A Comparison of SaTScan and FleXScan for Outbreak Detection and Monitoring

– An Application to Data of Absentees in Primary School –

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OBJECTIVE

This paper describes a comparison between two statistics – SaTScan and FleXScan, applying to a data of absentees in primary school in Japan.

BACKGROUND

Early detection of disease outbreaks enables public health officials to implement disease control and prevention measures at the earliest possible time. A time periodic geographical disease surveillance system based on a cylindrical space-time scan statistic proposed Kulldorff(2001) has been used extensively for disease surveillance along with the SaTScan software. Recently, Takahashi *et al.*(2008) proposed a flexibly shaped space-time scan statistic ("FleXScan" hereafter) to detect arbitrarily shaped disease outbreaks, and the statistic is well suited for detecting and monitoring disease outbreaks in irregularly shaped areas. They have suggested that we may use both statistics for disease outbreak detection, but for different purposes. Then it is important to know their performances.

In many cities such as New York City, Boston, real-time, geographic, early outbreak detection system have been implemented, and the SaTScan is used for the analysis. On the other hand, in Japan, there is not yet such a system which includes statistical analysis using cluster detection tests, and its implementation is demanded now.

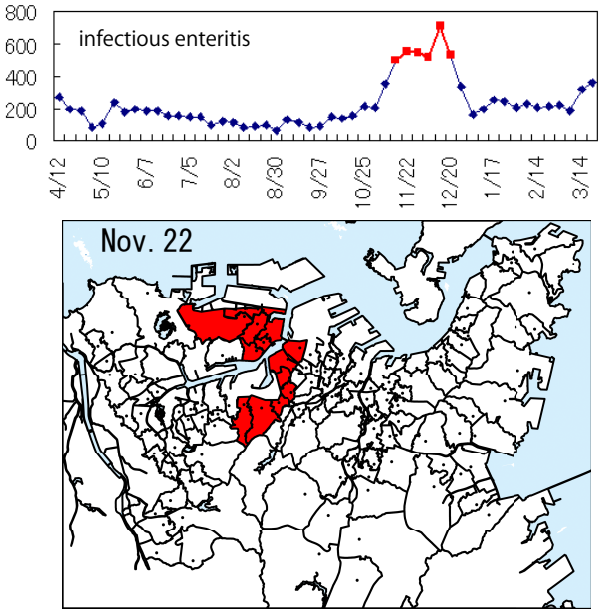
METHODS

We applied a prospective space-time analysis using the SaTScan and the FleXScan to a surveillance data of number of absentees in primary school in Kita-kyushu, Japan. The data came from weekly surveillance of the absentees on every Wednesday in 132 primary schools in Kita-kyushu, during April 2006 to March 2007. Total number of school children was 52,189. We set $K = 15$ as the maximum length of the geographical window, and the maximum temporal length to be $T = 2$ weeks. The expected number (baseline) of absentees were calculated as the averages during April to September for each school, and the analysis started from October 11. The number of replications for the Monte Carlo procedure was set to $B = 999$ and its significance level was set to $p < 0.02$ corresponding to the recurrence interval of 50 weeks, i.e., 1 year.

RESULTS

For the analysis during October 11 to November 15, both tests did not detect any signals. On November 22, both tests detected a cluster of 2 weeks (i.e., from November 15 to 22) with $p = 0.001$. The SaTScan detected a circular cluster of 11 schools, on the other hand, the FleXScan detected a non-circular cluster of 13 schools. The secondary cluster was not detected on the day. From November 22 to December 13, significant clusters were detected by both tests. Their results were similar but detected areas were slightly different. On December 20, both tests detected the same cluster, which was a small cluster of only 2 schools.

At the same periods, an outbreak of infectious enteritis has been observed in the area from a sentinel medical system, which consists of some hospitals and clinics. It seems that the outbreak was detected by our analysis of absentees in school.



CONCLUSIONS

The FleXScan is well suited for detecting and monitoring disease outbreaks. And the data of absentees in primary school is useful for detecting outbreaks.

REFERENCES

Takahashi K, Kulldorff M, Tango T, Yih K. A flexibly shaped space-time scan statistic for disease outbreak detection and monitoring. *International Journal of Health Geographics* 2008; **7**:14.

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