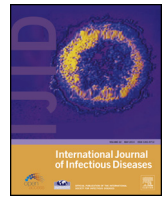




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## Short Communication

## Epidemiological features and trends of Ebola virus disease in West Africa

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## SUMMARY

According to a World Health Organization report, the epidemiological features of Ebola virus disease (EVD) have changed significantly in West Africa. In this study, the new epidemiological features and prevalence trends for EVD in Guinea, Liberia, and Sierra Leone are described. It was predicted that the Ebola outbreak would end in June 2015.

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## 1. Introduction

According to the latest World Health Organization (WHO) report on Ebola virus disease (EVD), 26 628 cumulative cases of EVD and 11 020 deaths had occurred as of May 3, 2015.<sup>1</sup> At present, the monthly increase in the number of new cases in Guinea, Liberia, and Sierra Leone has slowed and has shown signs of reversing. Therefore, there has been a significant change in the epidemiological features of EVD in West Africa. Research on the new epidemiological features and developmental trends of the EVD outbreak is urgently required, as this will provide important guidance for the formulation of policies to prevent and control the EVD outbreak.

## 2. Methods

EVD data from Guinea, Liberia, and Sierra Leone published by the WHO between March 22, 2014 and May 3, 2015 were collected.<sup>1</sup> During this period, there were 26 593 total cases

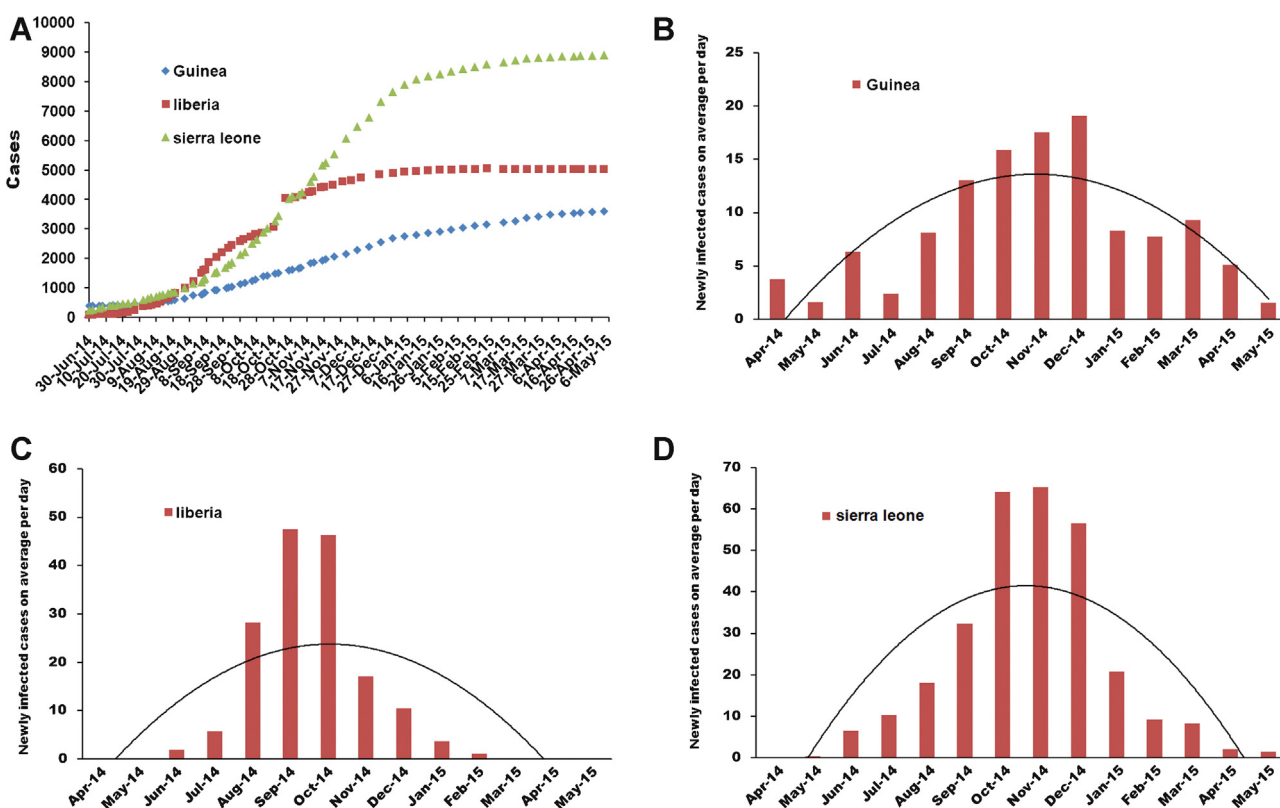
(14 913 confirmed, 2581 probable, and 9099 suspected) and 11 005 total deaths. As there were no new cases in Liberia from April 2015, the data from Guinea and Sierra Leone were used for model fitting in this study. The number of daily increases was fitted to a quadratic polynomial. The goodness-of-fit ( $R^2$ ) of the prediction models was used to evaluate the model.

## 3. Result and discussion

The outbreak was initially reported in February 2014 in Guinea, where the number of cases increased rapidly. From the beginning of the outbreak to the present, the number of cases increased to an average of 43.63 cases per day (including confirmed and probable cases) in Guinea, Liberia, and Sierra Leone combined (Figure 1A). In Guinea, the number of new cases increased by 3.73 per day in April 2014, rose continually to 19.07 new cases per day in December 2014 (peak of the outbreak), and then decreased to 1.5 new cases per day in May 2015 (Figure 1B). In Liberia, the number of new cases increased by 0.15 per day in April 2014, rose continually to 47.53 cases per day in September 2014 (peak of the outbreak), and then decreased to zero new cases per day from April 2015 (Figure 1C). In Sierra Leone, the number of new cases increased by 0.44 per day in May 2014, rose continually to 65.23 new cases per day in November 2014 (peak of the outbreak), and then decreased to 1.5 new cases a day in May 2015 (Figure 1D).

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**Figure 1.** Numbers of cases of Ebola virus disease and simulated predictions in three West African countries (Guinea, Liberia, and Sierra Leone). (A) Distribution of accumulated cases in Guinea, Liberia, and Sierra Leone over time. (B) Number of new cases on average per day from April 2014 to May 2015 in Guinea; the curve represents the fitted curve. (C) Number of new cases on average per day from April 2014 to May 2015 in Liberia; the curve represents the fitted curve. (D) Number of new cases on average per day from April 2014 to May 2015 in Sierra Leone; the curve represents the fitted curve.

The above analysis indicates that there were different degrees of decline in the number of new cases in October 2014 for Liberia, December 2014 for Sierra Leone, and January 2015 for Guinea. Compared to the peak of the outbreak, the number of new cases per day decreased by 92.13% in Guinea and 97.70% in Sierra Leone, and there were no new cases in Liberia. At the same time, the mortality rate decreased from 53.17% between March and August 2014 to 39.50% between September 2014 and May 2015. The decrease in mortality rate might be due to the increase in available beds, the accumulation of treatment experience, and medical assistance from the international community.

New epidemiological features have emerged in the Ebola outbreak; therefore, prospective research on the developmental trends of the EVD outbreak based on these new epidemiological features is necessary, as such studies will provide the basis for the formulation of policies and measures for the prevention and control of EVD. There have been several prospective studies on the EVD outbreak.<sup>2–4</sup> The data used for model fitting in these studies were mainly collected before September 2014, and the predicted results were significantly higher than the actual values. As the prevalence of EVD is influenced by numerous factors, there is always a degree of uncertainty in model predictions. However, model predictions are able to effectively guide policy makers in the formulation of related prevention and control policies. Therefore, the importance of outbreak prediction outweighs whether or not the prediction itself is accurate.<sup>5</sup> As there have been significant changes in the rate of increase in prevalence of EVD in West Africa, prospective research on the Ebola outbreak based on new epidemiological data is necessary. The goodness-of-fit ( $R^2$ ) of

the prediction models for Guinea and Sierra Leone were 0.64 and 0.61, respectively. Based on this model, it was predicted that the outbreak would cease in Guinea and Sierra Leone in June 2015.

Therefore, based on the number of new cases per day and simulated prediction data, a decreasing trend has emerged in the Ebola outbreak. The control measures have been effective to a certain extent, while the mortality rate has decreased further. Hence, the current prevention and control measures should be strengthened further in Guinea and Sierra Leone until the outbreak ceases.

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*Conflict of interest:* The authors declare that they have no competing interests.

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