

Global dynamics of Highly Pathogenic Avian Influenza



Propagation speed analysis 2005 – 2015

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INTRODUCTION

Infection with influenza A viruses of high pathogenicity (HPAI) is a disease of global interest due to the continued increase in the number of affected countries and to the circulating subtypes. From 2005 to 2015, 73 countries/territories notified the presence of HPAI. The aim of this analysis is to describe the dynamics of the virus in the last eleven years, considering in particular the propagation speed of the virus.

MATERIAL AND METHODS

In total, more than 6000 outbreaks reported for 289 events by 73 countries/territories (period 2005 – 2015) were analysed (Figure 1). For each event, the outbreak reported with the earliest date of start was considered the starting point. The distance of each outbreak from the starting point was calculated using the Haversine formula. The propagation speed was determined as the ratio between 'distance from starting point' and 'days after the start of the event'. To evaluate possible temporal trends, the outbreaks were grouped and categorised in eleven time categories according to the natural breaks (Jenks) classification (Table 2).

RESULTS

The highest propagation speeds (about 2000 km/day) were observed in the biggest countries and especially those with the capacity to track the evolution of the disease within their national boundaries. The countries that reported the lowest speeds were Australia (all less than 0.1 km/day) and Iran (maximum of 0.8 km/day). The distribution of speed frequencies is presented in Figure 2. The speed values vary a lot during the study period, with a maximum in T2 (median value 3.25 km/day) and a minimum in T5 (median value 0.42 km/day). No significant trend of speed was observed from T1 to T11.

DISCUSSION AND CONCLUSION

The Sixth Strategic Plan of the OIE envisages making better use of the animal disease information and the analysis presented here is an example of the usefulness of good quality data collection.

Using these results as a baseline, countries experiencing HPAI events can now compare the evolution of the disease in their country with global data.

Moreover the basic information on disease dynamics, in addition to an advanced analysis on the influence of risk factors (e.g. type of farming system involved, subtype of the virus, climatic conditions, etc.) could be used in the future as a decision tool to predict the potential behaviour of HPAI events and to increase the preparedness level of the countries.

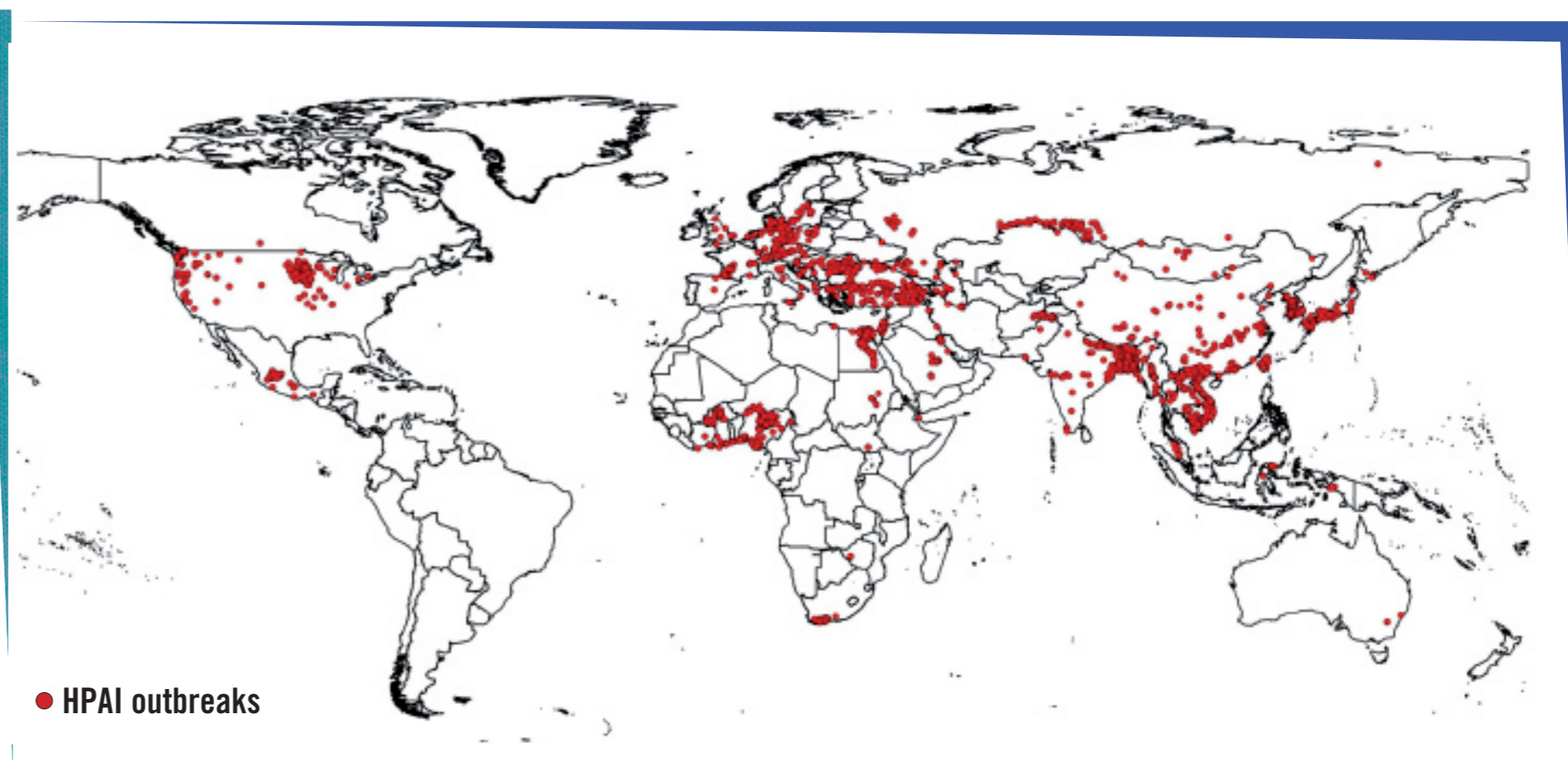


Figure 1. HPAI outbreaks location

	Minimum	Lower quartile	Median	Upper quartile	Maximum
Value (km/day)	0	0.6	2.4	6.4	2,285.8

Table 1. Speed results for HPAI virus at national event level, from 2005 to 2015

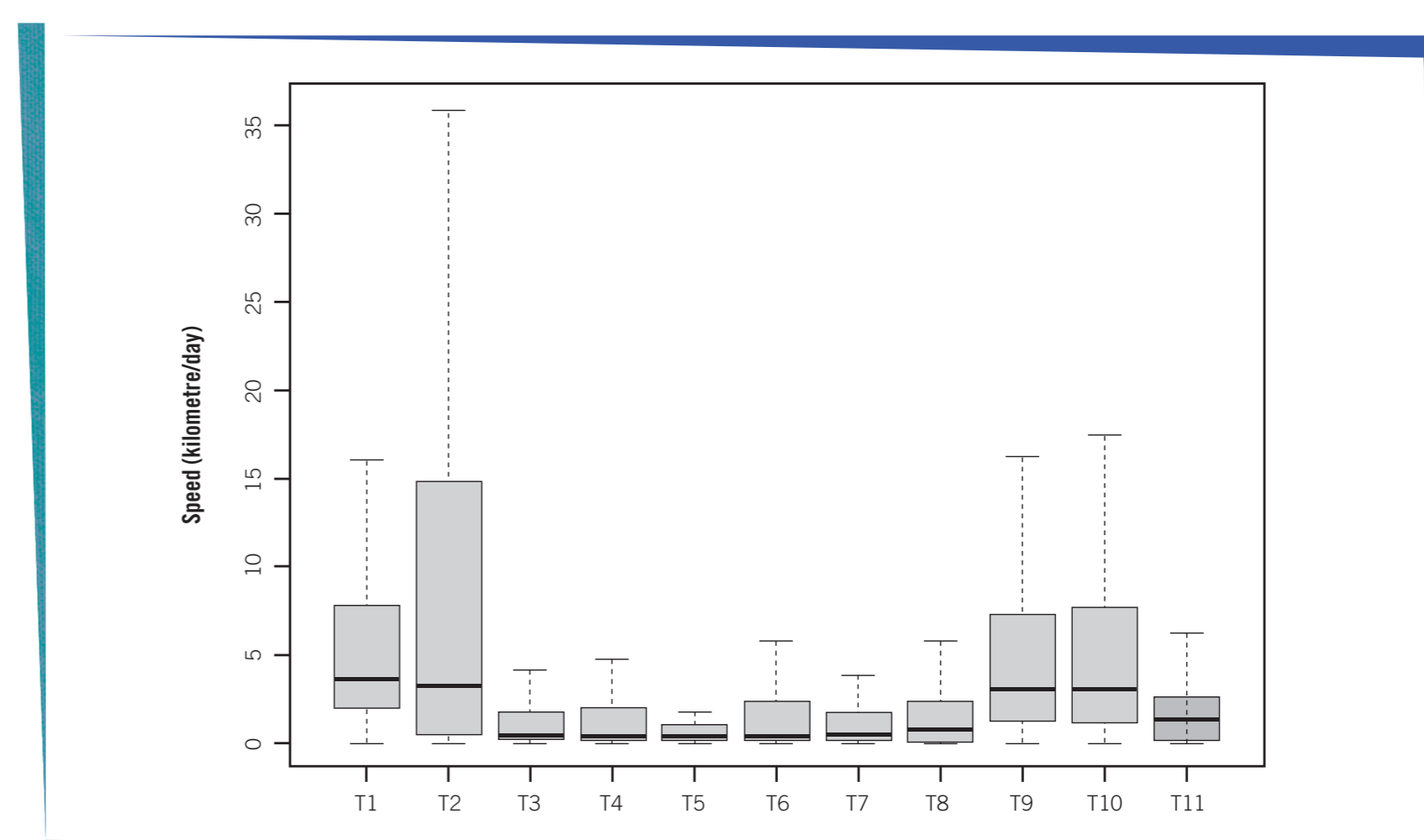


Figure 2. Speed trend along the study period

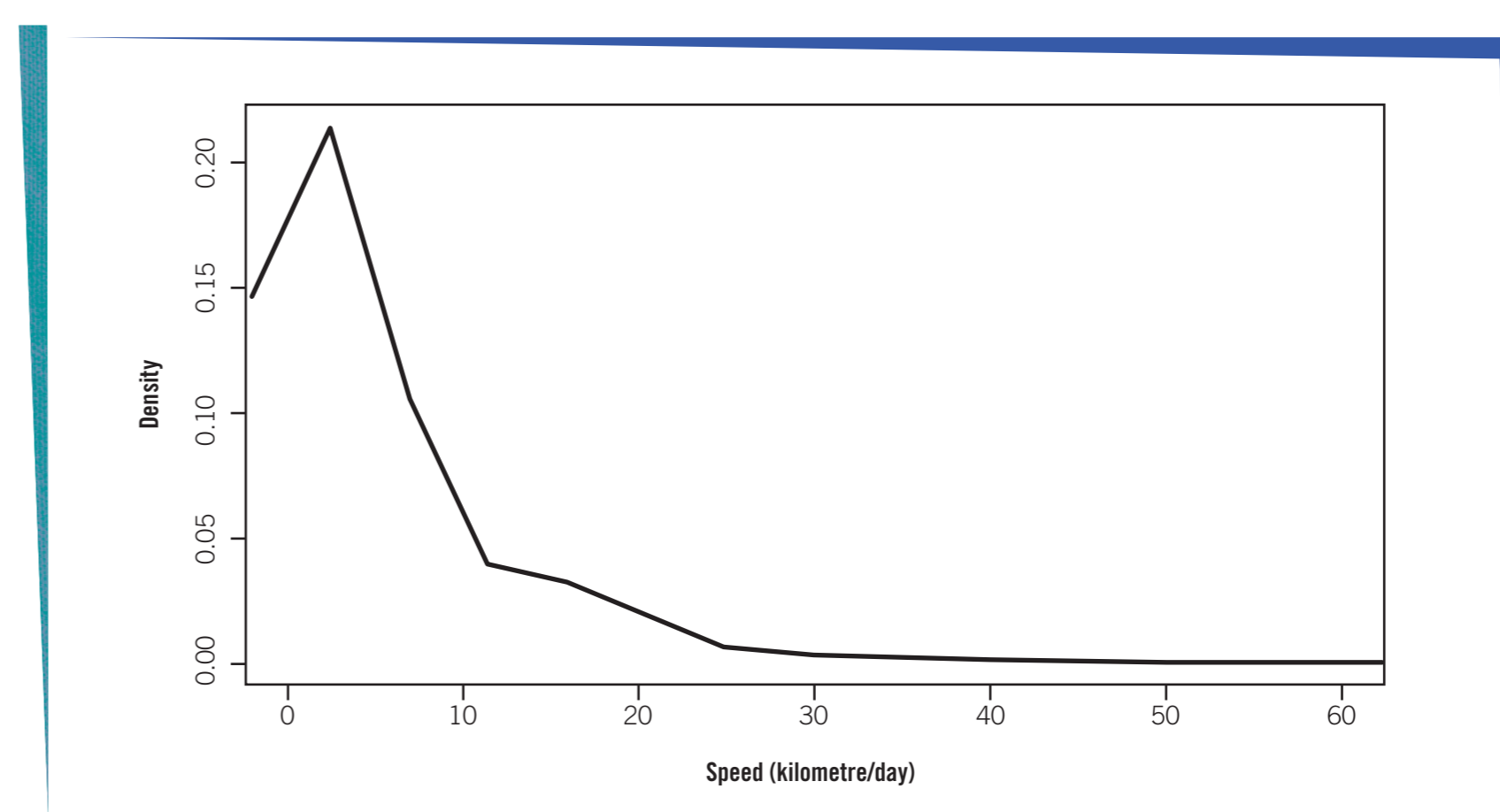


Figure 3. Speed trend along the study period

	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11
Time range	[0, 569]	(569, 919]	(919, 1249]	(1249, 1569]	(1569, 1961]	(1961, 2390]	(2390, 2778]	(2778, 3115]	(3115, 3458]	(3458, 3744]	(3744, 3942]
No outbreaks	1679	815	602	130	94	401	194	178	110	1681	274

Table 2. Time range used (Jenks' classification) and number of outbreaks for each time group



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