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An exploratory analysis of the 2010 measles outbreak in Zimbabwe

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Objective

To systematically organize the World Health Organization data on the 2010 measles outbreak in Zimbabwe. To perform a post hoc exploratory analysis to understand how the outbreak spread geographically and evaluate the effectiveness of a mass vaccination campaign.

Introduction

This report describes an exploratory analysis of the 2009–2010 Zimbabwe measles outbreak based on data publicly available in the World Health Organization's Zimbabwe cholera epidemiological bulletin archive. As of December 12, 2010, the outbreak appears to have ended after it is suspected to have caused 13,783 infections, 693 of those being confirmed IgM positive and 631 deaths (1).

Methods

Data were extracted from the weekly Zimbabwe cholera epidemiological bulletins available in the World Health Organization's Zimbabwe cholera epidemiological bulletin archive (2). The focus of the data collection was on the tables titled 'Distribution of Measles IgM Positive by Age group and District of residence', which typically contained both cumulative and new cases of IgM-confirmed measles cases by district and age categories. Although not entirely consistent, the age categories were younger than 9 months, 9–11 months, 1–4 years, 5–14 years, and 14 years and older.

The statistical software R (3) was used for data cleaning (an extensive process) and exploratory analysis. The maptools package (4) was used to generate maps of the geographical disease progression.

Results

Fig. 1A provides an example time series for the cumulative-confirmed measles cases in Harare, the capital of Zimbabwe, where all age categories have been combined. Indicated in green is the mass vaccination campaign that took place between May 24 and June 2.

Fig. 1B provides an example map displaying the geographical distribution of confirmed measles cases upon extinction of the outbreak. The darker color indicates a higher attack rate (number of confirmed cases divided by total population); the darkest red area is Harare.

Conclusions

This exploratory analysis questions the utility of the mass vaccination campaign since the campaign came after the peak of the outbreak in the hardest hit district in Zimbabwe. But since Harare was one of the earliest districts affected, perhaps the campaign prevented further spread to other districts. In addition, it is possible that suspected cases in Harare were more likely to become confirmed cases due to geographical proximity of testing laboratories, thereby inflating the relative attack rate.

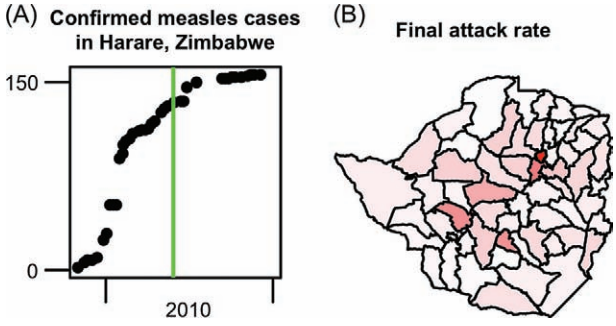

Fig. 1. (A) Cumulative confirmed cases for the 2010 measles outbreak in Harare, Zimbabwe, with mass vaccination campaign (green). (B) Raw district-specific attack rates (confirmed cases divided by population, darker indicates higher) in Zimbabwe as of Dec 12, 2010.

Keywords

Measles; Zimbabwe; exploratory analysis; geographical; R

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References

1. World Health Organization. Zimbabwe epidemiological bulletin number 89. http://www.who.int/entity/hac/crises/zwe/sitreps/zwe_epi_12december2010.pdf, Aug 18, 2010.
2. World Health Organization. Zimbabwe cholera epidemiological bulletin archive. http://www.who.int/hac/crises/zwe/sitreps/epi_archive/en/index.html, Aug 18, 2010.
3. R Development Core Team. R: a language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0, URL http://www.R-project.org/.
4. Lewin-Koh NJ, Bivand R. maptools: Tools for reading and handling spatial objects. R package version 0.8–10. http://CRAN.R-project.org/package=maptools; 2011.

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