



IMMUNISATION  
COALITION



## Prof Jim Buttery

Professor of Child Health  
Informatics Paediatrics  
Royal Children's Hospital

SNOTWATCH: Ecological approaches to  
understanding the impact of respiratory viruses

3:00 pm





Centre  
for Health  
Analytics



SNOTWATCH

# SNOTWATCH: Ecologic approaches to understanding the impact of respiratory viruses

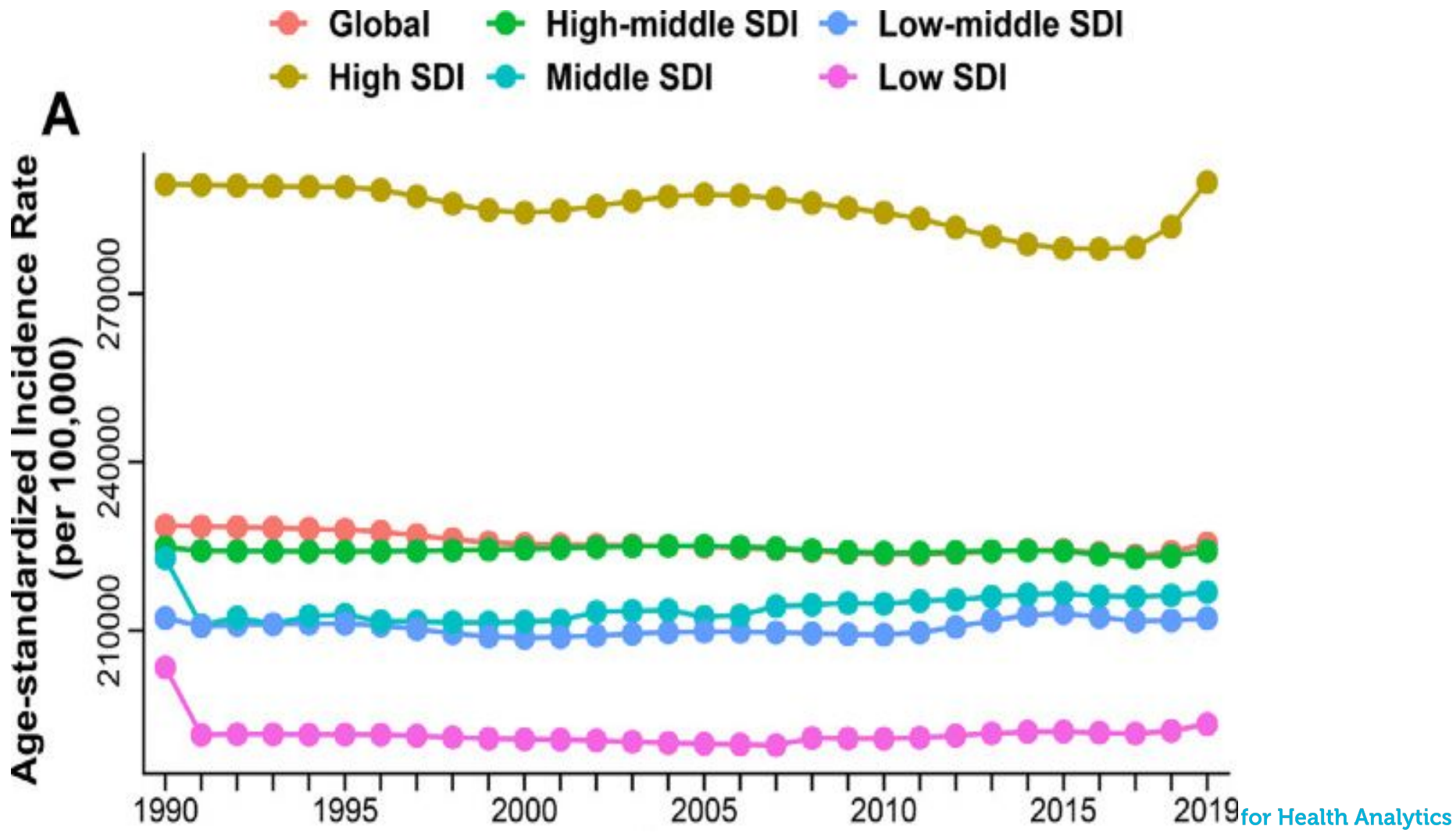
Professor Jim Buttery

University of Melbourne

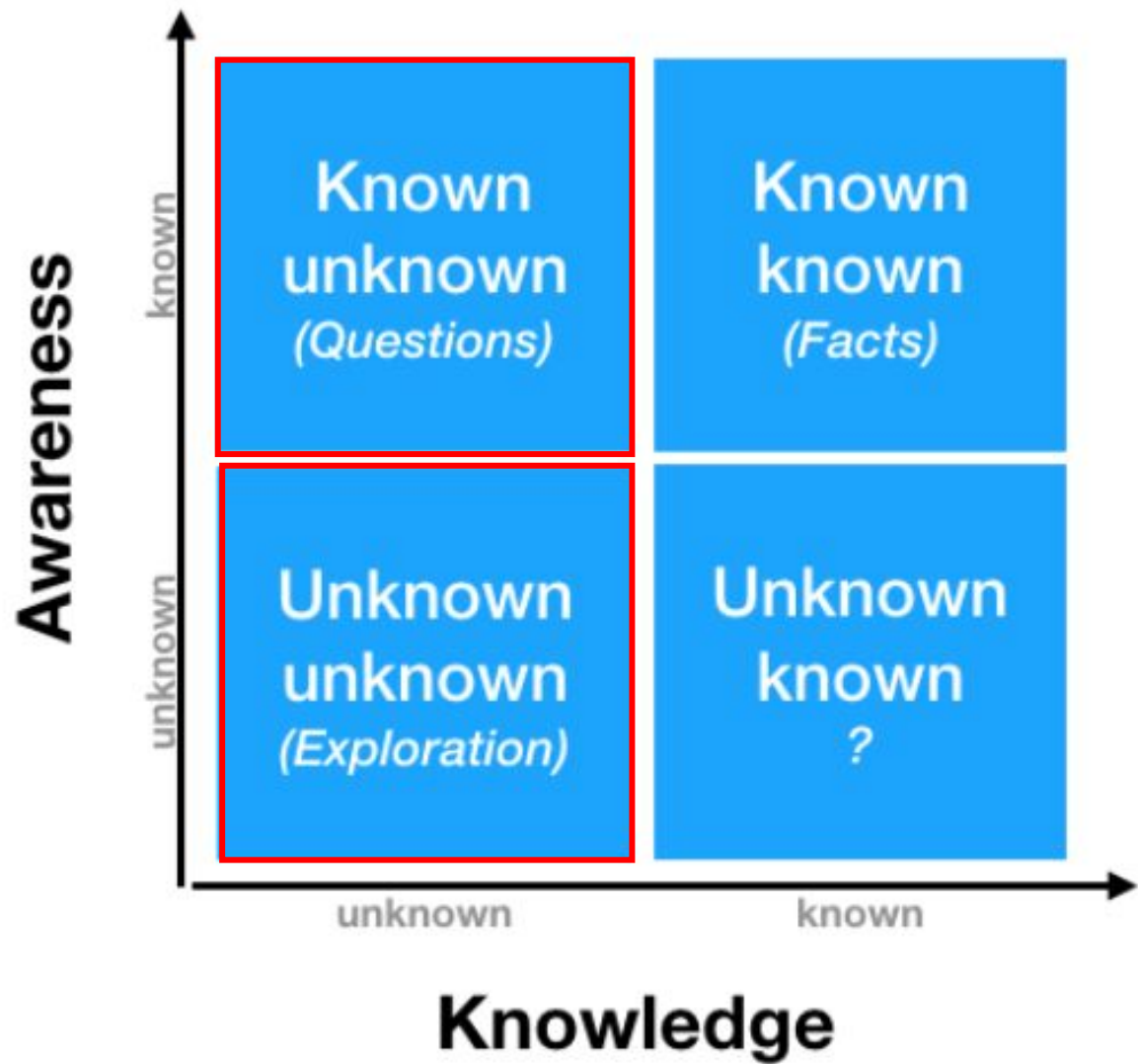
Epi-Informatics, Centre for Health Analytics

Immunisation Coalition  
25th Annual Scientific Meeting

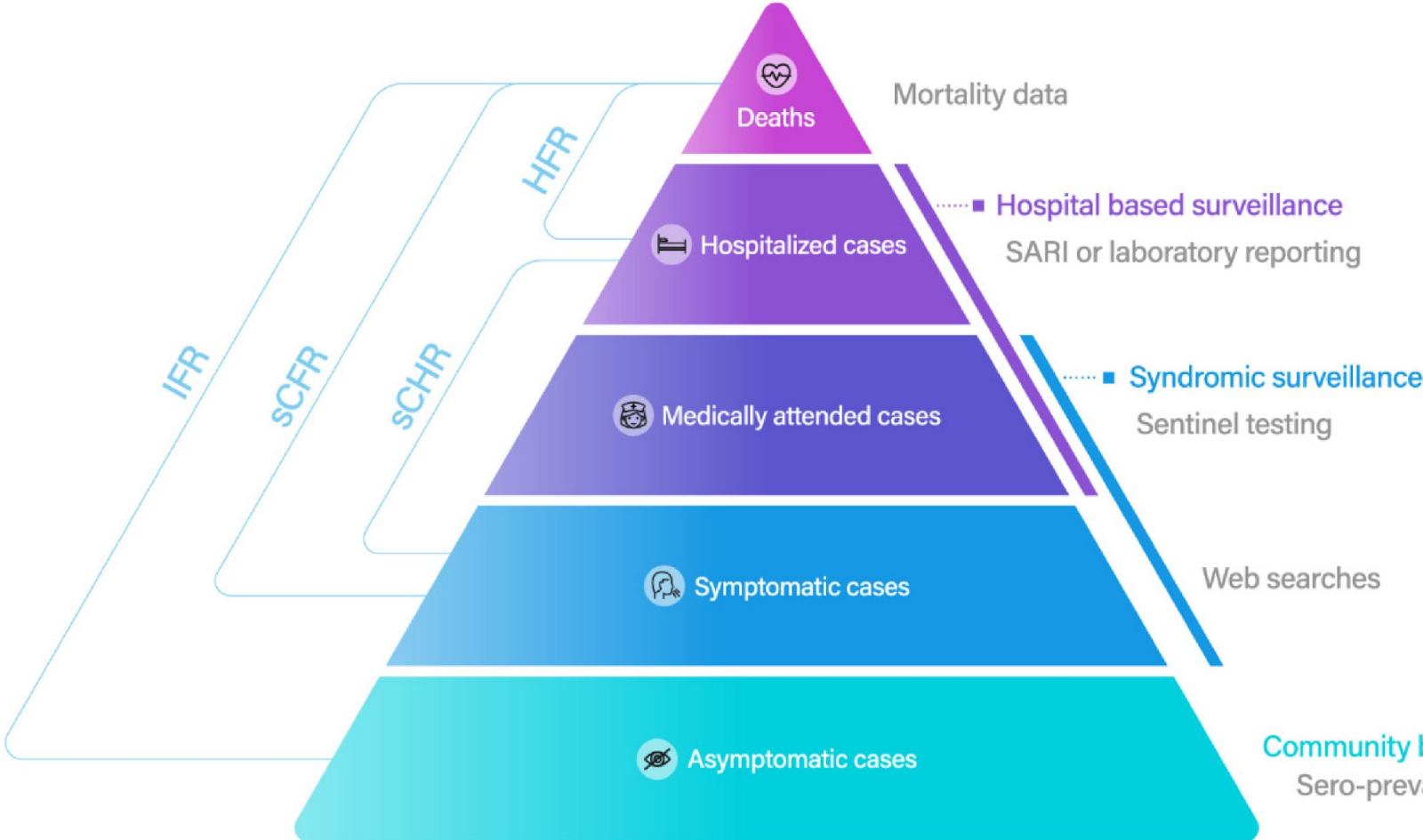
# Respiratory viruses: 17 billion p.a. pre pandemic<sup>1</sup>







# Health outcome presentations



**NHS costs**  
**Social care costs**  
**Productivity losses**

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>

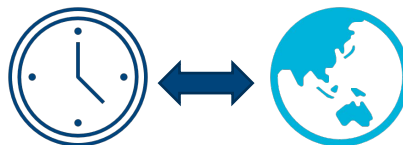


Exposures:  
Viruses & Environmental

Health Outcome  
Data

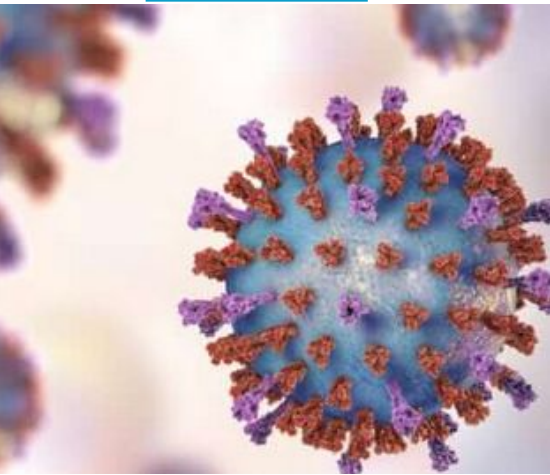


Associations between exposures  
and health outcomes.



# Capturing exposures

## Respiratory Pathogens 16-well (Ref 20620)



SARS-CoV-2 (2 assays)

Influenza A

Influenza B

Respiratory Syncytial Virus A & B

Rhinovirus / Enterovirus

Parvovirus

Parainfluenza 1, 2, 3, 4

Adenovirus groups B, C, E, some A, D

Metapneumovirus

Bordetella spp.

Mycoplasma pneumoniae

16

well



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

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# Capturing exposures

## PREDICTOR VARIABLES



### Respiratory Viruses

>4 M 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



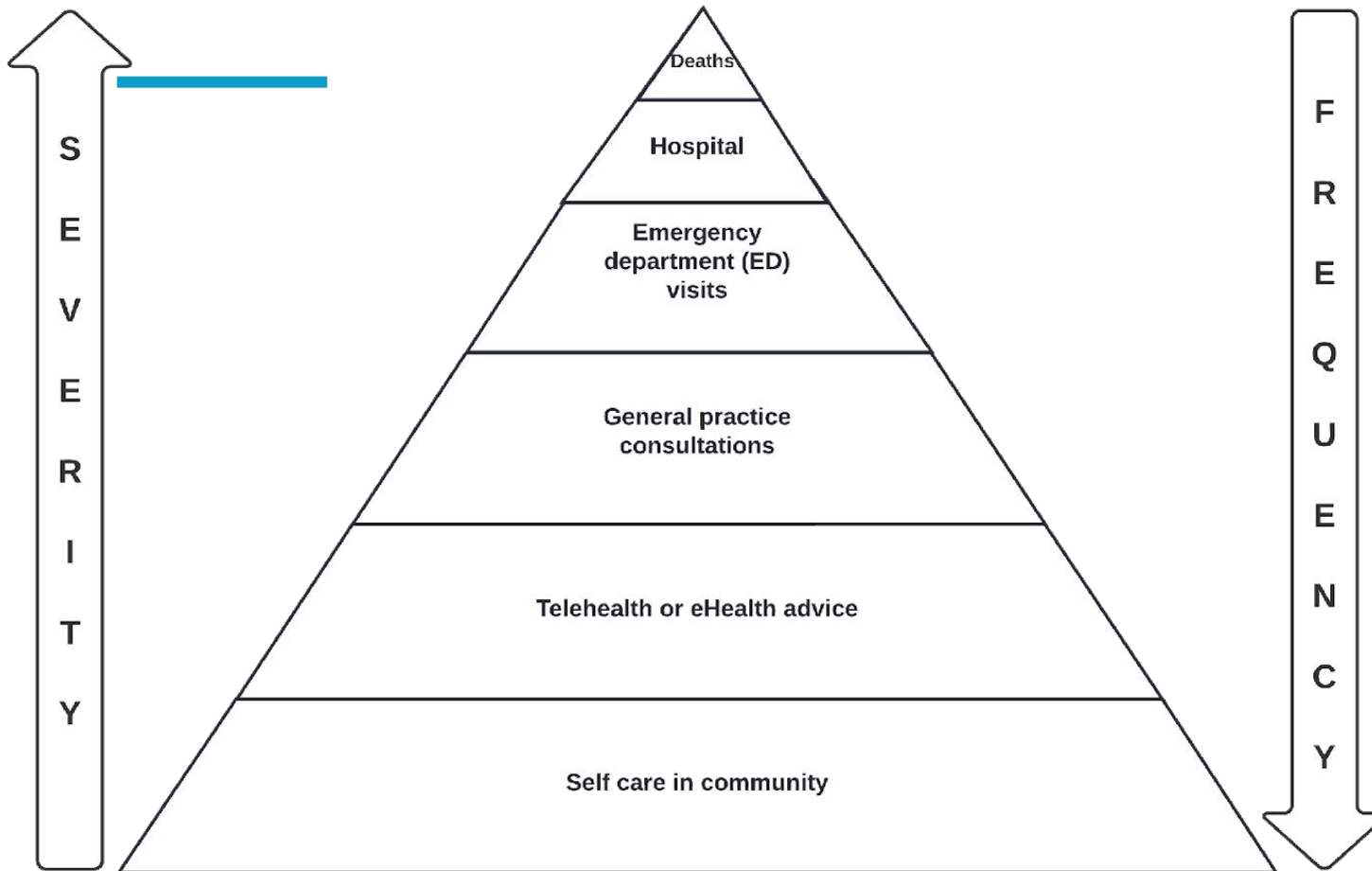
### Temperature

Mean minimum temperature for each week was included





# Capturing outcomes



EHR/VAED statewide

EHR/VEMD statewide  
Synsurv

**POLAR**  
Synsurv



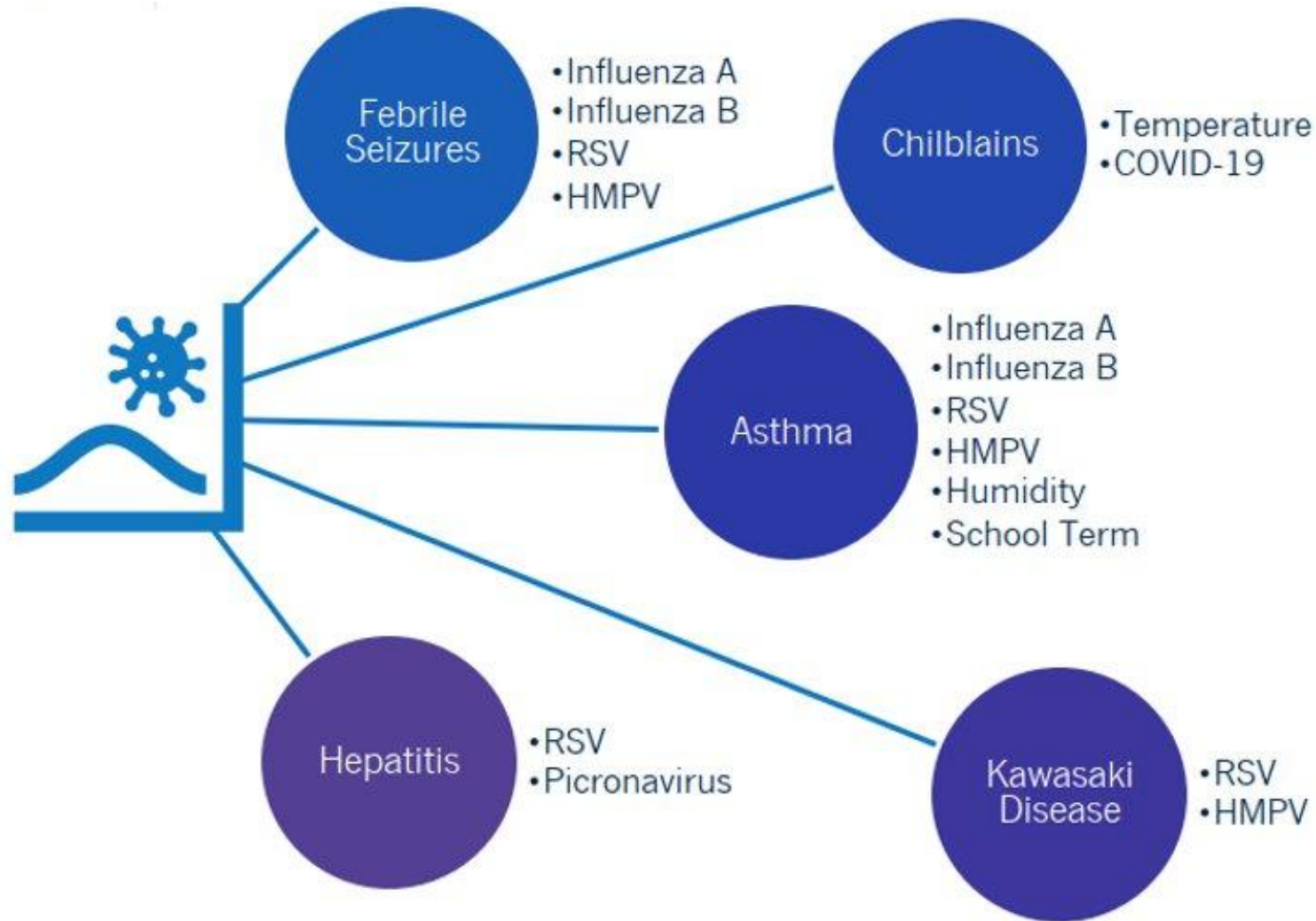
Patron

*healthdirect*  
Synsurv

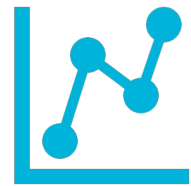
School absenteeism  
Child care absenteeism



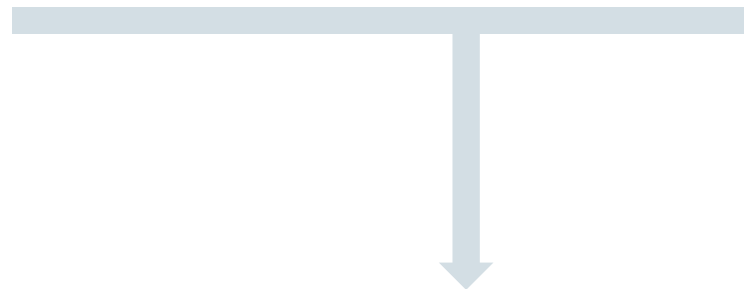
SNOTWATCH



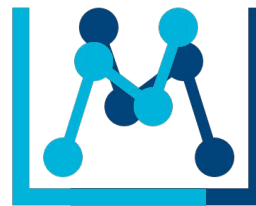
# What is Snotwatch?



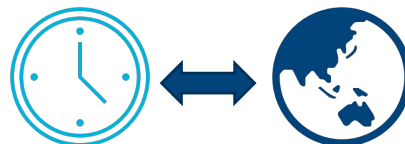
Virus Data



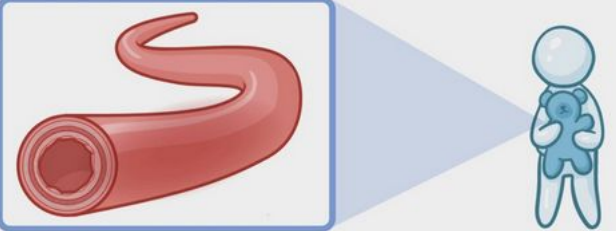
**Kawasaki Disease**



Associations between viruses  
and clinical presentations.




**KAWASAKI DISEASE**



ACUTE INFLAMMATION of MEDIUM-SIZED ARTERIES

TYPICALLY in CHILDREN of 6 MONTHS - 5 YEARS



**Coronary artery aneurysms**

**Red eyes**

**Swollen lymph nodes**

**Peeling of skin around fingernails/toenails**

**Red, dry, cracked lips and inflamed tongue**

**Widespread rash**

**Fever (for more than 5 days)**

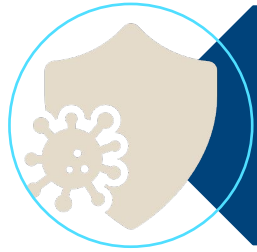
**Swelling and/or erythema of palms/soles**

Cause unknown

No diagnostic test

Outcomes improved with IVIG





Infective trigger is likely



Seasonality suggested



Differentiating Kawasaki Disease from PIMS-TS\*

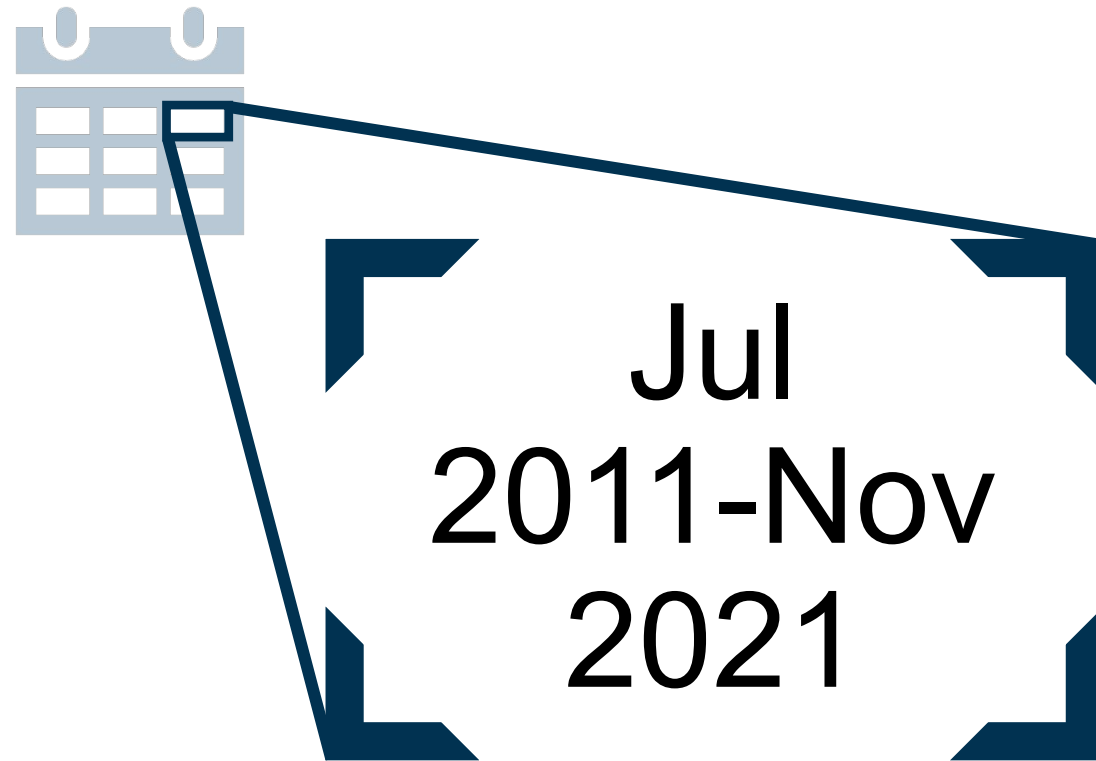
## Rationale Kawasaki Disease





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# When?



# Independent Datasets



Kawasaki  
Disease

**1,081**  
Presentations



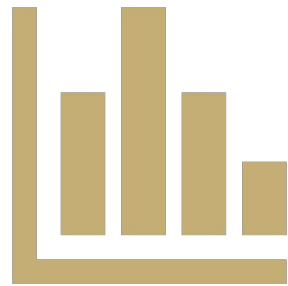
Respiratory  
Multiplex PCR

**153,153**  
positive  
PCR tests





# Methodology



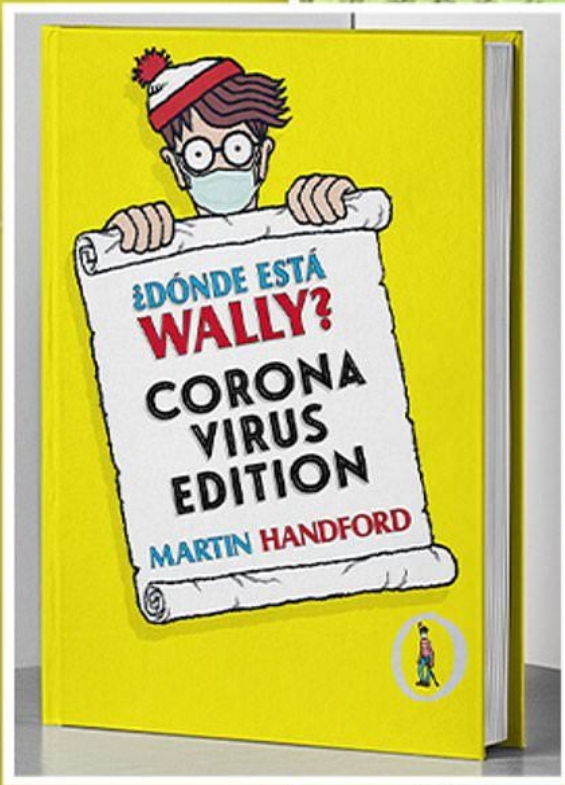
Data Visualisation: Graphing  
and Mapping

Statistical Analysis:  
Spatiotemporal Associations

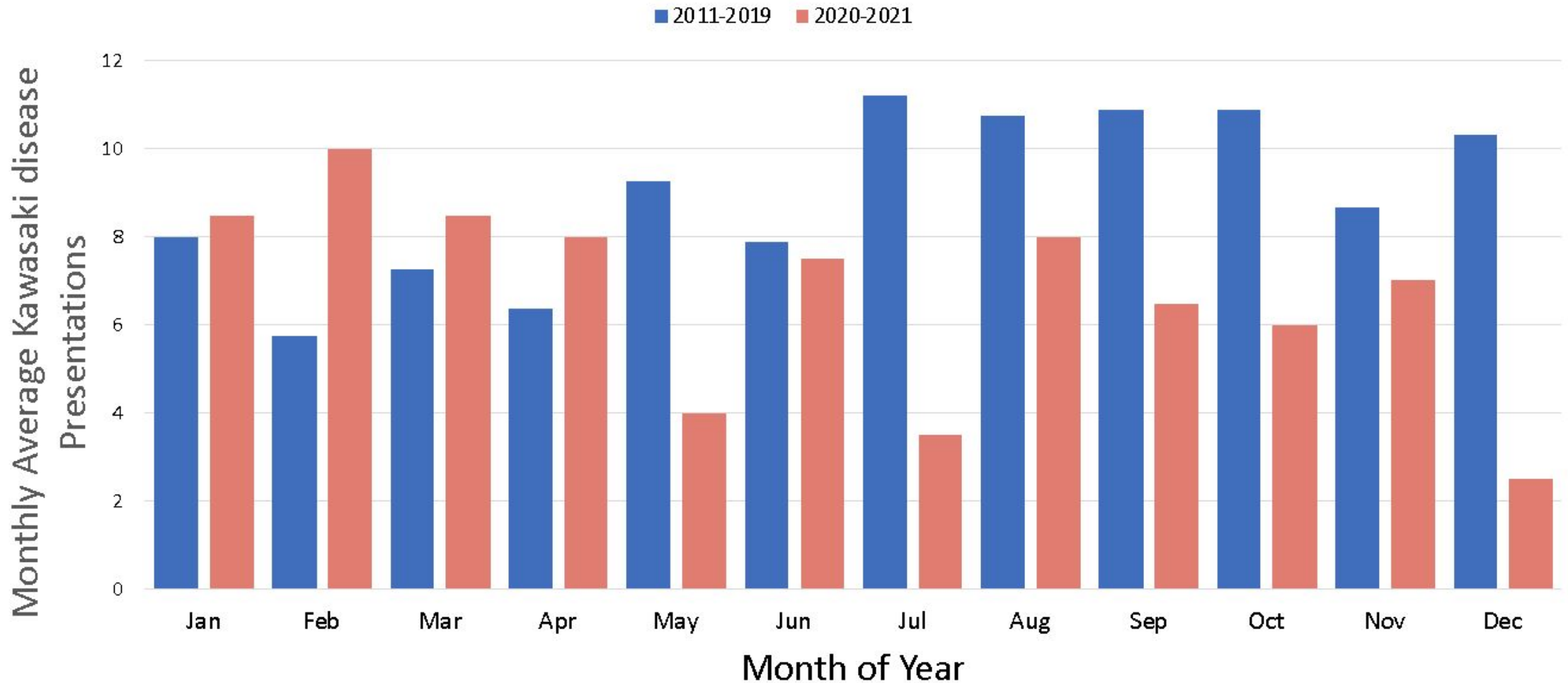


IN ARMOUR  
FANTASTICI

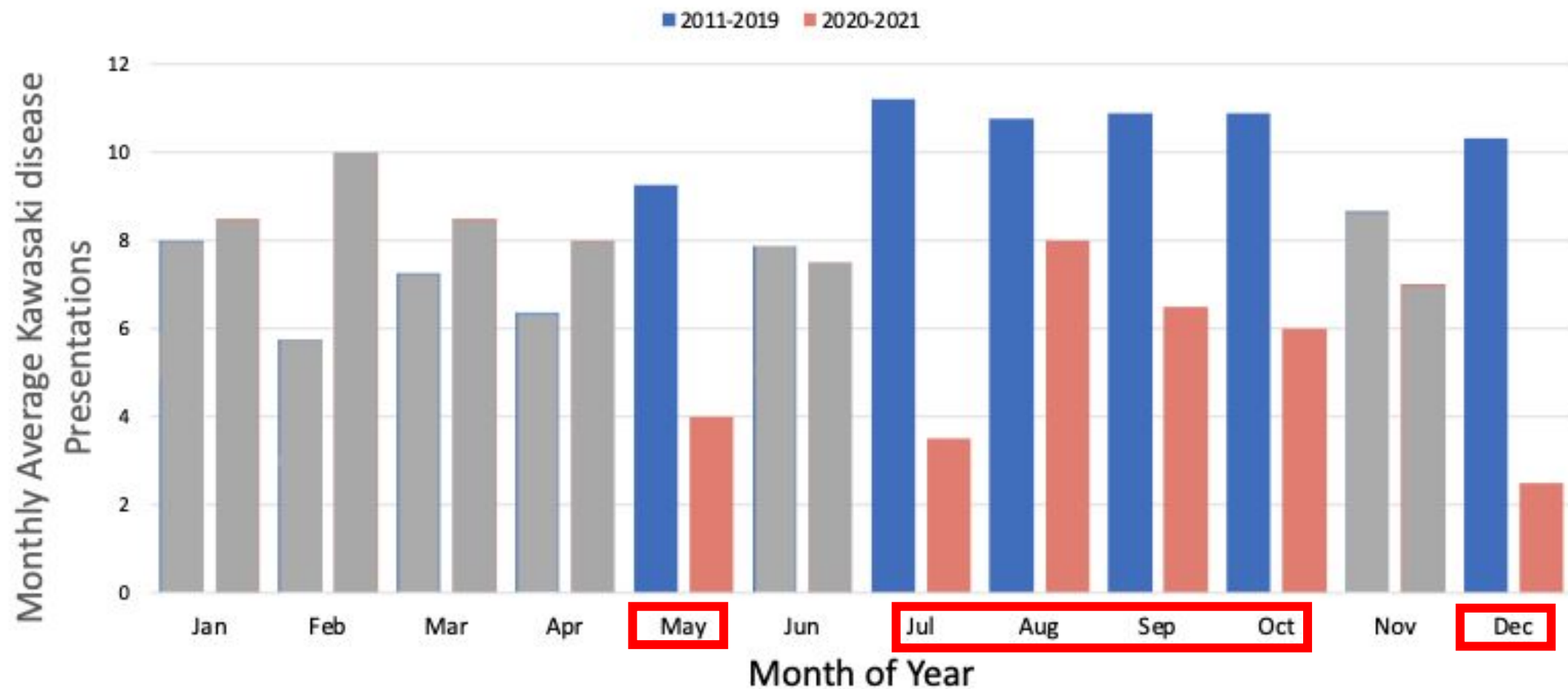
HERE, THERE,  
EVERYWHERE.



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

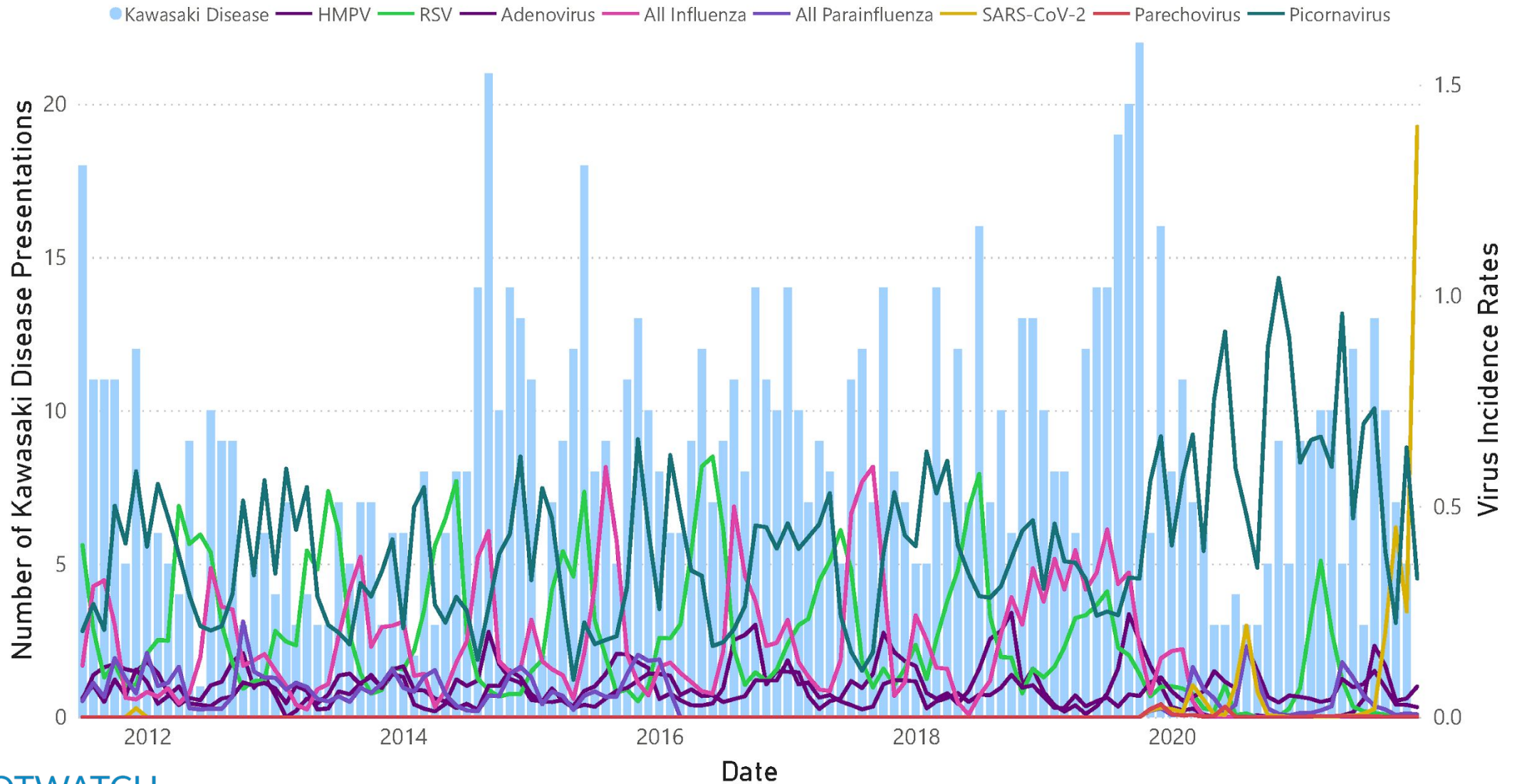


# Kawasaki disease presentations prior to and during the COVID-19 pandemic in Victoria, Australia





# Kawasaki Disease and Virus Incidence Rate 2011-2021



# Spatiotemporal analysis

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	<b>1.52 (1.27-1.82)*</b>	<b>&lt;0.0001</b>	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	<b>1.43 (1.17-1.73)*</b>	<b>&lt;0.0001</b>	1.16 (1.00-1.35)	0.01



# Interpreting the Findings

## TEMPORAL PATTERNS

No seasonality identified.

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

## VIRAL ASSOCIATIONS

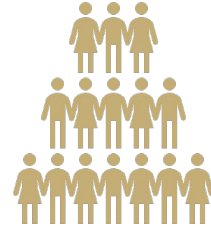
Kawasaki disease is more likely in peak HMPV and RSV seasons.

## COVID-19 PANDEMIC

SARS-CoV-2 is not a culprit.



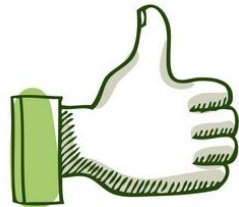
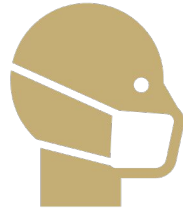
Relatively large cohort



Granularity of spatial component

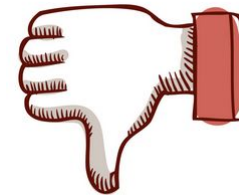


Includes pre- pandemic and pandemic years



Association  
not  
causation

Skewed  
viral PCR  
coverage







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# Hepatitis and Adenovirus Clusters

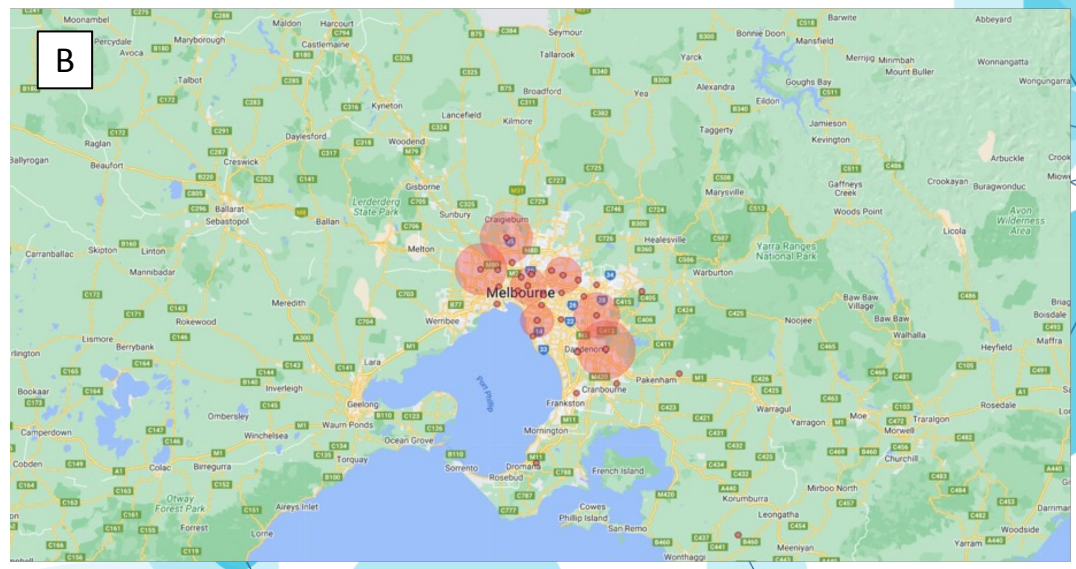
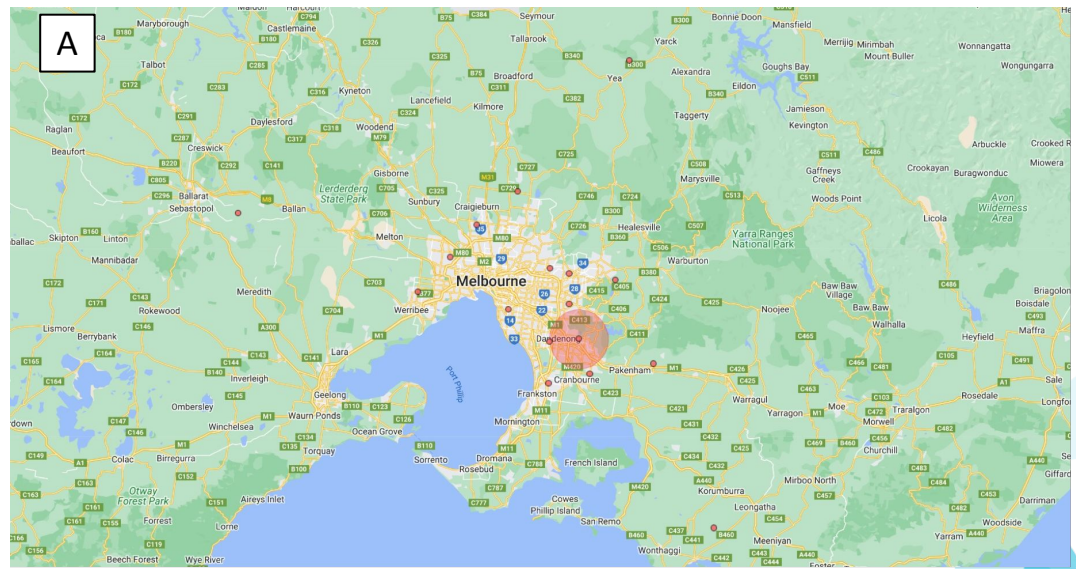


## Pediatric Hepatitis and Respiratory Viruses: A Spatiotemporal Ecologic Analysis

Sawires, Rana BMedSci<sup>††</sup>; Osowicki, Joshua MD, PhD<sup>‡§¶¶</sup>; Clothier, Hazel PhD<sup>†,¶\*\*</sup>; Fahey, Michael MD, PhD<sup>††,‡‡</sup>; Buttery, Jim MD<sup>†,‡¶</sup>

Author Information

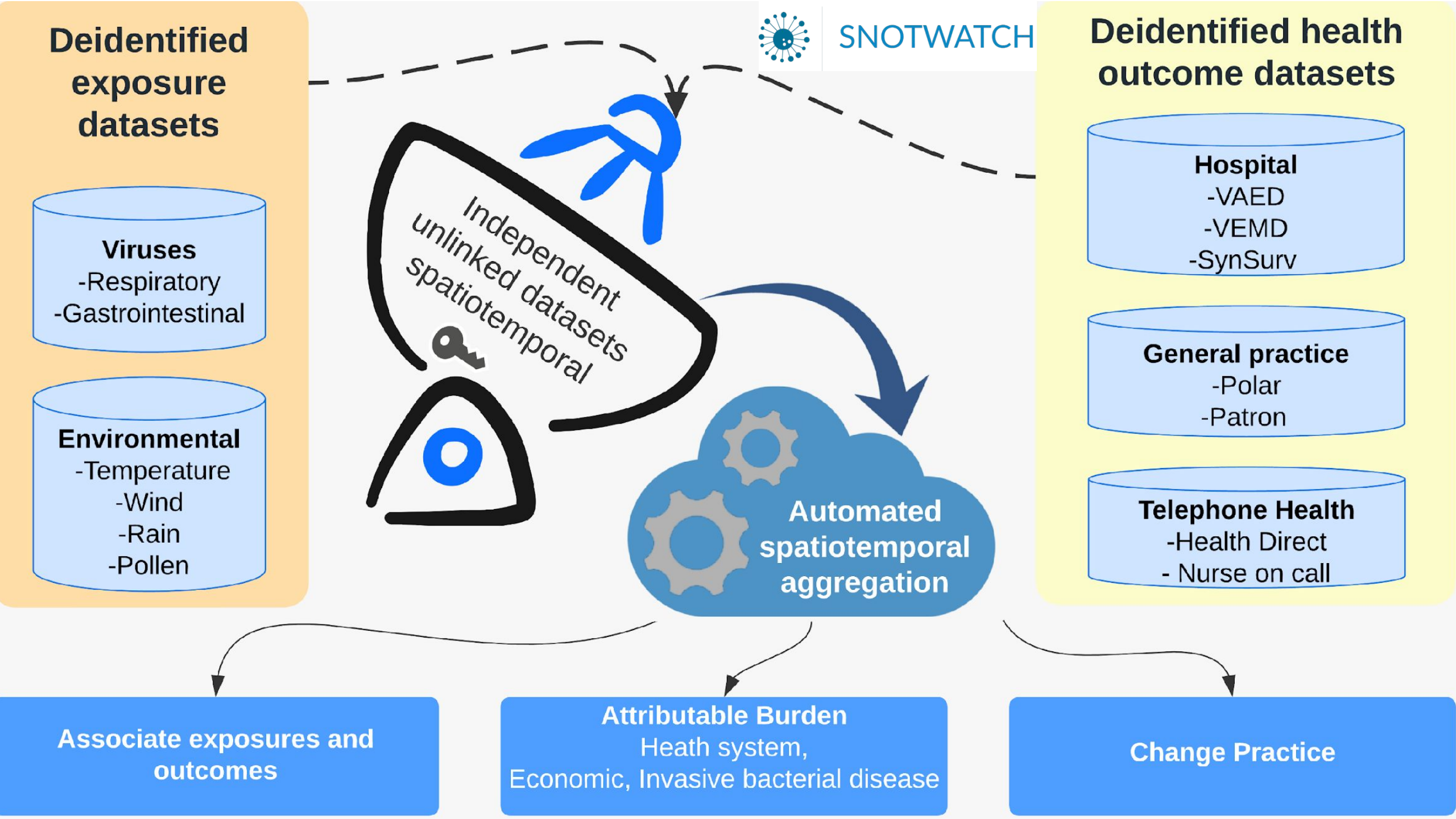
*The Pediatric Infectious Disease Journal* 42(4):p 276-280, April 2023. | DOI: 10.1097/INF.0000000000003828



# Results: Hepatitis (non A/B/C/E)

Virus	2011-2019 Risk Ratio (99%CI)	P-value	2020-2022 Risk Ratio (99%CI)	P-value
Adenovirus	0.77 (0.66-0.90)*	<0.0001	1.04 (0.54-2.02)	0.88
COVID-19	-	-	1.01 (0.99-1.03)	0.17
HMPV	1.44 (1.25-1.67)*	<0.0001	0.98 (0.83-1.16)	0.79
Influenza A	1.42 (1.28-1.57)*	<0.0001	1.00 (1.00-1.00)	0.58
Influenza B	1.23 (1.13-1.34)*	<0.0001	1.00 (1.00-1.00)	0.35
Parechovirus	1.00 (0.00-1.00)	0.99	1.00 (1.00-1.00)	0.55
Picornavirus	1.90 (1.54-2.35)*	<0.0001	6.70 (3.67-12.22)*	<0.0001
Parainfluenza	1.48 (1.32-1.68)*	<0.0001	1.12 (0.86-1.44)	0.27
RSV	1.90 (1.63-2.22)*	<0.0001	1.44 (1.23-1.69)*	<0.0001







# Thank you



## LinkedIn

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



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



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