ABSTRACT

DANI ARDIYANTO. A Space-time Permutation Scan Statistic for Measles Disease Hotspots Detection in West Java. Under the advisory of ASEP SAEFUDDIN and BAGUS SARTONO.

In this research, scan statistic was implemented to detect clusters in a point process. The scan statistic can be applied on wide area of interest, one of them are on disease area clustering. The ability in performing disease surveillance without population-at-risk data is important in developing countries, where these data may be hard to be obtained.

This paper presents the application of the scan statistic in order to detect measles disease hotspots in West Java Province. Unlike the spatial scan statistic, space-time permutation scan statistic not only detects the location of the significant hotspot cluster but also identifies its occurrence. Further, the space-time permutation scan statistic can be implemented when the population-at-risk is unavailable. This method creates a large number of permutations of the spatial and temporal attributes of each dataset to get the expected number of cases, with the underlying assumption that the probability of a case being in an area \( z \), given the observed \( d \), is equal. The test statistic was based on likelihood ratio test and evaluated using Monte Carlo hypothesis testing.

The research used aggregated measles disease case in West Java districts obtained from Statistics Indonesia Potensi Desa (Podes) year 2003 and 2006. They were twelve detected measles hotspots in West Java during year 2003 and 2006, which only four of them were significant. The highest log-likelihood ratio values, the most likely cluster (MLC), happened in Cirebon in 2006 time frame.

Keywords: space-time permutation scan statistic, measles, hotspot.