

# Explore the spatial and temporal patterns of Respiratory Syncytial Virus in human populations

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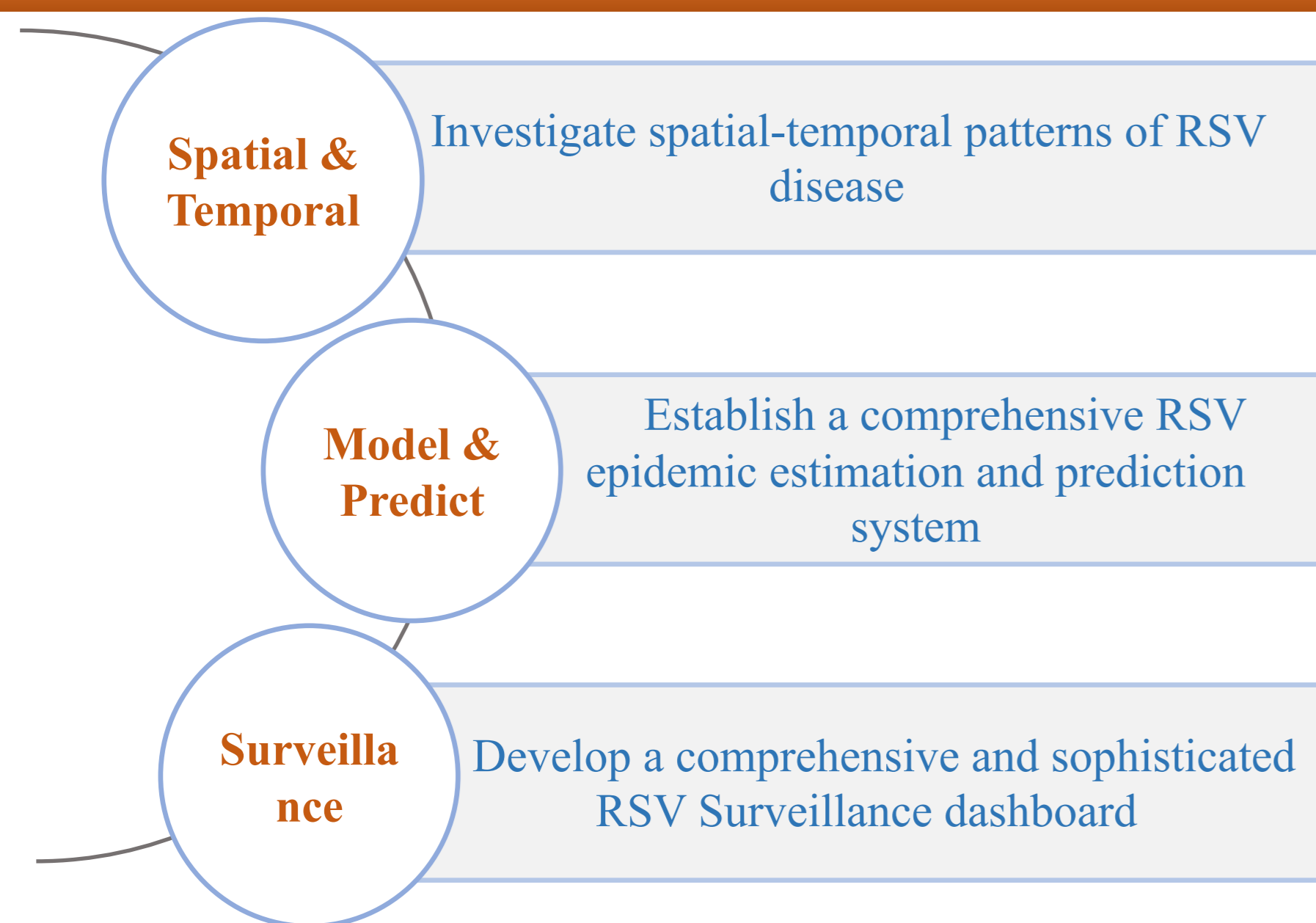
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## BACKGROUND

Respiratory syncytial virus (RSV) is the most common pathogen identified in lower respiratory tract infection in infants [1]. The traits of RSV activity are highly correlated with the geographical location, with seasonal patterns varying significantly in different regions worldwide. With the occurrence of coronavirus disease 2019 (Covid-19) pandemic, typical seasonality and spatiality of RSV epidemics may be affected, as several countries have shown the “drop and rebound” of RSV epidemics [2].

This research intends to systematically investigate the spatial and temporal pattern of RSV disease, to better understand the evolution and spread of RSV disease and thus preventing RSV infections efficiently.

## OBJECTIVES



## HYPOTHESIS

- Assume the non-pharmaceutical interventions for Covid-19 are indeed useful for the prevention of the RSV infection.
- Assume the disease distribution could be affected by geographical factors and show certain spatial modes.
- Assume the early prediction can help in control of RSV epidemic using immunization and therapeutics.

## Early Symptoms of Respiratory Syncytial Virus



## METHODS

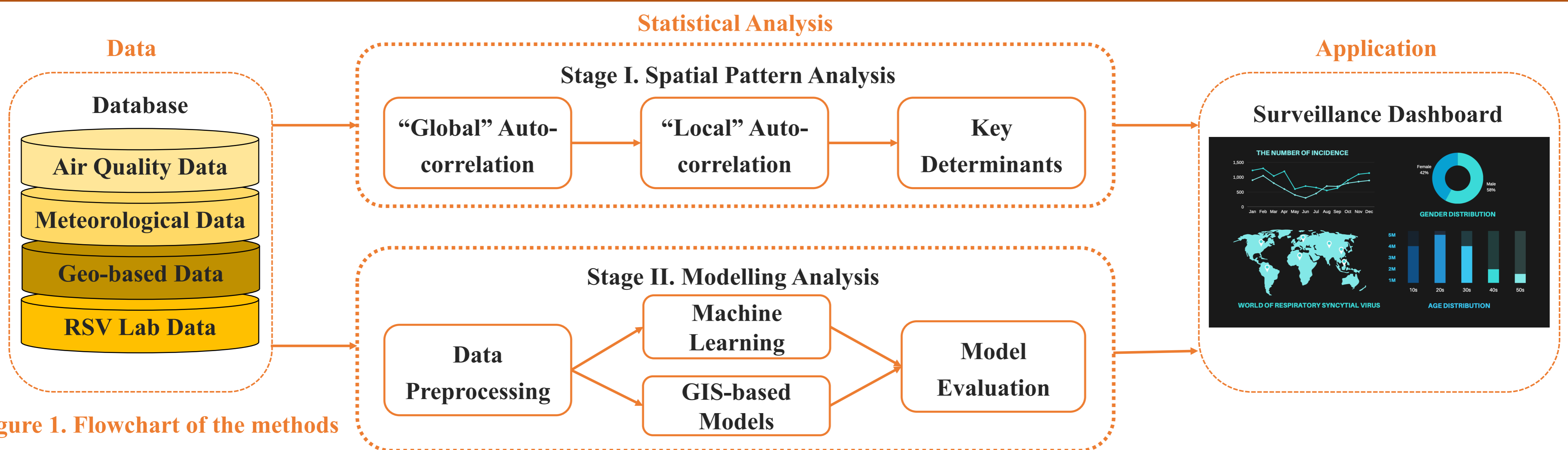


Figure 1. Flowchart of the methods

### I. Spatial Pattern Analysis

- To explore the spatial pattern of the RSV infection, global spatial autocorrelation analysis (e.g., **Moran’s I**) will be performed.
- To explore the specific aggregation mode (the hot and cold spots) of the RSV infection, local spatial autocorrelation analysis (e.g., **LISA Map**) will be performed.
- Statistical analysis will be conducted to analyze how the different aggregation modes of the RSV infection are associated with potential determinants such as geographic-related factors, environment-related factors, and air quality-related factors.

### II. Modelling Analysis

- To solve the spatial heterogeneity, clustering algorithms as **K-Means**, **Latent Class Analysis (LCA)**, or **Self-Organizing Mapping (SOM)** will be performed.
- To estimate and predict the RSV infection, machine learning algorithms such as **Support Vector Machine (SVM)** and **Long-Short Term Memory (LSTM)**, and Geo-based models such as **Geographically Weighted Regression (GWR)**, **Spatial Autocorrelation Model (SAM)** and **Bayesian Spatio-Temporal Model Hierarchical (BSTHM)** will be implemented.
- Cross-Validation and other comparative methods will be used to choose an outperformed algorithm for the prediction task of the RSV infection.

## REFERENCES.

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