MEDINFO23

8 – 12 JULY 2023 | SYDNEY, AUSTRALIA

Centre for Health Analytics

@kidsanalytics

SNOTWATCH: A novel population level spatiotemporal ecologic approach to understanding impact of common respiratory viruses

Jim Buttery

Professor of Child Health Informatics

University of Melbourne

Melbourne Children's Campus

AIDH IMIA

Centre for Health Analytics

Unleashing the power of data to improve health

healthanalytics.org.au

Melbourne Children's

A world leader in child and adolescent health

The Royal Children's Hospital Melbourne

murdoch children's research institute

The University of Melbourne

Supported by The Royal Children's Hospital Foundation

Data services

Data systems

Workforce

Interoperability

Research

Engagement

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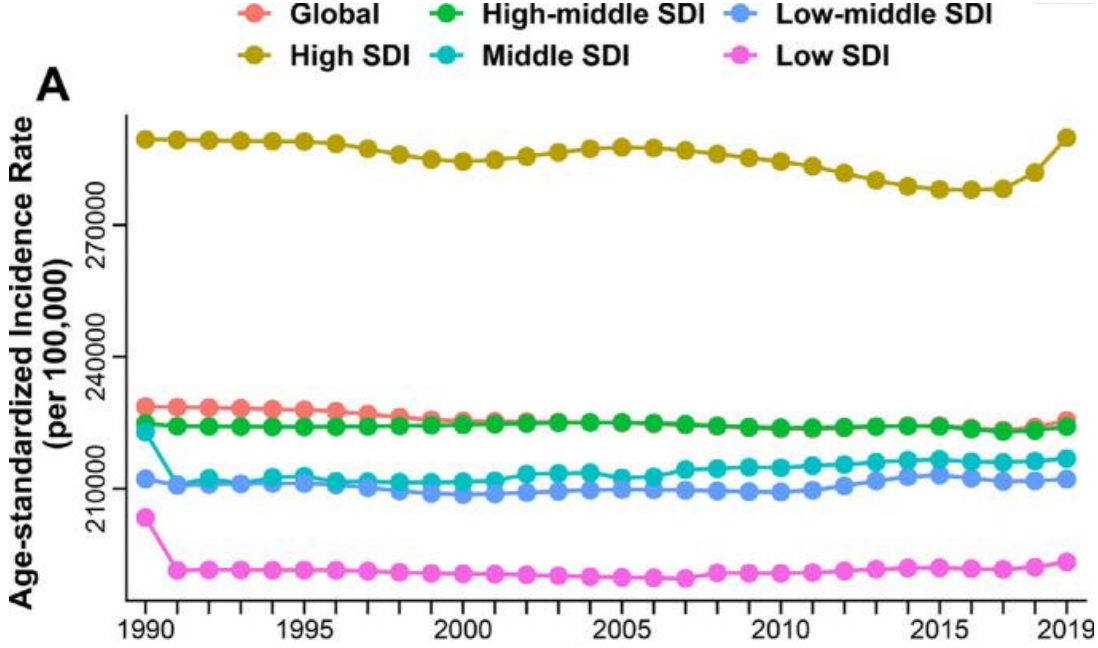
Respiratory viruses: 17 billion p.a. pre pandemic[1]



1. doi: 10.1016/j.eclinm.2021.100986

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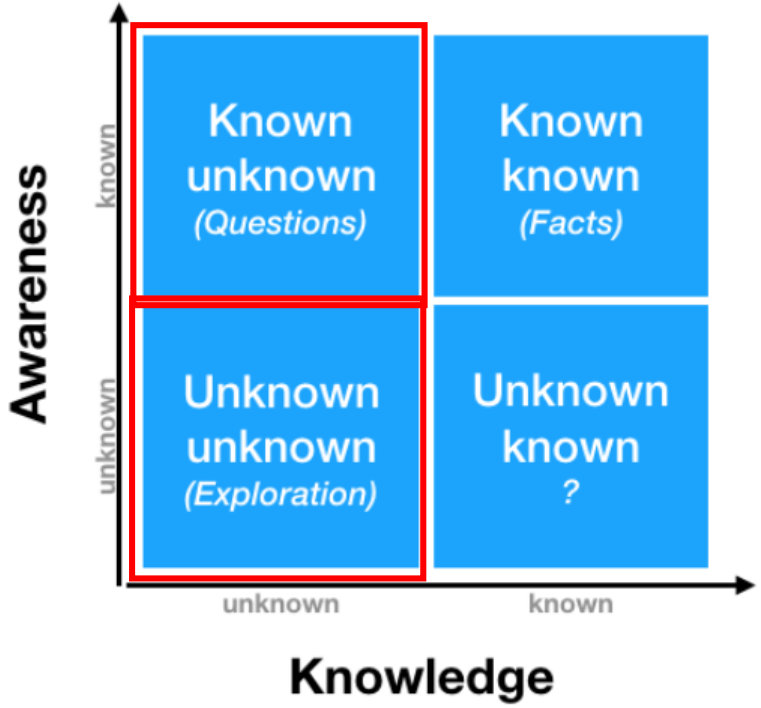

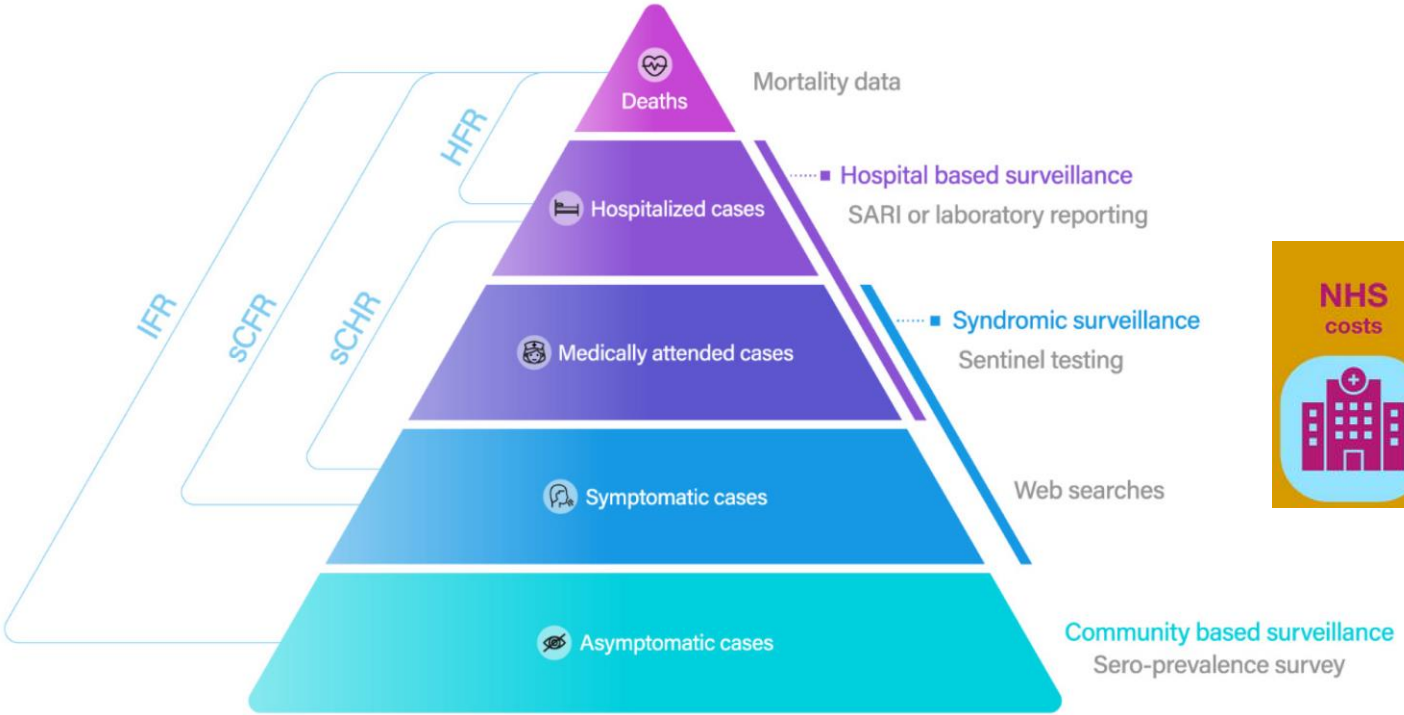

1. Ryu S, Chun JY, Lee S, Yoo D, Kim Y, Ali ST, Chun BC. Epidemiology and Transmission Dynamics of Infectious Diseases and Control Measures. *Viruses*. 2022; 14(11):2510. https://doi.org/10.3390/v14112510

Exposures:

Viruses & Environmental

Health Outcome Data

Associations between exposures and health outcomes.

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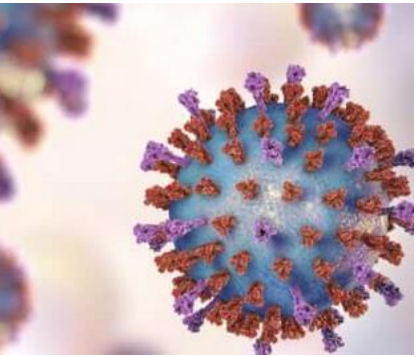
Capturing exposures

Respiratory Pathogens 16-well (Ref 20620)

16 well



- SARS-CoV-2 (2 assays)
- Influenza A
- Influenza B
- Respiratory Syncytial Virus A & B
- Rhinovirus / Enterovirus
- Parechovirus
- Parainfluenza 1, 2, 3, 4
- Adenovirus groups B, C, E, some A, D
- Metapneumovirus
- Bordetella spp.
- Mycoplasma pneumoniae

1. https://www.ausdiagnostics.com/respiratory-pathogens/

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Capturing exposures

PREDICTOR VARIABLES

Respiratory Viruses

197,926 positive tests from 2012-2022

Grass Pollen Concentration

Categorised as Low, Medium, High or Extreme levels of grass pollen concentration

School Term Dates

First two weeks considered "beginning of school term"

Humidity

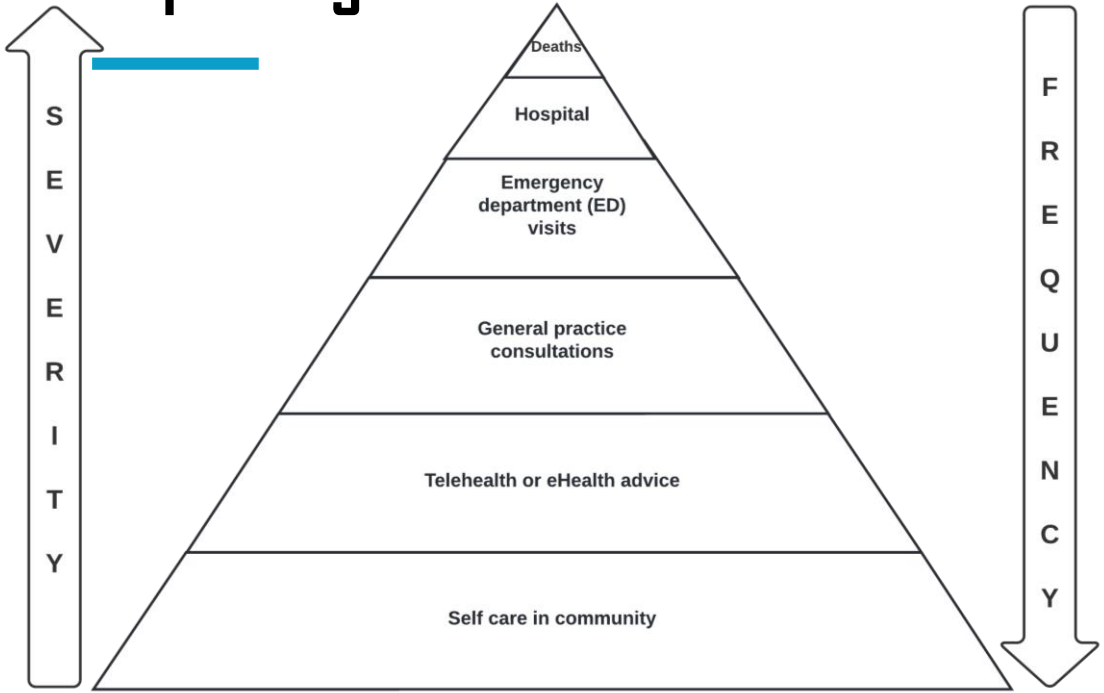
Thunderstorm Incidence

Lightning strike data used as surrogate measure of thunderstorms

Temperature

Mean minimum temperature for each week was included

Capturing outcomes



EHR/VAED statewide

EHR/VEMD statewide
Synsurv

POLAR
Synsurv
THE UNIVERSITY OF MELBOURNE
Patron

healthdirect
Synsurv

School absenteeism
Child care absenteeism

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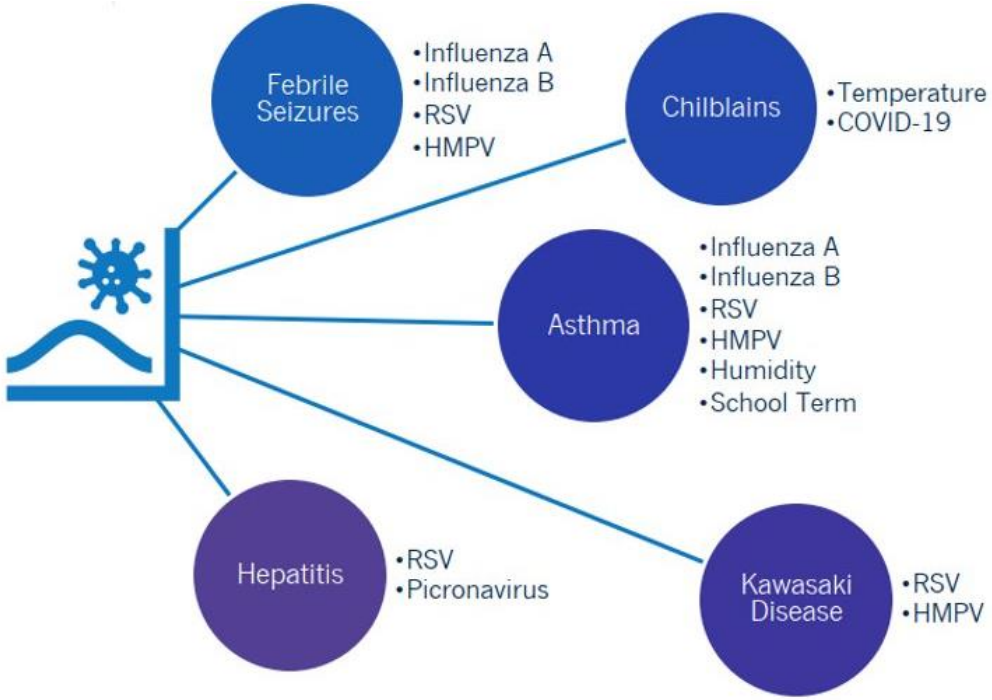
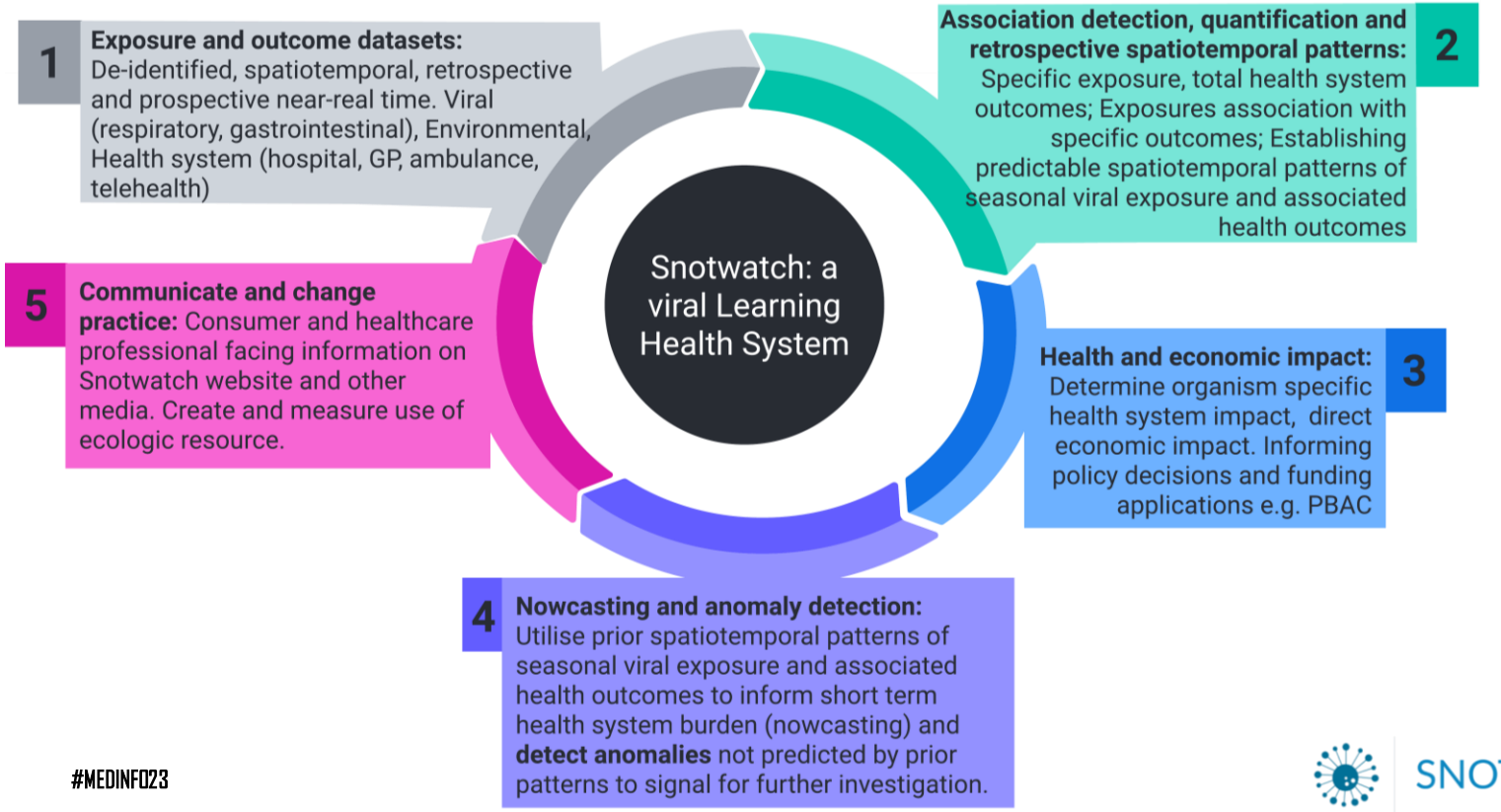


Febrile seizures – RSV, Flu, hMPV DOI: 10.1186/s12887-022-03222-4 / Chilblains- SARS-CoV-2 DOI: 10.1371/journal.pgph.0000488 / Paediatric hepatitis – mult viruses DOI:10.1097/INF.0000000000003828 / Kawasaki Disease- ESPID 2023 / Asthma- ESPID 2023


Snotwatch: a viral Learning Health System
1
Exposure and outcome datasets: De-identified, spatiotemporal, retrospective and prospective near-real time. Viral (respiratory, gastrointestinal), Environmental, Health system (hospital, GP, ambulance, telehealth)
2
Association detection, quantification and retrospective spatiotemporal patterns: Specific exposure, total health system outcomes; Exposures association with specific outcomes; Establishing predictable spatiotemporal patterns of seasonal viral exposure and associated health outcomes
3
Health and economic impact: Determine organism specific health system impact, direct economic impact. Informing policy decisions and funding applications e.g. PBAC
4
Nowcasting and anomaly detection: Utilise prior spatiotemporal patterns of seasonal viral exposure and associated health outcomes to inform short term health system burden (nowcasting) and detect anomalies not predicted by prior patterns to signal for further investigation.
5
Communicate and change practice: Consumer and healthcare professional facing information on Snotwatch website and other media. Create and measure use of ecologic resource.

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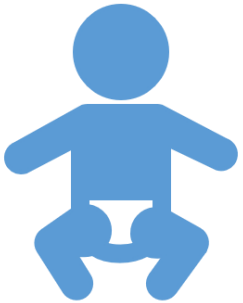
Virus Data

Kawasaki Disease



Associations between viruses and clinical presentations.

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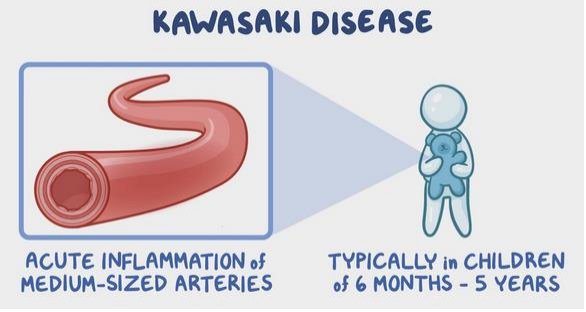
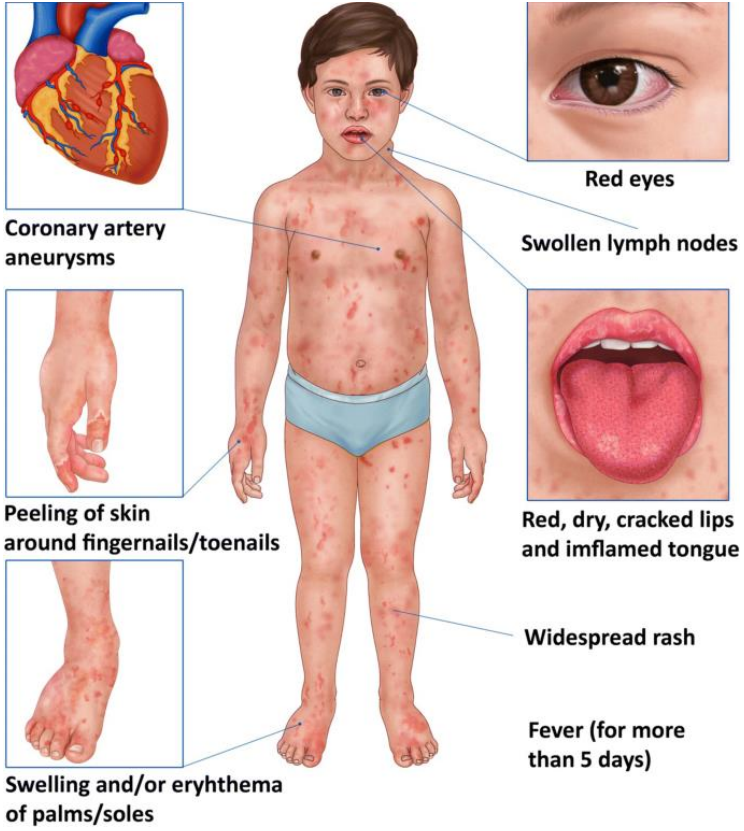
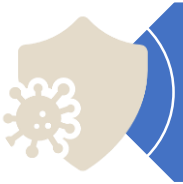




Cause unknown

No diagnostic test

Outcomes improved with IVIG



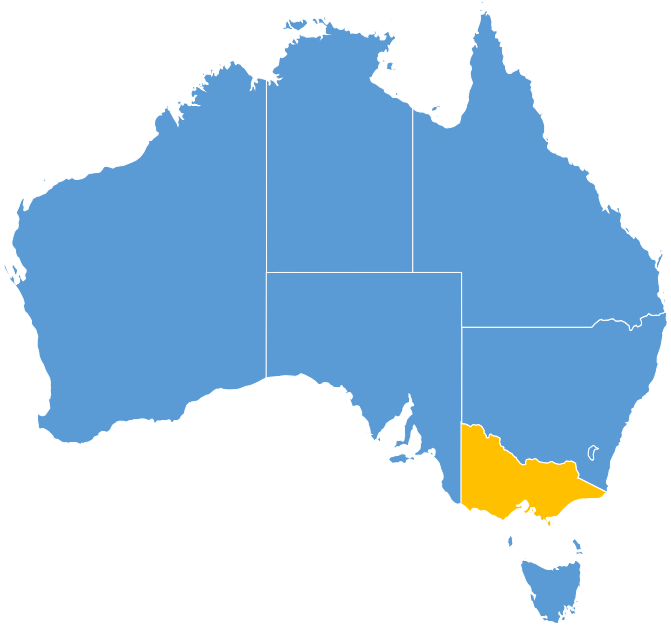
Infective trigger is likely

Seasonality suggested

Differentiating Kawasaki Disease from PIMS-TS*

Rationale

*PIMS-TS: Paediatric Inflammatory Multisystem Syndrome Temporally associated with SARS-CoV-2. Also called MIS-C (Multisystem Inflammatory Syndrome in Children)



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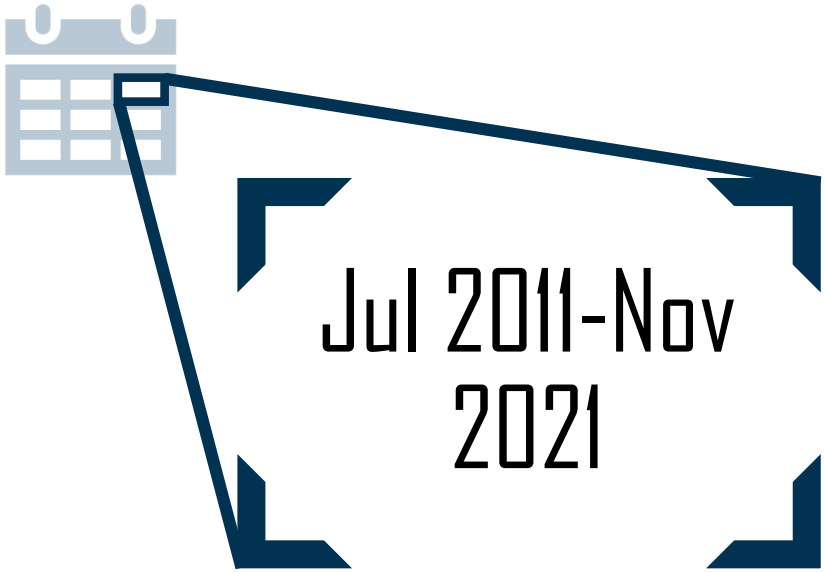
Jul 2011-Nov
2021

Independent Datasets

Kawasaki Disease

1,081 Presentations

Respiratory Multiplex PCR

153,153 positive PCR tests

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Methodology

Data Visualisation: Graphing and Mapping

Statistical Analysis: Spatiotemporal Associations

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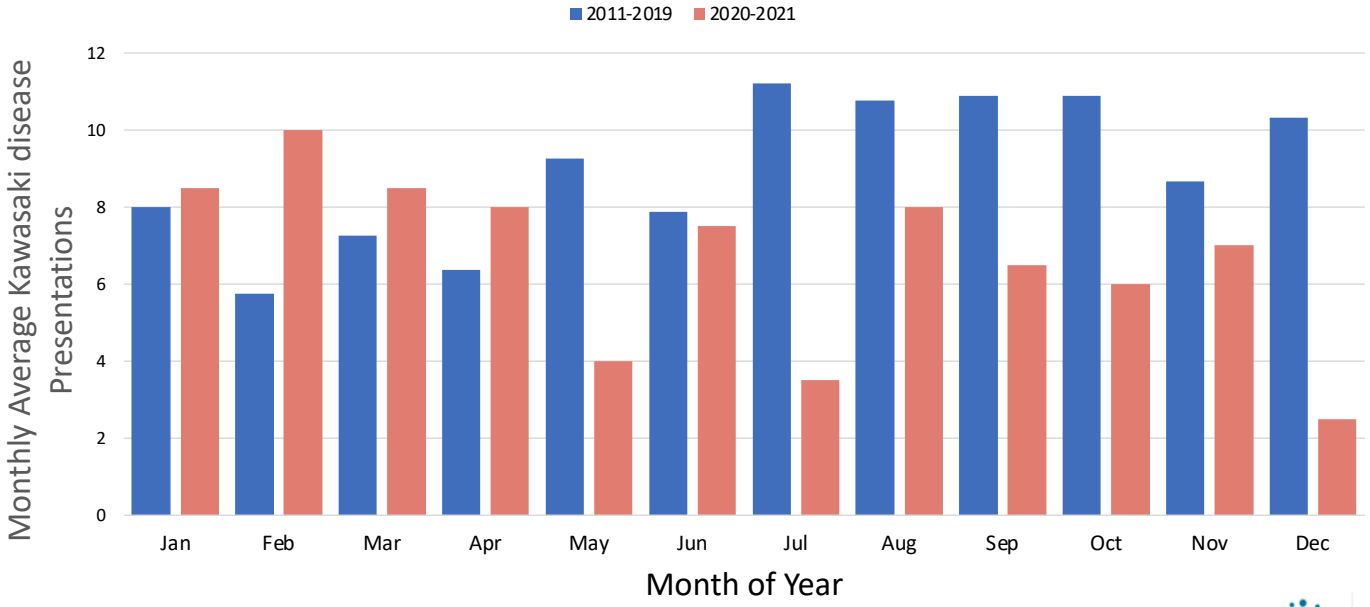
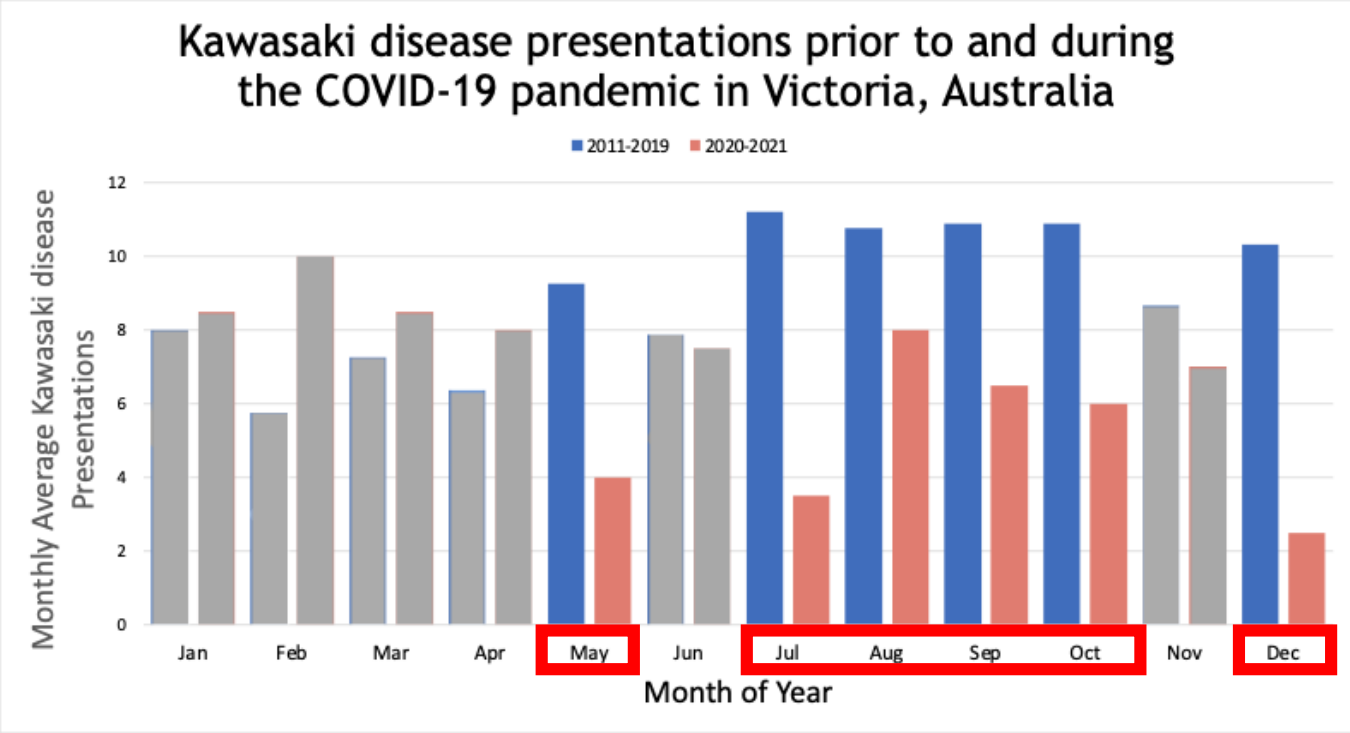
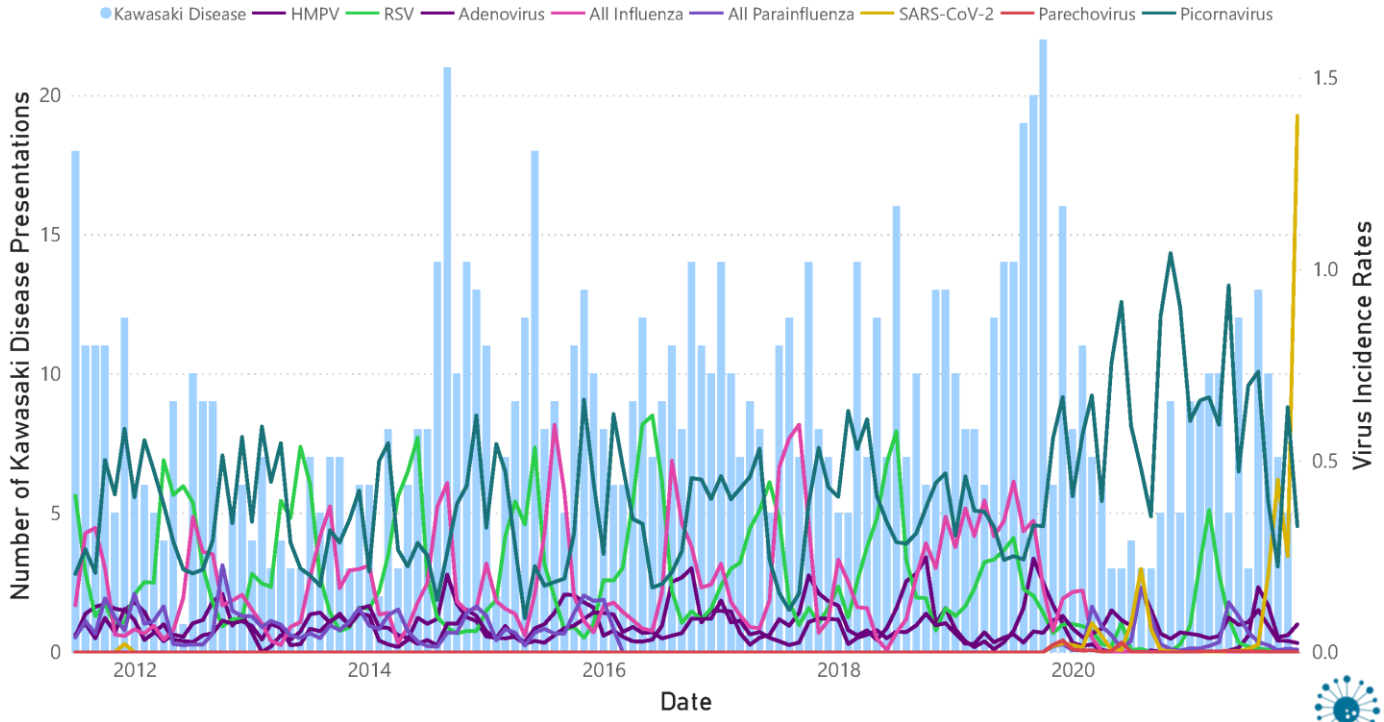
Kawasaki disease presentations prior to and during the COVID-19 pandemic in Victoria, Australia




Kawasaki disease presentations prior to and during the COVID-19 pandemic in Victoria, Australia
2011-2019
2020-2021
Monthly Average Kawasaki disease Presentations
0
2
4
6
8
10
12
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month of Year

Kawasaki Disease and Virus Incidence Rate 2011-2021



Virus	2011-2019 Risk Ratio (99%CI)	P-value	2020-2021 Risk Ratio (99%CI)	P-value
Adenovirus	1.06 (0.87-1.30)	0.45	0.96 (0.45-2.07)	0.89
COVID-19	-	-	1.00 (1.00-1.00)	0.15
HMPV	1.52 (1.27-1.82)*	<0.0001	0.99 (0.92-1.07)	0.78
Influenza A	1.12 (0.99-1.26)	0.02	1.03 (0.91-1.18)	0.49
Influenza B	1.02 (0.91-1.13)	0.71	1.00 (1.00-1.00)	0.37
Parechovirus	1.00 (1.00-1.00)	0.20	1.00 (1.00-1.00)	0.55
Picornavirus	0.91 (0.70-1.18)	0.34	1.21 (0.70-2.10)	0.38
Parainfluenza	1.01 (0.93-1.10)	0.76	1.01 (0.78-1.32)	0.92
RSV	1.43 (1.17-1.73)*	<0.0001	1.16 (1.00-1.35)	

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RSV	1.43 (1.17-1.73)*	<0.0001	1.16 (1.00-1.35)	

Interpreting the Findings

TEMPORAL PATTERNS
No seasonality identified.

CHANGES TO KAWASAKI DISEASE PATTERNS PRE- AND DURING PANDEMIC Support transmissible triggers.

VIRAL ASSOCIATIONS
Kawasaki disease is more likely in peak HMPV and RSV seasons.

COVID-19 PANDEMIC
SARS-CoV-2 is not a culprit.

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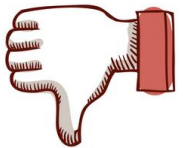
Relatively large cohort

Granularity of spatial component

Includes pre- pandemic and pandemic years

Association not causation

Skewed viral PCR coverage



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LinkedIn
au.linkedin.com/in/jim-buttery-824a4278

Email
Jim.buttery@mcri.edu.au

https://www.healthanalytics.org.au/

Twitter
@kidsanalytics

Thank you

Rana Sawires, Aaron Weinman, Deniz Akin, Hazel Clothier, Michael Fahey, Martin Kulldorf, Davis Burgner, Josh Osowicki, Chris Pearce, Adam McLeod

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