



Exploring workplace TB interventions with foreign-born Latino workers

Donald E. Eggerth, PhD, Brenna M. Keller, MPH, and Michael A. Flynn, MA

Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, Cincinnati, Ohio

Abstract

Background: Persons born outside the United States are more likely to be diagnosed with tuberculosis disease (TB) than native-born individuals. Foreign-born Latinos at risk of TB may be difficult to reach with public health interventions due to cultural and institutional barriers. Workplaces employing large concentrations of foreign-born Latinos may be useful locations for TB interventions targeting this high-risk population.

Method: This study used a two-phase approach to investigate the feasibility of workplace TB interventions. The first phase investigated employer knowledge of TB and receptiveness to allowing TB interventions in their businesses through 5 structured interviews. The second phase investigated foreign-born workers' knowledge of TB and their receptiveness to receiving TB interventions in their places of employment through 12 focus groups stratified by gender and education.

Results: Phase 1: Only 1 of the 5 employers interviewed had a high level of knowledge about TB, and three had no knowledge other than that TB was a disease that involved coughing. They were receptive to workplace TB interventions, but were concerned about lost productivity and customers finding out if an employee had TB. Phase 2: There was no observed differences in responses between gender and between the bottom two education groups, so the final analysis took place between a gender-combined lower education group and higher education group. The higher education group tended to have knowledge that was more accurate and to view TB as a disease associated with poverty. The lower education group tended to have more misconceptions about TB and more often expressed concern that their employers would not support worksite interventions.

Correspondence Donald E. Eggerth, PhD, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, 1090 Tusculum Ave. M/S C-10, 45226 Cincinnati, OH. dfef0@cdc.gov.

AUTHORS' CONTRIBUTION

Dr DEE contributed to the conception and design of the work, analyzed and interpreted the data, drafted the manuscript, approved final version to be published and agrees to be accountable for all aspects of the work. Ms BMK analyzed and interpreted the data and participated in drafting the manuscript. Mr MAF contributed to the conception and design of the work, analyzed and interpreted the data, and assisted in finalizing the manuscript.

Institution at which the work was performed: National Institute for Occupational Safety and Health.

ETHICS APPROVAL AND INFORMED CONSENT

This work was performed at CDC/NIOSH. The work was reviewed and approved by the CDC/NIOSH Institutional Review Board. Participants were given verbal informed consent.

DISCLOSURE (AUTHORS)

The authors declare no conflicts of interest.

DISCLOSURE BY AJIM EDITOR OF RECORD

Steven B. Markowitz declares that he has no conflict of interest in the review and publication decision regarding this article.

Conclusions: The results from both phases indicate that more TB education is needed among both foreign-born Latino workers and their employers. Obstacles to implementing workplace TB interventions include knowledge, potential productivity loss, employer liability, and perceived customer response.

Keywords

education; Latino workers; occupational health; training; tuberculosis

1 | INTRODUCTION

It is estimated that globally each year 9 million people develop tuberculosis disease (TB), and 1.5 million die annually from TB.¹ The rise of multidrug-resistant strains of TB adds urgency to the need to find more effective methods to reach at-risk populations with TB control efforts.² The TB incidence rate in the United States is 1.1 per 100 000 for native-born individuals, as compared to 15.3 per 100 000 for foreign-born individuals.³ The TB rate for Latinos in the United States is eight times higher than for non-Hispanic whites.³ This disparity arises from these individuals having been exposed to TB in their country of origin. Persons born outside the United States account for 76% of all TB cases occurring among Latinos in the United States.³ Persons born in Mexico account for the highest percentage (20.6%) of TB cases among foreign-born persons reported in the United States.³

1.1 | Immigrants and tuberculosis

Only the approximately 500 000 immigrants who come to the United States as legal permanent residents are screened for TB.⁴ However, the 11.1 million undocumented foreign-born Latinos in the United States⁵ have generally not been screened for TB. Davidow et al⁴ report that not only are undocumented individuals more likely to have positive acid fast bacilli smears at diagnosis than permanent residents, but they also report far fewer opportunities for latent tuberculosis infection (LTBI) screening.

TB is transmitted when an infected individual coughs or sneezes and those nearby inhale the bacteria.⁶ Most infected individuals' immune systems are able to prevent the spread of the bacteria in the body, giving rise to the asymptomatic and non-contagious condition of LTBI.⁷ When the body's immune system cannot control the reproduction of the bacteria, the individual develops TB, which is contagious and, ultimately, can be fatal if not treated. Both TB and LTBI are treatable, with most regimens lasting between 6 and 9 months,^{8,9} however an effective 12-week course of treatment has been suggested as an alternative to the more lengthy treatment.¹⁰ If not treated, approximately 5-10% of individuals with LTBI will eventually develop TB.

1.2 | Reaching populations at risk

Attempts by public health agencies in the United States to target groups at high risk for TB infection, and to successfully treat those infected, have been fraught with difficulties.¹¹ Among these difficulties is the need to build institutional capacity to account for social factors such as language, education, and undocumented immigration status.¹²⁻¹⁴ In addition to reaching and testing a high risk population, it is also essential to improve adherence to

treatment. Treatment for LTBI can take months to complete and does not involve continuous patient oversight. Consequently, treatment compliance can be difficult to ensure. Research has found that even populations with a high degree of knowledge and motivation to adhere to treatment recommendations comply at disappointingly low rates. For example, one study found that only 8-10% of physicians with a positive skin test (PPD+) were treated for LTBI.¹⁵

The barriers of language, culture, education, and documentation status, which may make it hard for public health professionals to reach foreign-born Latinos, tend to concentrate Latino workers within certain industry sectors (agriculture, service, construction, and manufacturing) and often within particular companies within a given industry.¹⁶ Reports in the literature suggest that in workplaces employing foreign-born Latinos, it is common for nearly all supervisory personnel to be American-born and virtually all of the non-supervisory workforce to be foreign-born.^{17,18} The divide between management and workforce presents another barrier that must be overcome in order to reach this population with public health interventions, as management may not be aware of some of the unique challenges immigrant workers face. The epidemiological data reviewed above suggest that such workplaces represent a concentration of individuals at risk for having LTBI and/or developing TB. The purpose of this study was to investigate whether these naturally occurring concentrations could be leveraged to increase education, screening opportunities, and treatment compliance among foreign-born Latino workers.

1.3 | Tuberculosis in the workplace

Past efforts addressing TB in the workplace typically focused on occupational groups, such as correctional officers and healthcare workers, who are at increased risk for becoming infected with TB from the individuals they interact with in the course of performing their work duties.¹⁹ However, as conceptualized here, for some occupational groups, the primary risk factor for becoming infected with TB may be personal factors, such as country or region of origin, rather than the nature of the work itself.

2 | METHOD

This study used a two phase approach to investigate the feasibility of workplace TB interventions. The first phase investigated employer knowledge of TB and receptiveness to allowing TB interventions in their businesses. The second phase investigated immigrant workers' knowledge of TB and their receptiveness to receiving TB interventions in their places of employment. The worksite TB interventions discussed with both the employers and the workers were both educational (ie, posters, informational flyers, and presentations) and active interventions (ie, onsite screenings and treatment).

2.1 | Participants and interview procedure

In Phase 1, recruitment of employers commenced with a list of approximately 30 businesses, which was provided by a community partner and represented attendance at an informational session on immigration reform they had recently conducted. When contacted for participation in this study, these businesses were also asked to suggest any other businesses

that might be willing to participate. Ultimately, five structured individual phone interviews with employers were conducted with managers/owners of businesses known to employ foreign-born Latino workers and who were willing to participate. This low acceptance rate was similar to those of previous efforts by the authors to solicit input from the employers of Latino migrant workers. The employers interviewed were from a restaurant, a racetrack, a janitorial services company, and two manufacturing firms (one small and one large). The businesses ranged in size from 12 to 850 employees, with 20-100% of their employees being foreign-born Latinos. Verbal consent was obtained over the phone at the beginning of the interview. The employers were asked to discuss their knowledge of TB, how TB might impact their workers, and how receptive they were to a range of workplace interventions. The interviews were approximately 45 min in duration, and the employers were not reimbursed for their participation.

In Phase 2, 12 focus groups ($n = 79$) were conducted with foreign-born Latino workers. Based upon the authors' previous activities with the Latino migrant population,^{20,21} the focus groups were stratified by gender and three education levels (6th grade and below, 7-12th grade, and education beyond high school) to ensure maximum participation and to capture possible differences in experiences and perceptions. Focus group participants were recruited with the assistance of local, non-profit immigrant advocacy groups. The inclusion criteria for the focus groups were being an adult (18 years or older) Latino person born outside of the United States who was currently employed in the United States.

No substantial differences were found between the responses by gender or between the lower two levels of education. However, differences were found between the responses of participants in the lowest two education groups when contrasted with those of participants with the highest level of education. Therefore, for the purposes of this paper, the groups were collapsed by gender and the lowest two education levels were also merged. The responses of this group (no formal education-12th grade) will be contrasted with those of the mixed gender, more than high school education group. These collapsed groups will be referred to in the remainder of this paper as the *lower education group* and the *higher education group*. The focus group responses were first categorized in two areas—*knowledge of TB* and *receptivity to workplace interventions*. Each area was then analyzed for the emergence of themes.

Focus group participants provided general demographic information before the focus groups. No personally identifiable information, such as name, birth date, employer, or immigration status, was collected. Verbal consent was obtained and recorded in lieu of signed written consent as an additional protection of anonymity for the participants, as the signed consent form would have been the only identifiable information collected by the study. The focus groups lasted between 1 and 2 h. At the end of each group, participants were provided a small monetary stipend and given a list of local TB resources.

Both the focus groups and employer interviews were conducted in Cincinnati, OH by trained, bilingual facilitators. Cincinnati was chosen as the study location because the researchers are based there, not because either Cincinnati or Ohio are considered high

incidence areas for TB. The study was reviewed and approved by the CDC/NIOSH Institutional Review Board.

2.2 | Data analysis

Qualitative content analysis for this study was conducted in two stages. Audio recordings of the focus groups were transcribed verbatim in Spanish, and then translated into English to ensure analytic input from all team members. In the initial phase, reflecting the structure of the focus group guide, participant responses were coded as representing either knowledge of TB or receptivity to using the workplace as a forum for TB interventions. In the second phase, the transcripts (in both Spanish and English) were reviewed independently by the authors of this paper and coded using the grounded theory approach.²² In this approach, the researchers code responses using the themes and patterns that emerge from their reading of the transcripts. Differences in coding are discussed by the raters until consensus is reached.

The employer interviews were not recorded; rather, the interviewer took extensive notes. Four of the five employer interviews were conducted in English. One was conducted in Spanish, but the interview notes were translated into English for analysis. The same two stage process was applied to the coding and analysis of the employer interviews as was used with the focus groups.

3 | RESULTS

As was previously described, this study was conducted in two phases. In Phase 1, employers were interviewed, and, in Phase 2, focus groups were conducted with foreign-born Latino workers.

3.1 | Phase 1: Employer interviews

3.1.1 | Knowledge—Only one of the five employers interviewed had a high level of knowledge about TB. This individual was able to accurately describe symptoms, transmission, treatment, and high-risk populations. This level of knowledge was the result of the relatively recent discovery that two employees had pulmonary TB. A second employer was able to fairly accurately describe symptoms and transmission, but stated that TB was only a concern in “poor countries” and believed that treatment always required long-term patient isolation. The remaining three employers had no knowledge of TB beyond it being a disease that involved coughing. They had no understanding of how TB was transmitted or treated, and were surprised to learn that foreign-born Latinos were at high-risk for TB.

3.1.2 | Receptivity to workplace interventions—When asked to discuss their receptivity to allowing TB interventions to occur at their businesses, all of the employers were receptive, albeit with many concerns and caveats. The majority of the concerns centered on two intertwined themes—cost and liability. The employers expressed concern over the expense of lost productivity due to worker participation in TB interventions. Although amenable to having these activities occur at their businesses, they expressed a strong preference that such activities be conducted during non-work hours and out of the sight of customers. Those employers who had health insurance coverage for their workers

also expressed the desire to work with or through their current health insurer. The employers were concerned about losing customers if it became known that any of their employers had TB or LTBI. This was especially true for the restaurant representative who thought their business would be particularly vulnerable given the extensive contact they have with the general public. One employer thought that his company would be likely to take action if a public health agency, such as the CDC, put out a recommendation encouraging workplace TB interventions. The employer whose company had workers with TB stated that their policy was to put individuals with TB on unpaid leave until they had completed treatment. This employer believed that this policy might make some of their workers unwilling to risk loss of income through participation in TB screenings at work. The employers were concerned with the potential for being held legally liable should transmission of TB occur either among workers or between infected workers and customers. Perhaps the best summary of the employer concerns was the statement by one that workplace TB interventions “would be good for workers, but bad for business.”

3.2 | Phase 2: Employee focus groups

3.2.1 | Demographics—There were a total of 79 focus group participants. Two-thirds ($n = 51$) of the participants were male. The mean age of the participants was 31.8 years ($SD = 9.5$ years). Most participants were from Guatemala ($n = 37$, 46.8%), Peru ($n = 19$, 24.1%), and Mexico ($n = 10$, 12.3%). The remainder ($n = 13$, 16.5%) were from other Latin American countries. Approximately half of the participants were single ($n = 40$, 50.6%), while 34 (43.0%) reported being married or in a relationship. The average number of years of school attended by the participants was 8.7 ($SD = 4.8$ years, Range: 0-18 years). The participants had been in the United States for an average of 5.6 years ($SD = 3.7$ years, Range: 3-16 years). Most participants currently worked in the Services ($n = 21$, 26.5%) or Transportation, Warehousing, and Utilities ($n = 20$, 25.3%) Sectors. The remainder ($n = 38$, 48.1%) reported working in a range of industry sectors, including some ($n = 18$, 19.0%) who reported working multiple jobs across a range of sectors. There appeared to be no connection between level of education and/or previous occupation (in countries of origin) with current employment. When asked if they had ever been tested for TB in any manner, only 18 (22.8%) reported they had, 33 (41.8%) reported that they had not, and 28 (35.4%) did not respond. Only 6 (7.6%) reported knowing someone diagnosed with TB or LTBI. When asked if they had ever been diagnosed with TB or LTBI, 50 (63.3%) reported that they had not, and the remainder ($n = 29$, 36.7%) did not respond.

3.2.2 | Knowledge of TB—The category knowledge of TB contains four subthemes—symptoms, causes/transmission, treatment, and social response. The lower and the higher education groups identified similar clusters of symptoms related to TB—cough, weight loss, and loss of strength. However, the groups differed significantly in their discussions of causes/transmission of TB.

The higher education group tended to view TB as a disease of the poor, arising from overwork and malnutrition.

“I think it is a disease which is typical of the lower classes . . . they suffer from all types of disease, one of them being tuberculosis.”

“I have realized since I arrived in this country that people keep two or three jobs ... if you are going out two or three nights a week, with two or three jobs, you never rest and you get weaker and then, after a time, your defenses go down and you are vulnerable to catch any disease.”

“Well, in my country, it is very common because tuberculosis is an ailment of malnutrition. In general, when somebody has a weak immune system, low defenses, well, this person catches it very fast.”

Some in the higher education group suggested that people who became infected with TB had only themselves to blame.

“There are people who are careless, well, they don’t take proper care. They work a lot in cold places and get lung disease. And if they don’t look for prompt care, they get the disease ... and from there, they catch three or four other diseases.”

Although several of the participants in the lower education indicated that they knew nothing about TB, most correctly believed that one could become infected with TB from being in close physical proximity with someone who was already infected with TB. According to participants, this transmission could be both airborne and/or from sharing dishes and utensils.

“It is family life bound, for example, sharing dishes and glasses and maybe having a conversation at a short distance.”

Some participants in both the lower and the higher education group believed that TB arose from having first had a cold or influenza.

“What happens is that tuberculosis is a consequence of flu, if you do not take care.”

The common symptom of coughing appears to be responsible for this conceptual linkage.

“Through coughing... through coughing. But this is not a strong cough; it is just one which starts as if you were coughing mildly. I think that tuberculosis starts there and then. At least that is what I have been told, that it starts like that.... And if you don’t realize, it does become real tuberculosis. And that is very contagious.”

Several respondents in the lower education group suggested that TB was contracted from pets living in the house.

“... sometimes the pets you may have, such as the cat. It’s what I have heard, that cats can transmit it to you.”

“I also think that tuberculosis comes about when people live with the pets inside the house. Many people say tuberculosis comes from cats because when one goes to a medical center the first thing they ask you is if you have pets into the house.”

Moving between extremes of temperature, particularly when performing demanding physical labor was also associated with contracting TB by the respondents in the lower education group.

“...many people who, for example, who have a job in the cold weather, their lungs get dry and they get very thin, and it can get even worse...”

“...in Guatemala, there are a lot of people who dig holes for a living ... they sweat, and the cold of the wall makes things even worse. So, I’ve seen that due to that they get ill.”

“... you are working long at night and you get little rest ... it is hot inside you go outside and the air is cold. You go out sweating, and you get infected.”

The two groups differed significantly in their discussions of the treatment of TB. The higher education group clearly understood that effective treatment required medical treatment by professionals. However, in keeping with the belief that TB is caused by first having a cold or influenza, some in the higher education group reported that TB could be cured in its earliest stages by similar over-the-counter treatments.

“At the beginning, you can get it cured with cough medicine, antibiotics; but after a time, it is more difficult to cure the person.”

This misbelief was even more widely reported by the lower education group. The lower education group did mention seeking medical treatment, however, there seemed to be little or no understanding of what this treatment involved. Many reported a “wait and see” approach and the use of either over-the-counter or folk remedies before incurring the expense of seeing a medical professional.

“In my country, we only use natural medicine. We sometimes see a doctor but only when it is serious.”

“Well, there we live in the outskirts of the city. We are always doing natural medicine. For example, for easy things like the flu. But if it is a serious disease, worse than flu, you cannot get the medicine there. So you have to pay a ticket, and see the doctor. You have to leave early morning to see a doctor.”

A number of participants reported that TB could be treated using herbal remedies. Indeed, one reported being at a loss because different plants grew here and she didn’t have knowledge of the local herbal remedies.

“In my country ... I know that there are plants, but I really don’t know what kind of plants (native to the United States) you can use to prevent tuberculosis.”

Participants in both the lower and the higher education group made reference to TB vaccination programs in their home countries. Some of the participants in the higher education group believed that childhood vaccination eliminated the possibility of getting TB as an adult.

“I know there is some vaccine against it ... When you are a kid, they give you that shot. That is very good to prevent the disease. So then, one is prevented from an early age and there is no need to worry.”

The participants in the lower education group were vaguer in their discussion of vaccines, typically mentioning it in connection with a host of other childhood vaccinations.

“...we are here talking about children, it’s best to vaccinate them for all types of disease, so they won’t go catching disease at school. There are many types of disease out there and if you have all types of vaccine then you don’t get them”

One participant thought the TB vaccine was prohibitively expensive.

“...there (are) also vaccines... I believe it cost like three hundred each shot against tuberculosis”

A final, somewhat mixed theme to emerge was social response to TB. Participants in both the lower and the higher education groups expressed fear of contracting TB from an infected individual. However, the responses of the lower education group were tempered with empathy for the affected individual.

“Let’s suppose... that person is a cousin of mine. On learning, this person has this, instead of moving away from the person, I would help him to get better. I would take him to hospital. Or to the doctor’s. And do this all so that he is cured.”

“Well, I would worry about catching it. But, if he is a friend and he has it... then this person will feel bad if I stay away from him, won’t he? Sometimes, one tries to ignore what is going on so that people won’t be hurt.”

The responses from the higher education group tended to lack expressions of personal support, rather emphasizing that TB treatment should be conducted by medical professionals and away from the community.

“...the treatment for one person with tuberculosis (should) be under medical control and this person should exactly follow the treatment given. In order to prevent another person from catching it, he should stay isolated”

“The community would ask for this family to leave the neighborhood out of fear of them all catching tuberculosis.”

3.2.3| Receptivity to workplace interventions—Both the lower and the higher education groups were open to worksite interventions for TB. Nearly all of the higher education group expressed strong support for such interventions.

“It would be a good thing because there are many, for example, places where they worry about the employees’ safety and ... they should worry about tuberculosis ...”

“I think that the idea is all right because it is said that tuberculosis is one of the endemic diseases that poor countries have, isn’t it? And we come from a poor country... the idea for me sounds excellent...”

However, the lower education group tended to be more guarded in their support than the higher education group. The lower education group participants expressed concern that anything that negatively impacted productivity was unlikely to be supported by their employers.

“...we say it’s OK, but the company won’t like it because they will lose time. They will be worried about the economy and not about the employees’ wellbeing.”

“It’s just that almost in all companies they don’t pay attention to health, they are more concerned about work and production than our health.”

4 | DISCUSSION

The results from both the employer interviews and the foreign-born Latino worker focus groups suggest that a great deal of TB education is required. The participant information found in this study ranged from fairly high to none, or, perhaps worse, gross misinformation. In the focus groups, there was a clear gap between the level of knowledge between the higher and the lower education groups. The focus groups were originally stratified by education based upon the authors' previous experience conducting focus groups with foreign-born Latino workers and was intended to avoid the deference to more highly educated individuals commonly found in Latino culture.^{20,23} It was expected that the more highly educated participants would have more, and more accurate information about TB than individuals with lower levels of education. Conceivable graphically, it was expected that the relationship between education and knowledge would be roughly linear. As was found in this study, the lower two education groups were very similar in their very low levels of knowledge (and attendant higher levels of misconceptions) as compared to the highest education group with its relatively high level of knowledge and lower level of misconceptions.

The study finding concerning the gap in knowledge and attitudes between the lower and the higher educated groups in this study serves as a cautionary note for those planning public health interventions with foreign-born populations. In this study, the best educated, most articulate participants were not really representative of the bulk of the foreign-born population. An intervention strategy based upon the responses of the higher education group in this study would likely be met by friendly expressions of agreement and passive resistance among lower educated workers. This strategy has been termed disengagement by Flynn et al.²¹ Flynn argues that the power differential experienced by vulnerable groups, such as undocumented foreign-born individuals lead them to expect that in interactions with the host culture, the onus to change will inevitably fall upon them. Therefore, from a perspective of simple adaptation, the best way to avoid constant demands for effortful change is to simply limit interactions with the host culture. Flynn suggests that for many immigrants, disengagement represents a default coping strategy. Unfortunately, disengagement predicts that during a period of increased anti-immigrant sentiment, foreign-born individuals will be less likely to seek professional medical services as part of an overall strategy of avoiding notice by the host society. Consequently, it is even more important for public health outreach efforts to use carefully tailored and persistent methods that cannot easily be dismissed as irrelevant by the intended audience.

Although the higher education group did have a much higher level of knowledge about TB, there were some important areas of misconception. In particular, the participants in the higher education group seemed confident that TB was not a disease that could affect them, as it was an affliction of the lower classes. Consequently, these participants were much more receptive to workplace TB interventions because they did not expect to be adversely impacted by any of the potential downsides (job loss, unpaid leave, etc.) that might impact a person testing positive for TB. These responses are suggestive of the complex interconnections between skin color, education, social class, and social power that have been observed by others researching Latino culture.²⁴ Other areas of concern include

misconceptions about the progression of common colds or flus to TB and the belief that childhood vaccinations for TB protected them as adults.

The lower education group clearly had many misconceptions about the causes, transmission, and treatment of TB. Many of these misconceptions mirrored those reported by Wieland et al²⁵ and Boulter et al²⁶ There seemed to be no understanding of LTBI in this group. Being symptomless, it seems to go unrecognized as a potential health threat. Although fearful of TB, unlike those in the higher education group, the lower education group participants expressed empathy for the afflicted and a determination to assist them, regardless of risk. This finding is suggestive of a common survival strategy of families and communities banding together, particularly to overcome adversity, which has been observed by others among some Latino populations.²⁷

A significant finding was the widespread reliance on folk remedies and/or a “wait and see” attitude toward seeking professional treatment. Farmer²⁸ cautions that such approaches are more likely to be a reflection of impoverished circumstances and lack of access to professional health care than it is to reluctance to try biomedical approaches. The reliance of some Latinos on folk remedies has also reported by Boulter et al²⁶ In addition, Ho²⁹ observes that medical professionals tend to view the use of folk remedies as a barrier to effective medical treatment. Ho suggests that although folk remedies are clearly not effective at eliminating *Mycobacterium tuberculosis*, they might be used to treat either symptoms of TB or the side-effects of pharmacological treatment. Ho further suggests that higher treatment compliance rates might be achieved by incorporating traditional remedies into the TB treatment regimen, when appropriate.

Perhaps because the participants in the lower education group believed that TB was something that could happen to them, they were more guarded in their receptivity to workplace TB interventions. They expressed concerns that their employers were unlikely to give them time off for education or treatment and believed that their health was not a primary concern of their employers. These concerns were supported in part by the employer interviews. Although all of the employers expressed concern over the health of their employees, they were clear that any TB intervention efforts would have to be done without reducing profit through loss of productivity, loss of business, and/or expenses related to legal liabilities. The one employer who reported having had employees with TB acknowledged that the company policy of putting individuals being treated for TB on unpaid furlough until successful completion of the treatment would most likely discourage employees with being truthful about their status. This employer stated that the prospect of job loss was so feared by her workers, that several with LTBI refused treatment, somehow fearing that they too would be laid off for their period of treatment.

Based upon the findings of this study, it would seem that the advisability of workplace interventions, such as posters, informational flyers, presentations, and onsite testing and treatment, while hopeful, is guarded. Clearly, many obstacles impacting both employers and employees would need to be addressed before successful implementation of TB interventions could occur. Perhaps the greatest obstacle is knowledge. Most employers will need considerable education about TB and guidance on how to implement best practices in

their businesses. For example, it is not necessary to place employees with TB on furlough for the entire duration of their treatment. After a few weeks of treatment, many are no longer infectious and are able to return to work.³⁰ These workers can return to work when their medical providers determined by they are no longer infectious.

Employers, particularly smaller businesses will need strategies and/or incentives to offset productivity losses due to interventions. The employers would prefer short, self-contained intervention efforts. However, such an approach may not lend itself to effective TB interventions. Employers will also need guidance on their liability for transmission of TB between workers or workers and customers. It is beyond the scope of this paper to explore the policy and/or legal issues of this topic. However, it is significant to note that several of the employers interviewed seemed to suggest that until such issues are resolved, it might be better for them to proceed in ignorance of the TB status of their workers, and hope that nothing will emerge requiring them to act. Additionally, employers will need support and guidance in how to best deal with perceived customer response or fears regarding TB. Similar to their attitudes toward liability issues, some employers suggested it might be better for them to ignore the possibility of having TB infected workers rather than doing anything that might draw adverse attention to their businesses.

How the above issues are dealt with by employers will have a great impact on how willing workers will be to participate in workplace TB interventions. For example, the employer who had workers with TB now tests all job applicants. Individuals with an active TB infection are not hired until completing treatment. The employer expressed concern that given the economic constraints common among many foreign-born Latino workers, nearly everyone testing positive will simply ignore the test result and will apply to work for a company that does not require TB testing prior to employment. Clearly, a compromise has to be reached between the safety and health of others and the economic needs of the foreign-born Latino worker before one can expect enthusiastic participation in TB elimination efforts from both employers and workers.

The findings from this study suggest that most current TB intervention approaches will need to be considerably modified to be effective with foreign-born Latinos in workplace settings. Beyond educating individuals about TB and encouraging testing and compliance with treatment, TB interventions will need to address the concerns of employers regarding legal liabilities. In addition, a successful intervention will need to be culturally sensitive enough to overcome the immigrants' fears related to employment loss and/or documentation status, and also be willing to sometimes incorporate folk beliefs into treatment regimens rather than dismissing them out of hand.

This study has identified a possible opportunity for TB interventions and many barriers that need to be overcome to take advantage of this particular avenue. Although this paper answers some fundamental questions, it has raised even more questions regarding practical application. The complexities and nuances that need to be addressed for both employers and workers are such that future activities in this area will require considerable formative research developing both educational products and intervention practices for these two distinct, but intertwined audiences.

4.1 | Study limitations

The findings from this study are limited by both the small size of employer sample (reflecting the difficulty recruiting the employers of foreign-born Latinos) and having been conducted in only one geographic area. As was previously discussed, the low rates of employer participation is consistent with the authors' previous efforts to solicit input from the employers of foreign-born Latinos. When asked why they were unwilling to participate, most employers stated that they were "too busy" or that the topic was "not relevant" to their business. Given the low level of information about TB among the employers who were interviewed, it is possible that some of these employers genuinely did not believe TB was an important risk factor for their employees. However, the data collection for this study occurred during a period of increased worksite raids of businesses hiring undocumented immigrants in the local metropolitan area. Some of the employers may have feared exposure to such actions resulting from cooperation with representatives of a government agency for the purposes of this study. Consequently, the employers interviewed for this study may not be representative of employers of foreign-born Latino workers in general. It is possible that other employers may have differing levels knowledge about TB and be more or less proactive in addressing it. Fortunately, the employers represented a fairly broad range of industries.

Another possible limitation of this study was the use of the grounded theory approach²² for data analysis. Although themes were arrived at through careful and repeated readings of the transcripts, accompanied by extensive discussions between the authors, in the end, the results are organized within the cognitive schemas of public health professionals and might differ from those identified by individuals of different backgrounds, including the participants themselves.

5 | CONCLUSION

This study revealed low levels of accurate TB knowledge among most participants. The large chasm between the two education level worker groups was unexpected, as to some degree was the level of class bias exhibited by the better-educated participants. It was expected that between the three education levels, with increased education there would be a continuous increase in accurate knowledge about TB. However, the two lower education groups were collapsed because they had a similar low level of knowledge, while the highest education group had a much higher level of knowledge. Given that better educated foreign-born Latinos are both easier to identify and to interview, future researchers must be cautious about generalizing any findings from that group to the less educated foreign-born individuals who may be at highest risk and most at need. The authors also agree with Farmer's²⁸ observation that reluctance to seek or comply with professional medical advice is better viewed as arising from economic necessity than from ignorance and/or superstition. Flynn et al.²¹ introduced the concept of *disengagement*, a coping strategy that attempts to minimize instances of contact between the immigrant and the host society, especially with individuals perceived as authority figures. As hopeful as is the prospect of using the workplace as an intervention site for TB or other significant public health concerns adversely impacting the foreign-born Latino community, great thought must first be given to addressing the concerns

of employers, particularly those related to legal consequences, or worksite access will not often be granted.

ACKNOWLEDGMENTS

The authors would like to thank Marie de Perio, M.D., for her technical review of the tuberculosis information presented, and for her assistance in identifying the most relevant literature.

FUNDING

This project was supported entirely from internal CDC/NIOSH funding.

DISCLAIMER

The findings and conclusions in this paper are those of the authors and do not necessarily represent the views of the National Institute for Occupational Safety and Health.

REFERENCES

1. World Health Organization. 2015 Global tuberculosis report 2015. Retrieved July 6, 2016 from http://www.who.int/entity/tb/publications/global_report/en/index.html.
2. The White House. 2015 National action plan for combatting multidrug-resistant tuberculosis. Retrieved July 5, 2016 from https://www.whitehouse.gov/sites/default/files/microsites/ostp/national_action_plan_for_tuberculosis_20151204_final.pdf.
3. Scott C, Kirking HL, Jeffries C, Price SF, Pratt R. Tuberculosis trends – United States. MMWR. 2015;64:265–269. [PubMed: 25789741]
4. Davidow AL, Katz D, Ghosh S, et al. Preventing infectious pulmonary tuberculosis among foreign-born residents of the United States. Am J Public Health. 2015;105:81–88.
5. Passel J, Cohn D. 2012 Unauthorized immigrants: 11.1 million in 2011. Retrieved July 6, 2016 from <http://www.pewhispanic.org/2012/12/06/unauthorized-immigrants-11-1-million-in-2011/>.
6. Centers for Disease Control and Prevention (CDC). 2012 TB elimination factsheet: Multidrug-resistant Tuberculosis. Retrieved July 5, 2016 from <http://www.cdc.gov/tb/publications/factsheets/drtb/mdrtb.pdf>.
7. CDC. 2011b TB elimination factsheet: The difference between latent TB infection and TB disease. Retrieved July 6, 2016 from <http://www.cdc.gov/tb/publications/factsheets/general/LTBIandActiveTB.htm>.
8. CDC. 2008 TB Staying on track with tuberculosis medicine. Retrieved July 6, 2016 from http://www.cdc.gov/tb/publications/pamphlets/tb_trtmnt.pdf.
9. Nahan P, Sorman SE, Alipanah N, et al. Official American Thoracic Society/Centers for Disease Control and Prevention/Infectious Diseases Society of American Clinical practice guidelines: treatment of drug-susceptible tuberculosis. Infect Dis 2016;7:e147–e195. Retrieved August 31, 2016. <http://cid.oxfordjournals.org/content/early/2016/07/20/cid.ciw376>.
10. CDC. Recommendations for use of an isoniazid-rifapentine regimen with direct observation to treat latent *Mycobacterium tuberculosis* infection. MMWR. 2011a;60:1650–1653. [PubMed: 22157884]
11. CDC. Tuberculosis elimination revisited: obstacles, opportunities, and a renewed commitment. Advisory Council for the Elimination of Tuberculosis (ACET). MMWR. 1999;48:1–13.
12. Institute of Medicine 2000 In: Geiter L, editor. Ending neglect: The elimination of tuberculosis in the United States. Washington, DC: National Academy Press.
13. Rubel AJ, Garro LC. Social and cultural factors in the successful control of tuberculosis. Public Health Rep 1992;107:626–636. [PubMed: 1454974]
14. Sumartojo E When tuberculosis treatment fails: a social behavioral account of patient adherence. Am Rev Respir Dis 1993;147:1311–1320. [PubMed: 8484650]
15. Ramphal-Naley L, Kirkhorn S, Lohman WH, Zelterman D. Tuberculosis in physicians: compliance with surveillance and treatment. Am J Infect Control. 1996;24:243–253. [PubMed: 8870908]

16. Kochhar R 2004 Latino labor report: More jobs for new immigrants but at lower wages. Pew Hispanic Center, Washington, DC: Retrieved from <http://pewhispanic.org/reports/report.php?ReportID=45>.
17. National Research Council. 2003 Executive Summary In Safety is Seguridad, 1–32. Washington, DC: The National Academies Press.
18. CPWR. 2004 Spanish-speaking construction workers discuss their safety needs and experiences: Residential construction program training program evaluation report. Silver Spring, MD: CPWR.
19. Institute of Medicine 2001 In: Field MJ, editor. Tuberculosis in the workplace. Washington, DC: National Academy Press.
20. Eggerth DE, Flynn MA. Applying the theory of work adjustment to Hispanic immigrant workers: an exploratory study. *J Career Dev* 2012;39:76–98. [PubMed: 26345693]
21. Flynn MA, Eggerth DE, Jacobson CJ. Undocumented status as a social determinant of occupational safety and health: the workers' perspective. *Am J Ind Med* 2015;58:1127–1137. [PubMed: 26471878]
22. Strauss AL, Corbin JM. 1990 Basics of qualitative research: Grounded theory procedures and techniques. Thousand Oaks, CA: Sage Publications.
23. Eggerth DE, DeLaney SC, Flynn MA, Jacobson CJ. Work experiences of Latina immigrants: a qualitative study. *J Career Dev* 2012;39:13–30. [PubMed: 26346566]
24. Uhlmann E, Dasgupta N, Elgueta A, Greenwald AG, Swanson J. Subgroup prejudice based on skin color among Hispanics in the United States and Latin America. *Soc Cognition*. 2002;20:198–225.
25. Wieland ML, Weis JA, Yawn BP, et al. Perceptions of tuberculosis among immigrants and refugees at an adult education center: a community-based participatory research approach. *J Immigr Minor Health*. 2012;14:12–22.
26. Boulter T, Moran S, Moxley V, Cole EC. Investigation of knowledge and perception of tuberculosis among Hispanics in Utah County. *Utah J Immigr Minor Health*. 2017;19:147–154. [PubMed: 26597023]
27. Antshel KM. Integrating culture as a means of treatment adherence in the Latino population. *Psychology. Health Med* 2002;7:435–449.
28. Farmer P Social science and the new tuberculosis. *Soc Sci Med* 1997;44:347–358. [PubMed: 9004369]
29. Ho MJ. Sociocultural aspects of tuberculosis: a literature review and a case study of immigrant tuberculosis. *Soc Sci Med* 2004;59:753–762. [PubMed: 15177832]
30. CDC. 2014 Questions and answers about TB. Retrieved July 10, 2017 from https://www.cdc.gov/tb/publications/faqs/qa_tbdisease.htm#stopspreadingtb.