



Temporal disruption in tuberculosis incidence patterns during COVID-19

A time series analysis in China

BACKGROUND

Despite extensive knowledge of tuberculosis (TB) and its control, there remains a significant gap in understanding the comprehensive impact of the COVID-19 pandemic on TB incidence patterns. This study aims to explore the impact of COVID-19 on the pattern of pulmonary tuberculosis in China and examine the application of time series models in the analysis of these patterns, providing valuable insights for TB prevention and control.

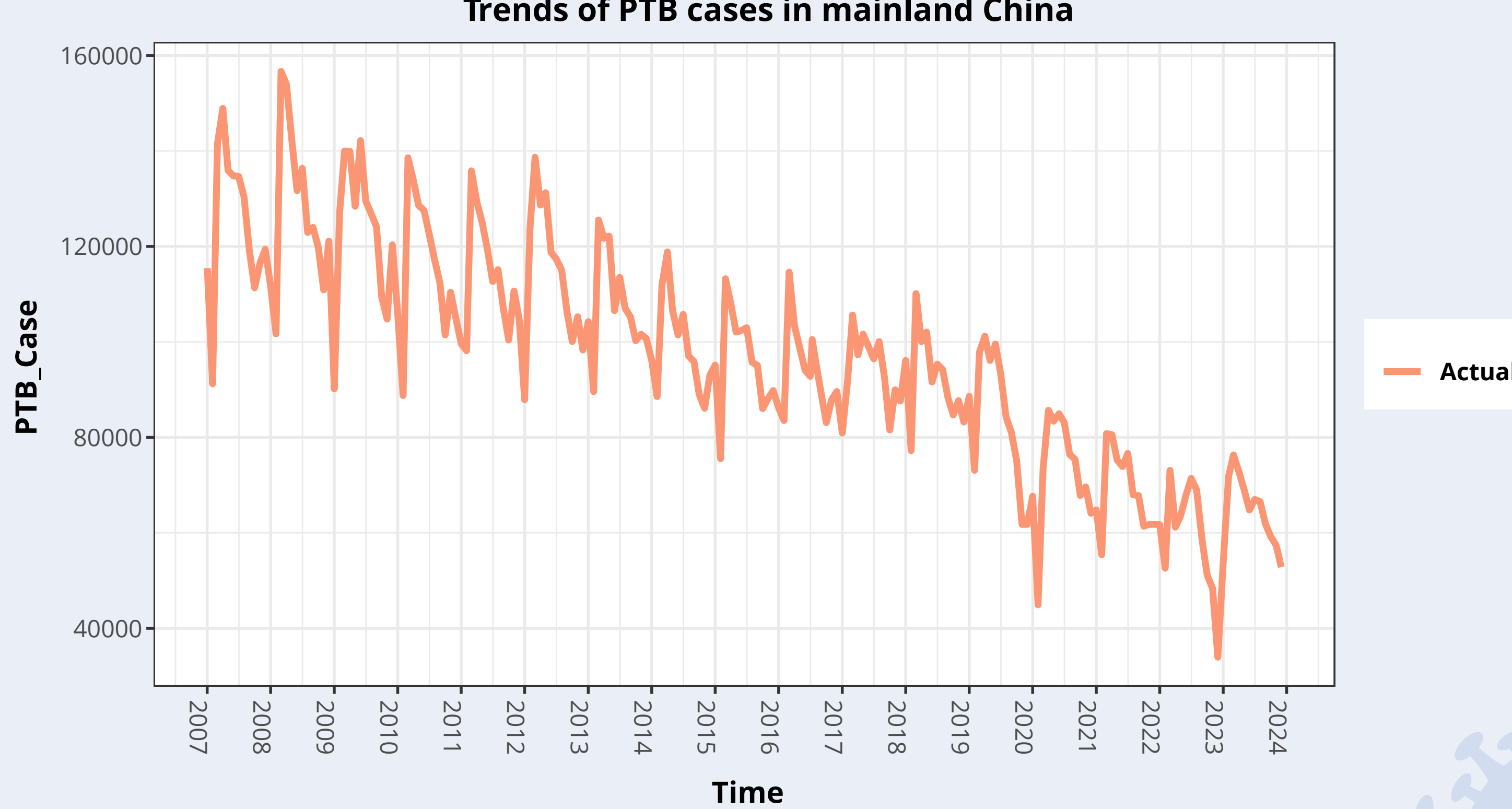


METHODS

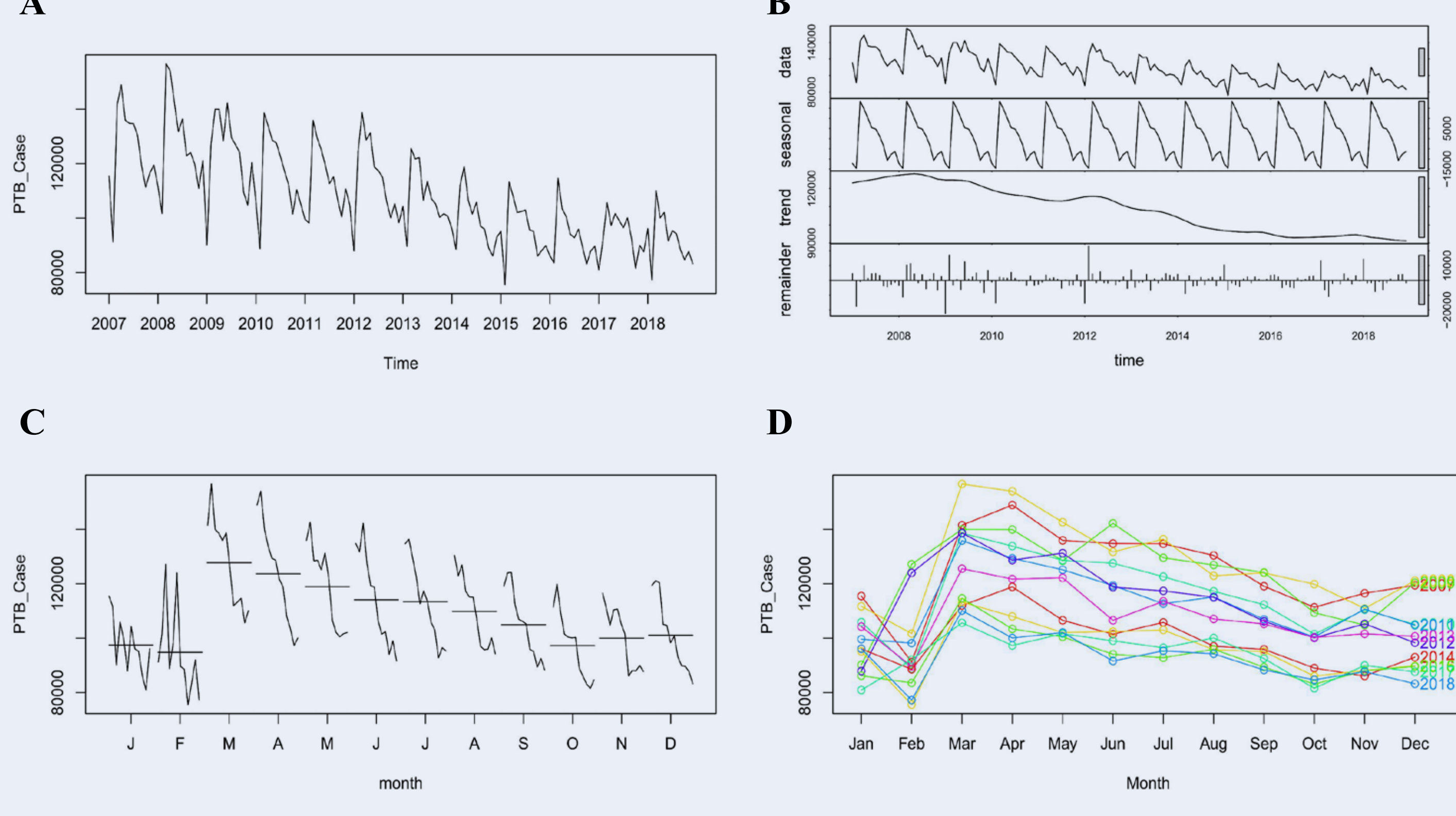
We used pre-COVID-19 pulmonary tuberculosis (PTB) data (2007–2018) to fit SARIMA, Prophet, and LSTM models, assessing their ability to predict PTB incidence trends. These models were then applied to compare the predicted PTB incidence patterns with actual reported cases during the COVID-19 pandemic (2020–2023), using deviations between predicted and actual values to reflect the impact of COVID-19 countermeasures on PTB incidence.

Time Series of Pulmonary Tuberculosis (PTB) Incidence in China from January 2007 to December 2023.

Trends of PTB cases in mainland China



The Monthly Incidence of Pulmonary Tuberculosis (PTB) in China from January 2007 to December 2018.

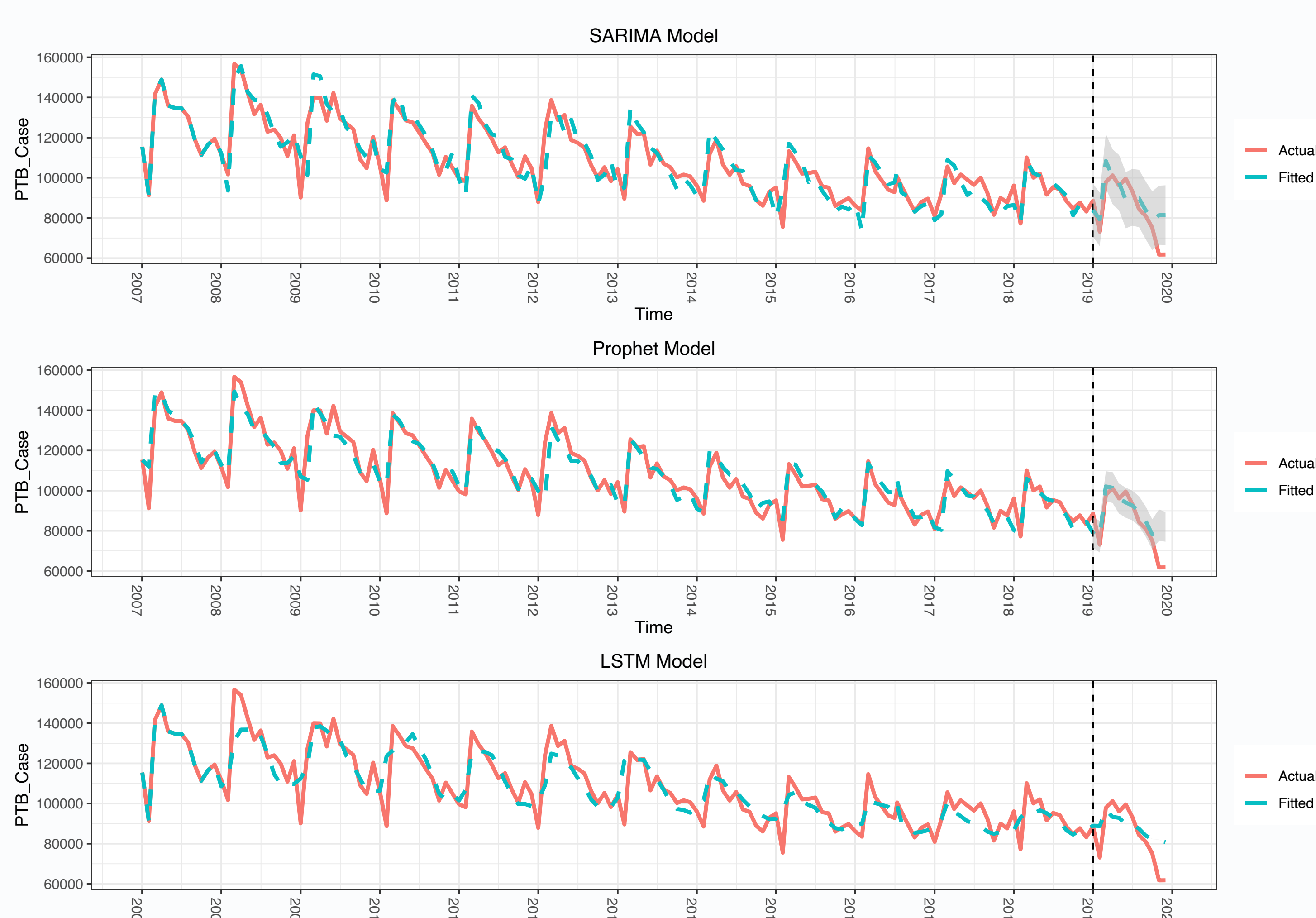


RESULTS

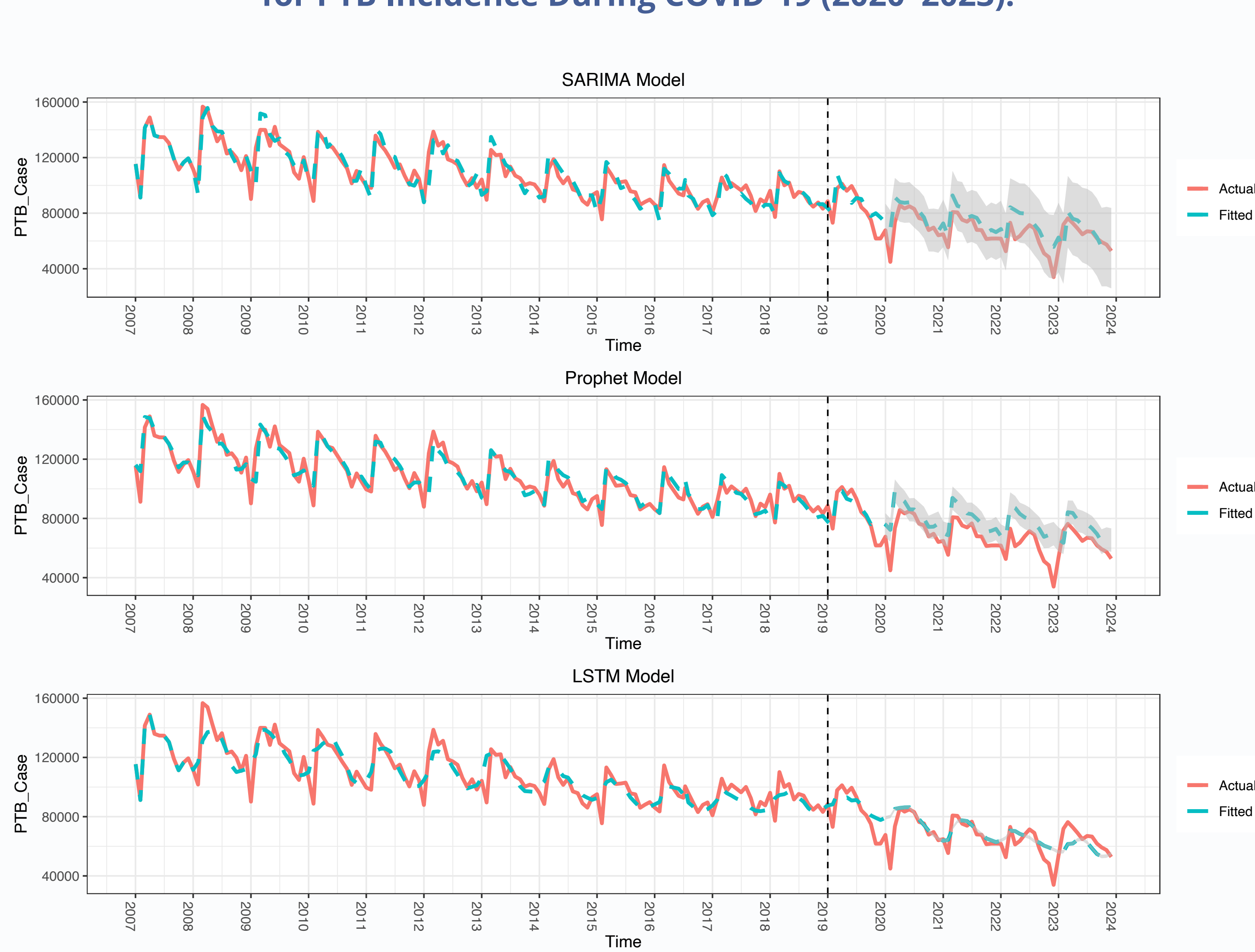
Prior to the COVID-19 outbreak, PTB incidence in China exhibited a steady decline with strong seasonal fluctuations, characterized by two annual peaks—one in March and another in December. These seasonal trends persisted until 2019. During the COVID-19 pandemic, there was a significant reduction in PTB cases, with actual reported cases falling below the predicted values. The disruption in PTB incidence appears to be temporary, as 2023 data indicate a gradual return to pre-pandemic trends, though the incidence rate remains slightly lower than pre-COVID levels.



Model Fitting and Forecasting Performance of SARIMA, Prophet, and LSTM Models (2007–2019)



Forecasting Performance of SARIMA, Prophet, and LSTM Models for PTB Incidence During COVID-19 (2020–2023).



CONCLUSIONS

The COVID-19 pandemic has had a temporary but significant impact on PTB incidence in China, leading to a reduction in reported cases during the pandemic. However, as pandemic control measures relax and the healthcare system stabilizes, PTB incidence patterns are expected to return to pre-COVID-19 levels. The Prophet model demonstrated the best predictive performance and proves to be a valuable tool for analyzing PTB trends and guiding public health planning in the post-pandemic era.