Detecting Changes in Mean of Malaria Time Series Using Change Point Analysis

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Declaration

This project is my original work and has not been presented for a degree in any other University.

Signature. . . . . Date . . . .

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This project has been submitted for examination with my approval as the supervisor

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Thank you very much!

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List of abbreviations and acronyms

CDC	Center for Disease Control
CPA	Change Point Analysis
CUSUM	Cumulative Sum
EDS	Early detection systems
EWMA	Exponentially Weighted Moving Average
IID	Independent and Identically Distributed
LLIN	Long-lasting Insecticidal Net
MLE	Maximum Likelihood Estimation
MCP	Malaria control programmes
MEWS	Malaria early warning systems
SCM	Structural Change Model
SD	Standard Deviation
SPC	Statistical Process Control
SSE	Sum of Squared Error
WHO	World Health Organization

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Abstract

Background

A sequence of observation usually undergoes sudden changes at unknown times. Hence, there is need to find out if a shift has occurred in time series data by identifying set of change points. Change point detection is the identification of abrupt changes in time series (sequential) data. Change point detection can be done using SPC or statistical change point detection methods. The algorithm uses CUSUM plus bootstrapping.

Objective

To detect points of change in mean of malaria time series using change point analysis

Methods

CUSUM CPA was used to detect changes in mean within the malaria time series data for Eldoret East district for the period 2010 and 2011. To detect change in mean, the two-step procedures in clued (1) calculating cumulative sums, followed by (2) use of bootstrapping to make inferences.

Results

The results suggest that most important changes in mean time series for malaria cases occur between May 2010 and December 2011 where the trends of malaria cases have reduced. It is shown that statistically detected changes in the mean of a time series coincide with identifiable period when the interventions were put in place and when there were epidemics, which might have caused these change points

Conclusion

It is suggested that CUSUM CPA is an effective tool for detecting changes in mean for time series data and should be adopted so as to detect points of change due to epidemics or intervention impact together with the existing methods so as to get meaningful results.