

Novel Signal Detection Methods for COVID-19 Vaccine Safety Surveillance

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VACCINES
& INFECTIOUS
DISEASES

 **AusVaxSafety**
An NCIRS led collaboration



Background

- Vaccination is safe and side effects are usually minor/temporary
- **BUT** there are always risks
- **How** do we monitor vaccine safety?
 - Clinical trials (**active**, selected/healthy population)
 - Spontaneous reports (passive, **general population**)
 - AusVaxSafety (**active, general population**)

AusVaxSafety

- SMS sent to participants after vaccination
- SmartVax, Vaxtracker and CVMS data capture
- Safety data summarised weekly
- **Signal detection methods to identify changes in safety**



Australia's active vaccine safety system

NCIRS AusVaxSafety PAEDS

AusVaxSafety
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About us Our work Safety data News & events Resources

COVID-19 vaccine safety surveillance

Our work

- National vaccine safety surveillance
- Active vaccine safety surveillance
- COVID-19 vaccine safety surveillance
- What is AusVaxSafety doing?
- How will AusVaxSafety monitor vaccine safety?

AusVaxSafety is conducting national COVID-19 vaccine safety surveillance in Australia. This is to ensure ongoing safety of COVID-19 vaccines used in Australia to promote provider and public confidence in the vaccination program.

Click on the tiles below to find out more.

What is AusVaxSafety doing?
AusVaxSafety is conducting active safety surveillance of COVID-19 vaccines in Australia. Find out more here.

How does AusVaxSafety monitor vaccine safety?
Find out how is AusVaxSafety monitoring COVID-19 vaccine safety here.

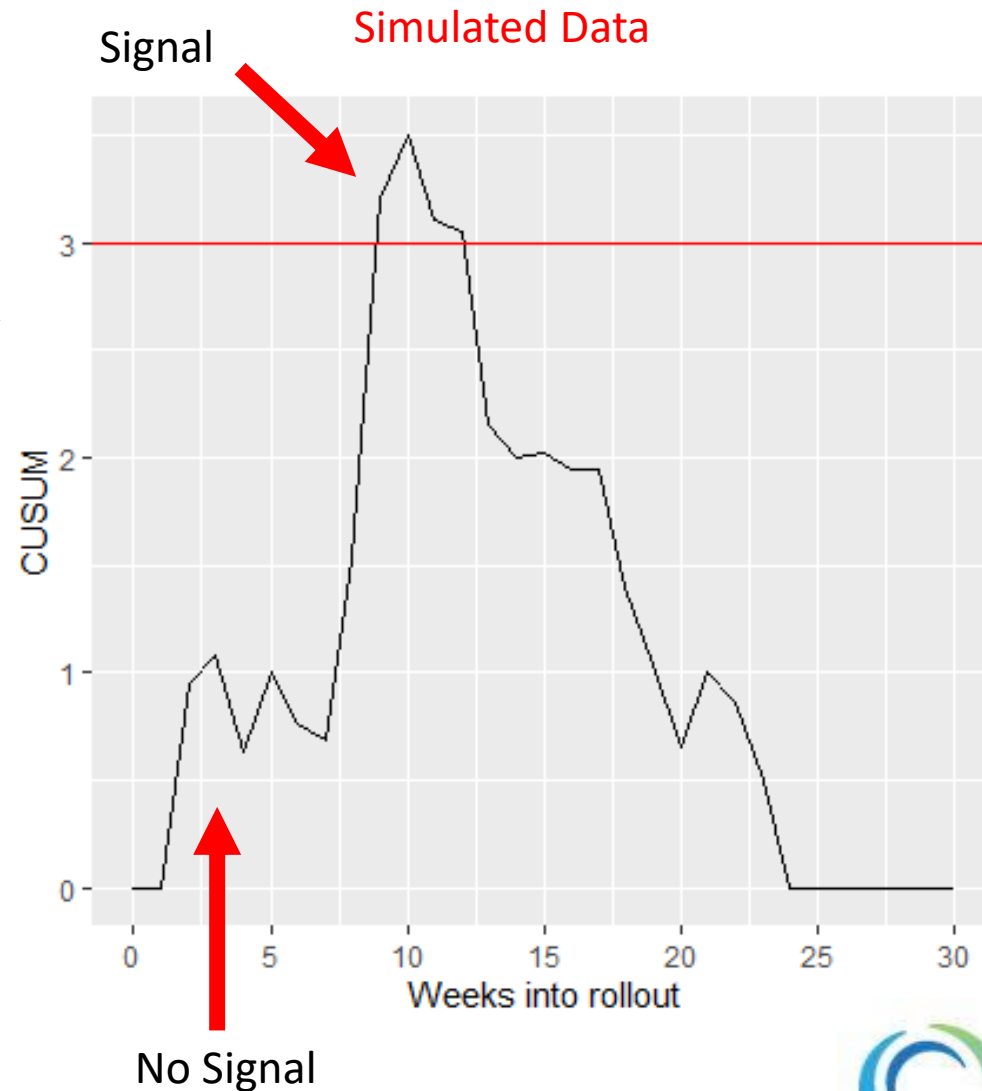
Signal Detection

- Rate of reported medical attention for adverse event within 3 days following immunisation (**medical attendance**)
- Cumulative Sum Control Chart (**CUSUM**)
 - Implemented since March 2021
- Bayesian Posterior Predictive Analysis (**PPA**)
 - Implemented since July 2021



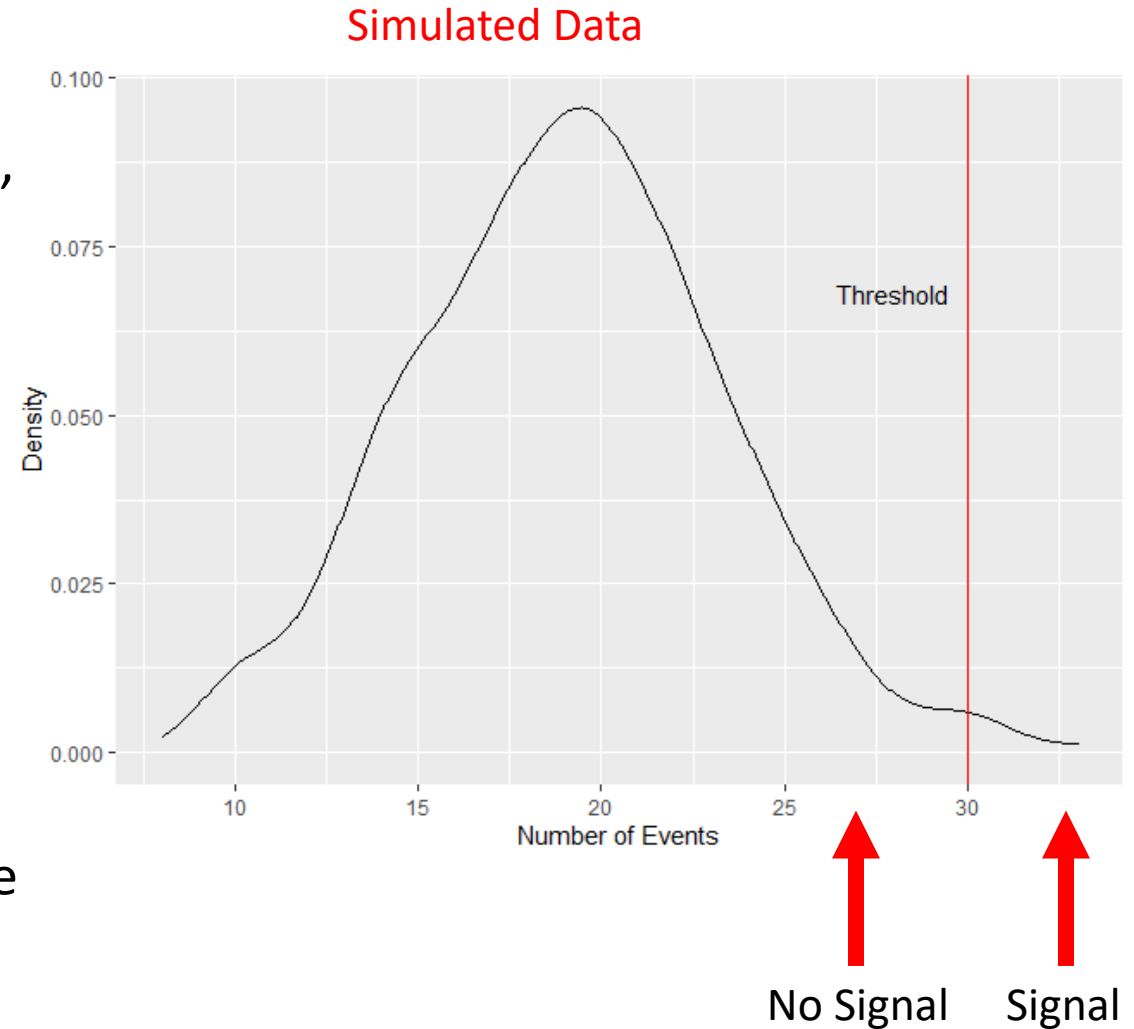
CUSUM

- Monitor how a rate **changes** over time
- Choose:
 - Expected rate
 - Maximum rate
 - Threshold
- **More** events → **Increased** evidence
- **Fewer** events → **Decreased** evidence
- Evidence > threshold → Investigate







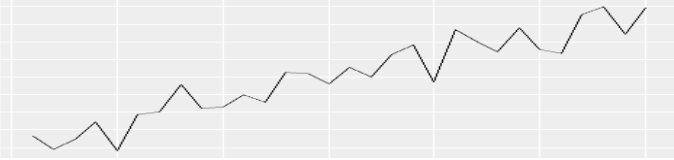


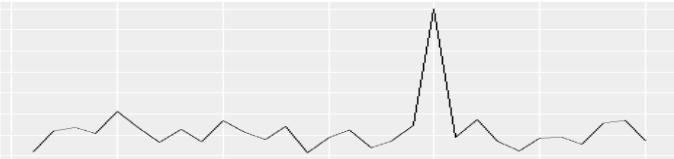






PPA

- Estimates probability of **medical attendance** accounting for participant characteristics (e.g., age, sex and comorbidities)
- Each week predicts expected **range** for number of medical attendances **given** participant characteristics
- Sets a **threshold** based on the range
- **Actual** number of events $>$ threshold \rightarrow Investigate



Compare the pair

		CUSUM	PPA
Detects changes in rate over time			
Accounts for participant information			
Requires preset thresholds			
Is sensitive to small gradual changes			
Is sensitive to small sudden changes			
Can determine the cause			

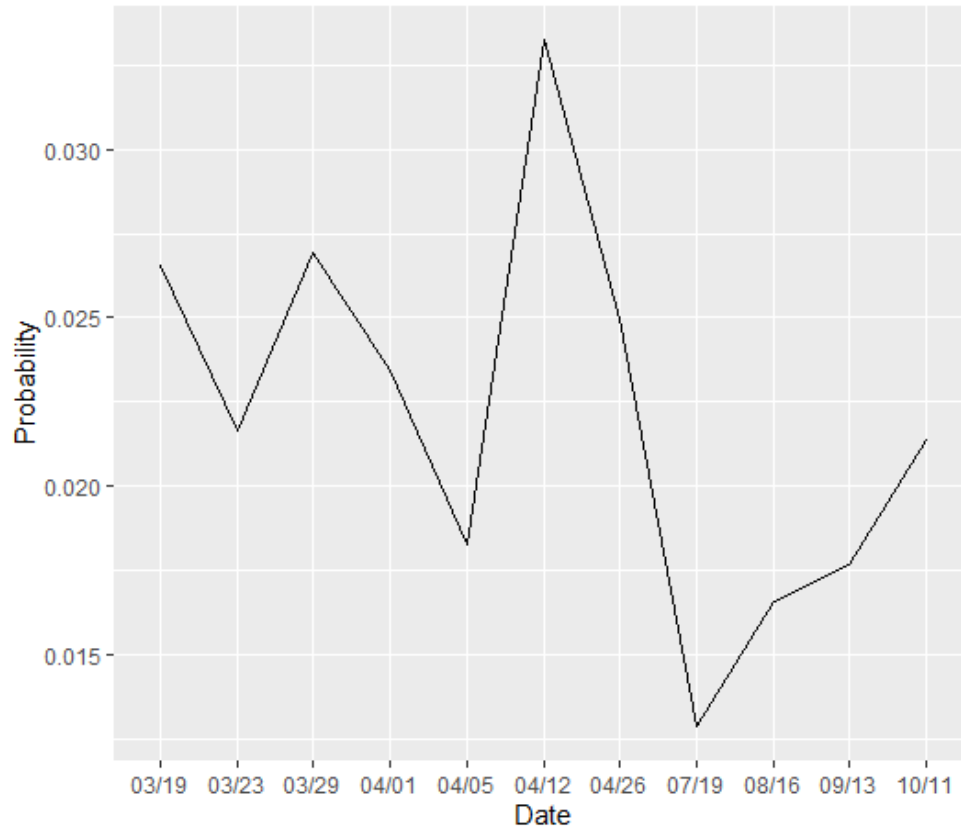


What about the real data?

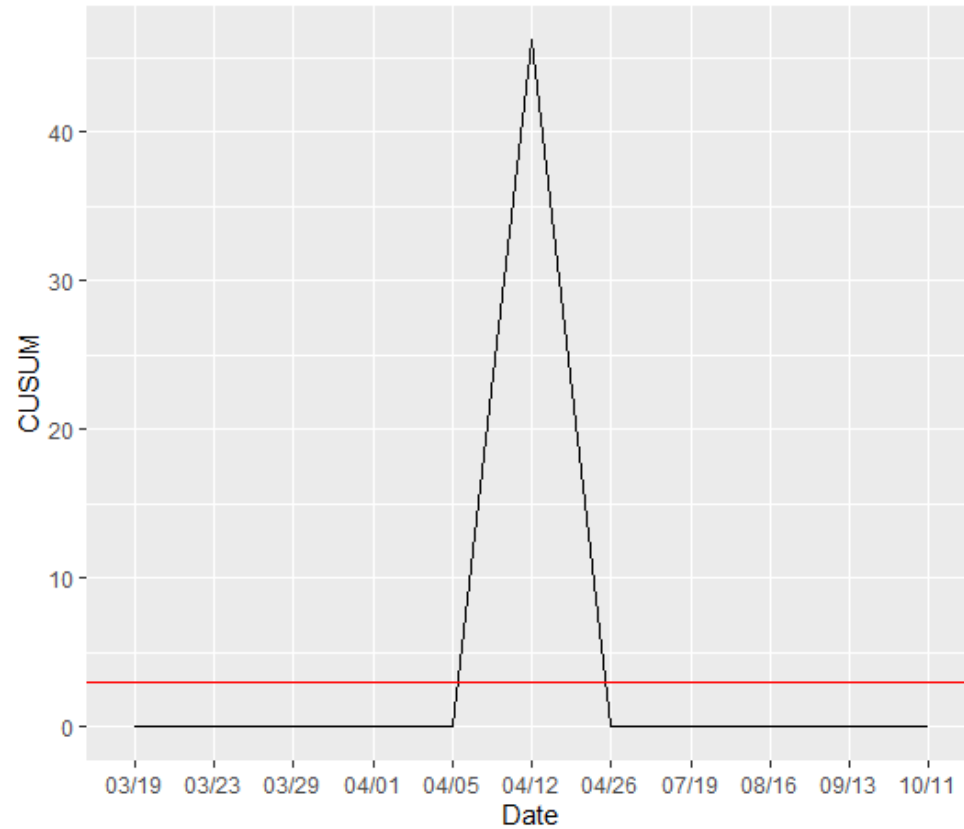
- Both methods have detected signals at different points in time*
- Signals do not necessarily mean there is a vaccine issue – there could be many causes
- Why would one method detect a signal but not the other?
 - Evolution of the responding “population”
 - The methods are **technically** designed to monitor different effects

*see Catherine Glover’s talk for details on signal investigation

AstraZeneca Dose 1 Under 50s

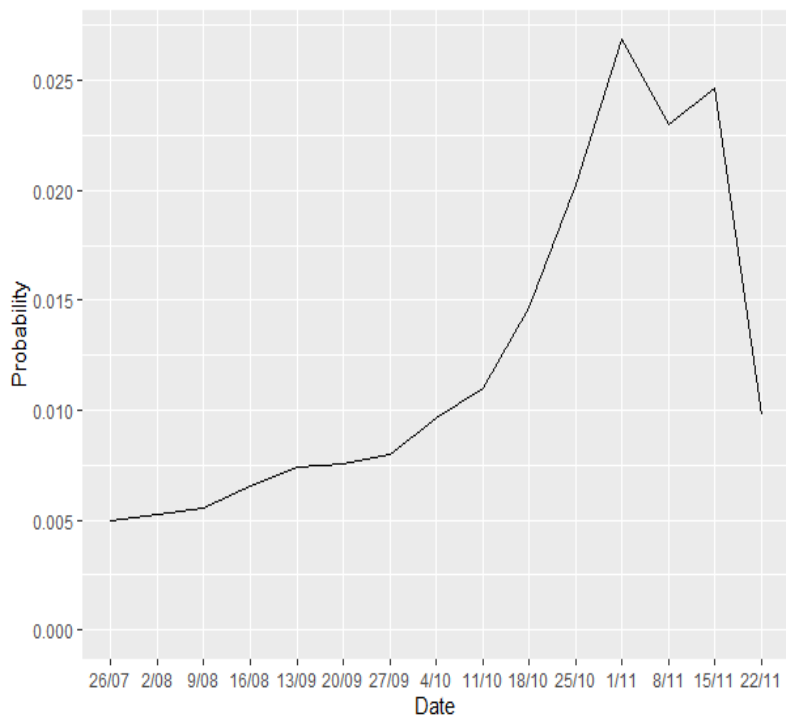


Raw Rate

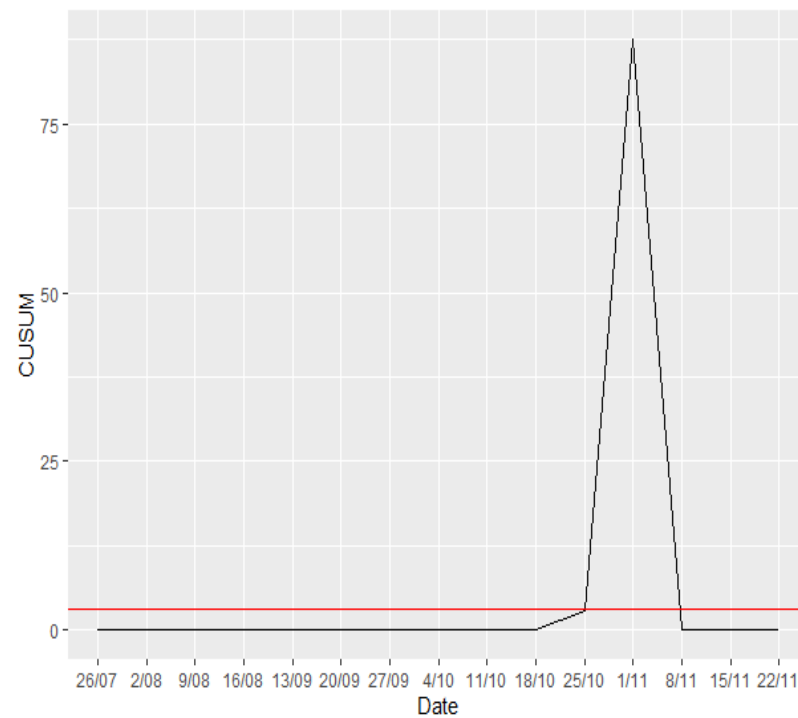


CUSUM

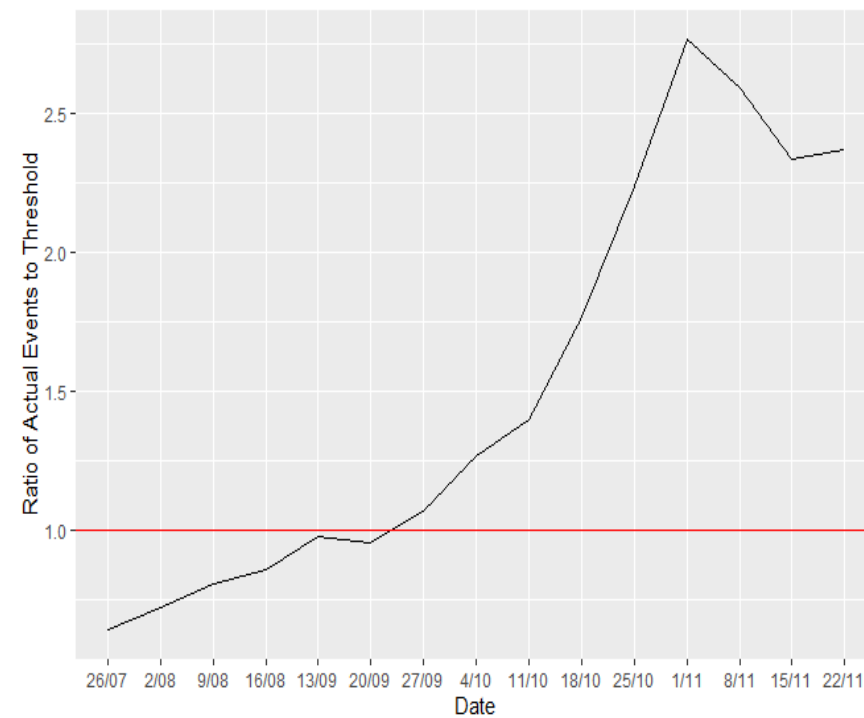
Comirnaty Dose 1 Under 50s



Raw Rate



CUSUM



PPA



What we are doing now

- Continuing using both CUSUM and PPA methods
- Extending the PPA method to model missing data
 - i.e., what do we know about the people that **do not respond** to the survey?
- Developing a causal model

Acknowledgements

