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Tuberculosis and Local Health Department Expenditures on Tuberculosis Services

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Tuberculosis and Local Health Department Expenditures on Tuberculosis Services

Abstract

Background: Although tuberculosis (TB) morbidity and mortality have decreased in recent decades, challenges exist regarding disproportionate distributions of TB among specific populations and geographic areas. Inconsistent local health department (LHD) funding for TB programs poses difficulties for LHDs to sustain resources and personnel that predisposes communities to risks of future outbreaks of TB and drug-resistant TB diseases.

Purpose: This study examined relationships between annual TB incidence rates and LHD expenditures on TB-related services to elucidate potential impacts of TB incidence on LHD TB spending.

Methods: This dataset included county-level TB incidence data with comparable, annual (2000–2010) TB-related service expenditures for each of the 160 LHDs in Florida, New York, and Washington States. A panel study design was adopted to estimate relationships between county-specific TB incidence and LHD TB service expenditures, while accounting for demographic, geographic, and TB service provision factors.

Results: Following declines in TB incidence, funding for LHD TB programs in Florida, New York, and Washington State has similarly declined. This study demonstrated significant, positive association between TB incidence rate and per capita TB expenditures. Jurisdictions with higher percentages of foreign-born and black populations had significantly higher TB service spending. Micropolitan jurisdictions had significantly lower TB service spending than metropolitan jurisdictions.

Implications: Effective TB control and prevention requires sustainable resources and strategies to assure local public health capacity for timely and thorough responsiveness to TB outbreaks. This capacity may need to be in the forms of cross jurisdiction sharing, state-level support, and partnerships with alternative providers in communities.

Keywords

Local health department expenditures, tuberculosis, public health services

Cover Page Footnote

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INTRODUCTION

Local health departments (LHDs) are the primary agencies responsible for tuberculosis (TB) control and prevention in U.S. communities. Decades of effort in controlling TB have greatly reduced morbidity and mortality in the nation.[1] None-the-less, challenges, exist at the local level regarding rising costs of increasingly complex TB treatment and care,[2] disparities in TB disease among racial/ethnic groups and foreign-born populations,[3] and disproportionate burdens of TB incidence in urban jurisdictions.[4] An approach to funding that follows the number of cases in TB control and prevention, therefore, has created challenges for LHDs to sustain their resources and personnel and has left many communities more vulnerable to TB and drug-resistant TB diseases.[5] This study examined the ecologic relationships between county-level annual TB incidence rates and LHD TB-service expenditures, elucidating the potential impact of TB incidence on LHD TB service spending.

METHODS

This panel study included all 160 LHDs in Florida, New York, and Washington (FL=67, NY=58, and WA=35)—states with active research partners involved in statewide Public Health Practice–Based Research Networks (PBRNs) and in studies with our research team. After examining data definitions for each state, the 3-state data were combined and harmonized, from LHD expenditure reports and annual communicable disease reports obtained from state data sources. They were then linked with data from the Census Bureau and National Association of County and City Health Officials (NACCHO). Data obtained from state sources included 11 years (2000–2010) of LHD TB-service expenditures, annual TB incidence for each county, county-level demographics, and TB service provision data, respectively. The outcome of interest was per capita LHD expenditures on TB service, and the primary explanatory variable was annual county-level TB incidence rate. Covariates were demographic, geographic, and TB service provision data that included percent foreign-born residents, percent black residents, percent population in poverty, whether or not alternative TB providers and services (aside from the LHD services) were available in the jurisdiction, state, and Core-Based Statistical Area (CBSA, categorized as metropolitan, micropolitan, and rural).

Descriptive analyses were conducted to examine LHD TB expenditures and TB incidence rates for patterns and employed generalized estimating equations (GEE) with an autoregressive 1-year lag of TB expenditures. This model assumed that preceding year TB expenditures affected current TB expenditures. Stata 13 was used for all analyses.

RESULTS

Like national trends, average TB incidence rates among our sample LHDs trended downward (Figure 1). While NY jurisdictions had the lowest per capita TB incidence rate across time, FL LHDs had the highest average rates of new TB cases, and WA State had erratic TB rates across time. TB incidences were disproportionally distributed by geographic area—with the metropolitan centers of New York City, Miami-Dade County, and Seattle and King County having the most new cases per year. Six jurisdictions (three in NY and three in WA) had no new TB cases, and 21% of jurisdictions (n=34) had five or fewer cases over the 11-year study period.

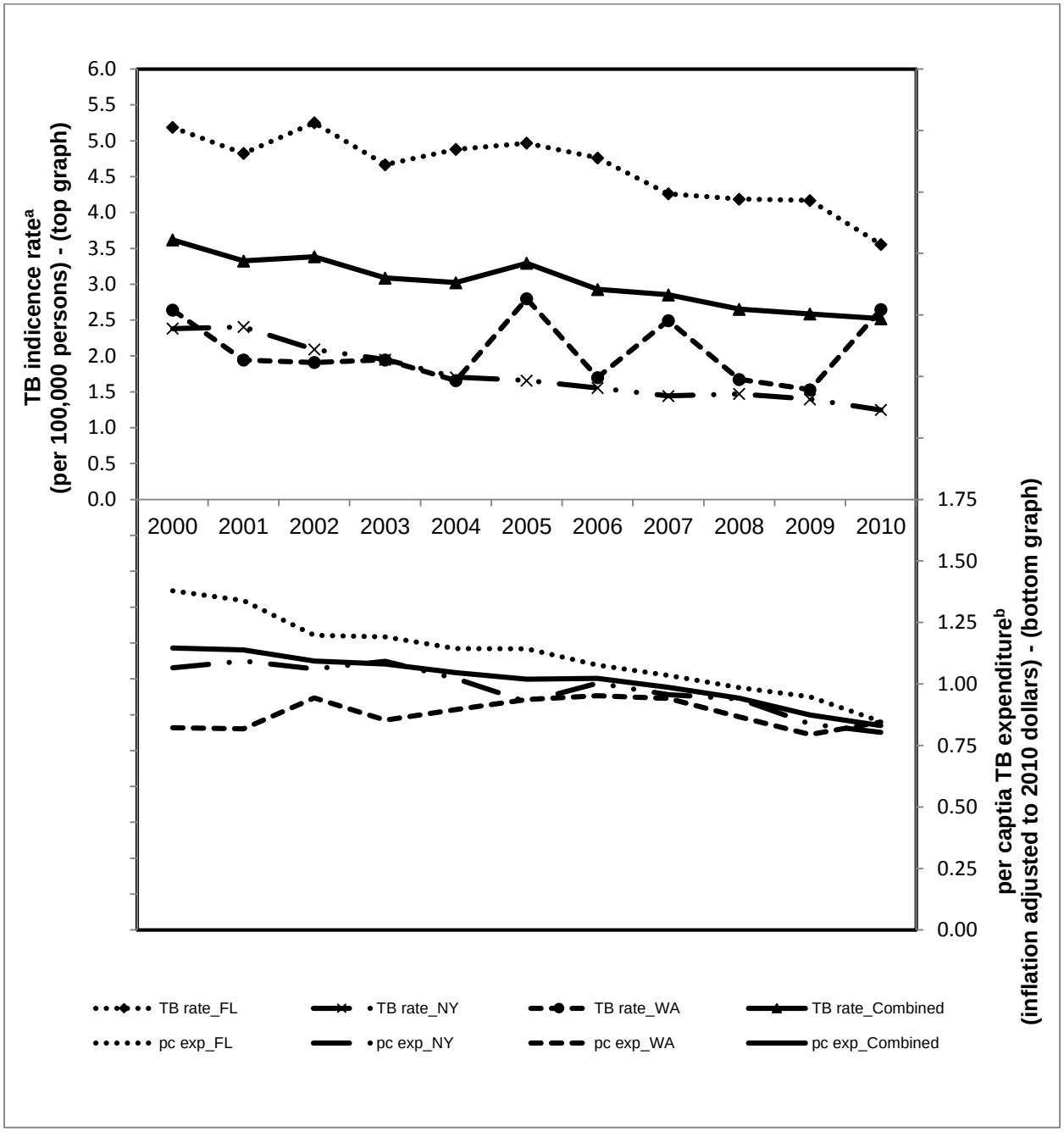

Figure 1. Mean TB incidence rates (top) and per capita LHD TB expenditures (bottom) in study states.

Notes: TB incidence rate is the number of TB incidence per 100,000 persons per year, and mean expenditures shown are adjusted for inflation to 2010 dollars

Mean per capita LHD TB expenditures by state, ranging from $0.83 to $1.11 among the study states, demonstrated an overall statewide decrease across time (Figure 1). Florida LHDs spent consistently more per capita than LHDs in the other two states on overall TB-related services. Average per capita TB spending among WA LHDs remained the lowest and flattest among the study states.

Generalized estimating equation analysis examining associations between TB incidence and TB expenditures at the individual LHD-level indicated a significant, positive effect by the annual jurisdiction TB incidence rate (Table 1). For every 1% increase in the TB incidence rate in a jurisdiction, LHDs encountered an increase of per capita TB expenditures by $0.02, while accounting for other factors.

Table 1. Generalized estimating equation results for per capita LHD TB expenditure and TB incidence rate

Variables	Estimated Coefficient	(95% CI)
TB incidence rate	0.02*	(0.012, 0.021)
Percent of foreign-born residents	7.41*	(6.035, 8.791)
Percent of black residents	1.45*	(0.082, 2.822)
Percent of poverty	–0.86	(–1.961, 0.252)
Alternative TB provider available	–0.02	(–0.279, 0.246)
Alternative TB service available	–0.12	(–0.367, 0.132)
State	***Reference Category: FL***	
NY	0.22	(–0.044, 0.491)
WA	0.04	(–0.285, 0.358)
CBSA	***Reference Category: Metropolitan***	
Micropolitan	–0.29*	(–0.538, –0.039)
Rural	–0.24	(–0.498, 0.020)
Intercept	0.55**	(0.155, 0.936)

* $p < 0.05$; ** $p < 0.01$
CBSA, Core-Based Statistical Area; LHD, local health department; TB, tuberculosis

The significant positive relationship in jurisdictions with greater proportions of foreign-born residents indicated that for every 1% increase in foreign-born populations in a county, LHD per capita TB service expenditures increased by $7.41. The relationship of higher proportions of black residents with TB expenditures was also significant, indicating that for every 1% increase in black residents in a county, LHD per capita TB expenditures increased by $1.45.

Control measures depicted geographic differences by CBSA and TB service provision by availability of alternative (non-LHD) TB providers and services in the jurisdiction. Compared to metropolitan jurisdictions, per capita LHD TB expenditures in micropolitan and rural jurisdictions were lower, with statistical significance in per capita LHD TB expenditures between metropolitan and micropolitan jurisdictions. LHDs with alternative TB providers and services in their jurisdictions had lower per capita TB expenditures than those LHDs without alternative TB providers or services available. The effect of available alternative TB service provision, however, was not significant.

IMPLICATIONS

Study findings suggest that funding follows cases. As TB incidence declined, related expenditures by LHDs decreased. The gradual decline in LHD TB resources exposes local communities to risks of TB outbreaks that unnecessarily severe, particularly in communities with scarce resources and limited personnel, unless TB support from outside the jurisdiction are available. LHDs likewise face particular challenges in TB control and prevention as demographics change with increasing populations of foreign-born and black residents. Decreases in TB resources and TB public health specialists also undermine LHDs' capacity to manage increasingly complex cases, such as those with drug resistance, comorbidities, homelessness, and immigrant or undocumented status.

This study points to the burden of TB response and expenses, particularly in jurisdictions with large populations of foreign-born and black residents. With foreign-born and black residents accounting for most of the recent U.S. TB cases, communities with high proportions of foreign-born and black populations suggest greater TB resources needed in those jurisdictions. While many LHDs continue service in assuring completeness of directly observed therapy with pulmonary TB patients and thoroughness of preventive treatment to persons with latent TB infection, efforts are needed to identify individuals who are at high risk of TB and to address linguistic and culturally competent care to those populations.

Local health department resources, distributed based on recent local TB incidence rates, however, pose challenges to jurisdictions with low TB incidence. For LHDs that typically experience low TB incidence in their communities and have correspondingly low TB expenditures, TB-related expenses are likely to have a particularly major impact on the LHD when new TB cases emerge. Low-incidence jurisdictions would likely be understaffed in terms of TB expertise and their local agencies would be less equipped. Thus, it is important to reinforce partnerships and cross-jurisdictional sharing across agencies in a region to enable effective TB outbreak response.

Data limitations such as a lack of standardized service data precluded us from being able to measure and compare actual TB services delivered across LHDs. Using TB expenditures as a proxy, however, provided indirect measures approximating LHD TB activities. This study examined only the incidence of active TB disease. To examine LHD engagement in TB control and prevention, standardized TB service measures should also include contact investigation and latent TB treatment.

Tuberculosis is highly resilient. Effective TB control and prevention require sustainable resources and strategies in maintaining surveillance systems, conducting timely detection, ensuring completion of drug therapies, performing thorough contact investigations, and providing preventive treatment for latent infections. Nonetheless, systematic collection and reporting of standardized TB services data is essential to evaluate effectiveness of TB programs.

SUMMARY BOX

What is already known about this topic? In the U.S., tuberculosis morbidity and mortality have decreased in recent decades. Funding for local health department (LHD) TB service has also declined. TB control and prevention is nonetheless critically needed and is challenged by the disproportionate distribution of TB infection across populations and geographic areas.

What is added by this report? This study was carried out with uniquely detailed administrative data that could be used to examine associations of TB incidence rates with LHD expenditures in ways that have not previously been possible across states and at the local level. Our findings support and extend existing evidence. LHD TB expenditures increased when TB incidence increased. Higher LHD TB expenditures were incurred in the jurisdictions where there were higher proportions of foreign-born and higher proportions of black residents.

What are the implications for public health practice, policy, and research? Effective TB control and prevention require sustainable resources and strategies in maintaining surveillance systems, conducting timely detection, ensuring completion of drug therapies, performing thorough contact investigations, and providing preventive treatment for latent infections. This study also suggests the importance of collecting and reporting standardized measures for TB services and activities for evaluating effectiveness of TB programs and informing resource allocations

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