



Forecasting (re)emergence of infectious animal diseases: prospects for monitoring risk indicators and generic alert setting

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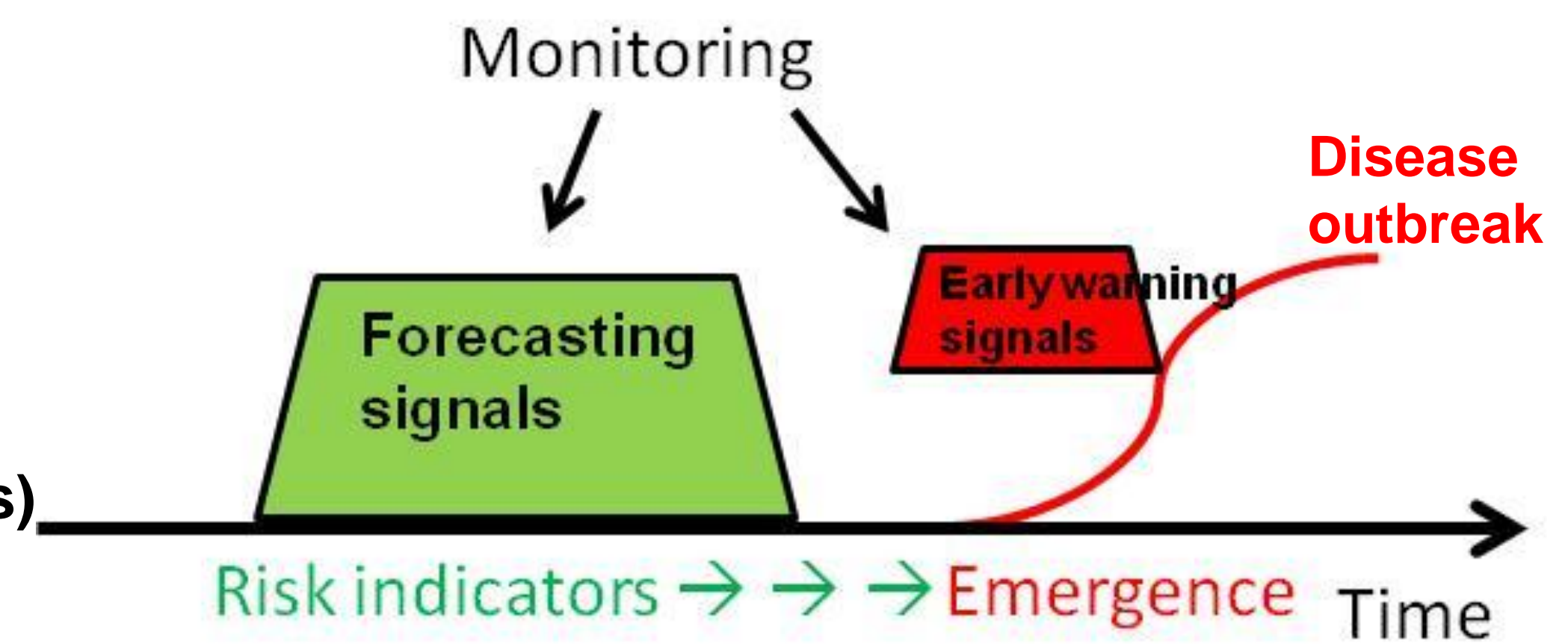
Introduction

Traditional active and passive animal disease surveillance is focused on the monitoring and/or early detection of diseases already present on the territory, based on clinical signs or diagnostic testing. These systems are unable to predict the next emerging animal disease outbreak. The latter represents a major challenge for veterinary and public health authorities.

The objective of this study is to develop a **MONITORING OF RISK INDICATORS OF EMERGENCE OF ANIMAL DISEASES** in Belgium and to verify its applicability for generic alert setting: increased risk periods of animal disease emergence (**FORECASTING**) and early identification of emergence of animal diseases (**EARLY WARNING**).

A stepwise approach is followed:

- 1) Identification of measurable risk indicators of emergence (forecasting or early warning signals)
- 2) Examination of the feasibility of their monitoring using existing data sources
- 3) Trend observation / trend analysis → detection of a pre-alert signal
- 4) Risk assessment → Alert? (Yes/No)



Preliminary results

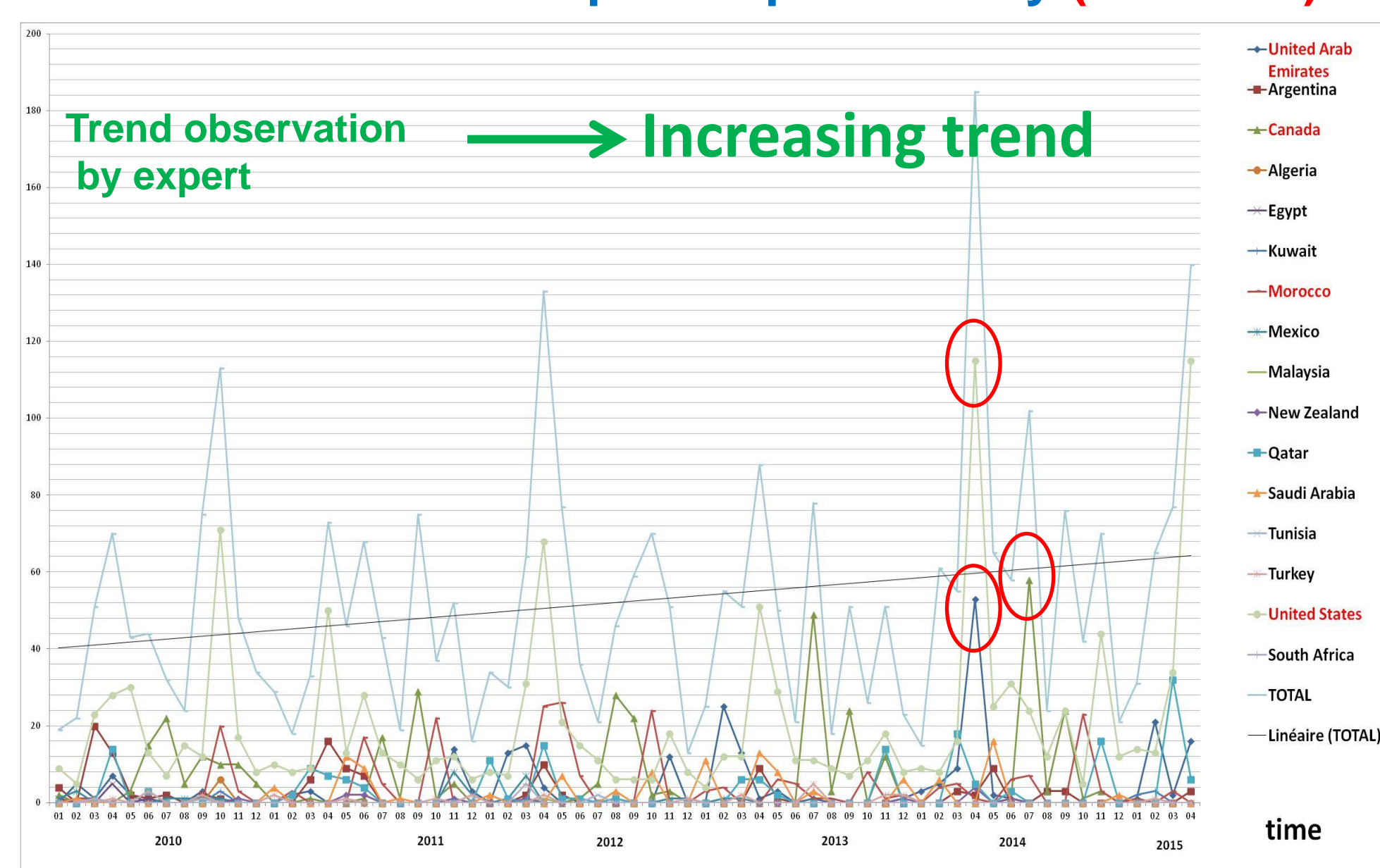
Historical data of 4 measurable risk indicators were **retrospectively monitored** on a monthly basis. Time frequency charts were visually examined for trends (trends observation). Statistical methods using detection algorithms (ex. Holt-Winters) were applied to detect baseline patterns and baseline overruns. Observed trends (expert opinion) and/or baseline overruns (quantitative approach) may lead to the detection of a generic **pre-alert signal** to be followed by a **risk assessment**. An **alert** can be emitted by experts if the risk of emergence of a disease is judged to be real.

Step 1

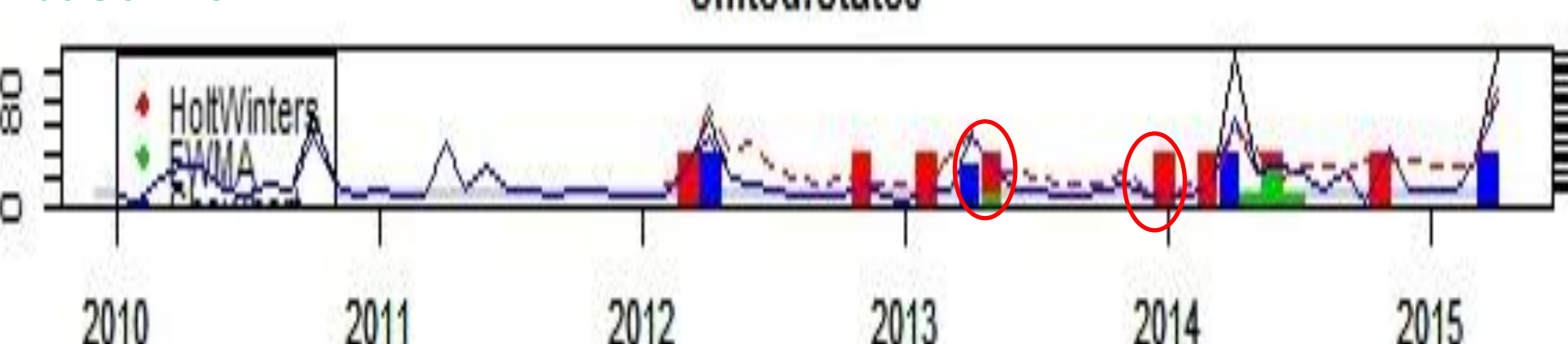
Forecasting indicators = indicators of risk of emergence		Data sources
1	Increase or modification of animal movements (e.g. commercial exchanges)	TRACES
2	Extension of the geographical distribution of the infectious agent or of the disease in animals and/or humans	ProMed, ADNS, WAHID
3	Increase of the incidence (new cases in animals and/or humans) in other countries	ProMed, ADNS, WAHID and health alerts of the OIE
Early warning indicators = indicators of disease emergence		
4	Increase of mortality rate of animals	Rendering company

Step 2 + 3: Monitoring of data and trend observation/analysis

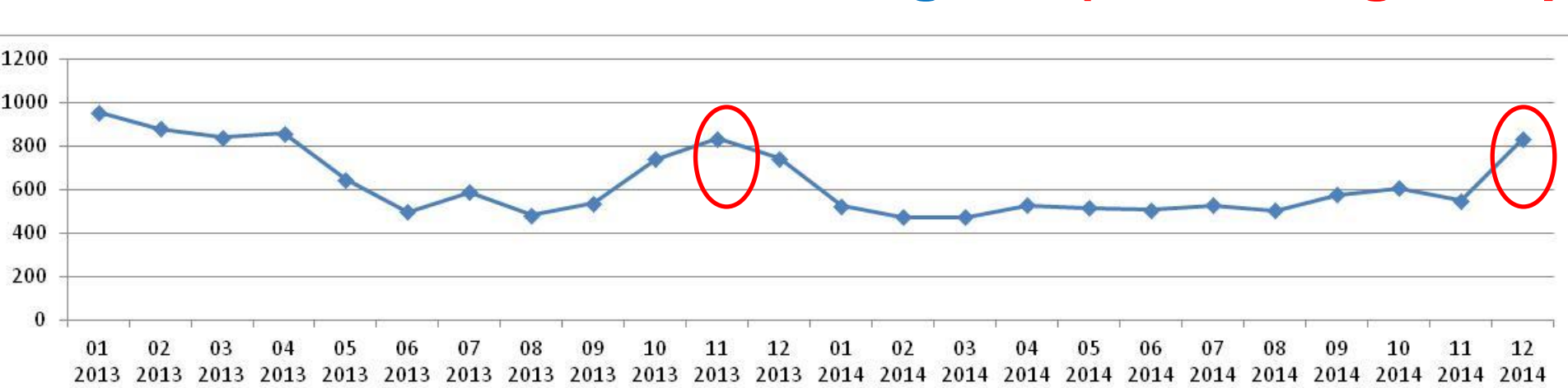
Ex: number of horses imported per country (TRACES)



Statistical (quantitative) detection of overrun of a baseline → **baseline overruns**



Ex. Number of dead horses in Belgium (Rendering company)



Generic pre-alert signal

Step 4: Risk assessment

Ex.: equine diseases in exporting countries (WAHID)

Equine diseases and infections	Canada		Morocco		United Arab Emirates		USA	
	2014	2015	2014	2015	2014	2015	2014	2015
Contagious equine metritis	never	never	never	never	0	0	x	/
Dourine	0	/	0	0	never	never	0	/
Equine encephalomyelitis (Western)	0	/	never	never	never	never	x	/
Equine encephalomyelitis (Eastern)	x	/	never	never	never	never	x	/
Venezuelan equine encephalomyelitis	never	/	never	never	never	never	0	/
Equine infectious anaemia	x	/	0	0	never	never	x	/
Equine influenza	x	/	0	0	0	0	x	/
Equine piroplasmiasis	0	/	x	x	0	0	x	/
Glanders	0	/	0	0	never	never	0	/
African horse sickness virus	never	/	0	0	never	never	never	/
Equine viral arteritis	x	/	x	0	never	never	x	/
Equid herpesvirus-1 (EHV-1)	x	/	x	x	0	0	x	/

x: present in 2014; 0: not reported in 2014; never: never reported; /: no information

Alert? → Possibility to obtain monthly data → Refine analysis

Conclusions, perspectives and recommendations

1. Measurable risk indicators can be monitored from existing datasources.
2. Trend watching or trend analysis of risk indicators followed by risk assessment can provide information for generic alert setting.
3. Further prospective study is necessary to prove the efficacy of a monitoring of risk indicators to really predict an emergence of an animal disease. Comparison of prospective baselines for indicators with real time values may allow to statistically early detect baseline overruns and forecast emergence risk situations.
4. A dedicated risk alert cell should further develop this forecasting system in order to combine early signals and to identify threshold levels for alert setting.