

# Substantial Overlap Between Incarceration and Tuberculosis in Atlanta, Georgia, 2011

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**Standard tuberculosis case reporting captures incarceration at diagnosis only. This retrospective analysis of 106 US-born adults with prevalent tuberculosis in 2011 found that 46.2% had documented histories of being in jail or prison, including 16.0% during the year before diagnosis.**

**Keywords.** homelessness; jails; prisons; public health surveillance; tuberculosis.

Incarceration is a risk factor for tuberculosis for multiple reasons. Jails typically house persons awaiting trial or serving short sentences, whereas prisons are longer term facilities for persons convicted of felonies. Compared with the nonincarcerated persons, people entering these facilities have a higher baseline risk for preexisting tuberculosis infection due to risk factors such as human immunodeficiency virus (HIV) and homelessness. Frequent transfers and releases greatly complicate investigations following a known *Mycobacterium tuberculosis* exposure, and effective treatment requires careful coordination of follow-up care. Consequently, tuberculosis outbreaks in jails and prisons have occurred, with spread into surrounding communities [1, 2].

Nationally, the proportion of persons incarcerated when diagnosed with active tuberculosis disease was 4.3% in 2011 [3].

The number of cases in the community that occur among recently incarcerated persons and which might thus be attributable to exposure while incarcerated is unknown because standard tuberculosis case reporting captures only whether the person was a resident of a correctional facility when the medical evaluation that led to the diagnosis of tuberculosis was initiated.

We sought to estimate the proportion of tuberculosis cases in 2011 in the Atlanta metropolitan area (defined here as DeKalb and Fulton counties) that were associated with being incarcerated before diagnosis and during treatment.

## METHODS

### Data Sources and Study Population

In Georgia, as in most US states, active tuberculosis cases are usually first detected in hospitals and then referred to county health departments for continued treatment after discharge [4]. Once a tuberculosis case report is initiated, copies of related medical records and public health encounters are gathered and maintained securely at the Georgia Department of Public Health, where this retrospective analysis was conducted onsite using existing records.

### Inclusion Criteria and Definitions

Our starting point was all incident (ie, newly diagnosed) tuberculosis cases reported among residents of DeKalb and Fulton counties in 2011. These included both pulmonary and extrapulmonary and both culture-confirmed and clinical cases. For this analysis, we were also interested in prevalence, so we added 2009–2010 cases still on treatment or with incomplete treatment for reasons other than death at the start of 2011. Furthermore, we selected all cases reported in 2012 but with symptom onset in 2011.

The infectious period for pulmonary tuberculosis cases was defined as beginning 3 months before symptom onset and ending with patient isolation when treatment was initiated [5]. When tuberculosis symptom onset was not recorded, or the medical record stated that there were no symptoms, we counted back 3 months from treatment start for cases with sputum smears positive for acid-fast bacilli and 1 month for negative sputum smears [5]. Tuberculosis cases reported as exclusively extrapulmonary were considered noninfectious.

### Incarceration History Ascertainment

We cross-matched the names of persons verified as having tuberculosis disease in 2011 with names of persons who had been

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incarcerated in an Atlanta jail, state prison, or federal prison. The sheriffs' offices for the 2 largest jails in the Atlanta metropolitan area have online public databases for querying past and present county jail detentions. The state prison system and Federal Bureau of Prisons have a similar online database, but records of first-time offenders in the state system are protected from public scrutiny. For this study population, the Immigration and Customs Enforcement online database was not helpful because it only lists persons currently incarcerated or released within the past 60 days, and the timeframe of the cross-matching work was May–July 2012. The city jail allowed a study author access to their registration system. For each incarceration of  $\geq 1$  day duration, we recorded the booking and release dates.

We verified the tuberculosis surveillance definition of incarceration (ie, at diagnosis) and also considered more inclusive definitions: during the individual's infectious period, during the previous 12 and 24 months or ever, and during treatment.

### Human Subjects Protection

The institutional review boards (IRBs) of Emory University and the Georgia Department of Public Health determined this analysis to be exempt from the requirement for IRB approval.

## RESULTS

### Initial Study Population and Subsequent Focus on US-Born Adults

In 2011, there were 116 incident tuberculosis cases reported among residents of Fulton and DeKalb counties, Georgia. Prevalent tuberculosis was twice that, or 248, based on an additional 103 tuberculosis cases from 2009 to 2010 still on treatment or with incomplete treatment for reasons other than death, as well

as an additional 29 cases first reported in 2012 but with symptom onset during 2011.

The 248 persons with prevalent tuberculosis in 2011 included 116 foreign-born adults, 9 foreign-born children, and 17 US-born children. Other than occasional arrests with a same-day release for driving violations, only 2 of the 116 foreign-born adults had any documented incarceration history, based on Atlanta jail, state prison, and federal prison records. (As noted previously, Immigration and Customs Enforcement records were not available for the timeframe of interest.) Two of the US-born teenagers were arrested during treatment. All subsequent findings presented here thus focus on the 106 US-born persons aged  $\geq 18$  at tuberculosis diagnosis.

### Incarceration History Among US-Born Adults Diagnosed With Tuberculosis

Table 1 shows the incarceration histories of the 106 US-born adults based on available records. None of the US-born had any documented federal prison history; the majority of documented incarcerations were at 1 of the 2 county jails. Even those who had a state prison history nearly always also had a local jail record. Four persons (3.8%) were under custody at the time their diagnostic evaluation for tuberculosis began (3 on the basis of symptoms and 1 based on a chest x-ray after a positive tuberculin skin test).

Overall, 16.0% of US-born adults diagnosed with tuberculosis had been incarcerated in the 12 months before diagnosis. This proportion increased to 46.2% ( $n = 49$ ) when previous lifetime incarceration was considered. Twenty-one (19.8%) of the 106 were incarcerated either in the 12 months before diagnosis or during treatment. For the 8 patients (7.5%) incarcerated during infectious periods, the median number of days in local jails was 18 (range, 1–102).

**Table 1. Incarceration History Among US-Born Tuberculosis Patients Aged  $\geq 18$  At Diagnosis: DeKalb and Fulton Counties, Georgia, 2011 (N = 106)**

Prevalent tuberculosis cases, 2011	No. (%) Incarcerated					
	At start of tuberculosis evaluation (standard surveillance definition of incarceration)	During infectious period before diagnosis	During 12 months before diagnosis	During 24 months before diagnosis	Ever before tuberculosis diagnosis	During tuberculosis treatment
Persons with a 2009–2010 diagnosis still on treatment in 2011 or with incomplete treatment for reasons other than death $n = 43^a$	4 (9.3)	4 (9.3)	7 (16.3)	8 (18.6)	18 (41.9)	6 (14.0)
Persons with a 2011 diagnosis (standard surveillance definition of incident tuberculosis) $n = 52$	0	3 (5.8)	8 (15.4)	12 (23.1)	27 (51.9)	4 (7.7)
Persons with a 2012 diagnosis with symptom onset in 2011 $n = 11$	0	1 (9.1)	2 (18.2)	3 (27.3)	6 (54.5)	1 (9.1)
Total $N = 106$	4 (3.8)	8 (7.5)	17 (16.0) <sup>b</sup>	23 (21.7)	49 (46.2)	11 (10.4) <sup>b</sup>

<sup>a</sup> 2009–2010 incident cases still considered prevalent at start of 2011 includes 39 US-born adults still on treatment, 3 lost to follow-up, and 1 who refused treatment.

<sup>b</sup> Twenty-one (19.8%) of the 106 were incarcerated either in the 12 months before diagnosis or during treatment.

Thirty-one percent (15 of 49) of those with an incarceration history were HIV-coinfected, compared with 21% of tuberculosis patients without a history of incarceration. Persons with any history of incarceration were also on average younger (median age 47 vs 54 years) and more likely to have experienced homelessness in the past year (43% vs 18%). Over half of persons (13 of 23; 57%) incarcerated within the past 2 years had been homeless within the past year. Stratifying results by race or gender did not substantially change any of these proportions.

### **Incarcerations During Tuberculosis Treatment**

Eleven (10.4%) of the 106 US-born adult tuberculosis patients spent a combined total of 1040 days (range, 4–341; median, 97) in 3 local jails during their tuberculosis treatment; we have no record that any entered the state or federal prison system.

## **CONCLUSIONS**

This retrospective analysis of Atlanta US-born adults with prevalent tuberculosis in 2011 found that nearly half had a lifetime history of incarceration. During the 12 months before diagnosis, 16% had been incarcerated, a percentage 4-fold greater than those incarcerated at diagnosis, the standard surveillance definition of incarceration. Furthermore, approximately 1 in 10 were incarcerated during at least part of their tuberculosis treatment, for a cumulative total of 19.8% incarcerated in the past year or during treatment.

Our findings underscore the fluidity of incarcerated populations [6] and suggest that how incarceration status is captured for standard tuberculosis surveillance might merit reconsideration. Incarceration is not a static characteristic, and local jails in particular have rapid turnover. Capturing any recent incarceration, rather than only at diagnosis, might better reflect the overlapping epidemiology between incarceration and tuberculosis.

Caution in interpreting these results is advisable. The timing and setting of the *Mycobacterium tuberculosis* infection that leads to each incident active tuberculosis case are rarely certain. Although we observed a substantial overlap between the incarceration and tuberculosis populations, the temporality of that relationship is unknown. Indeed, the simultaneous overlap with homelessness and probably other social risk factors (eg, substance use) complicate any inference about the circumstances and direction of transmission.

On the other hand, others have previously noted the importance of correctional settings for public health interventions for high-risk populations that otherwise might lack ready access to healthcare [6, 7]. In Atlanta jails and Georgia prisons, intake procedures include a tuberculosis symptom check for all entrants and a tuberculin skin test for persons without a known history of latent or active tuberculosis. Persons with potential tuberculosis symptoms or a positive skin test are further medically evaluated. Intake screening led to a tuberculosis diagnosis

for at least 3 of the 106 tuberculosis patients in this analysis, and correctional facility medical providers were important public health partners in ensuring continuity of care for 11 patients incarcerated for at least part of treatment.

Our findings mirror other local observations made over a decade ago. Our finding that 46.2% of US-born adults with tuberculosis had ever experienced incarceration was similar to the 43% observed in a predominantly US-born population in Memphis, Tennessee, in 1995–1997 [2]. Had we included the foreign-born adults, then 21% of tuberculosis patients in Atlanta had such a history, which is compatible with the 24% found in Phoenix, Arizona, in 1999–2000, where approximately one third of persons diagnosed with tuberculosis were foreign-born [8]. On the other hand, our observation that 16.0% of tuberculosis patients had been incarcerated during the past year was considerably lower than an earlier, national estimate of 39.6% [9].

An important study limitation is that because the incarceration histories we present are minimal estimates, we likely underestimated incarceration. We were able to examine records of only 3 local jails and the state and federal prison systems; incarcerations in other jurisdictions were missed. At least 16% of our US-born study population was incarcerated during the year before diagnosis, and at least 46% had a lifetime history of incarceration.

A study design with an incarcerated but tuberculosis-free comparison group would help determine the importance of other risk factors for tuberculosis. For example, HIV coinfection was notably high (31%) among the US-born adults with a history of incarceration. Others have estimated that 8.5% of tuberculosis infection and disease in the population is attributable to exposure in prison settings [10].

In conclusion, this project found that the standard tuberculosis surveillance definition of incarceration greatly underestimated the potential association of incarceration with tuberculosis. Persons who do not complete treatment can experience recurrence of tuberculosis and become infectious again, and persons who do not complete treatment for tuberculosis infection remain at risk for progression to disease, which is particularly problematic if they dwell in a congregate setting [1, 11, 12]. Ensuring prompt diagnosis, treatment initiation, and treatment completion benefits both incarcerated persons and the broader community.

## **Notes**

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All authors have submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest. Conflicts that the editors consider relevant to the content of the manuscript have been disclosed.

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