbox"/> Indeterminate		Date Collected: Month Day Year <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> </div>	
Enter specimen type: <input type="checkbox"/> Sputum OR If not Sputum, enter anatomic code (see list): <div style="border: 1px solid black; width: 20px; height: 20px;"></div>		Date Result Reported: Month Day Year <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> </div>	
Initial Chest Radiograph and Other Chest Imaging Study		Reporting Laboratory Type (select one): <input type="checkbox"/> Public Health Laboratory <input type="checkbox"/> Commercial Laboratory <input type="checkbox"/> Other	
22A. Initial Chest Radiograph (select one) <input type="checkbox"/> Normal <input type="checkbox"/> Abnormal* (consistent with TB) <input type="checkbox"/> Not Done <input type="checkbox"/> Unknown		* For ABNORMAL Initial Chest Radiograph: Evidence of a cavity (select one): <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown Evidence of miliary TB (select one): <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown	
22B. Initial Chest CT Scan or Other Chest Imaging Study (select one) <input type="checkbox"/> Normal <input type="checkbox"/> Abnormal* (consistent with TB) <input type="checkbox"/> Not Done <input type="checkbox"/> Unknown		* For ABNORMAL Initial Chest CT Scan or Other Chest Imaging Study: Evidence of a cavity (select one): <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown Evidence of miliary TB (select one): <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown	
23. Tuberculin (Mantoux) Skin Test at Diagnosis (select one) <input type="checkbox"/> Positive <input type="checkbox"/> Not Done <input type="checkbox"/> Negative <input type="checkbox"/> Unknown		Date Tuberculin Skin Test (TST) Placed: Month Day Year <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> </div>	
24. Interferon Gamma Release Assay for Mycobacterium tuberculosis at Diagnosis (select one) <input type="checkbox"/> Positive <input type="checkbox"/> Not Done <input type="checkbox"/> Negative <input type="checkbox"/> Unknown <input type="checkbox"/> Indeterminate		Date Collected: Month Day Year <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> </div>	
Test type: Specify _____		25. Primary Reason Evaluated for TB Disease (select one) <input type="checkbox"/> TB Symptoms <input type="checkbox"/> Abnormal Chest Radiograph (consistent with TB) <input type="checkbox"/> Contact Investigation <input type="checkbox"/> Targeted Testing <input type="checkbox"/> Health Care Worker <input type="checkbox"/> Employment/Administrative Testing <input type="checkbox"/> Immigration Medical Exam <input type="checkbox"/> Incidental Lab Result <input type="checkbox"/> Unknown	

Patient's Name _____ (Last) _____ (First) _____ (M.I.) _____
 Street Address _____ (Number, Street, City, State) _____ (ZIP CODE) _____



**Centers for Disease
Control and Prevention**
National Center for HIV/AIDS,
Viral Hepatitis, STD, and
TB Prevention

FORM APPROVED OMB NO. 0920-0026 Exp. Date 03/31/2017

REPORT OF VERIFIED CASE OF TUBERCULOSIS

Initial Drug Susceptibility Report

(Follow Up Report – 1)

[illegible]

Submit this report for all culture-positive cases.

38. Genotyping Accession Number

Isolate submitted for genotyping (*select one*): ☐ No ☐ Yes

If YES, genotyping accession number for episode:

--	--	--	--	--	--	--	--	--	--

39. Initial Drug Susceptibility Testing

Was drug susceptibility testing done? (*select one*) ☐ No ☐ Yes ☐ Unknown

If NO or UNKNOWN, do not complete the rest of Follow Up Report –1

If YES, enter date FIRST specimen collected on which initial drug susceptibility testing was done:

Month

--	--

 Day

--	--

 Year

--	--	--	--

Enter specimen type: ☐ Sputum
OR
If not Sputum, enter anatomic code (*see list*):

--	--

40. Initial Drug Susceptibility Results (*select one option for each drug*)

	<u>Resistant</u>	<u>Susceptible</u>	<u>Not Done</u>	<u>Unknown</u>		<u>Resistant</u>	<u>Susceptible</u>	<u>Not Done</u>	<u>Unknown</u>
Isoniazid	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Capreomycin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rifampin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Ciprofloxacin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pyrazinamide	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Levofloxacin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ethambutol	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Ofloxacin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Streptomycin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Moxifloxacin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rifabutin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Other Quinolones	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rifapentine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Cycloserine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ethionamide	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Para-Amino Salicylic Acid	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Amikacin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Kanamycin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Specify _____				
					Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
					Specify _____				

Comments:

Public reporting burden of this collection of information is estimated to average 35 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed and completing and reviewing the collection of information. An agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to CDC, Project Clearance Officer, 1600 Clifton Road, MS D-74, Atlanta, GA 30333, ATTN: PRA (0920-0026). Do not send the completed form to this address.

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Patient's Name _____ (Last) _____ (First) _____ (M.I.)

Street Address _____ (Number, Street, City, State) _____ (ZIP Code)

REPORT OF VERIFIED CASE
OF TUBERCULOSIS



**Centers for Disease
Control and Prevention**
National Center for HIV/AIDS,
Viral Hepatitis, STD, and
TB Prevention

FORM APPROVED OMB NO. 0920-0026 Exp. Date 03/31/2017

REPORT OF VERIFIED CASE OF TUBERCULOSIS

Case Completion Report

(Follow Up Report – 2)

[illegible]

Submit this report for all cases in which the patient was alive at diagnosis.

41. Sputum Culture Documented (select one) <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> Unknown		
If YES, enter date specimen collected for FIRST consistently negative sputum culture:		
Month	Day	Year
<input style="width: 30px; height: 20px; border: 1px solid black;" type="text"/> <input style="width: 30px; height: 20px; border: 1px solid black;" type="text"/>	<input style="width: 30px; height: 20px; border: 1px solid black;" type="text"/> <input style="width: 30px; height: 20px; border: 1px solid black;" type="text"/>	<input style="width: 30px; height: 20px; border: 1px solid black;" type="text"/> <input style="width: 30px; height: 20px; border: 1px solid black;" type="text"/> <input style="width: 30px; height: 20px; border: 1px solid black;" type="text"/> <input style="width: 30px; height: 20px; border: 1px solid black;" type="text"/>
If NO, enter reason for not documenting sputum culture conversion (select one):		
<input type="checkbox"/> No Follow-up Sputum Despite Induction <input type="checkbox"/> Patient Refused <input type="checkbox"/> Patient Lost to Follow-Up		
<input type="checkbox"/> No Follow-up Sputum and No Induction <input type="checkbox"/> Other Specify _____		
<input type="checkbox"/> Died <input type="checkbox"/> Unknown		

42. Moved		
Did the patient move during TB therapy? (select one) <input type="checkbox"/> No <input type="checkbox"/> Yes		
If YES, moved to where (select all that apply):		
<input type="checkbox"/> In state, out of jurisdiction (enter city/county) Specify _____ Specify _____		
<input type="checkbox"/> Out of state (enter state) Specify _____ Specify _____		
<input type="checkbox"/> Out of the U.S. (enter country) Specify _____ Specify _____		
If moved out of the U.S., transnational referral? (select one) <input type="checkbox"/> No <input type="checkbox"/> Yes		

43. Date Therapy Stopped	44. Reason Therapy Stopped or Never Started (select one)	
Month	Day	Year
<input style="width: 30px; height: 20px; border: 1px solid black;" type="text"/> <input style="width: 30px; height: 20px; border: 1px solid black;" type="text"/>	<input style="width: 30px; height: 20px; border: 1px solid black;" type="text"/> <input style="width: 30px; height: 20px; border: 1px solid black;" type="text"/>	<input style="width: 30px; height: 20px; border: 1px solid black;" type="text"/> <input style="width: 30px; height: 20px; border: 1px solid black;" type="text"/> <input style="width: 30px; height: 20px; border: 1px solid black;" type="text"/> <input style="width: 30px; height: 20px; border: 1px solid black;" type="text"/>
<input type="checkbox"/> Completed Therapy <input type="checkbox"/> Not TB <input type="checkbox"/> If DIED, indicate cause of death (select one):		
<input type="checkbox"/> Lost <input type="checkbox"/> Died <input type="checkbox"/> Related to TB disease <input type="checkbox"/> Unrelated to TB disease		
<input type="checkbox"/> Uncooperative or Refused <input type="checkbox"/> Other <input type="checkbox"/> Related to TB therapy <input type="checkbox"/> Unknown		
<input type="checkbox"/> Adverse Treatment Event <input type="checkbox"/> Unknown		

45. Reason Therapy Extended > 12 months (select all that apply)		
<input type="checkbox"/> Rifampin Resistance	<input type="checkbox"/> Non-adherence	<input type="checkbox"/> Clinically Indicated – other reasons
<input type="checkbox"/> Adverse Drug Reaction	<input type="checkbox"/> Failure	<input type="checkbox"/> Other Specify _____

46. Type of Outpatient Health Care Provider (select all that apply)		
<input type="checkbox"/> Local/State Health Department (HHD)	<input type="checkbox"/> IHS, Tribal HD, or Tribal Corporation	<input type="checkbox"/> Inpatient Care Only
<input type="checkbox"/> Private Outpatient	<input type="checkbox"/> Institutional/Correctional	<input type="checkbox"/> Other
<input type="checkbox"/> Unknown		

Comments:

Public reporting burden of this collection of information is estimated to average 35 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. An agency may not conduct or sponsor an information collection and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to CDC, Project Clearance Officer, 1601 Clifton Road, MS D-74, Atlanta, GA 30333; ATTN: PRA(0920-0026). Do not send the completed form to this address.

Information contained on this form which would permit identification of any individual has been collected with a guarantee that it will be held in strict confidence, will be used only for surveillance purposes, and will not be disclosed or released without the consent of the individual in accordance with Section 308(d) of the Public Health Service Act (42 U.S.C. 242m).

Patient's Name _____ (Last) (First) (M.I.) State Case No. _____ REPORT OF VERIFIED CASE OF TUBERCULOSIS



**Centers for Disease
Control and Prevention**
National Center for HIV/AIDS,
Viral Hepatitis, STD, and
TB Prevention

FORM APPROVED OMB NO. 0920-0026 Exp. Date 03/31/2017

REPORT OF VERIFIED CASE OF TUBERCULOSIS

Case Completion Report - Continued

(Follow Up Report - 2)

47. Directly Observed Therapy (DOT) (select one)

- ☐ No, Totally Self-Administered
☐ Yes, Totally Directly Observed
☐ Yes, Both Directly Observed and Self-Administered
☐ Unknown

Number of weeks of directly observed therapy (DOT)

48. Final Drug Susceptibility Testing

Was follow-up drug susceptibility testing done? (select one) ☐ No ☐ Yes ☐ Unknown

If NO or UNKNOWN, do not complete the rest of Follow Up Report -2

If YES, enter date FINAL specimen collected on which drug susceptibility testing was done:

Month Day Year

Enter specimen type: ☐ Sputum

OR

If not Sputum, enter anatomic code (see list):

49. Final Drug Susceptibility Results (select one option for each drug)

	Resistant	Susceptible	Not Done	Unknown		Resistant	Susceptible	Not Done	Unknown
Isoniazid	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Capreomycin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rifampin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Ciprofloxacin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pyrazinamide	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Levofloxacin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ethambutol	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Ofloxacin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Streptomycin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Moxifloxacin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rifabutin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Other Quinolones	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rifapentine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Cycloserine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ethionamide	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Para-Amino Salicylic Acid	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Amikacin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Kanamycin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Specify _____				
					Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
					Specify _____				

Comments:

Public reporting burden of this collection of information is estimated to average 35 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed and completing and reviewing the collection of information. An agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to CDC, Project Clearance Officer, 1600 Clifton Road, MS D-74, Atlanta, GA 30333, ATTN: PRA (0920-0026). Do not send the completed form to this address.

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APPENDIX B: PROVIDER INTERVIEW GUIDE WITH ASSOCIATED CONSTRUCTS FROM SOCIAL COGNITIVE THEORY, DIFFUSION THEORY, AND ORGANIZATIONAL CHANGE THEORY*

NOTE: While the term “persons with TB” is preferred to “TB patients,” the latter was used as it is common in the conversational language of the types of providers interviewed. The constructs were not mentioned as part of the interview process.

1. How comfortable are you with offering HIV testing to your patients with TB or presumed TB? (Self-efficacy)

2. How comfortable do you think other physicians/nurses/public health workers are in offering HIV testing to persons with TB? (Self-efficacy, Reinforcement, Reciprocal determinism)

3. How do you decide to whom to offer HIV testing? Probe: Are there certain characteristics you look for in your patients which help you to decide whom to test for HIV? Does this differ with TB patients? (Outcome expectations, Outcome expectancies, Modifiability, Commitment, Relative advantage)

4. What is your clinic/practice’s policy on offering HIV testing to TB patients? (Problem definition, Institutionalization of change)

5. How does your clinic/practice's policy on offering HIV testing to TB patients factor into your decision to offer HIV testing? (Stages of change, Complexity, Organizational development, Climate and culture, Self-control)
6. Do you have ready access to rapid HIV testing kits? If so, how are they used in your practice/clinic? If not, do you think they would make a difference in offering HIV testing to TB patients? (Organizational capacity, Complexity, Self-control)
7. Do you draw blood in your office or do patients have to go to a lab or other setting for HIV testing? If they go outside of your facility, who delivers the HIV test result to the patient? (Environment, Risk and uncertainty level, Communicability, Complexity, Impact of social relations, Modifiability)
8. Do you have educational materials about HIV testing for your TB patients? If so, do you use them? If you don't use them, why not? (Environment)
9. Do most providers know after an HIV test result is determined what the next steps are such as reporting requirements and treatment protocols? (Behavioral capability)
10. Do providers know what to do if the test result is indeterminate? Negative? Positive? (Communicability, risk and uncertainty level, Reciprocal determinism)

11. How important is known HIV status in the treatment of persons with TB? Does this depend on the patient's lifestyle or other characteristics? (Outcome expectations, Outcome expectancies)
12. Do many of your fellow physicians/nurses/public health workers offer HIV testing to persons with TB? (Observability, Reinforcement)
13. What challenges do you have in offering HIV testing to persons with TB or suspected of having TB? (Compatibility, Complexity, Communicability, Risk and uncertainty level, Reversibility, Modifiability, Organizational capacity)
14. Why might results of HIV testing in TB patients be unknown or not reported? (Compatibility, Complexity, Time)
15. Have you received training or attended an educational event on HIV testing? If so, was it specific to persons with TB? Did you find the training useful or helpful? If yes, in what ways? (Self-efficacy, Behavioral capability, Emotional coping response)

APPENDIX C: INTERVIEW CODES AND DESCRIPTIONS

1. Access to HIV testing:

Ability to perform HIV testing in the practice setting using rapid testing or blood draws or having knowledge of testing sites (e.g., HIV clinics, laboratories). This can also pertain to patients being able to conveniently access HIV testing (e.g., within the doctor's office or clinic, offsite, at an affiliated Ryan White Clinic, etc.).

2. Health department clinic is public health authority/Case management

Health department or TB/chest clinic has the ultimate responsibility or expertise to report HIV status and has best knowledge of TB care and management. Health department clinics have case managers who can follow up with community providers on all aspects of a patient's care.

3. Community cared for patients not tested or rates lower

Persons with TB in the community under the care of a private provider, federally qualified health center, hospital, etc., may not have HIV testing done as part of their diagnostic work up or medical examinations.

4. Continuity of care

Having a full medical record and follow up with the provider about a specific patient helps in a complete patient care process when passed on from one provider or facility to another for their TB management.

5. Decision to test: Demographics

Provider chooses to test based on demographics of the patient (e.g., foreign-born, rich, married, older). Different from universal testing (testing all patients without any decision making involved).

6. Decision to test: Risk assessment

Provider chooses to offer HIV testing based on risk factors (e.g., sex partners, drug use, etc.) of patient requiring testing.

7. Decision to test: Universal

Provider tests all patients with TB and does not do any risk assessment or make judgments about whether the patient should be tested or not.

8. Documentation lacking/sharing of records

Lack of paper trail for rapid HIV testing or testing completed, but results not shared or not easily shared between facilities due to release of information or confidentiality. Case manager or someone at health department or TB/chest clinic needs to request HIV testing information and it may or may not be easily shared.

9. Inpatient/hospital effect

Being in an inpatient/hospital setting allows HIV testing to be done as part of a battery of tests without inconvenience to the patient or need for consent or informing the patient.

10. Organizational policy/standard of care/routine care

HIV testing is part of the clinic/practice's or provider's routine exam. The provider may tell the patient that HIV testing is done as part of the routine or do not tell the patient and go ahead and do HIV testing in all patients.

11. Patient (perceived) barriers: Culture

Provider feels that patient won't accept HIV testing because of religion, ethnicity, country of origin, etc.

12. Patient (perceived) barriers: Fear of test/test results

Patient may not want to be tested for fear of the HIV test results or fear of the test itself.

13. Patient (perceived) barriers: Risk factors

Patient chooses to get HIV testing based on whether he or she feels they have adequate risk factors. For example, a patient may be married or monogamous, thus feeling he/she does not need to be tested.

14. Patient (perceived) barriers: Stigma

Provider perceives that a patient may be ashamed being asked about HIV or there is shame in getting the result.

15. Patient barriers: Consent form

Presence of a consent form can reduce chance of patient accepting HIV testing or the provider feels the consent form is a barrier. This code can also be used for any discussion of consent forms.

16. Patient education

Provider uses educational materials with the patient or emphasizes the importance of using them. Provider states educating patient (e.g., verbally) is important or influential.

17. Privacy

Challenge of asking about HIV or HIV testing when people other than patient are in the room (e.g., spouse, parent of a minor).

18. Provider always comfortable with HIV testing

Provider's comfort in universally offering HIV testing. He/she is comfortable with any type of patient.

19. Provider not always comfortable with HIV testing

Provider states discomfort with offering HIV testing to certain types of patients or in offering HIV testing at all.

20. Provider testing: Don't know/think to test

No knowledge of guidelines on HIV testing in persons with TB or, this knowledge is present but the provider does not think to do an HIV test. TB is not on the provider's immediate set of diagnoses to think about.

21. Provider testing: Education/Reminder/Prompt

Information, continuing medical education (CME), outreach, TB/HIV relationship, training in HIV counseling influence on testing comfort and practice, verbal reminders/prompt and/or consultation.

22. Provider testing: Historically gotten easier

It has been easier with time (since the beginning of the AIDS epidemic) to talk with patients about HIV. Either the provider has gained more comfort or patients are more

comfortable with hearing about HIV or ask the provider for the HIV test without the provider.

23. Provider testing: Persistence

Asking several times may cause the patient to accept HIV testing. This can occur during one interaction or over several weeks or months.

24. Provider testing: Relationship with patient/fear of result

Knows patient too well, or not very well (e.g., first visit); fear of hurting relationship with or embarrassing patient; fearing of revealing HIV test result (even if result is not available yet)

25. Provider testing: Time

Providers do not have time to address HIV testing during the interaction with a person with TB. There may not be enough staff to just deal with HIV testing.

26. Validity of historical test

Patient had a previous test and documentation is not available or the test result is available result but is too old.

**APPENDIX D: PROPORTIONS OF INDEPENDENT VARIABLES BY
OUTCOME VARIABLES BY PROVIDER TYPE**

Variable	HIV Testing Offered (yes)		Known HIV Status (yes)	
	Health Department	Community	Health Department	Community
Age Group				
0-14 years	49.3%	44.9%	43.0%	35.9%
15-24 years	84.0%	70.6%	73.1%	60.3%
25-44 years	87.5%	70.7%	79.7%	56.7%
45-64 years	82.4%	65.0%	74.1%	51.3%
65+ years	65.4%	41.4%	54.4%	28.5%
Sex				
Male	83.0%	63.6%	75.2%	50.3%
Female	78.1%	55.8%	68.2%	42.6%
Race/ethnicity				
Hispanic	80.8%	65.5%	72.8%	56.5%
Asian	77.32%	54.3%	65.9%	38.4%
Black	89.2%	75.2%	83.2%	66.4%
White	73.0%	51.0%	63.4%	34.2%

Appendix D, continued

Variable	HIV Testing Offered (yes)		Known HIV Status (yes)	
	Health Department	Community	Health Department	Community
Birthplace				
US	79.0%	61.6%	72.7%	49.9%
Not-US	81.1%	59.2%	72.1%	54.2%
Substance user				
Yes	79.5%	85.1%	86.4%	79.2%
No	91.8%	57.9%	70.4%	44.1%
Homeless				
Yes	88.2%	83.7%	87.3%	83.7%
No	80.7%	59.5%	71.8%	46.0%
Long-term care resident				
Yes	58.8%	45.7%	52.9%	37.1%
No	81.0%	60.5%	72.3%	47.3%
Corrections resident				
Yes	83.3%	85.2%	77.8%	74.1%
No	80.9%	59.7%	72.2%	46.5%
Opt-out year				
2000-2006	74.0%	57.8%	60.8%	41.6%
2007-2013	88.3%	64.9%	84.2%	57.8%