



Forecasting Outbreaks (Part 2)

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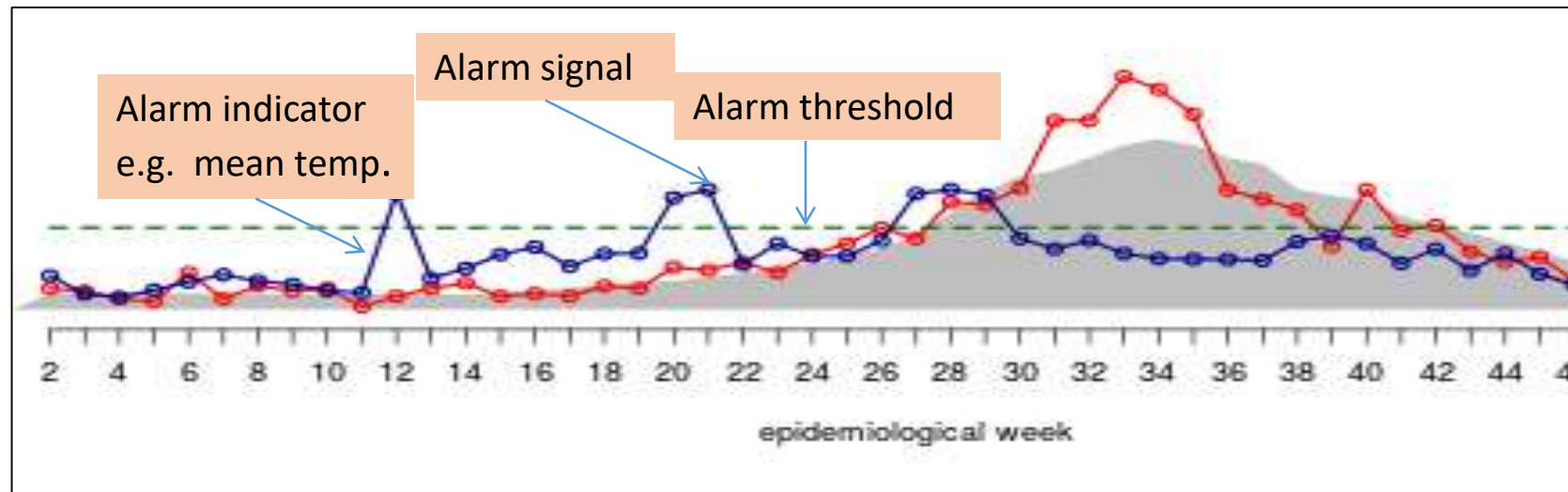
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Definitions (2a): OUTBREAK ALARM

- **Alarm indicator** = A variable which might show that an outbreak is coming.

(Metereological, entomological, epidemiological, social alarm indicators)

Suitable alarm indicators are weekly available throughout the year and of suitable quality (see following table)



Potential Alarm indicators: Pros and Cons

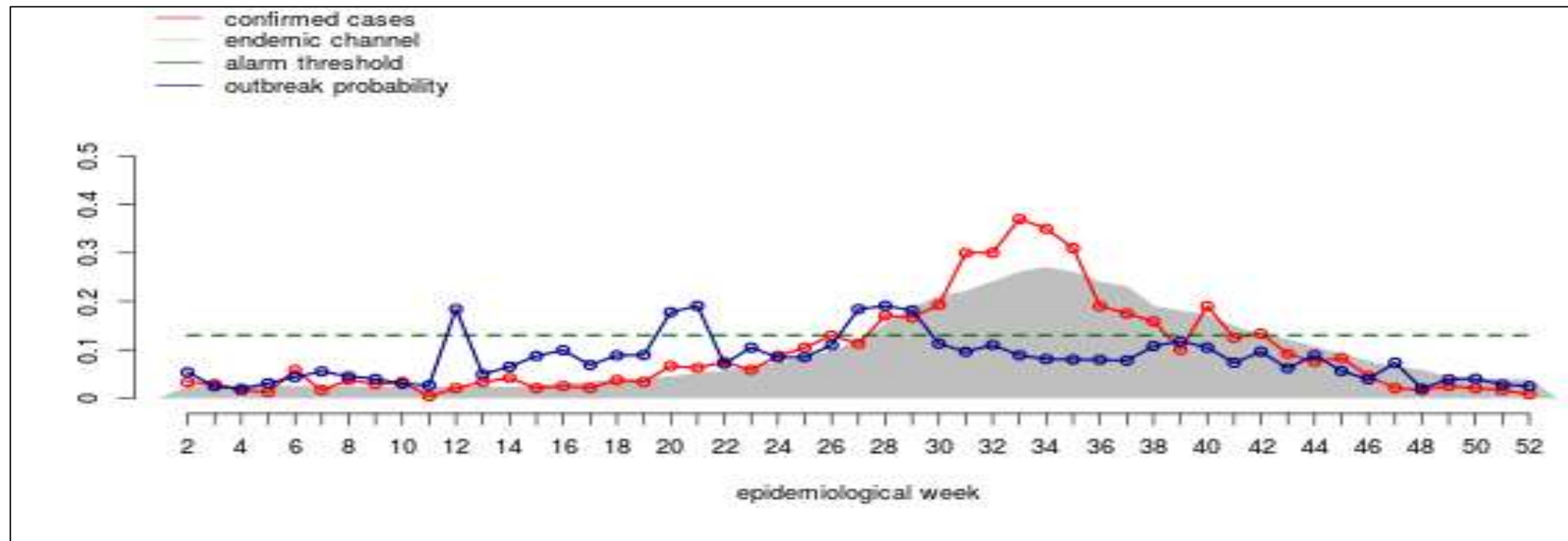
Alarm indicators	Weekly availability	Issues
<u>Meteorological</u> (temperature, rainfall, humidity)	+++	<ul style="list-style-type: none"> • Irregular meteorological stations • MoU with met. services required • Less precision with satellite images
<u>Entomological</u> - larval indices	++?	<ul style="list-style-type: none"> • Inconsistent collection • Difficult to standardise
- ovitrap indices	+++	<ul style="list-style-type: none"> • Routinely collected; easy to standardise
<u>Epidemiological</u> - Patients` age	+++	<ul style="list-style-type: none"> • Indicates probably change of serotype • Often not weekly reported • No weekly reports
- % seropositivity of samples	(+)	
- predominant serotype	(+)	
<u>Event based</u> - Social media reports	(+)	<ul style="list-style-type: none"> • Usefulness to be tested • occasionally
- Large gatherings	-	
- Others		

Definitions (2b): OUTBREAK ALARM

- **Alarm threshold** = Line above which an alarm indicator turns into an alarm signal
- **Alarm signal** (outbreak alarm) = Values of the alarm indicator (e.g. mean weekly temperature) above the alarm threshold
- **Alarm window** = The time (number of weeks) we wait after the alarm indicator has crossed the alarm threshold (to avoid singular alarm spikes triggering an outbreak alarm)

Synoptic view: alarm and outbreak

The **alarm indicator** (blue line) turns into an **alarm signal** (above the dotted green line) and is followed by an outbreak (case numbers, red line, cross the upper level of the endemic channel, grey area)



Definitions (2c): STAGED ALARM

- **Initial alarm (weeks before start of outbreak, lower level of probability)** = single alarm signal (after completing the alarm window) is present for one or two weeks
- **Early alarm (weeks before start of outbreak but higher probability)** = Multiple alarm signals in the 1st week OR one alarm signal for more than 2 weeks
- **Late alarm** = When the outbreak has already started (i.e. case numbers have crossed the alarm threshold for more than 2 weeks)

NB. The level of the outbreak response depends on the type of alarm (staged response)