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Spatial Clustering of ILI in Yunnan Province, China, Based on a Geographical Information System

Xia Xiao*[1, 4], Chunrui Luo[2], Xiaoxiao Song[1, 3, 4], Wei Liu[1, 4], Le Cai[1, 4], Yan Li[1, 4], Lin Lu[4, 2] and Qiongfen Li[2, 4]

[1]School of Public Health, Kunming Medical University, Kunming, China; [2]Yunnan Province Center for Disease Control and Prevention, Kunming, China; [3]Fudan University, Shanghai, China; [4]Yunnan Provincial Collaborative Innovation Center for Public Health and Disease Prevention and Control, Yunnan, China

Objective

The purpose of the study was to determine spatial clustering of the spread of influenza like illness (ILI) epidemic in Yunnan province, China with the aim of producing useful information for prevention and control measures.

Introduction

Influenza is a highly contagious, acute respiratory disease that causes periodic seasonal epidemics and global pandemics[1]. Yunnan Province is characterized by poverty, multi-ethnic, and cross-border movement, which maybe be susceptible of influenza (Fig-1). Finding from spatial patter of ILI will promote to control and prevent the respiratory diseases epidemic.

Methods

Data was obtained from the sentinel surveillance of illness like influenza (ILI) in Yunnan Center of Disease Control and Prevention from 2009 to 2013. The characteristics of the ILI clustering will be assessed by 'Global' and 'Local' Moran's *I* using Monte Carlo simulation by GeoDa. The spatial weights methods based on Queen-contiguity (polygons are adjacent if they share a border or corner)[2].

Results

A total of 49139 ILI cases were reported from sentinel surveillance data, which accounted for 3.35% of the total outpatient visit. Two incidence peaks occurred in spring and autumn. Among the positive samples, the top was Victoria (accounted for 31.98%), and the follow rank was influenza A (H1N1) (accounted for 26.03%).

From the Fig-2, we got the global Moran's I=0.256($p<0.05$). It indicated clustering was actually apparent throughout Yunnan Province. The four quadrants in the scatter plot correspond to different types of spatial correlation. However, the Global of Moran's *I* assume that the spatial process under investigation is stationary and fail to know 'where was cluster of disease'[3]. So we turn to look the Local measures of spatial autocorrelation (LISA, local Moran's I). Examination of the LISA map showed that most of the counties were no statistical significant differences in 0.05, except only 4 counties. You can add the results of the LISA analysis to the LISA map (Fig-3). From the above studying, we concluded that the areas susceptible to influenza featured mostly in poorer surrounding districts, or be neighboring with Vietnam or/and Laos.

Conclusions

General spatial autocorrelation indicated that influenza incidence was aggregated at the provincial level, and local spatial autocorrelation analyses found that border- area with poorer living-level were evidence for hotspots of high incidence of ILI. An approach base on Moran's I statistic complemented with GeoDa for visualization facilitates decision-making regarding various options such as isolation according to districts and months, and implement specific control measures in high risk districts to control the spread of ILI.

Fig-1 The map of research site -Yunnan Province- in China

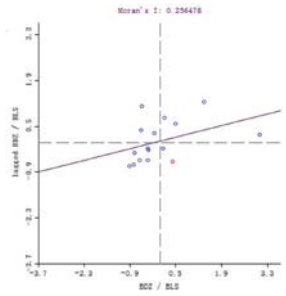

Fig-2 The Moran's *I* scatter plot of virus-strain positive rates

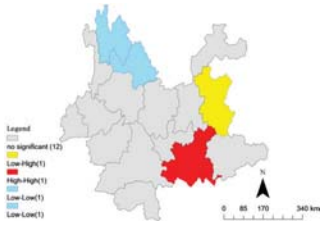

Fig-3 LISA cluster map of Influenza virus-strain positive rates for $p<0.05$

Keywords

Influenza like illness; geographical information systems; spatial autocorrelation

References

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*Xia Xiao
E-mail: xxkmyn@gmail.com