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Challenges and Opportunities in Routine Time Series Analysis of Surveillance Data

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Objective

To discuss challenges and opportunities in the introduction of an automated approach for time series analysis (TSA) regarding epidemiological methodology for generation of hypotheses, steps to be performed and interpretation of outputs.

Introduction

ECDC long term strategies for surveillance include analysis of trends of communicable disease of public health importance for European Union countries to guide public health actions. The European Surveillance System (TESSy) holds data on 49 communicable diseases reported by 30 countries for at least the past five years. To simplify time related analysis using surveillance data, ECDC launched a project to enable descriptive and routine TSA without the need for complex programming.

Methods

Protocols for TESSy data were developed specifying hypotheses to be tested, types and format of variables needed for TSA for several diseases, including VTEC, and legionellosis. Stata scripts were developed to comply with the basic steps of TSA, including data aggregation, data checking, data description, analysis of trends and seasonality, residual analysis, simple modelling and long-term forecasting. TSA steps were presented as successive tabs in a TSA dialogue box in Stata. Before using the Stata TSA dialogue box, experts were offered a two-day training, and provided with an in-depth manual supporting use and interpretation of TSA outputs using the Stata TSA dialogue box.

Results

For VTEC, it was possible to identify a small increase in the trend and a seasonal pattern in surveillance data with an estimate of the start of the increased risk for infection in the beginning of the summer season [1]. For legionellosis, an increasing trend in the number of reported cases was observed in 2010 [2]. Feedback from the training showed that using the Stata TSA dialogue box enables a quick exploratory analysis even by non-Stata users who could focus on interpretation of results, rather than the programme writing. However, we emphasise that statistical knowledge of TSA as well as rigorous preparation of the datasets (including data quality checks) and generation of hypotheses, are essential to ensure appropriate analysis and meaningful interpretation of the results.

Conclusions

Using the Stata TSA dialogue box saves time when performing rapid exploratory TSA of epidemiological data, avoiding the need for complex programming which is still needed for sophisticated TSA. Results of exploratory TSA analysis can trigger new hypothesis, for more advanced and sophisticated TSA. The introduction of a new technology (Stata TSA dialogue box) does not replace multi-disciplinary approach, knowledge and application of a methodological approach to TSA to produce meaningful results that can inform public health decision making. Further testing and training will be performed to enhance simplicity before appropriate dissemination of the Stata TSA dialogue box for a wider use.

Keywords

surveillance; epidemiology; statistical model; data analysis; software tool

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References

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