Mapping tuberculosis prevalence in Ethiopia using geospatial meta-analysis

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- The overall prevalence of tuberculosis (TB) in Ethiopia was 0.19% (95% CI: 0.12%–0.28%).

- TB prevalence varied substantially at sub-national and local levels in Ethiopia.

- Targeted interventions tailored to high-risk areas might be important to reduce the burden of TB in Ethiopia.

- Geospatial meta-analysis is a novel epidemiological method that combines the principles of traditional meta-analysis and geospatial analysis into a single framework.

BACKGROUND

Reliable and detailed data on the prevalence of TB with sub-national estimates are scarce in Ethiopia. We address this knowledge gap by spatially predicting the national, sub-national, and local prevalence of TB, and identifying drivers of TB prevalence across the country.

METHODS

- TB prevalence data were obtained from the Ethiopia national TB prevalence survey and from a comprehensive review of published reports.
- Geospatial covariates were obtained from publicly available sources.
- A random effects meta-analysis was used to estimate a pooled prevalence of TB at the national level, and model-based geostatistics was used to estimate the spatial variation of TB prevalence at sub-national and local levels.
- Within the MBG framework, a logistic regression model was fitted to TB prevalence data using both fixed covariate effects and spatial random effects to identify drivers of TB and to predict the prevalence of TB.

RESULTS

- The overall pooled prevalence of TB in Ethiopia was 0.19% (95% confidence intervals (CI): 0.12%–0.28%).
- There was a high degree of heterogeneity in the prevalence of TB (I2 96.4%, p < 0.001), which varied by geographical locations, data collection periods, and diagnostic methods.
- The highest prevalence of TB was observed in Dire Dawa (0.96%), Gambela (0.88%), Somali (0.42%), Addis Ababa (0.28%) and Afar (0.24%) regions.
- Nationally, there was a decline in TB prevalence from 0.18% in 2001 to 0.04% in 2009. However, prevalence increased back to 0.29% in 2014.
- Substantial spatial variation of TB prevalence was observed at a regional level, with a higher prevalence observed in the border regions, and at a local level within regions.
- The spatial distribution of TB prevalence was positively associated with population density.
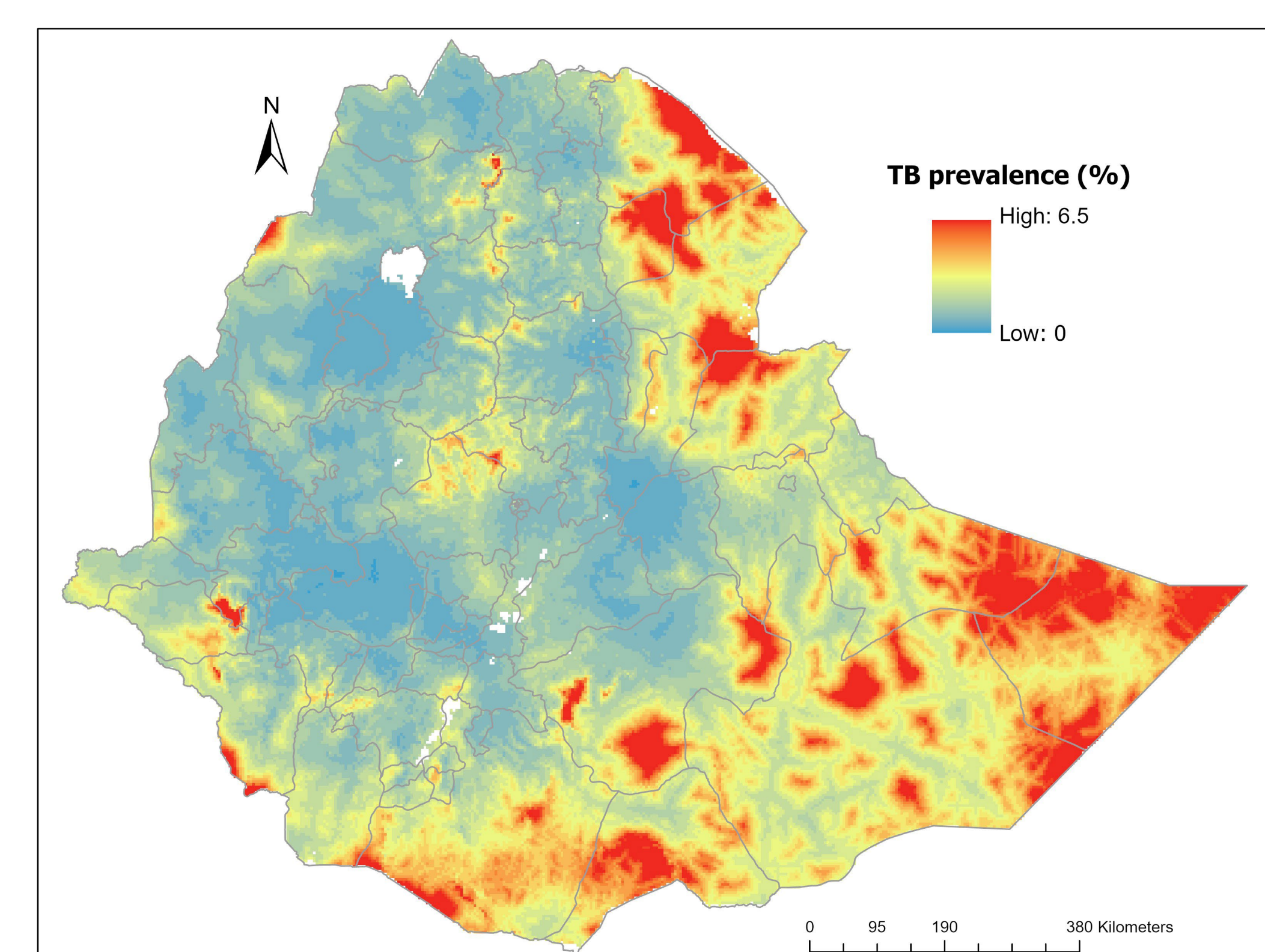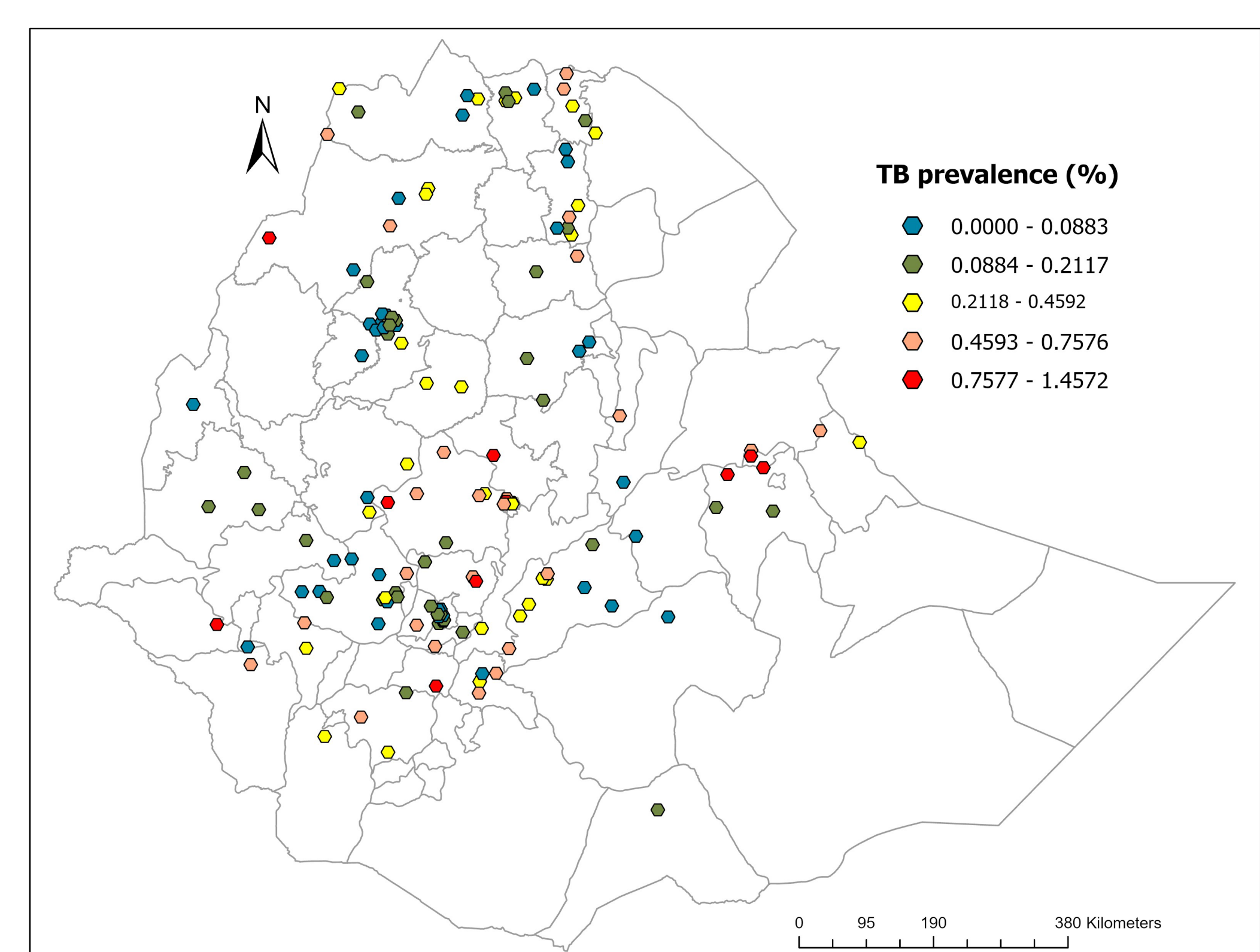
CONCLUSIONS

- TB prevalence varied substantially at sub-national and local levels in Ethiopia.
- Targeted interventions in high-risk areas may reduce the burden of TB in Ethiopia
- Additional data collection would be required to make further inferences on TB prevalence in areas that lack data.

ADDITIONAL KEY INFORMATION