

A One Health Approach to Zoonotic Diseases: Report from the Randall Lewis Health Policy Fellowship

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Introduction and Background

- ✓ One Health (OH) integrates a multidisciplinary collaboration, globally and nationally, to examine the relationship between the environment, animals, and human health.⁵
- ✓ Infectious diseases, such as the zoonotic strain of Tuberculosis, target vital organs and threaten health.^{5, 19}
- ✓ Pregnant women, individuals who are immunocompromised, and those who have special needs, are especially susceptible to the effects of zoonotic diseases.^{7, 18}
- ✓ Pregnant women are more susceptible and vulnerable to zoonotic infections due to the changes in their immune system during pregnancy¹

Financial Burden: Tuberculosis

Figure 1 **DIRECT COST (per person in USA)**⁴

Year	Non-drug resistant	Multi-drug resistant	Extreme multiple-drug resistant infection
2014	\$45,000	\$288,000	\$678,000
2020	\$67,000	\$420,000	\$801,000

TUBERCULOSIS IN CALIFORNIA

2021: A total of 1,750 TB cases reported³
2020: A total of 1,706 TB cases reported³

TB incidence was **4.4 cases per 100,000 people**, approximately double the national incidence rate of 2.4 cases per 100,000³

2021: Costs associated with TB infection reached **203 million**³

Purpose

This project explores the efficacy of a OH approach and examines equitable public health (PH) considerations involving special populations that include maternal and child health, and families with children with special healthcare needs, while highlighting the efficacy of a multi-sectoral approach as effective in mitigating against threats of biosecurity and public health.

Methods

Critical literature review: Key search terms included "one health" AND impact* OR effect* OR influence* OR outcome* OR result* OR consequence* OR experience* AND "special needs" OR pregnan* OR immunocompromise* OR autism* OR elder* OR immunosuppress* OR "immune deficiencies" OR "immune deficiency" OR "immune deficient") OR "poverty" OR "TB" OR "Tuberculosis" OR infectious disease* OR "policy" OR "policies" and "one health". A total of 15 peer-reviewed articles were included in the literature review.

Critical Literature Review Summary:

- ✓ Infectious diseases place the heaviest burden of morbidity and mortality on poor and marginalized communities¹³
- ✓ One Health framework has proven to be successful in the eradication, reduction, and prevention of disease^{11, 10, 9}
- ✓ This framework has strengthened collaborations in an effort to address research gaps, risk factors, social determinants, and has facilitated a path for surveillance strategies^{9, 15, 16}
- ✓ Transmission of congenital TB from mother to fetus during pregnancy can result in severe disease in the newborn, including meningitis, sepsis, and respiratory failure²¹
- ✓ Special needs individuals face difficulties accessing healthcare, which leads to a delayed diagnosis, increasing risk of transmission to others⁶
- ✓ Individuals with special needs individuals living in group homes or long-term care facilities are more susceptible to the transmission of TB²
- ✓ The risk associated with developing TB is highest in children ages 5-9, followed by age group 10-18 years¹⁷
- ✓ Literature on specific efficacy of One Health public health case studies is limited

Public Health Implications

- ✓ **Systems Level:** Policies and strategies for early detection, diagnosis, and treatment of zoonotic diseases.²⁰
- ✓ **Community Level:** Public education, awareness campaigns as a means of preventative measures. Promoting vaccination of animals against zoonotic diseases.¹⁰
- ✓ **Individual Level:** Education in pregnant women and caregivers about good hygiene practices, and recognizing signs and symptoms of zoonotic diseases that require immediate medical attention.¹⁸

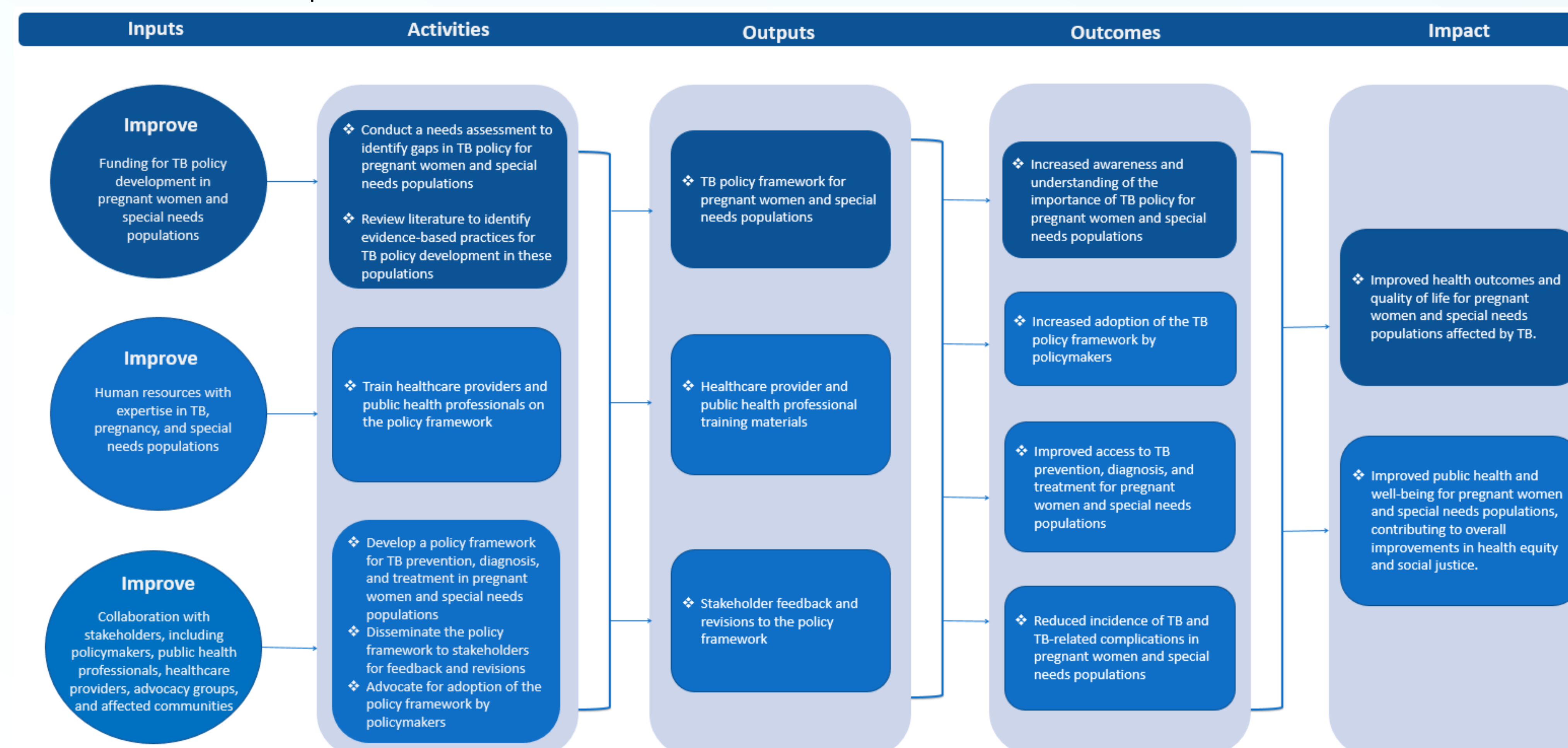


Figure 2. Logic Model

Logic Model. Adapted from "Developing a Logic Model" Centers for Disease Control and Prevention

Health Policy Implications

- ✓ Policies should promote collaboration and coordination between healthcare providers, PH officials, and veterinary professionals¹⁶
- ✓ Develop surveillance systems to monitor disease outbreaks, while promoting interdisciplinary research and coordinating response efforts in the event of an outbreak¹⁵
- ✓ Prioritize the prevention, detection and treatment of TB in special needs populations with a focus on providing specialized care and support, including assistance with medication adherence, and monitoring drug interactions and side effects.^{2, 17}

Proposed Policy: One Health
Expected Outcome: Achieve optimal health outcomes through recognition of the interconnection between people, animals, plants, and their shared environment

Stakeholders	Effectiveness Impact	Efficiency Cost	Equity Fairness
<ul style="list-style-type: none"> ✓ Pregnant women and Special needs families with zoonotic disease infections 	<ul style="list-style-type: none"> • Routine Screenings could help reduce the incidence of TB among these populations. Early detection in special needs individuals may be at higher risk due to any existing underlying conditions.^{2, 17} 	<ul style="list-style-type: none"> • Early detection and treatment of TB can prevent the development of severe disease and reduce the need for more costly treatments later on.¹² • TB preventive therapy is also cost-effective in high-risk populations, such as children, pregnant women, and individuals with special healthcare needs.⁸ 	<ul style="list-style-type: none"> • Early intervention helps address health disparities and improve access to care for these vulnerable populations.⁷ • Access to preventative therapy, and screening, despite socioeconomic status is important in working towards achieving health equity.^{13, 14}
<ul style="list-style-type: none"> ✓ Healthcare organizations and providers 	<ul style="list-style-type: none"> • Early detection can effectively prevent spreading TB within healthcare facilities and communities.^{2, 18} 	<ul style="list-style-type: none"> • Early detection and treatment has proven to reduce TB incidence and mortality in addition to preventing the onset of multidrug-resistant TB and the steep costs associated with this condition.^{4, 13} 	<ul style="list-style-type: none"> • By prioritizing the health needs of vulnerable populations, healthcare organizations and providers can work towards reducing health disparities and achieving health equity.^{13, 14, 24}
<ul style="list-style-type: none"> ✓ Animals, Plants, Shared Environment 	<ul style="list-style-type: none"> • Examples of Shared Zoonotic Diseases:^{24, 25} <ul style="list-style-type: none"> - Rabies - West Nile Virus - Salmonella - Anthrax - Q Fever - Lyme disease - Brucellosis - Ebola 	<ul style="list-style-type: none"> • See Financial Burden, Figure 1 	<ul style="list-style-type: none"> • "One Health issues include emerging, re-emerging, and endemic zoonotic diseases, neglected tropical diseases, vector-borne diseases, antimicrobial resistance, food safety and food security, environmental contamination, climate change and other health threats shared by people, animals, and the environment"²⁵

Table 1. "3E": Effectiveness, Efficiency, Equity

Conclusion

- ✓ Screening and early detection among adults have proven to be effective in preventing cases of TB in children.
- ✓ TB control programs and policies should be developed within a One Health Framework, in consideration of age, health, and specific groups with increased risk factors.
- ✓ Public Health policies should prioritize the prevention, detection, and treatment of TB with a focus on providing specialized care and support.
- ✓ Policy recommendations could benefit community contacts: APU, MotherToBaby California, the Carolyn E. Wylie Center for Children, Youth & Families

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References

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