Multi-country validation of a simple alert system to improve measles outbreak response

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Background

Outbreak alert systems can offset the severity of measles epidemics by minimising response delays. Existing systems, however, are often too sensitive to be practical when identifying areas for reactive interventions. To redress this challenge, we present a simple alternative system that combines a weekly and triweekly suspected case threshold. First evaluated in the DRC in 2022, here we extend the evaluation of this system to the context of Niger.

Methods

A large number of threshold combinations were evaluated against indicators of cases captured by intervention and false alert risk. Combinations were evaluated against admin 2 level surveillance data from the DRC and Niger from 2015-2024. Performance was then compared to standard recommendations from the WHO and MSF.

Results

The two example countries have distinct epidemic profiles, with the DRC exhibiting mas epidemics and Niger showing strong annual seasonality. In both settings, the proposed alternative alert system outperformed the existing WHO and MSF recommendation. The WHO recommendation, which is triggered by four suspected cases occuring within one month in a given locale (here, admin level 2), performs similarly to the proposed alternative when selecting the most sensitive of threshold combinations. The MSF recommendation, which is triggered by a raw increase in number of cases for three consecutive weeks, performed markedly worse, capturing 50% or less of cases. This poor performance is predominantly attributable to the high volatility of weekly measles surveillance data.

Conclusion

This analysis presents a simple evidence based alert system to improve measles outbreak response. It has been assessed in two countries, Niger and the DRC, and found to outperform standard recommendations. At present the system is available for use in both countries via their respective surveillance dashboards. Ongoing work is being conducted to evaluate the system in settings with additional epidemic profiles, including areas with low burden and areas with poor surveillance.

Alert systems are a valuable tool to improve outbreak response but standard options are often too sensitive to be practical. Here we propose and evaluate a simple alternative that offers more balanced performance.