Social Determinants of Health in Public Health Practice: Case Study of Rent Stipends to Augment Tuberculosis Cluster Management

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Summary: Precariously housed patients with tuberculosis (TB) may transmit TB while moving between various relatives' or friends' homes. Here, we describe the experience of the City of Milwaukee Health Department with leveraging funding not traditionally used for housing to help contain a TB cluster embedded in an environment of housing instability.

Key words: Tuberculosis, housing, precariously housed, housing instability, homelessness, poverty, public health practice, social determinants of health.

Although tuberculosis (TB) has long been viewed as a disease of poverty, State and local public health department efforts against TB in the U.S. typically focus on surveillance, reactive case-contact investigations, and individual therapy provision[1] rather than interventions targeting poverty or related social determinants of health (SDoH). At the same time, lack of housing among those living in poverty is strongly correlated with TB,[2,3] and TB incidence among the homeless was recently estimated to be 100 times the general U.S. rate.[4]

In the context of TB prevention and care,[5] homelessness exists along a spectrum ranging from having "no fixed, regular, and adequate nighttime residence" to "alternating between multiple residences for short stays of uncertain duration," any of which can make directly observed therapy (DOT)—the supervised ingestion of medication used by public health care workers to treat TB—logistically and programmatically challenging.[6]

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Though few TB treatment programs target the chronically homeless, even fewer documented in the literature target the "precariously housed,"[7] which is the population moving between various friends' and relatives' homes due to a lack of stable housing. In this paper, we present a case study of the management of a TB cluster by the City of Milwaukee Health Department (MHD), incorporating a strategy to address housing among a precariously housed extended family.

Background

In Wisconsin, 92 autonomous local health departments (LHDs) and 11 tribal health agencies provide the bulk of governmental public health services. The State health department influences TB service delivery indirectly through clinical and epidemiologic guidelines, reporting requirements, targeted grant funding, and by providing advice and consultation to LHDs. Wisconsin's *per capita* State and federal funding for public health consistently ranks among the lowest in the country.[8]

Milwaukee is Wisconsin's largest city, with approximately 600,000 individuals. The roughly $1 million annual operating budget for MHD's Tuberculosis Control Center (TBCC) is primarily funded by municipal property taxes and secondarily by State contracts for refugee screening and a TB medication dispensary. The MHD TBCC budget supports a program manager, three nurses, a Directly Observed Therapy (DOT) worker, an office assistant, an x-ray technician, part time physician consultation, and associated program equipment, supplies, and support such as mobile phones, radiologic technology, and automobile mileage reimbursement.

Milwaukee as a city ranks below any of Wisconsin's 72 counties in health outcomes.[9] Furthermore, even within the city itself, significant disparities on multiple health measures are strongly associated with striking economic disparities.[10] Of the 30 ZIP codes wholly or partly within the city limits, Milwaukee's 10 lowest socioeconomic status (SES) ZIP codes house approximately 50% of the city's population. Between 2009–2011, 64% of persons with active TB in Milwaukee lived in these 10 ZIP codes (Figure 1).

Unstable housing is also associated with lower SES. In cases of extreme residential instability and poverty, people tend to move frequently to avoid homelessness.[11] Further, many patients with unstable housing respond to provider questions about their residence by clarifying that the supplied address is where they *stay* rather than where they *live*. Such individuals do not necessarily fit the federal definition of homelessness.[12] Instead they fall into the category of *precariously housed*, where doubling up with friends or relatives is common.[7]

In this context, a large social network can be a protective factor against chronic homelessness, yet simultaneously be a risk factor for spread of communicable diseases, including TB.[13] On the other hand, keeping a family in stable housing can assist in promoting completion of TB treatment and in reducing TB exposures to others. Here, we describe MHD's experience with leveraging funding not traditionally used for housing to help contain a TB cluster embedded in an environment of high poverty and housing instability.

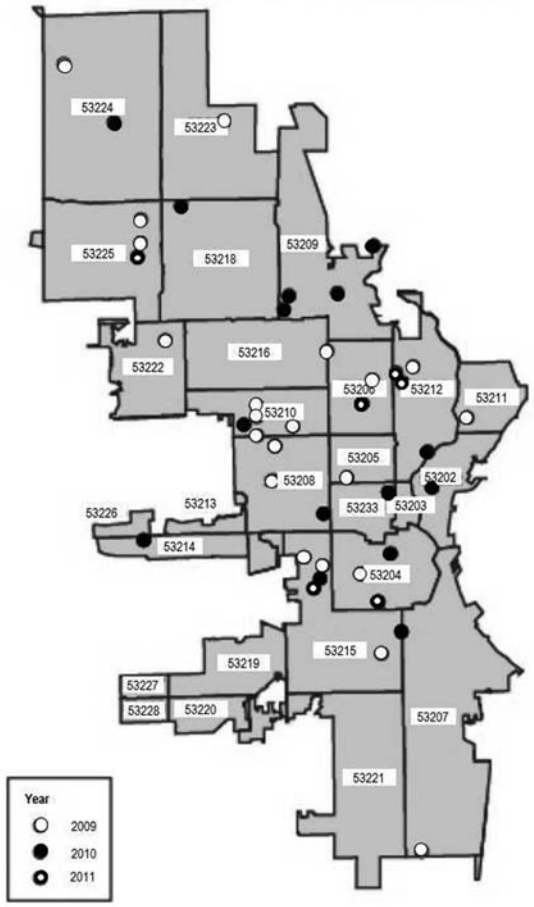

Figure 1. Active Pulmonary TB cases in Milwaukee during period of study, January 2009–July 2011. Dots are placed randomly within ZIP codes. Note that the lowest SES ZIP codes, as indicated by Milwaukee Health Report, are the centrally located ZIP codes 53204, 52305, 53206, 53208, 53210, 53212, 53215, 53216, 53218, and 53233.

Case study

A 40-year-old U.S.-born woman presented to a Milwaukee emergency room in September 2010 with severe symptoms of active TB, including coughing, weight loss, night sweats, and coughing up blood. This index patient had been symptomatic for several months prior to seeking care; TB was subsequently confirmed *via* sputum culture.

During 2010–2011, MHD's contact investigation of this case eventually grew to encompass over 100 individuals, 10 households, and four pediatric cases of active TB (Figure 2). Co-workers and family members of the index patient were promptly identified, tested, and treated. However, the family's social network turned out to be far more complex than initially expected. Factors complicating the investigation included poverty, unemployment, homelessness, overcrowded households of extended families,

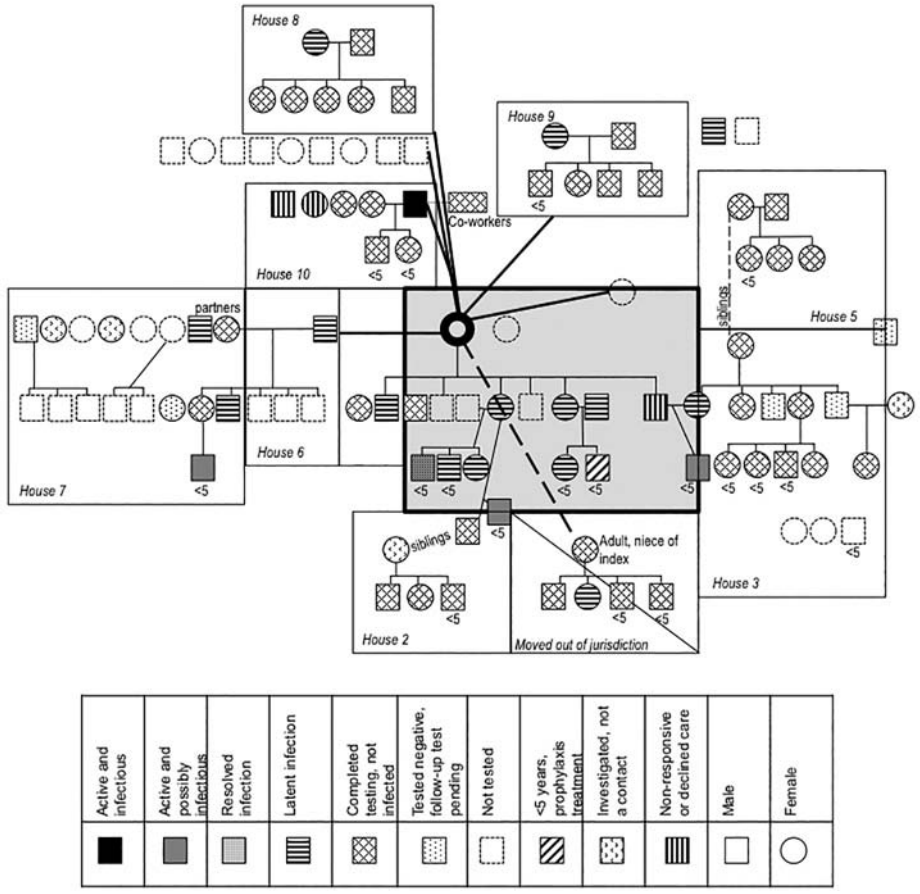

Figure 2. Diagram of persons and TB treatment status associated with the TB cluster, boxed by household, as of 06/2011. This chart was used to track the testing and treatment status of individuals in the cluster. (The index case is emphasized in center, the index household is emphasized in the gray box, and close contact with the index case is indicated by connecting lines. Age, if known, is indicated below each symbol.)

social gatherings (e.g., card games), criminal convictions, health illiteracy, and distrust of government. Further, the household containing the index patient had moved during the infectious period (prior to the initial emergency room visit) due to an inability to afford rent payments.

In the 2010–2011 Milwaukee TB cluster, MHD requested funds from the Wisconsin Chapter of the American Lung Association (ALA) for extended-use rent assistance for the index household. Tuberculosis prevention and care campaigns are a historically important feature of the ALA, and the State health department's TB Program provides a portion of its Centers for Disease Control and Prevention (CDC) funds to WI ALA for its TB Control Incentive Program. This WI ALA program provides incentives for people with TB to stay adherent to treatment, thus supporting public health's efforts to reduce transmission of disease in the community.[14] Incentive programs have proven

to be successful in promoting adherence to treatment among members of high-risk communities.[15–17]

Examples of items typically covered by the WI ALA incentive program include food, beverages, school supplies, bus tickets, gas vouchers, and shoes. In rare cases, the incentive funds have been used to subsidize such things as the cost of Internet access if a patient cannot attend school, or to assist with short-term rent if a patient cannot work during the infectious period.

In this case, MHD requested these WI ALA incentive funds for extended-use rent assistance in part because the children with active TB either lived in or frequently visited the index household. With a stable source of rent, the index apartment acted as a hub for the extended family. It became a home for members who had previously been living in transient situations as well as a gathering place for other members. When the family had to move during the treatment period, the rent money allowed the family to stay together. Because only one or two individuals in the household were employed during the treatment period, the housing stability provided by this extended rent assistance was crucial to facilitating treatment of the individuals with active TB and those with latent TB. The MHD's Tuberculosis Control Center (TBCC) nurses were able to conduct testing and provide DOT in a consistent location. Rent money was provided for the duration of treatment within the household (nine months). This was approximately seven months longer than the infectious period, and thus was a novel approach to the use of these ALA funds.

Preliminary Outcomes: The Team's Perspective

Focus groups with the TBCC's four nurses, program manager, and physician advisor (author PH) were conducted by author KMG to explore their perspectives on the WI ALA rent stipend's effects on the outbreak response efforts, as well as to gain a deeper understanding of program staff's personal experience with this novel strategy. The main feedback from the focus groups is listed in Box 1. The staff unanimously described the strategy as a time-saving mechanism for the health department; additional key themes from the focus groups included that this strategy increased trust, helped mitigate other social factors impacting the family, likely prevented additional cases, and ultimately significantly supported the completion of treatment.

Discussion

Similar TB outbreaks in which unstable housing contributed to secondary cases have been documented.[18] However, there have been only a few other published examples of successful housing-related interventions to support TB case management in the United States. A study of providing housing for chronically homeless TB patients in San Diego County demonstrated cost savings of over $25,000 per patient.[19]

A subset of State health departments have historically offered some form of housing incentive for completion of TB treatment, including Alaska, Delaware, Kentucky, Texas, Utah, and Virginia.[20]

The intervention perhaps most similar to our case study is the Virginia Department

Box 1.

THEMES FROM STAFF FOCUS GROUPS ON THEIR PERSPECTIVES OF THE RENT STIPEND INTERVENTION

Themes	Descriptions and Quotes Provided by Focus Group Participants
Saved staff time	Time was saved by staff having to make fewer calls, fewer trips to multiple residential locations, and less additional coordination of care related to locating the patients.
Increased trust	In the past, the TBCC has had to issue orders—and even request court orders—when individuals with active TB were non-adherent. Though these individuals were ultimately treated and community health was protected, the legal proceedings proved to be time-intensive and eroded trust between the patients and the clinic. Addressing the housing stability in this cluster therefore not only saved time by obviating the need for such orders, it also increased trust between the family and the nurses, which in turn supports treatment adherence. As one nurse stated, "I had a pretty good rapport with the index case. Because I really did go out of my way to make [the rent stipend] happen, and I let her know why I was doing it and why it was important to her family. So she did have a level of trust with me that she might not have had [otherwise]."
Stipend as an educational tool	Teaching patients about TB infection and transmission often takes repeated educational efforts; here, the fact that MHD was providing a rent stipend helped convey the severity of the situation. According to a nurse, "When you have so many stressors, you're not as attentive, it's not as much on your radar screen, maybe it has something to do with less education as well." The physician advisor noted, "It was almost as if the money was an educational tool and the education was, 'this is really important because I am spending money on it.'"

(continued on p. 1805)

Box 1. (*continued*)

Themes	Descriptions and Quotes Provided by Focus Group Participants
Potentially fewer cases	Though the number of individuals involved in the cluster was extensive, the nurses acknowledged the possibility of additional cases resulting from unmitigated housing instability; i.e., spread into the community could have been increased without the rent stipend. It is also possible that the rent stipend could have *promoted* transmission by attracting friends and additional family members to the house, since it was a stable gathering location. The nurses indicated that a number of additional visitors did appear at the house, but because the nurses were consistently there, the visitors were tested for TB as well as informed about ways to reduce their risk, making it unlikely that transmission was promoted via the rent stipend.
Aided in treatment completion	Housing instability would have caused interruptions in treatment, which can be especially dangerous when young children are involved, as they were in this cluster. Interruptions in treatment can also cause resistant TB bacteria to develop, leading to drug-resistant TB—a much more complex and expensive infection to treat. As a result of the rent stipend, treatment was completed for both active and latent infections.
Helped mitigate other social factors	One TBCC nurse noted, "Poverty is what creates all of these problems—that's the heart of the problem. It's almost as if the disease itself is secondary." Other challenges related to SDoH remained—including complex family dynamics, interactions with child protective services and schools, stress, and unemployment—but the stability generated by the housing stipend helped overcome these barriers in the context of communicable disease treatment. A TB nurse noted that shelter is one of the most basic needs within Maslow's Hierarchy[17] and described that when such needs are met, other priorities can become the focus. Another TB nurse described, "Anytime you have people that have stress in terms of they don't know how long they're going to be able to stay where they're at . . . the priority of the TB treatment, especially if they're no longer infectious or not feeling the symptoms—it's pretty low. Other things are much more important. Sometimes even if they want treatment, literally they might forget because they're so stressed out, they don't remember 'oh yeah I need to be home for this medicine today.'"

of Health's Homeless Incentive and Prevention Program, which offers comprehensive housing for homeless or unstably housed individuals with active TB in the form of rent, motel, or mortgage payments for the duration of the infectious period.[21] This approach "prevents the client from becoming truly homeless as a result of his TB disease."[22[p.2]] Since the program's initiation over 15 years ago, treatment completion rates have remained near 100%, and costs range from $150 to over $7,000 per person, the majority of which are housing-related.[23] The funding for the program comes from both State and federal funds.[24]

Beyond TB, efforts targeting non-medical SDoH-related needs alongside service provision include Ryan White Part B funding for low-income people living with HIV, which provides support for non-medical case management, housing services, child-care services, and legal services.[25] Thus, low-income people living with both HIV and TB are assured housing (under Ryan White), but HIV-negative TB patients are not, making positive HIV status a bizarre "protective"[4] factor in the context of TB infection.

In this Milwaukee case example, staff feedback supported the conclusion that the use of targeted WI ALA funding to address housing instability during the treatment period proved important in the management of a complex TB cluster. To study fully the impacts of rent stipends on TB prevention and care, an in-depth program evaluation after repeated implementations of the intervention and a cost effectiveness analysis would be required. However, pending future rigorous studies examining the effectiveness of rent stipends for TB prevention and care—particularly for the precariously housed, rather than chronically homeless—the preliminary outcomes from this case example are encouraging.

One limitation of this approach is that the rent stipends issued in this cluster exhausted the entire pool of WI ALA incentive money for Milwaukee for the year. Thus, the sustainability of this promising practice[26] remains a key challenge, especially if multiple TB cases and clusters were concentrated within a particular jurisdiction. Yet other public health agencies, such as Virginia, have arranged for more sustainable funding sources for similar interventions.

Conclusion

Local health departments must work with a broad and diverse spectrum of community and governmental partners to creatively address the structural socioeconomic factors of housing, unemployment, education, and poverty.[27] While sustained State and federal funding would ideally support housing initiatives such as those described in this case study, the current national fiscal environment and policies are unlikely to result in new or significant influxes of federal resources.

In addition, state-level investment in such priorities—and in public health in general—is highly variable. Therefore, local government health agencies must explore and identify unique sources and partners for addressing SDoH, such as private individuals or foundations, community housing agencies, and in our case, community-based advocacy organizations.

While the literature continues to highlight the statistical associations between social

factors and health, our case study of linking rent stipends to TB prevention and care provides a concrete example of a promising practice that addresses SDoH at the local level with positive preliminary outcomes. The relationship between TB and socioeconomic factors—including poverty and housing instability—has long been known.[28] To be optimally effective, TB prevention and care efforts therefore must address the broader context of SDoH.[29]

Targeting funding at the socioeconomic drivers of health outcomes, such as MHD and the WI ALA did in this cluster by providing long-term rent support, may increase the efficiency and effectiveness of public health practice in achieving measurable outcomes in TB prevention and care.

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