

Spatiotemporal Variation and Risk Factors of Tuberculosis in Socio-Economic Development Unbalanced Region

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Abstract

Background: Previous studies had indicated that the incidence of Tuberculosis (TB) was closely related to the regional aging population and socio-economic condition. However, spatio-temporal variation and risk determinants of TB in aging population and socio-economic development unbalanced region have been unclear.

Methods: The data on TB registered cases and social-economic factors from 2009 to 2014 were collected for each district/county in the region with Beijing, Tianjin and Hebei province of China, which consists of aging population and social-economic development disparity region. The Bayesian space-time hierarchy model was used to reveal the spatio-temporal variation of elderly TB incidence from 2009 to 2014, and GeoDetector was applied to measure the determinant power (q statistic) of elderly TB risk factors.

Results: Elderly TB incidence presents geographical spatial heterogeneity, they were higher in underdeveloped rural areas compared with that in urban areas. The hotspots of elderly TB incidence risk were mostly located in the northeastern and southern regions of the study region distant from metropolitan areas. Areas with low risk were mainly distributed in the Beijing-Tianjin metropolitan areas. Social-economic factors presented nonlinear influence on elderly TB incidence, the dominant factors were income of rural populations (q statistic = 0.20) and medical conditions (q statistic = 0.17). These factors presented nonlinearly interact with each other in influencing the elderly TB incidence; medical conditions and level of economic development showed the strongest relationship (q statistic = 0.54).

Conclusions: These findings explain spatiotemporal variation and risk determinants of elderly TB incidence where there are social-economic development disparities. High-risk zones were mainly located in rural areas far from metropolitan centers. Medical conditions and economic development level were significantly associated with elderly TB incidence, and they showed nonlinearly interact with each other in influencing the elderly TB incidence. Knowing this helps to optimize the allocation of health resources and to control the transmission of the TB epidemic in the aging population in this region.

Full Text

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Figures

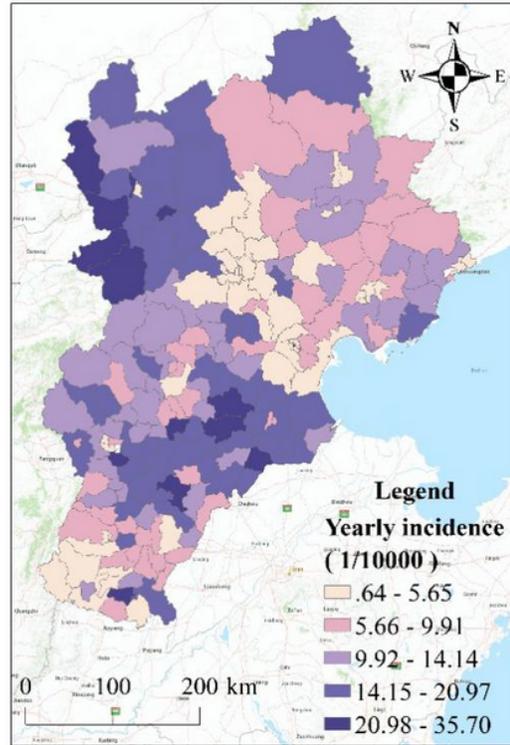


Figure 1

Geographic distribution of the Beijing–Tianjin–Hebei region in China and average annual tuberculosis incidence in 2009-2014 Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.

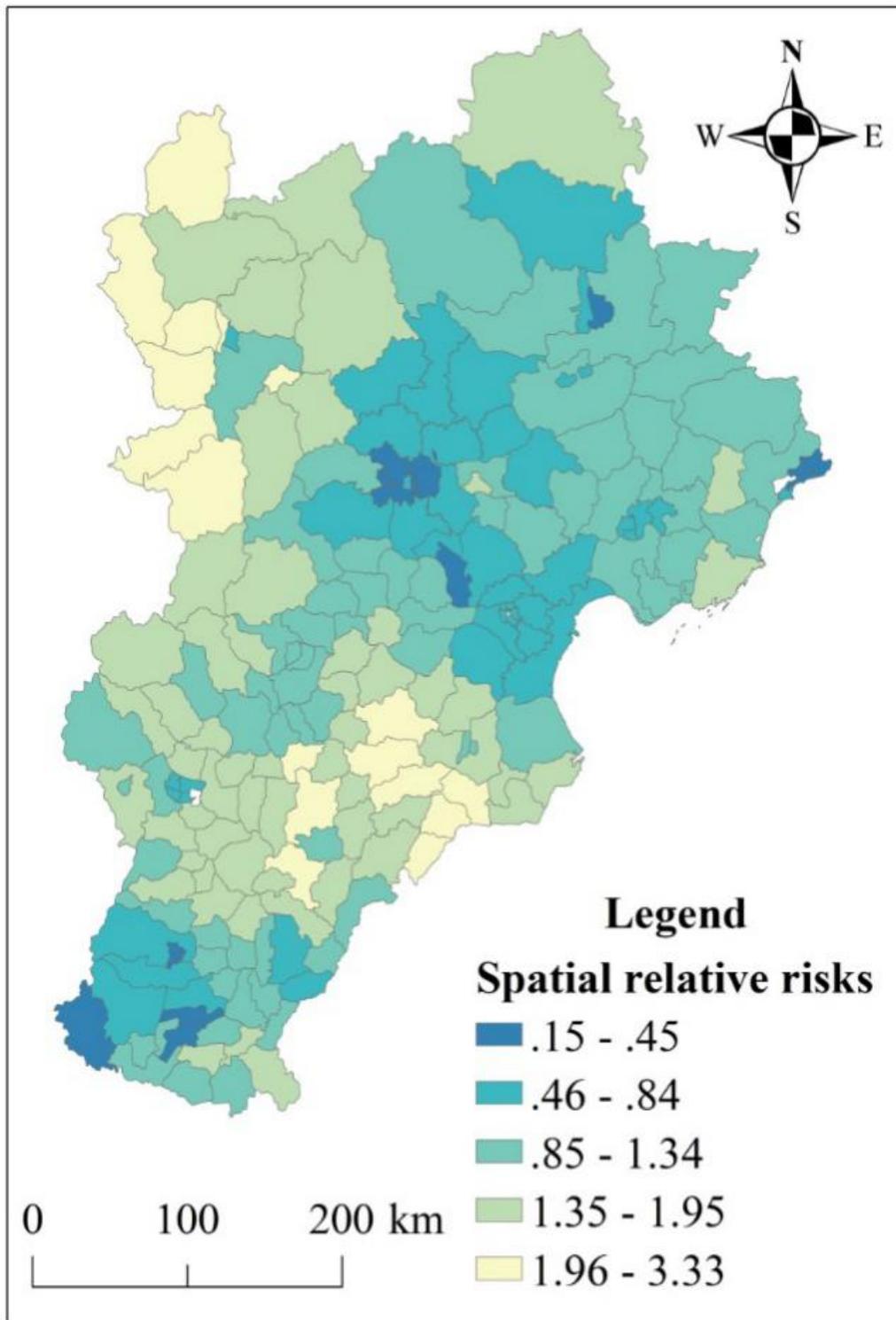


Figure 2

The spatial relative risk of elderly TB incidence in Beijing–Tianjin–Hebei region Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.

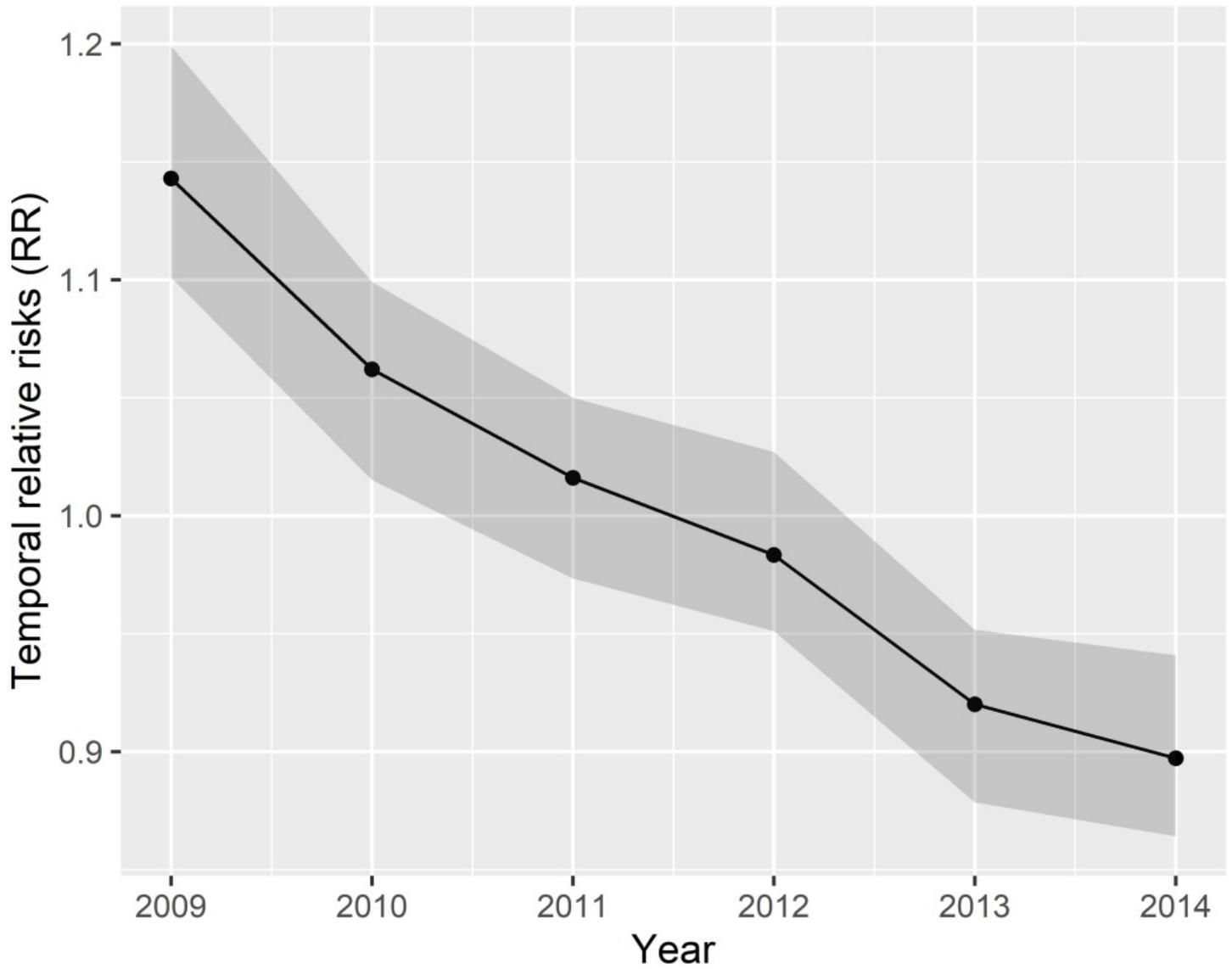


Figure 3

The overall elderly TB incidence RR trend; the posterior medians of $\exp(b_0t^* + vt)$ with the 95% confidence interval (CI).

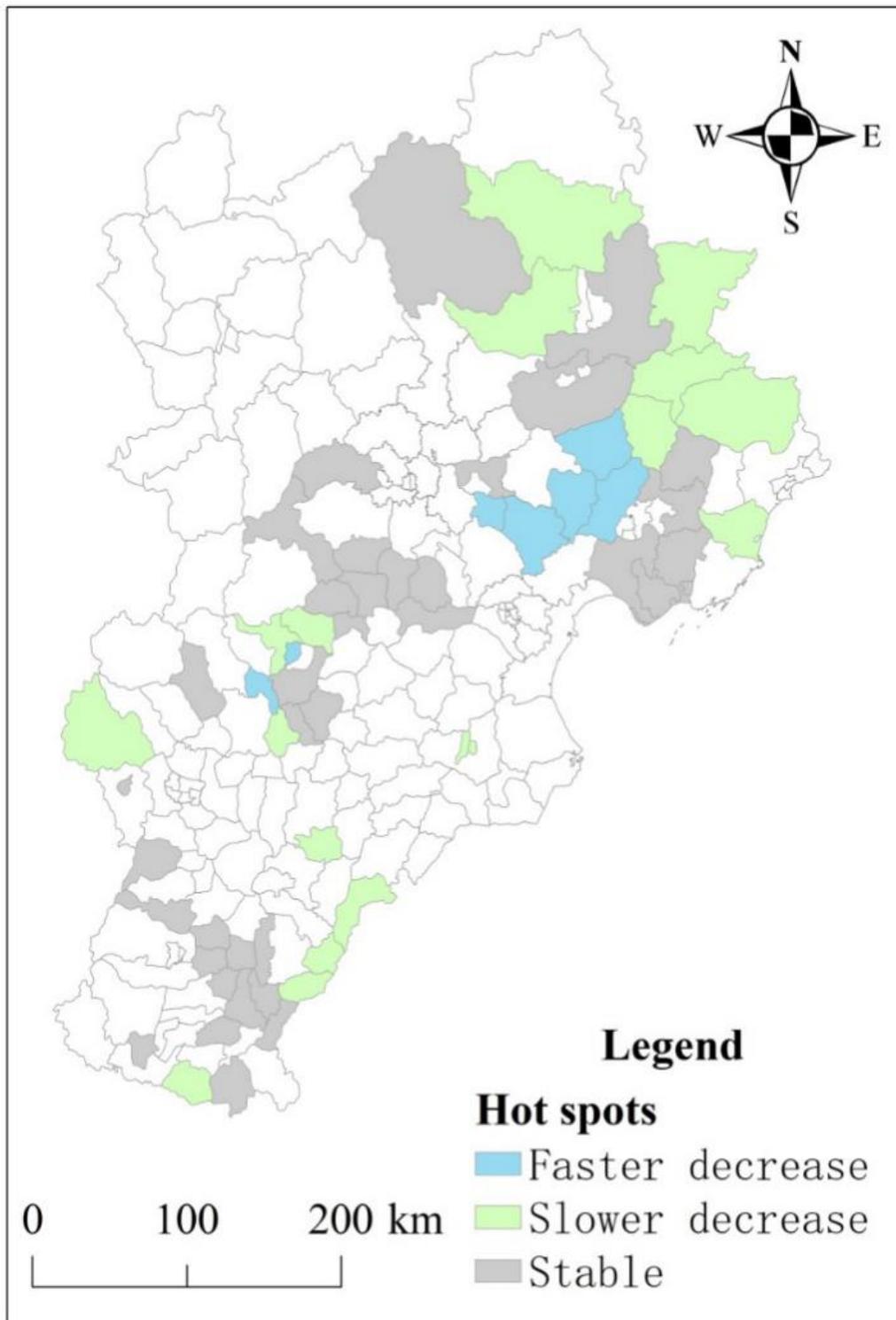


Figure 4

Hotspots with a persistently high risk of elderly TB incidence from 2009 to 2014. Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.

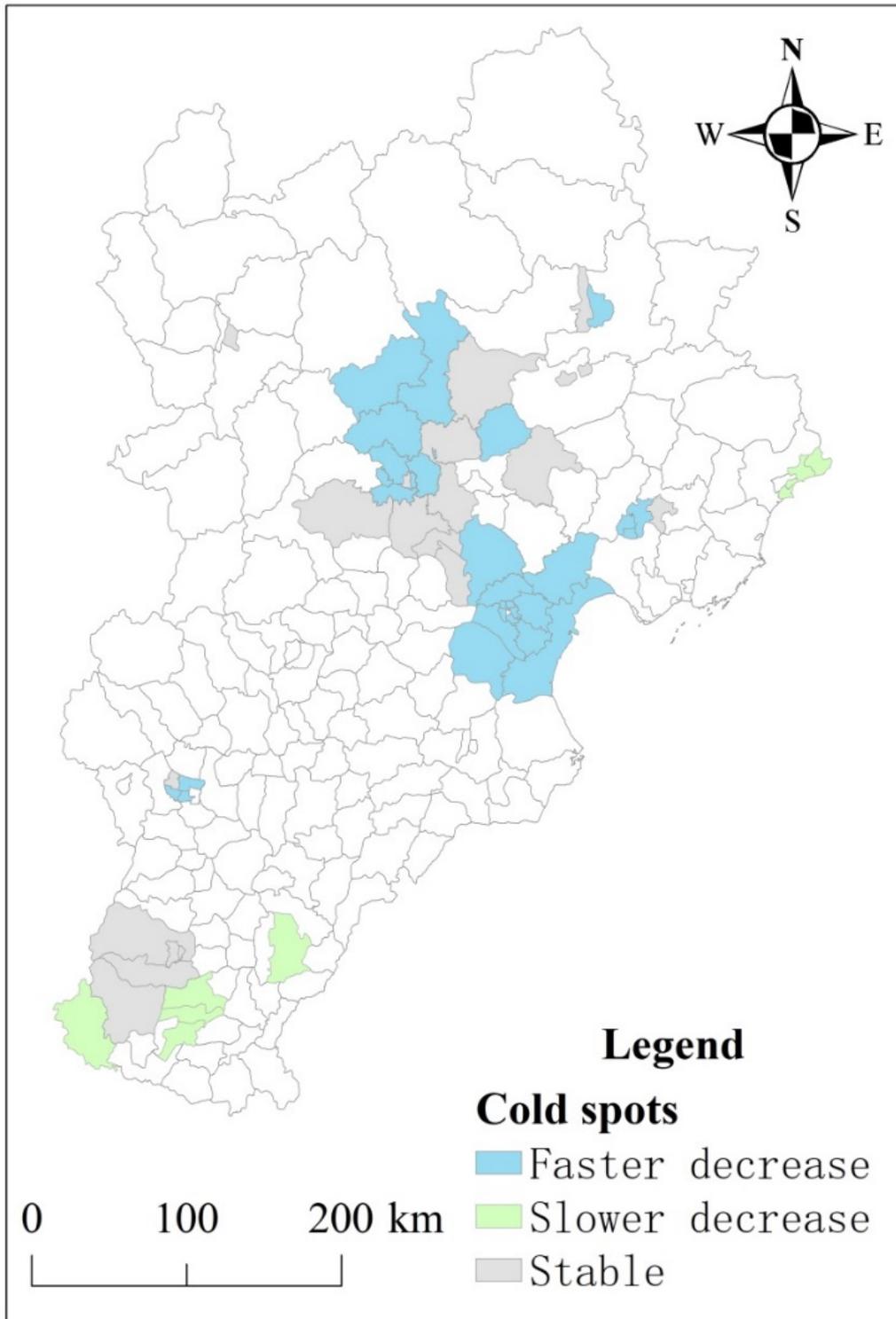


Figure 5

Coldspots with a persistently low risk of elderly TB incidence from 2009 to 2014. Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.