ABNMS Conference

16th Nov, 2022

CoRiCal

Implementing a risk-benefit calculator for COVID-19 Vaccine

https://corical.immunisationcoalition.org.au/

h.mayfield@uq.edu.au

QUT

The University Of Queensland AUSTRALIA

THE UNIVERSITY OF SYDNEY

Flinders UNIVERSITY

IMMUNISATION COALITION

Carissa Bonner

Risk communication

Colleen Lau

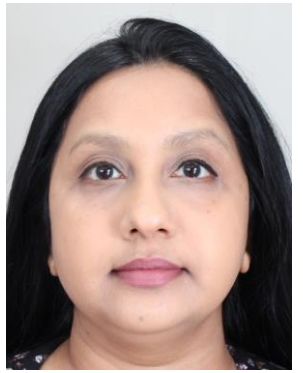
BN, public health expertise

Jane Sinclair

Data collection & BN modelling

Kerrie Mengersen

BN modelling & statistics



Ramona Muttucumaru

Data collection & BN modelling

Helen Mayfield

BN modelling & product management

Sam Brown

Data collection & model validation

John Litt

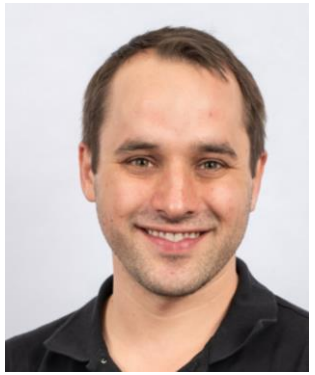
Data collection, public health expertise

Kirsty Short

Data collection & virology

Tina Moghaddam

Programming & interface



Michael Waller

Statistics & model assumptions

Tej Shukla

Paediatrics

CoRiCAL is designed to help people make an **informed choice** about COVID-19 vaccinations

Uses Australian data where possible, and International data when local data not available

ABC NEWS

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Australian researchers launch COVID-19 calculator that assesses your risk from the virus

By Janelle Miles

Posted Mon 25 Oct 2021 at 6:00am, updated Mon 25 Oct 2021 at 10:34am

Dr Kirsty Short is one of the research leaders who developed the online COVID calculator dubbed CoRiCal. *(Supplied)*

Help keep family & friends informed by sharing this article

abc.net.au/news/qld-coronavirus-cov...

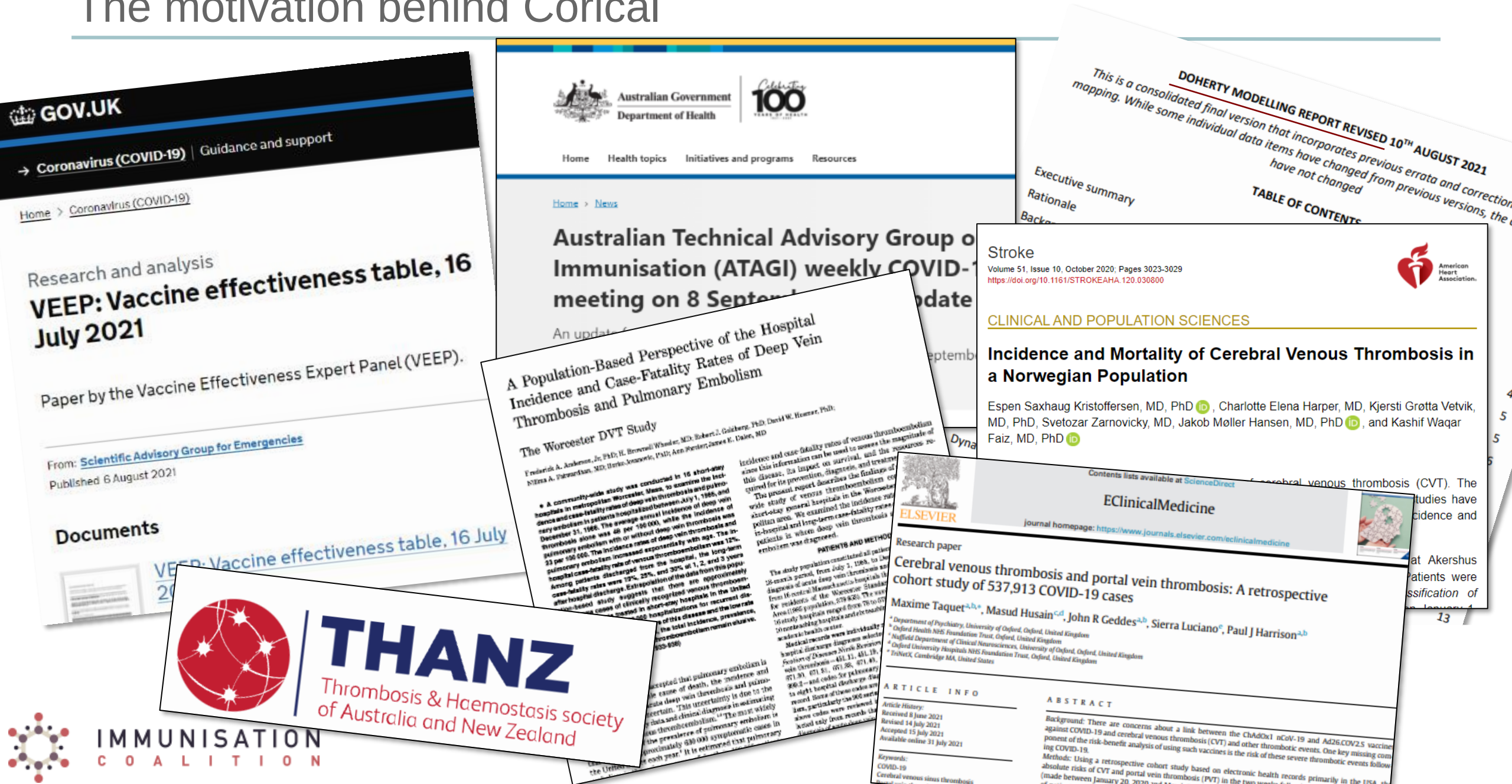
COPY LINK

SHARE

A COVID-19 risk calculator that allows people to assess their chances of catching coronavirus and dying from it, based on their age, gender, vaccination status, and

https://www.abc.net.au/news/2021-10-25/qld-coronavirus-covid-risk-calculator/100563068

The motivation behind Corical



CoRiCal: Covid Risk Calculator

https://corical.immunisationcoalition.org.au/

- CoRiCal is a tool to help people who are not sure about getting the COVID-19 vaccines. It tells you how the vaccine can reduce your chances of getting or dying from COVID-19. It also shows the chances of developing certain rare conditions from the vaccines.
- The benefits and risks of the vaccines vary because of many reasons. Some of these are: your age, your sex, how many vaccines you have had, which vaccine(s) you have had, and the number of COVID-19 cases in your community.
- The tool shows you what your chances are of getting sick based on your age and sex. It shows you the risk out of a million people, or a one in x chance. You can choose which way the results are displayed for each calculator by clicking on the tabs for 'Show risk per million people' or 'Show risk as a chance'.
- Note that the chances shown are only a rough guide. The tool shows the average chance for people who are the same sex and age as you. It does not use other factors, like any health problems you have, such as heart problems or diabetes. It also does not know if you live or work in a place with more COVID-19 cases, or if you have a job that puts you in contact with a lot of people. These things may change your chances of getting COVID-19 or dying from it.
- Even if there are not many cases in your community right now, this can change. The number of cases can go up quickly at any time. So when you make your decision about getting the COVID-19 vaccine, you should also think about possible cases in the future.
- The Moderna vaccine has similar effectiveness as the Pfizer vaccine when used for the third (booster) dose.
- Last updated on 11/03/2022. Estimates based on an assumed distribution of 100% Omicron variant.

WHAT'S NEW!

Choose a risk calculator

First dose Pfizer - Omicron Variant, updated 11/03/2022

PFIZER CALCULATOR

First dose AstraZeneca - Omicron Variant, updated 11/03/2022

ASTRAZENECA CALCULATOR

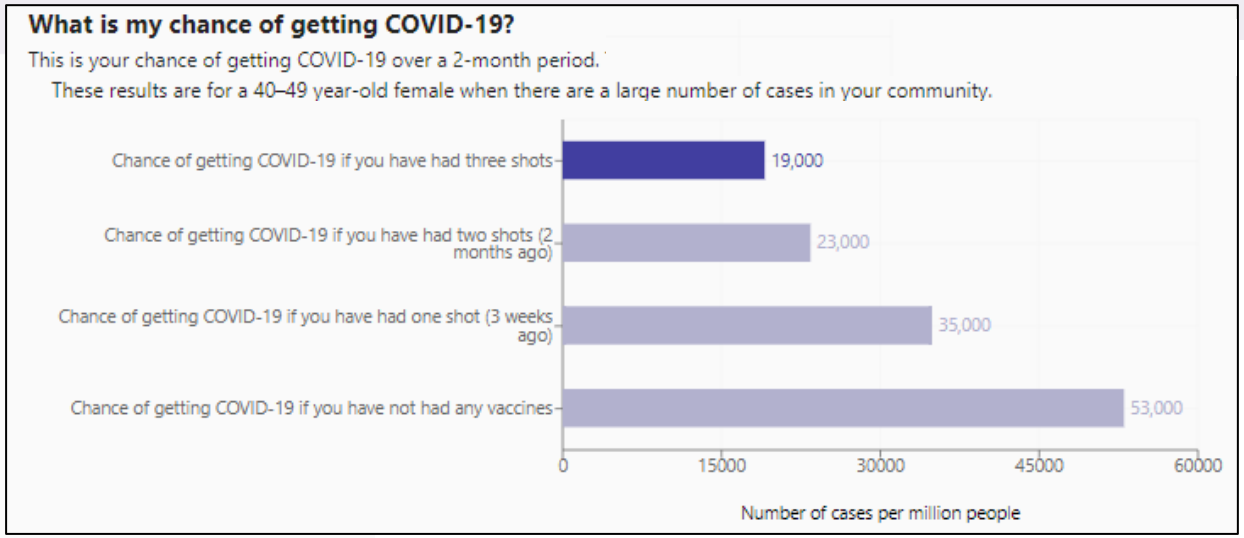
View risk chart

Risk of dying from COVID-19 based on age, sex, and vaccination status - 90% Omicron/10% Delta Variants, updated January 2022

RISK CHART FOR DYING OF COVID-19

Risk of developing myocarditis from COVID-19 infection or vaccination based on age, sex, and vaccination status - updated October 2022

RISK CHART FOR DEVELOPING MYOCARDITIS



About you

Enter your age, sex, and if you've had a vaccine to check your risks.

Age

Sex

◯ Female ◯ Male ◯ Unspecified

Vaccine

We don't currently have estimates for people whose second or third shot is overdue

◯ None

◯ One shot of Pfizer (3 weeks ago)

◯ Two shots of Pfizer

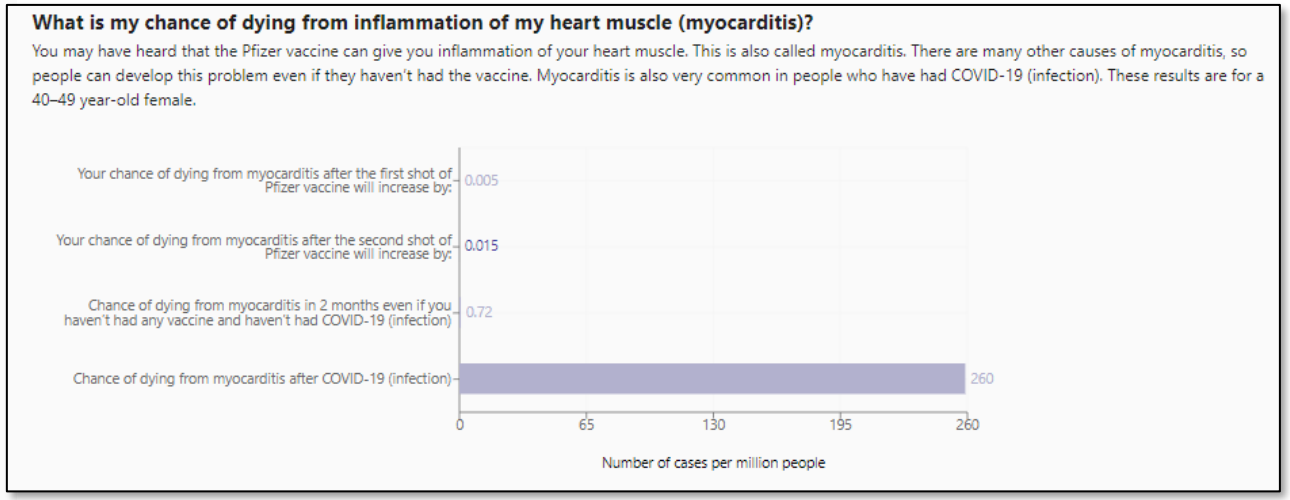
◯ Three shots of Pfizer

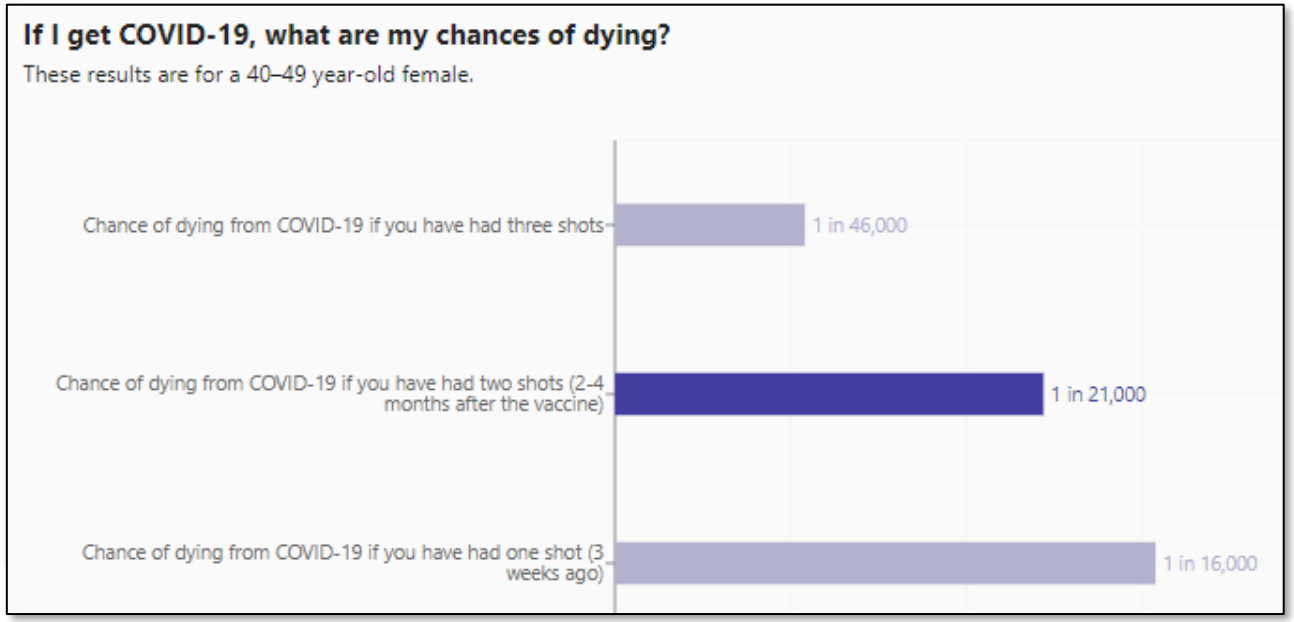
How many cases are there in your community?

◯ A huge number of cases
10% chance of getting COVID-19 over 2 months – about the same as 13,600 cases per day in NSW

◉ A large number of cases
5% chance of getting COVID-19 over 2 months – about the same as 6,800 cases per day in NSW

Risks can be displayed in x per million, or 1 in x, with or without relative risks

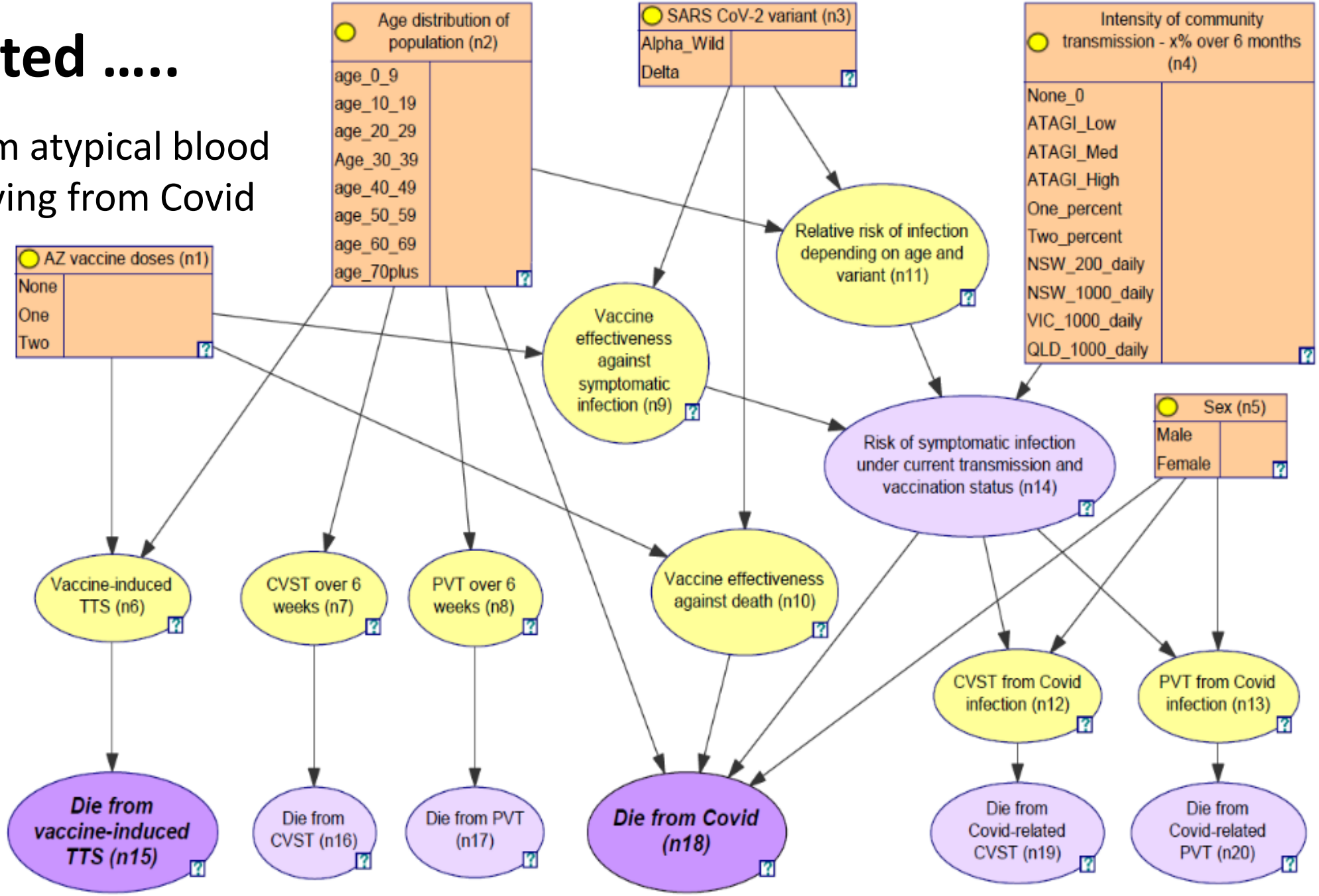




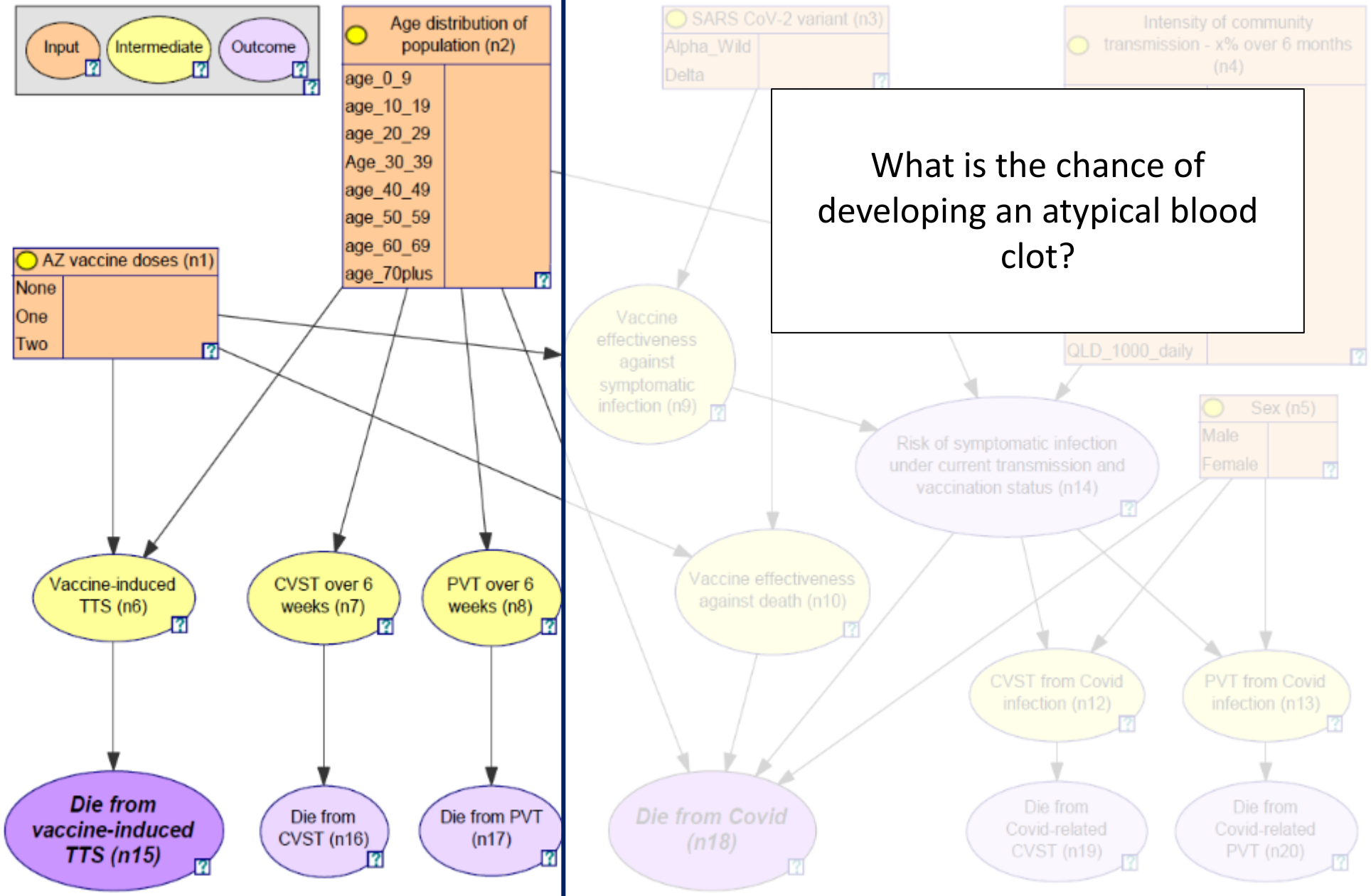
https://corical.immunisationcoalition.org.au/

How it started …..

Risk of dying from atypical blood clots Vs risk of dying from Covid



Mayfield et. al. 2021 Designing an evidence-based Bayesian network for estimating the risk versus benefits of AstraZeneca COVID-19 Vaccine: https://doi.org/10.1016/j.vaccine.2022.04.004



What is the chance of developing an atypical blood clot?

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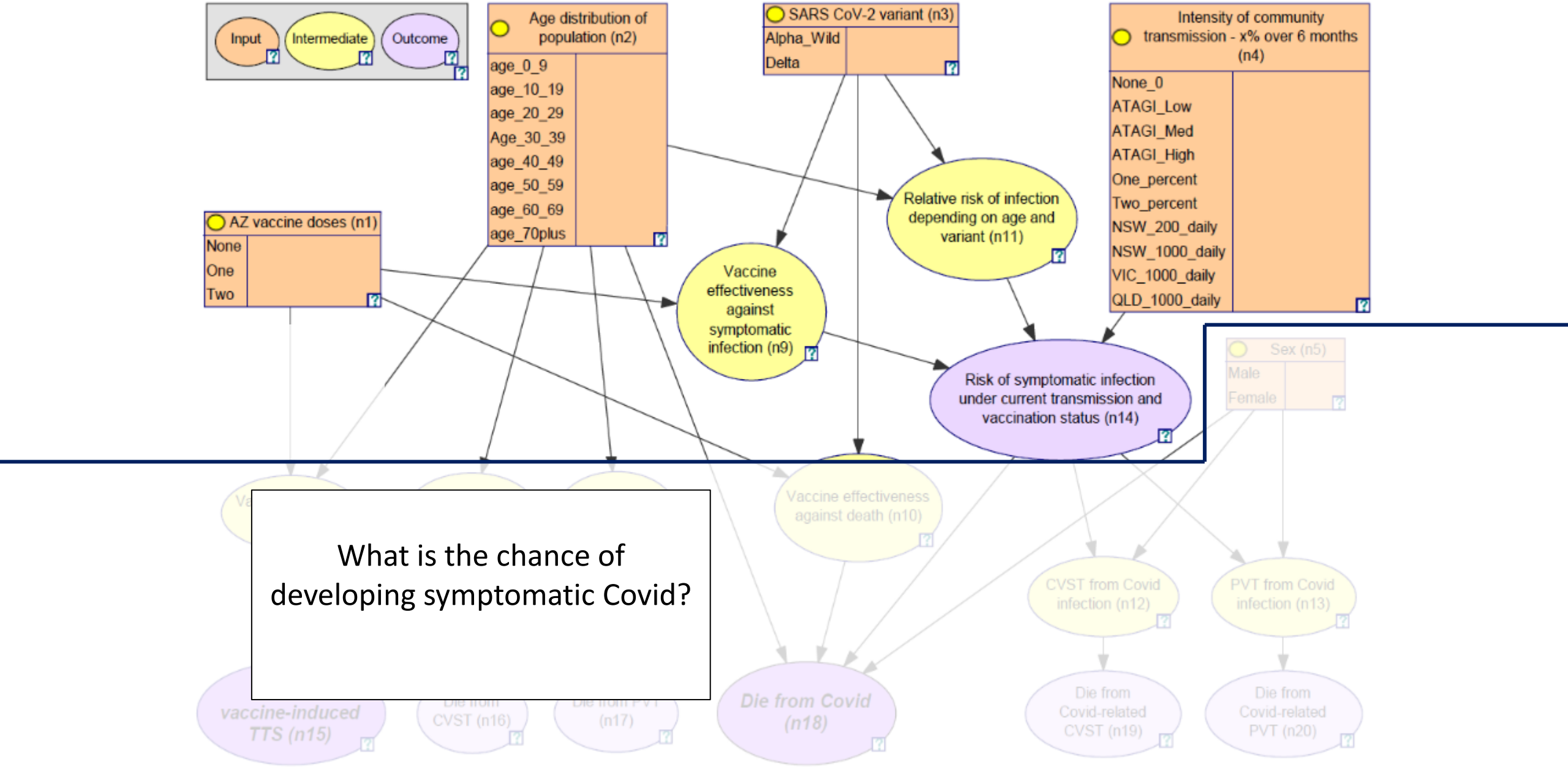
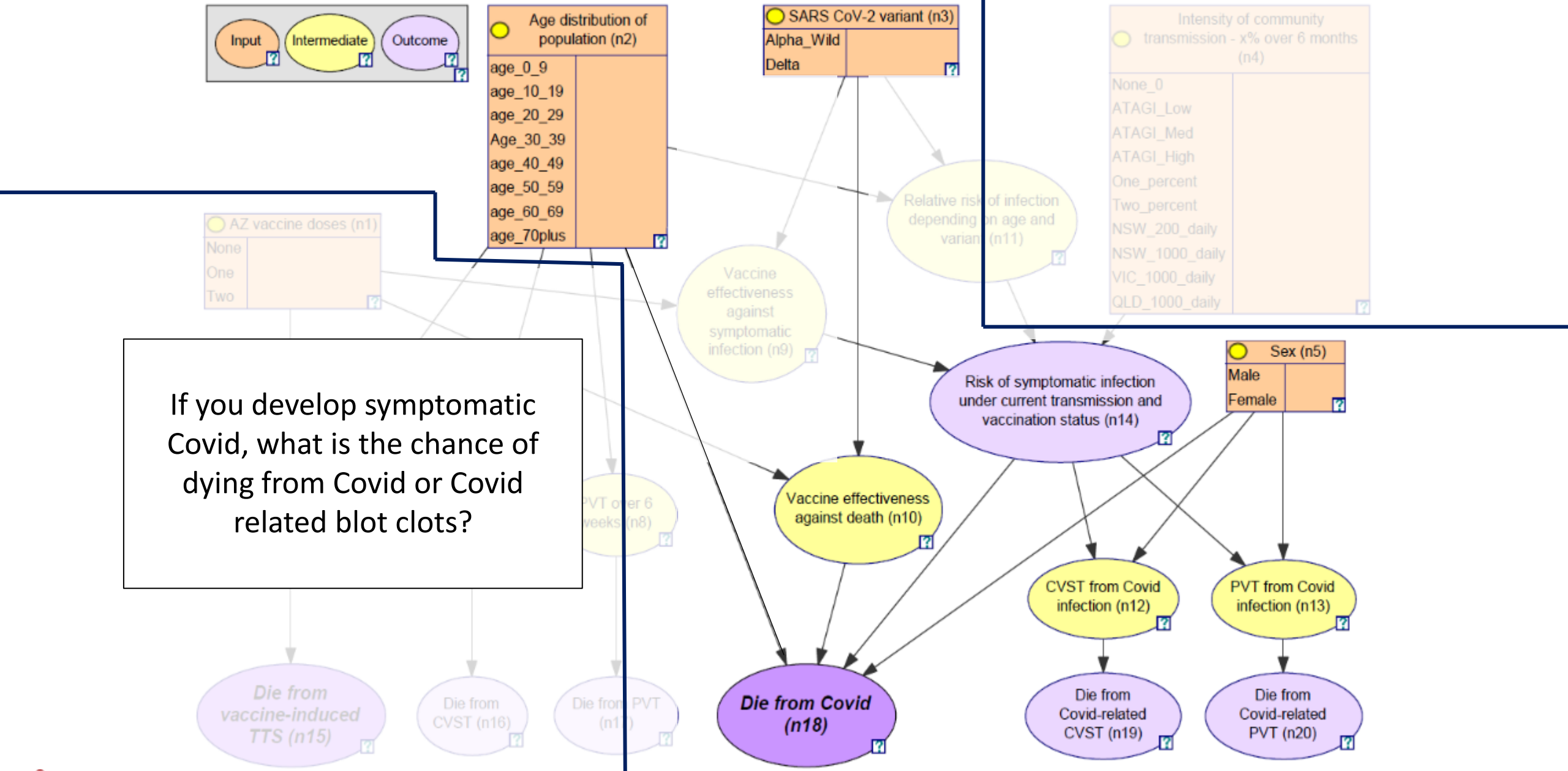


What is the chance of developing symptomatic Covid?

IMMUNISATION COALITION



If you develop symptomatic Covid, what is the chance of dying from Covid or Covid related blot clots?

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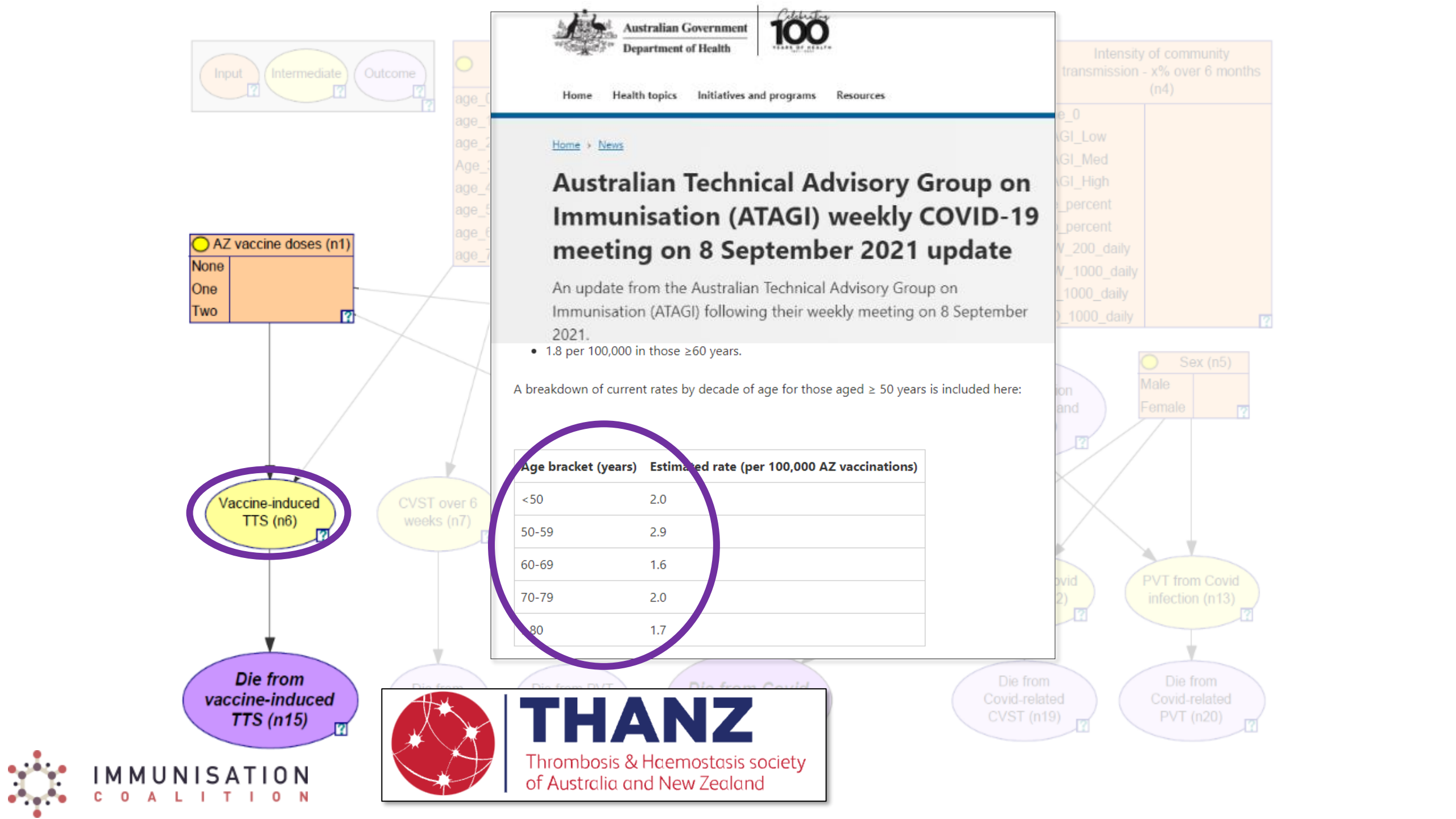
Input
Intermediate
Outcome
AZ vaccine doses (n1)
None
One
Two
Vaccine-induced TTS (n6)
CVST over 6 weeks (n7)
Die from vaccine-induced TTS (n15)
Intensity of community transmission - x% over 6 months (n4)
Sex (n5)
Male
Female
PVT from Covid infection (n13)
Die from Covid-related CVST (n19)
Die from Covid-related PVT (n20)
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Department of Health
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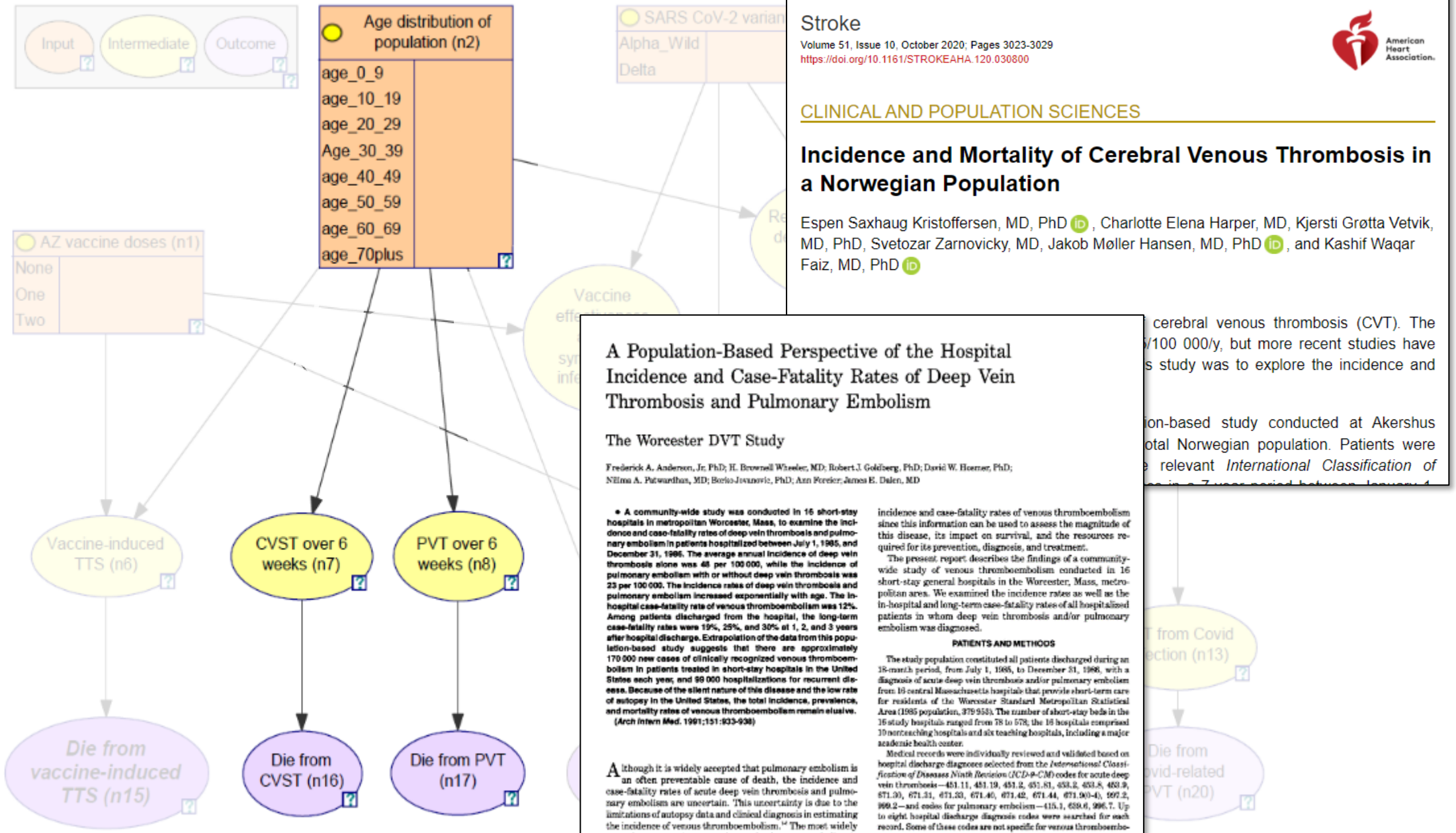
Australian Technical Advisory Group on Immunisation (ATAGI) weekly COVID-19 meeting on 8 September 2021 update
An update from the Australian Technical Advisory Group on Immunisation (ATAGI) following their weekly meeting on 8 September 2021.
1.8 per 100,000 in those ≥60 years.
A breakdown of current rates by decade of age for those aged ≥ 50 years is included here:
Age bracket (years)
Estimated rate (per 100,000 AZ vaccinations)
<50
2.0
50-59
2.9
60-69
1.6
70-79
2.0
≥80
1.7
THANZ
Thrombosis & Haemostasis society of Australia and New Zealand
IMMUNISATION COALITION



Stroke
Volume 51, Issue 10, October 2020; Pages 3023-3029
https://doi.org/10.1161/STROKEAHA.120.030800

CLINICAL AND POPULATION SCIENCES

Incidence and Mortality of Cerebral Venous Thrombosis in a Norwegian Population

Espen Saxhaug Kristoffersen, MD, PhD, Charlotte Elena Harper, MD, Kjersti Grøtta Vetvik, MD, PhD, Svetozar Zarnovicky, MD, Jakob Møller Hansen, MD, PhD, and Kashif Waqar Faiz, MD, PhD

cerebral venous thrombosis (CVT). The
/100 000/y, but more recent studies have
s study was to explore the incidence and

ion-based study conducted at Akershus
otal Norwegian population. Patients were
relevant *International Classification of*

A Population-Based Perspective of the Hospital Incidence and Case-Fatality Rates of Deep Vein Thrombosis and Pulmonary Embolism

The Worcester DVT Study

Frederick A. Anderson, Jr, PhD; H. Brownell Wheeler, MD; Robert J. Goldberg, PhD; David W. Hoerner, PhD; Nilma A. Patwardhan, MD; Boris Jovanovic, PhD; Ann Forcier; James E. Dalen, MD

• A community-wide study was conducted in 16 short-stay hospitals in metropolitan Worcester, Mass, to examine the incidence and case-fatality rates of deep vein thrombosis and pulmonary embolism in patients hospitalized between July 1, 1965, and December 31, 1986. The average annual incidence of deep vein thrombosis alone was 48 per 100 000, while the incidence of pulmonary embolism with or without deep vein thrombosis was 23 per 100 000. The incidence rates of deep vein thrombosis and pulmonary embolism increased exponentially with age. The in-hospital case-fatality rate of venous thromboembolism was 12%. Among patients discharged from the hospital, the long-term case-fatality rates were 19%, 25%, and 30% at 1, 2, and 3 years after hospital discharge. Extrapolation of the data from this population-based study suggests that there are approximately 170 000 new cases of clinically recognized venous thromboembolism in patients treated in short-stay hospitals in the United States each year, and 99 000 hospitalizations for recurrent disease. Because of the silent nature of this disease and the low rate of autopsy in the United States, the total incidence, prevalence, and mortality rates of venous thromboembolism remain elusive.
(*Arch Intern Med.* 1991;151:933-938)

Although it is widely accepted that pulmonary embolism is an often preventable cause of death, the incidence and case-fatality rates of acute deep vein thrombosis and pulmonary embolism are uncertain. This uncertainty is due to the limitations of autopsy data and clinical diagnosis in estimating the incidence of venous thromboembolism.[1-4] The most widely quoted estimate of the prevalence of pulmonary embolism is that there are approximately 630 000 symptomatic cases in the United States each year.[5] It is estimated that pulmonary

incidence and case-fatality rates of venous thromboembolism since this information can be used to assess the magnitude of this disease, its impact on survival, and the resources required for its prevention, diagnosis, and treatment.

The present report describes the findings of a community-wide study of venous thromboembolism conducted in 16 short-stay general hospitals in the Worcester, Mass, metropolitan area. We examined the incidence rates as well as the in-hospital and long-term case-fatality rates of all hospitalized patients in whom deep vein thrombosis and/or pulmonary embolism was diagnosed.

PATIENTS AND METHODS

The study population constituted all patients discharged during an 18-month period, from July 1, 1985, to December 31, 1986, with a diagnosis of acute deep vein thrombosis and/or pulmonary embolism from 16 central Massachusetts hospitals that provide short-term care for residents of the Worcester Standard Metropolitan Statistical Area (1985 population, 379 953). The number of short-stay beds in the 16 study hospitals ranged from 78 to 578; the 16 hospitals comprised 10 nonteaching hospitals and six teaching hospitals, including a major academic health center.

Medical records were individually reviewed and validated based on hospital discharge diagnoses selected from the *International Classification of Diseases Ninth Revision (ICD-9-CM)* codes for acute deep vein thrombosis—451.11, 451.19, 451.2, 451.81, 453.2, 453.8, 453.9, 671.30, 671.31, 671.33, 671.40, 671.42, 671.44, 671.90-4), 997.2, 999.2—and codes for pulmonary embolism—415.1, 639.6, 996.7. Up to eight hospital discharge diagnosis codes were searched for each record. Some of these codes are not specific for venous thromboembolism, particularly the 900 series. Therefore, while all records with the above codes were reviewed in a systematic manner, data were collected only from records that included a written hospital discharge

DOHERTY MODELLING REPORT REVISED 10TH AUGUST 2021

This is a consolidated final version that incorporates previous errata and corrections to data mapping. While some individual data items have changed from previous versions, the conclusions have not changed

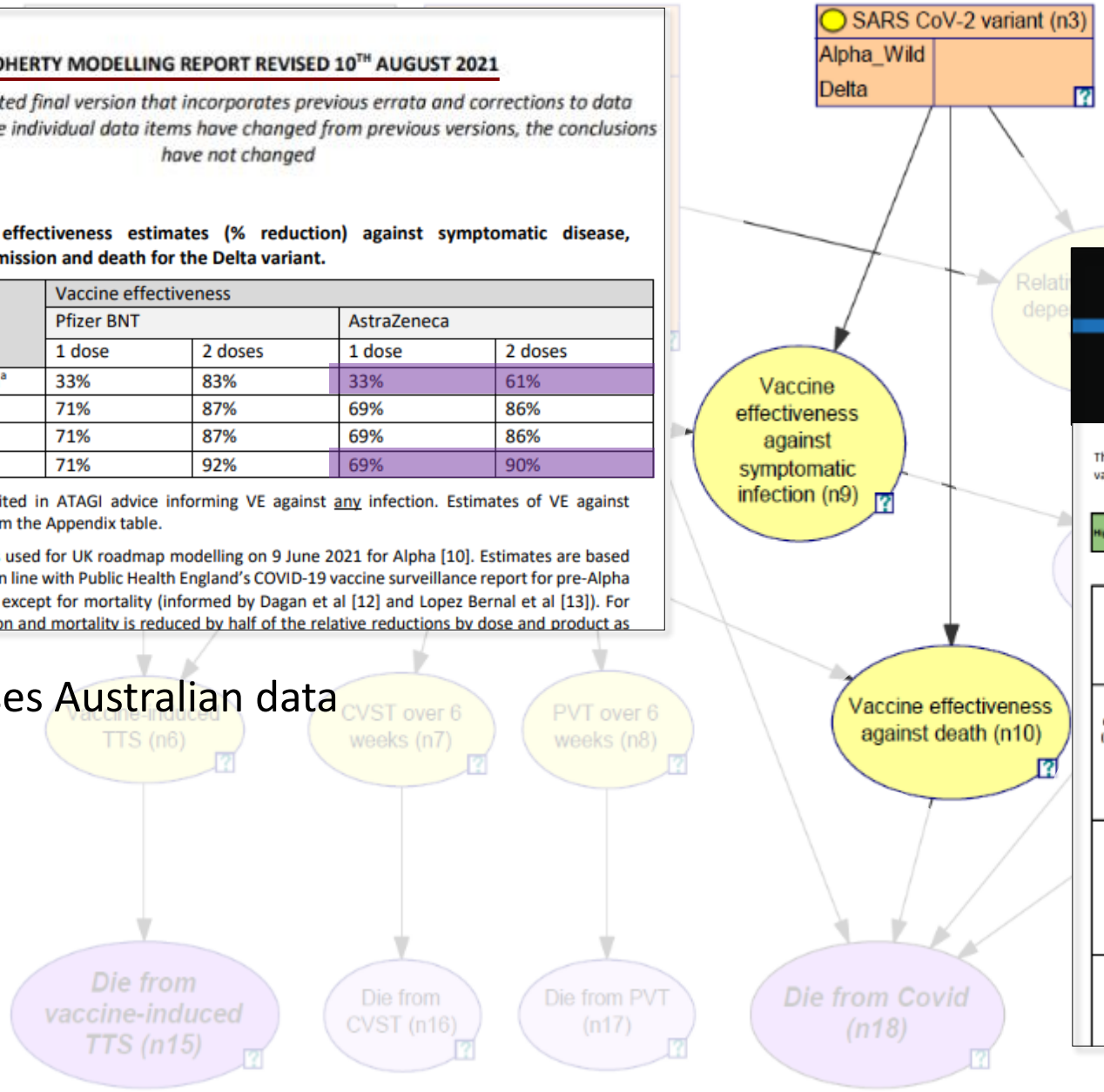
Table S2.5. Vaccine effectiveness estimates (% reduction) against symptomatic disease, hospitalisation, ICU admission and death for the Delta variant.

Outcome	Vaccine effectiveness			
	Pfizer BNT		AstraZeneca	
	1 dose	2 doses	1 dose	2 doses
Symptomatic infection[a]	33%	83%	33%	61%
Hospitalisation[b]	71%	87%	69%	86%
ICU admission[c]	71%	87%	69%	86%
Mortality[b]	71%	92%	69%	90%

[a] Sheik et al [8]. Study cited in ATAGI advice informing VE against any infection. Estimates of VE against symptomatic infection from the Appendix table.

[b] LSHTM central estimates used for UK roadmap modelling on 9 June 2021 for Alpha [10]. Estimates are based on a range of studies and in line with Public Health England's COVID-19 vaccine surveillance report for pre-Alpha and Alpha (week 22) [11] except for mortality (informed by Dagan et al [12] and Lopez Bernal et al [13]). For Delta, VE for hospitalisation and mortality is reduced by half of the relative reductions by dose and product as

Delta – uses Australian data



Alpha – uses UK data

GOV.UK

→ Coronavirus (COVID-19) | Guidance and support

This product captures data agreed by a consensus of experts on one and two dose vaccine effectiveness. Effectiveness is measured against infection, sympto variants in circulation within the UK.

High Confidence	Evidence from studies is consistent and comprehensive	Medium Confidence	Evidence is emerging but may be inconsistent requires further analysis

Vaccine Product	Dose Regime	Alpha (B.1.1.7 - Kent)			
		Real World Data			
		Infection	Symptomatic	Severe	Transmission
Oxford/AstraZeneca (Non-replicating viral vector) AZD1222	1st Dose	60-70%, Source 1 61%, Source 4	55-70%, Source 1 69%, Source 2 71%, Source 4	7[illegible]5% (hospitalisation), 75-80% (mortality), Source 1	35-50%, Source 1
	2nd Dose	79%, Source 4	85-90%, Source 1 75%, Source 2 97%, Source 4	80-95% (hospitalisation), Source 1	Insufficient data
Pfizer-BioNTech (RNA) BNT162b2	1st Dose	55-70%, Source 1 66%, Source 4	[illegible], Source 1 68%, Source 2 78%, Source 4	75-85% (hospitalisation), 75-80% (mortality), Source 1 64% (hospitalisation), Source 6	45-50%, Source 1
	2nd Dose	70-90%, Source 1 80%, Source 4 92%, Source 5	85-90%, Source 1 94%, Source 2 95%, Source 4 97%, Source 5	90-95% (hospitalisation), 95-99% (mortality), Source 1 97% (hospitalisation), 97% (mortality), Source 5 94% (hospitalisation), Source 6	Insufficient data
Moderna (RNA) mRNA-1273	1st Dose	88%, Source 7	Insufficient data	Insufficient data	Insufficient data

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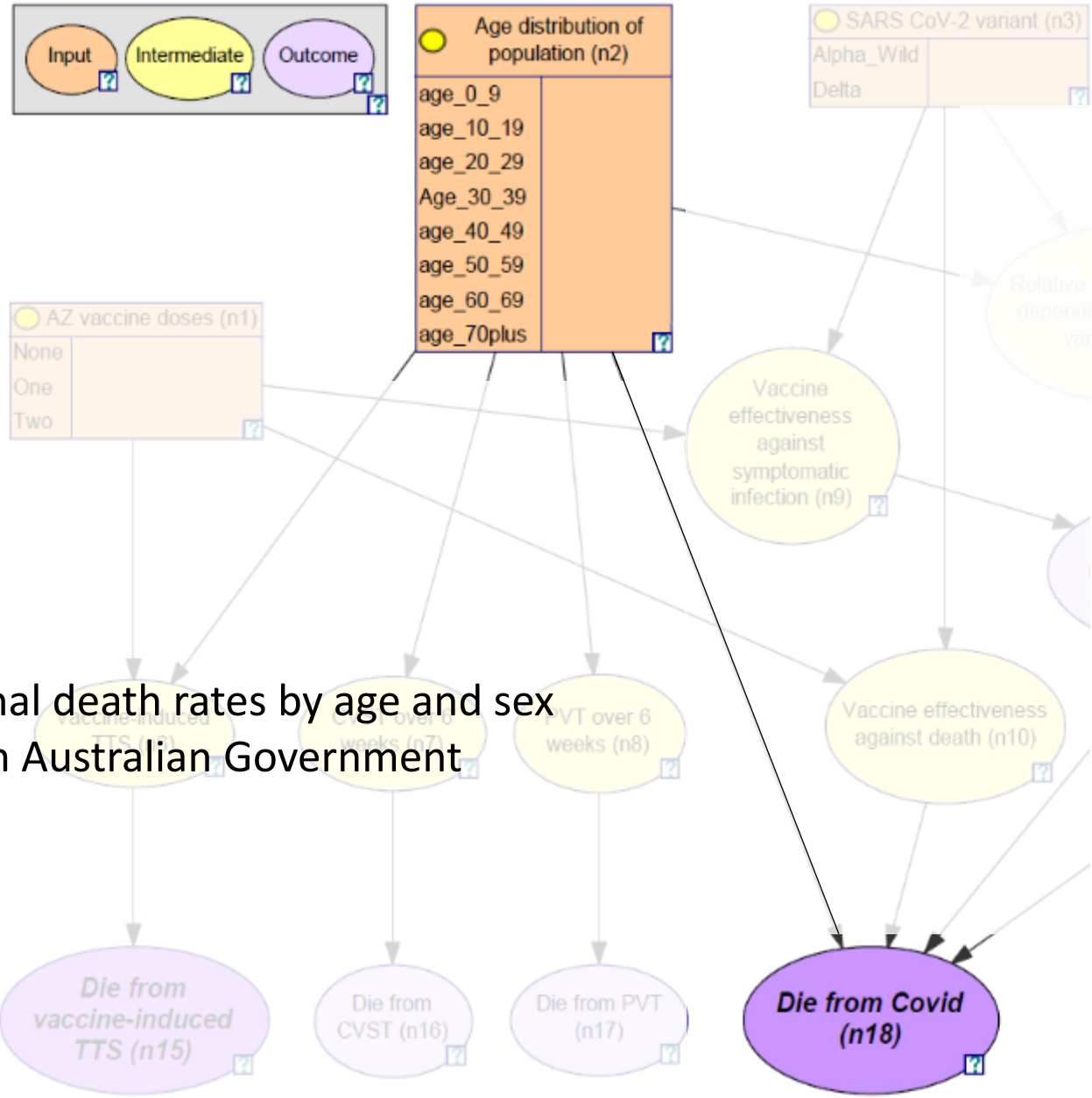

Proportional death rates by age and sex taken from Australian Government reports

04 October 2021 Coronavirus (COVID-19) health alert

Australian Government
Department of Health

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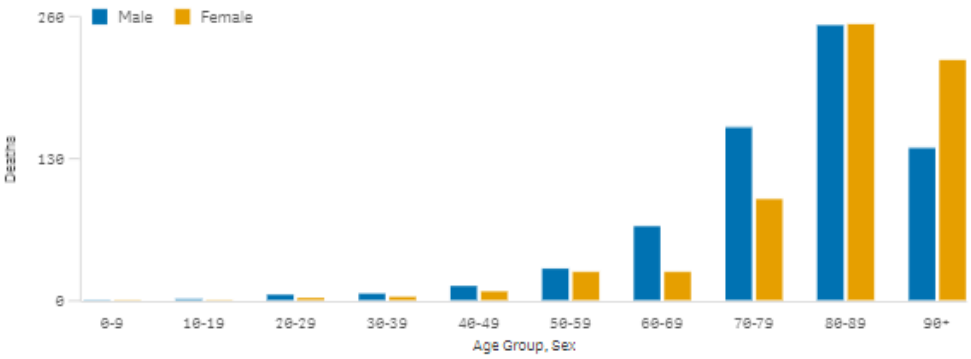
Home › News › Health alerts › Coronavirus (COVID-19) health alert

Coronavirus (COVID-19) case numbers and statistics

COVID-19 deaths by age group and sex

This graph shows the number of COVID-19 associated deaths in Australia for males and females by age group since the first case was reported.

Source: NINDSS data 4/10/2021



The total number of deaths in this chart may be less than what is reported due to delays in notification to the National Interoperable Notifiable Disease Surveillance System (NINDSS) or where the case's age or sex are unknown.

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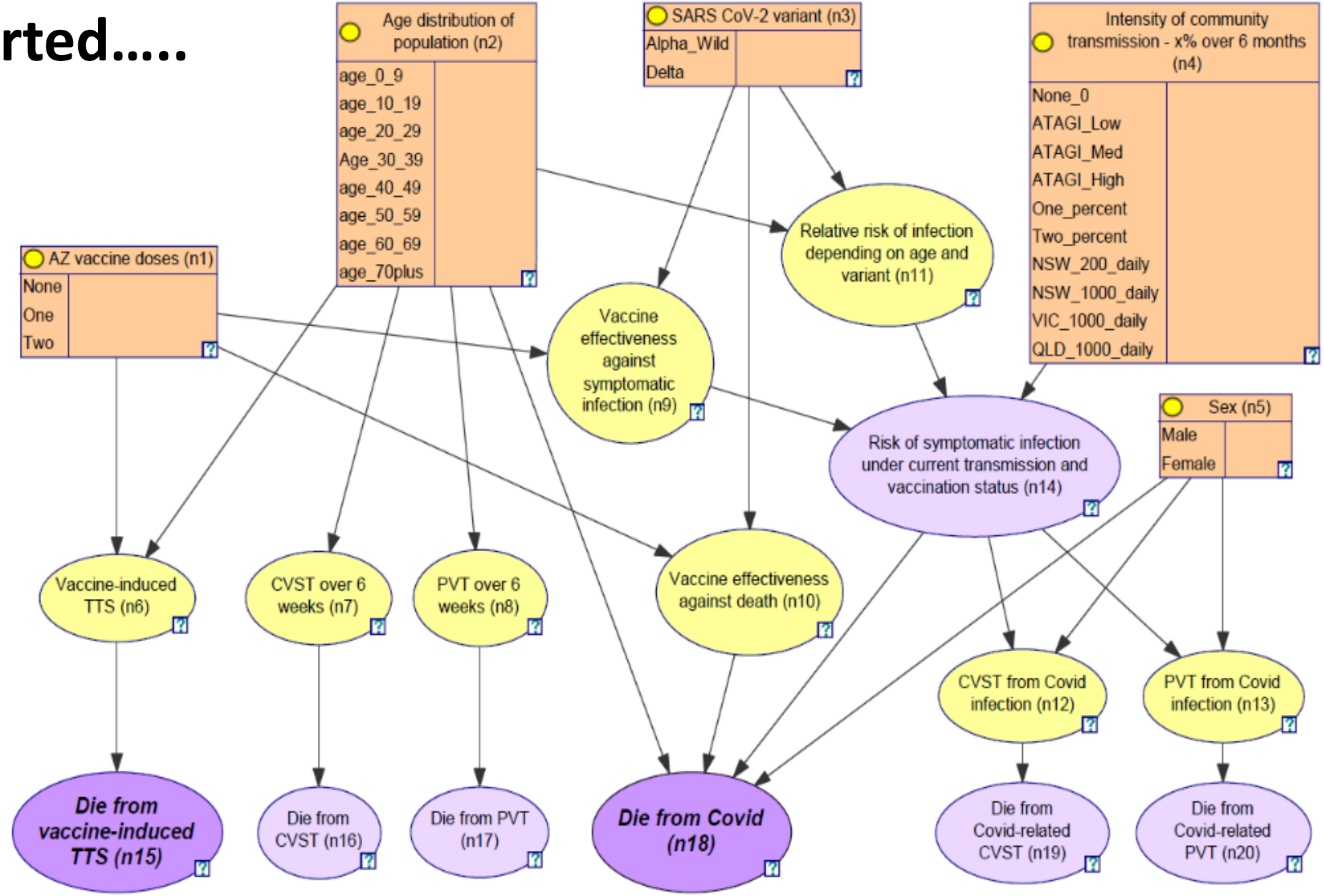
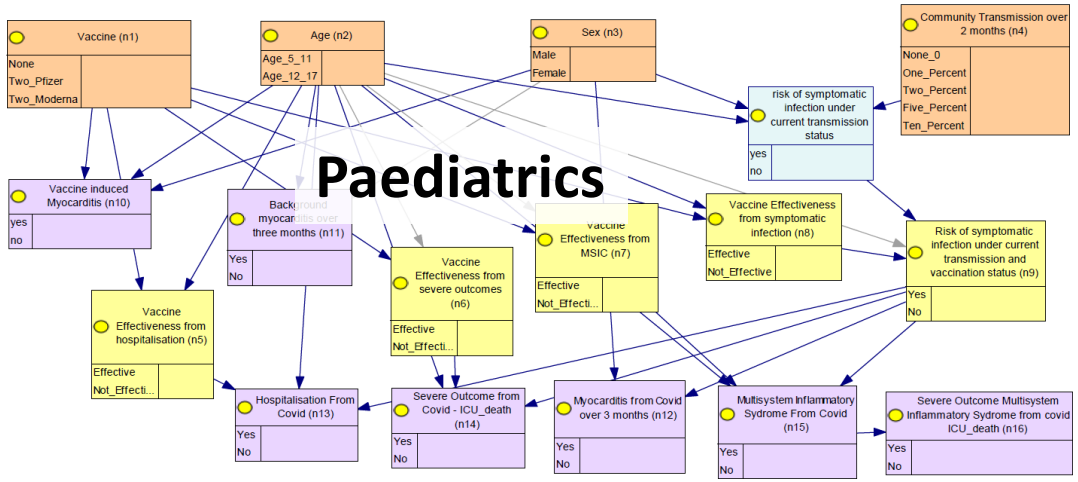
How it started…..

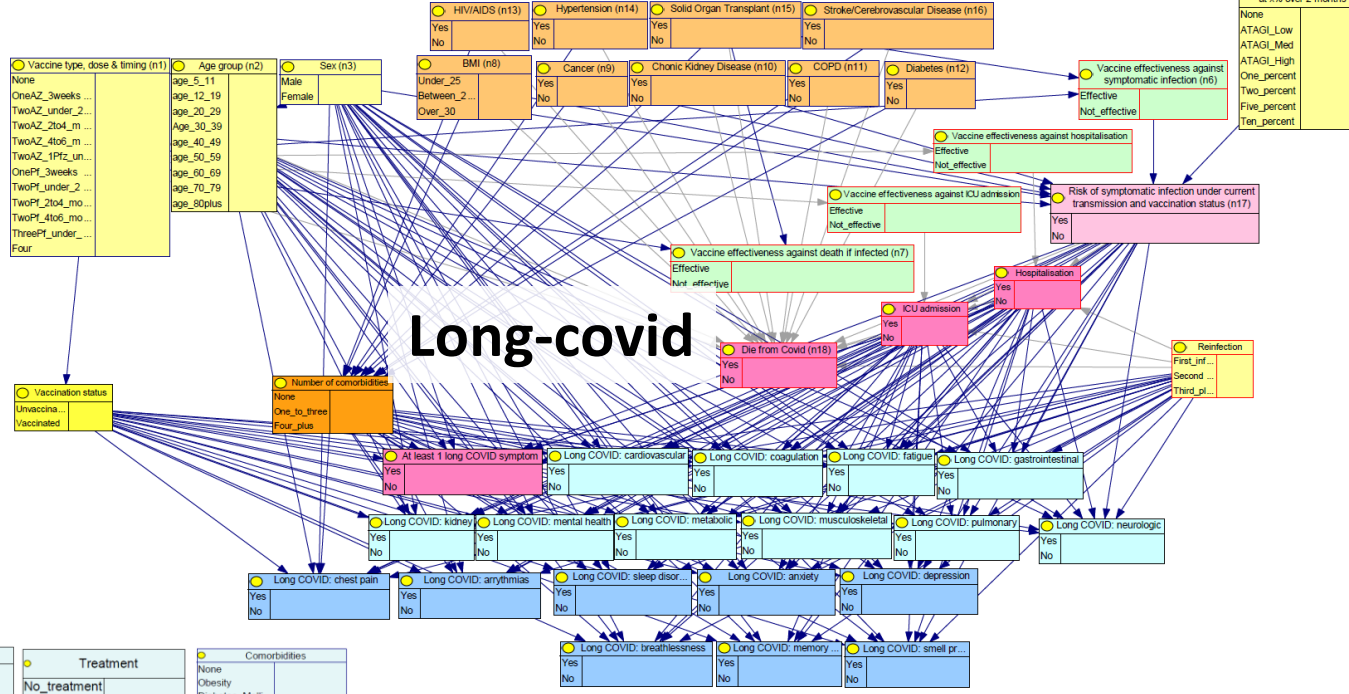


Mayfield et. al. 2021 Designing an evidence-based Bayesian network for estimating the risk versus benefits of AstraZeneca COVID-19 Vaccine: https://doi.org/10.1016/j.vaccine.2022.04.004

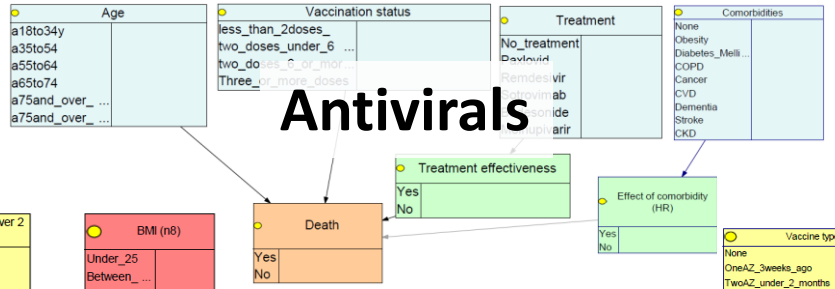
How it's going.....



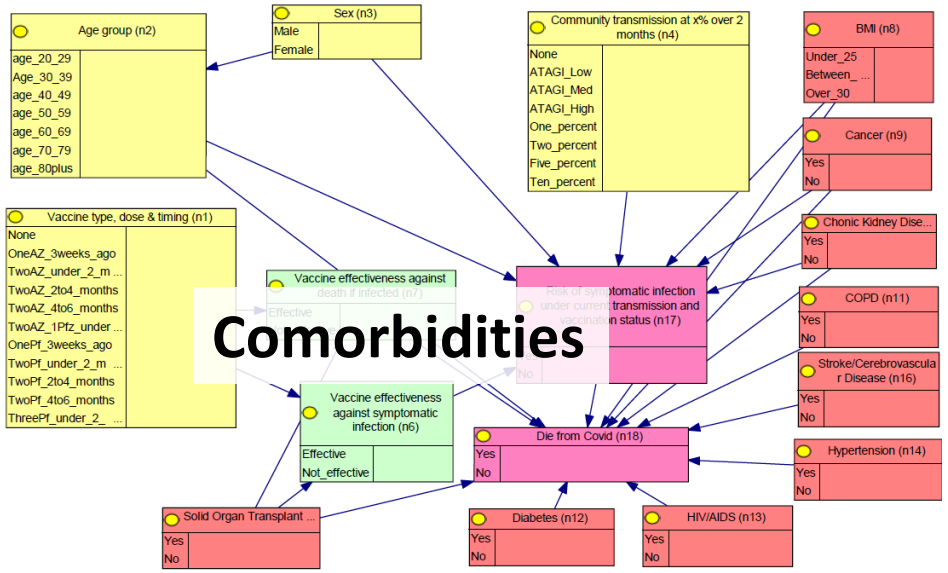
Paediatrics



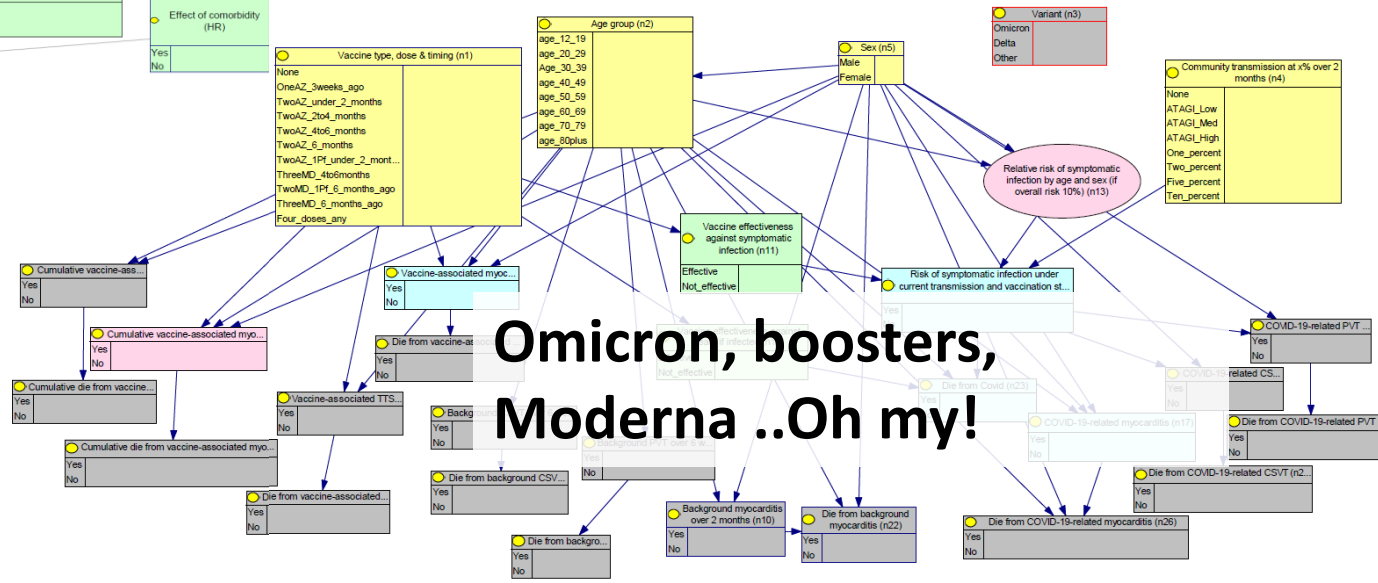
Long-covid



Antivirals



Comorbidities



Omicron, boosters, Moderna ..Oh my!

But the pandemic is over….. Right?

Queensland Government Queensland Health Contact us

Chief Health Officer Public Health Directions

During a public health emergency, the Chief Health Officer can issue Public Health Directions to assist in containing, or to respond to, the spread of COVID-19 within the community.

The *Public Health (Further Extension of Declared Public Health Emergency—COVID-19) Regulation (No. 3) 2022* , made by Queensland's Governor in Council, is set to end at **11.59pm AEST on Monday 31 October 2022**.

COVID-19 hospitalisations and deaths in NSW up to 4pm 03 November 2022

809	17	24
people in hospital	people in ICU	lives lost in the past 7 days*

COVID-19 cases and deaths reported in NSW

Time	Cases confirmed by PCR	Cases confirmed by RAT	Total
Cases this week	6,851	5,599	12,450
Cases last week	5,591	4,459	10,050
Total cases (since beginning of pandemic)	1,952,760	1,608,786	3,561,546
Total deaths (since beginning of pandemic)			5,454

COVID-19 deaths

7 days	Total
14	2,288

Queensland COVID-19 statistics

Changes to reporting

Routine reporting of COVID-19 statistics, including case numbers, hospitalisations and deaths now occurs weekly.

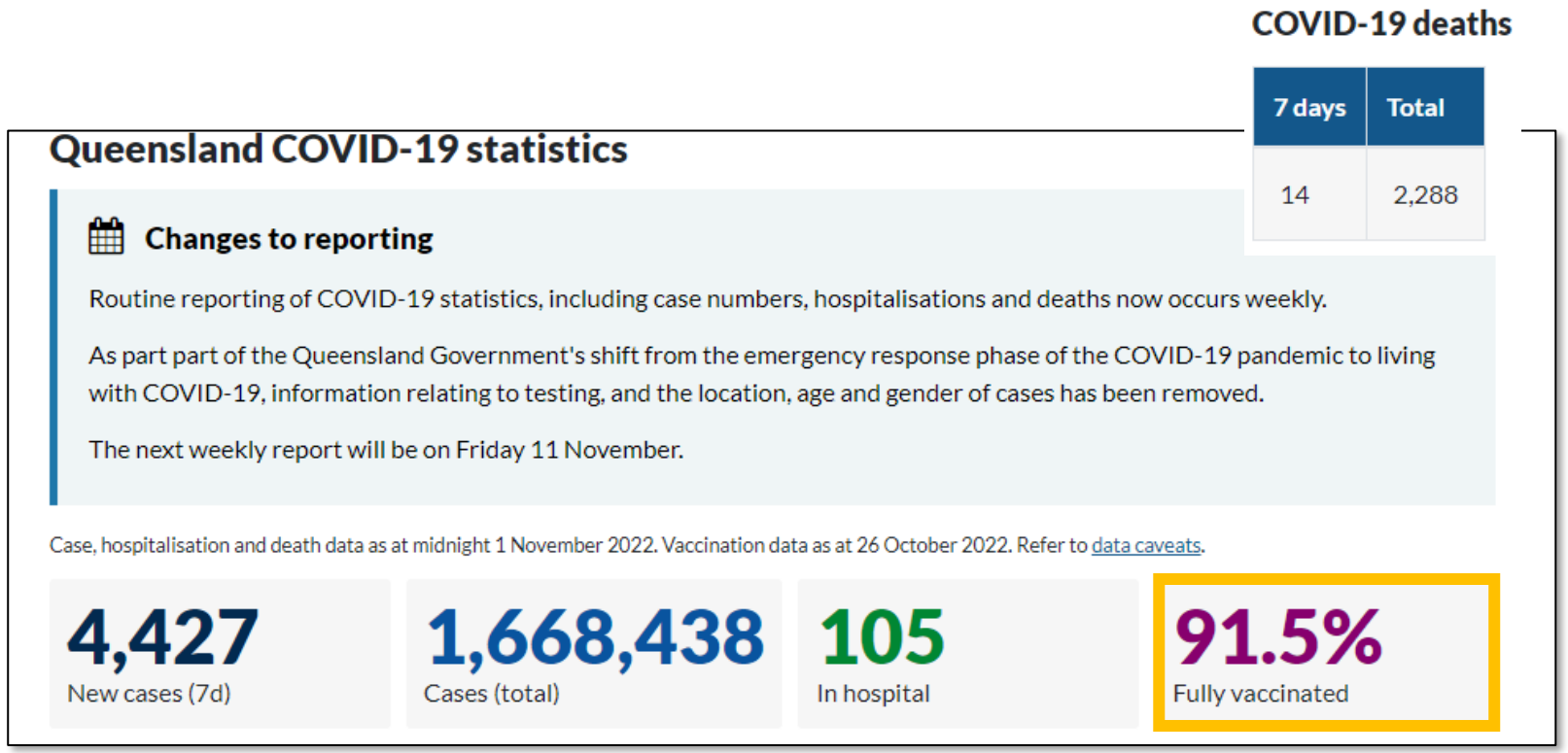
As part part of the Queensland Government's shift from the emergency response phase of the COVID-19 pandemic to living with COVID-19, information relating to testing, and the location, age and gender of cases has been removed.

The next weekly report will be on Friday 11 November.

Case, hospitalisation and death data as at midnight 1 November 2022. Vaccination data as at 26 October 2022. Refer to data caveats.

4,427	1,668,438	105	91.5%
New cases (7d)	Cases (total)	In hospital	Fully vaccinated

Most Australians are already vaccinated though?



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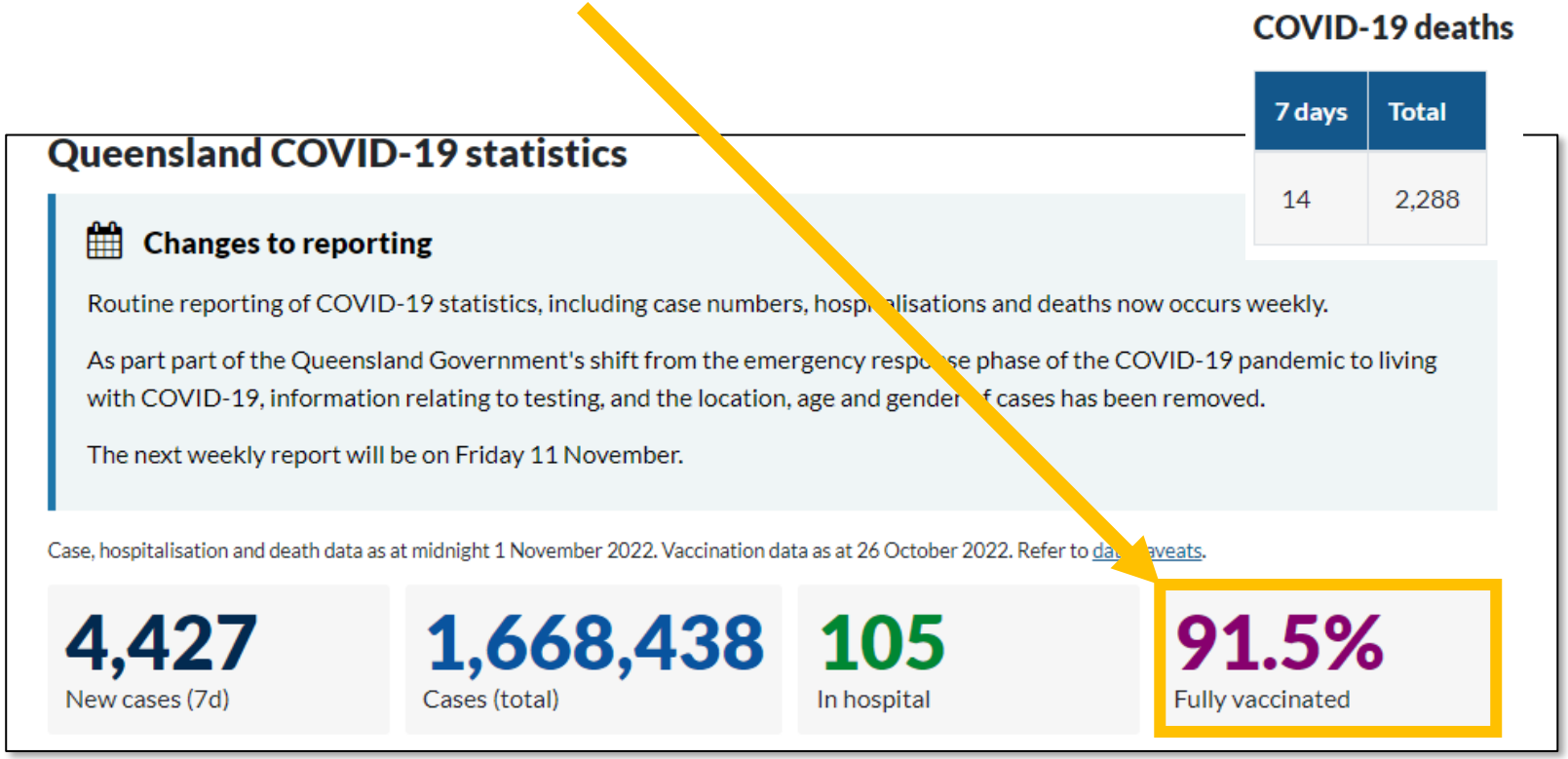
4,427	1,668,438	105	91.5%
New cases (7d)	Cases (total)	In hospital	Fully vaccinated

Most Australians are already vaccinated though?

People who have had 2 shots

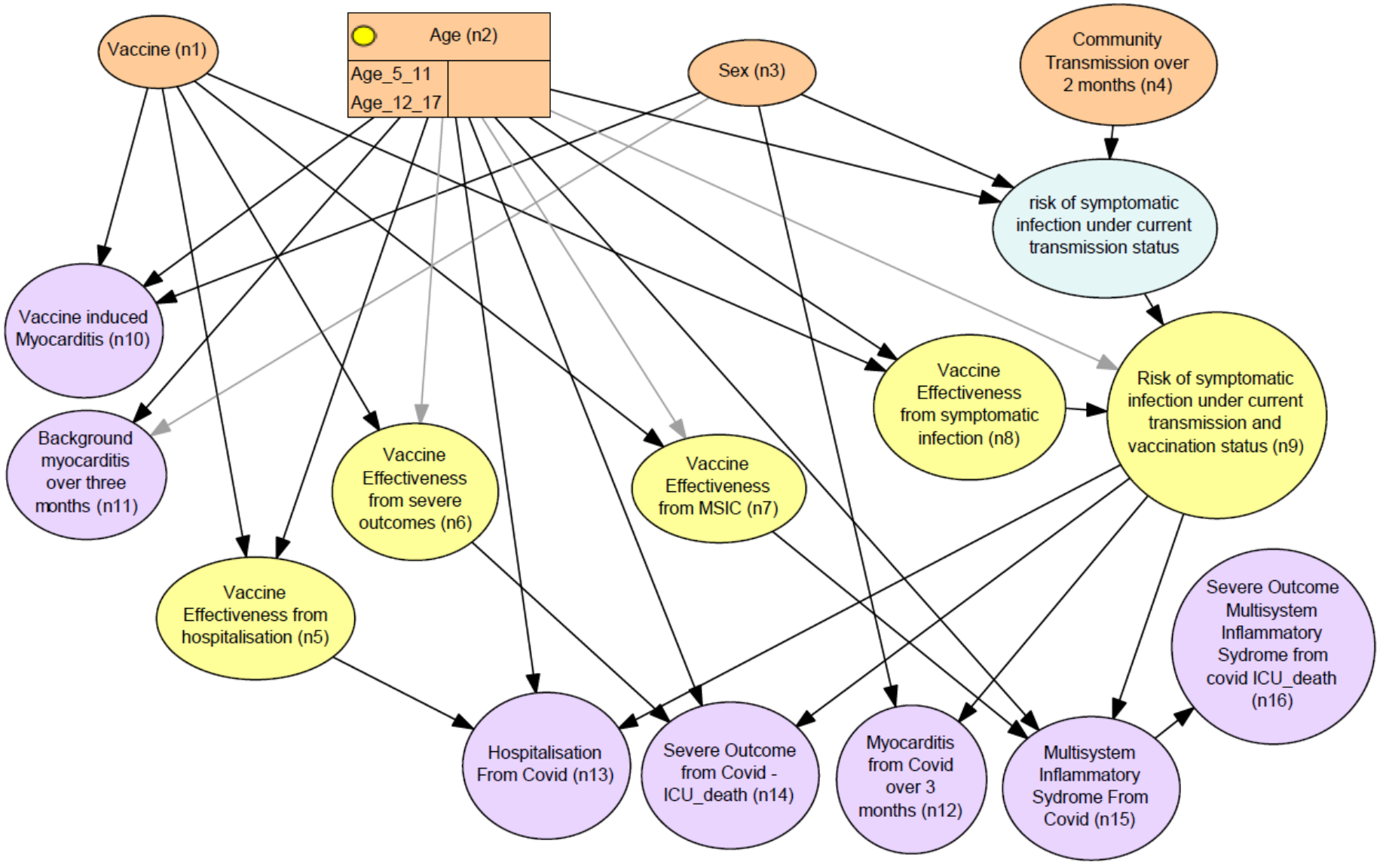


Most Australians are already vaccinated though?

- Conflicting information on the risks and benefits of vaccination remains prominent
- Boosters will become relevant as new variants emerge

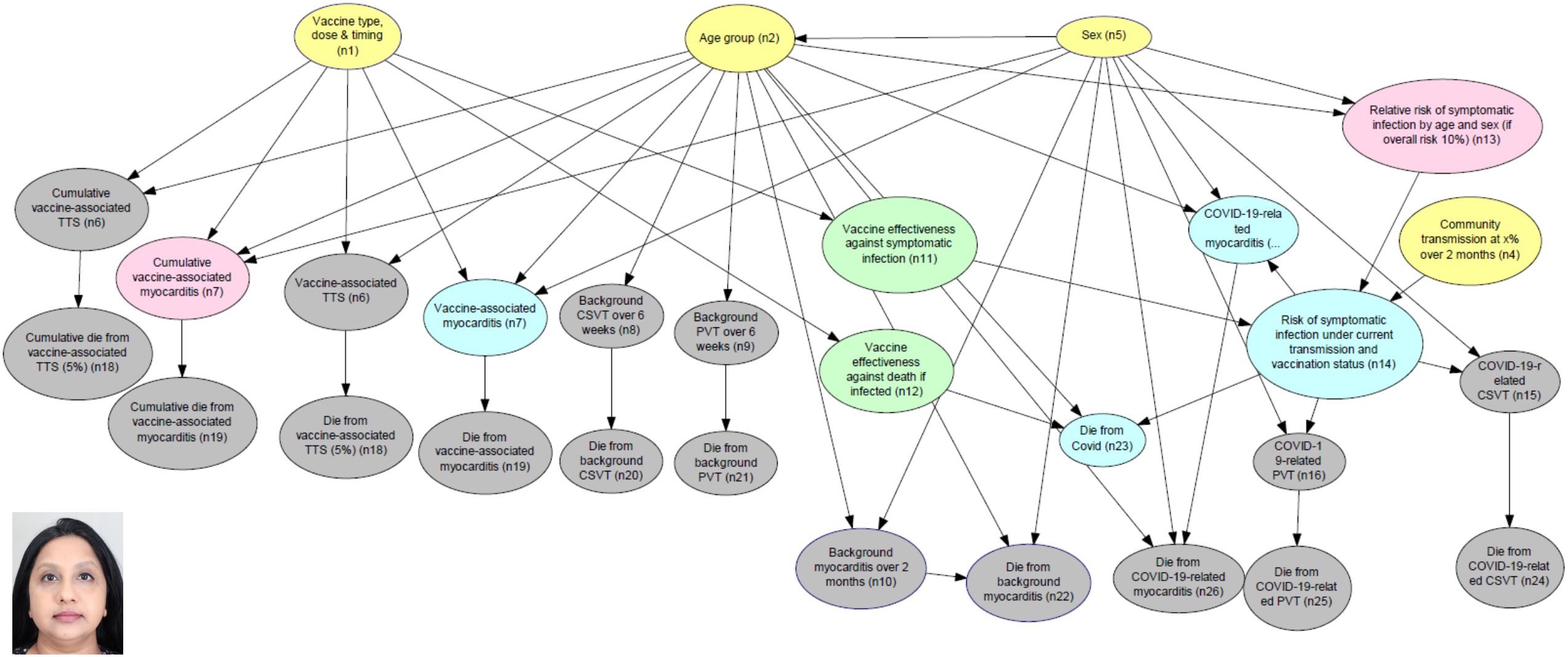
CoRiCAL Kids

- Under 18s have different risks from COVID-19
- Death is from COVID-19 is very rare
- Paediatric model focuses on risk of hospitalisation and severe outcomes
- Results pending



Moderna and boosters

- Combines original AZ and Pfizer models for easier updating
- Added Moderna and boosters
- Parameterised for Omicron variant



Myocarditis risk charts

IMMUNISATION COALITION

Risk of myocarditis after mRNA COVID-19 vaccination vs after COVID-19 infection
Estimated cases of myocarditis by age, sex and vaccination status
Australia, October 2022

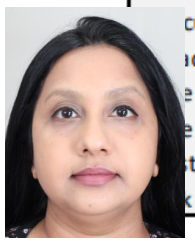
The University Of Queensland AUSTRALIA · Flinders UNIVERSITY · The University of Sydney

Gender	Age group (years)	Cases of myocarditis per million vaccine doses: Pfizer COVID-19 vaccine – Post first dose	Pfizer COVID-19 vaccine – Post second or third dose	Moderna COVID-19 vaccine – Post first dose	Moderna COVID-19 vaccine – Post second or third dose	Post COVID-19 infection	Estimated myocarditis cases per million post COVID-19 vaccination or infection
Male	5-11	≤10	≤10	Insuff. data	Insuff. data	176	10 or less
	12-17	32	134	57	236	590	10.1 to 50
	18-29	23	94	56	232	637	50.1 to 100
	30-39	≤10	32	12	50	630	100.1 to 300
	40+	≤10	≤10	≤10	13	630	More than 300
Female	5-11	≤10	≤10	Insuff. data	Insuff. data	81	
	12-17	15	28	27	50	357	
	18-29	15	28	26	48	195	
	30-39	≤10	≤10	≤10	≤10	363	
	40+	≤10	≤10	≤10	11	363	

IMPORTANT NOTES

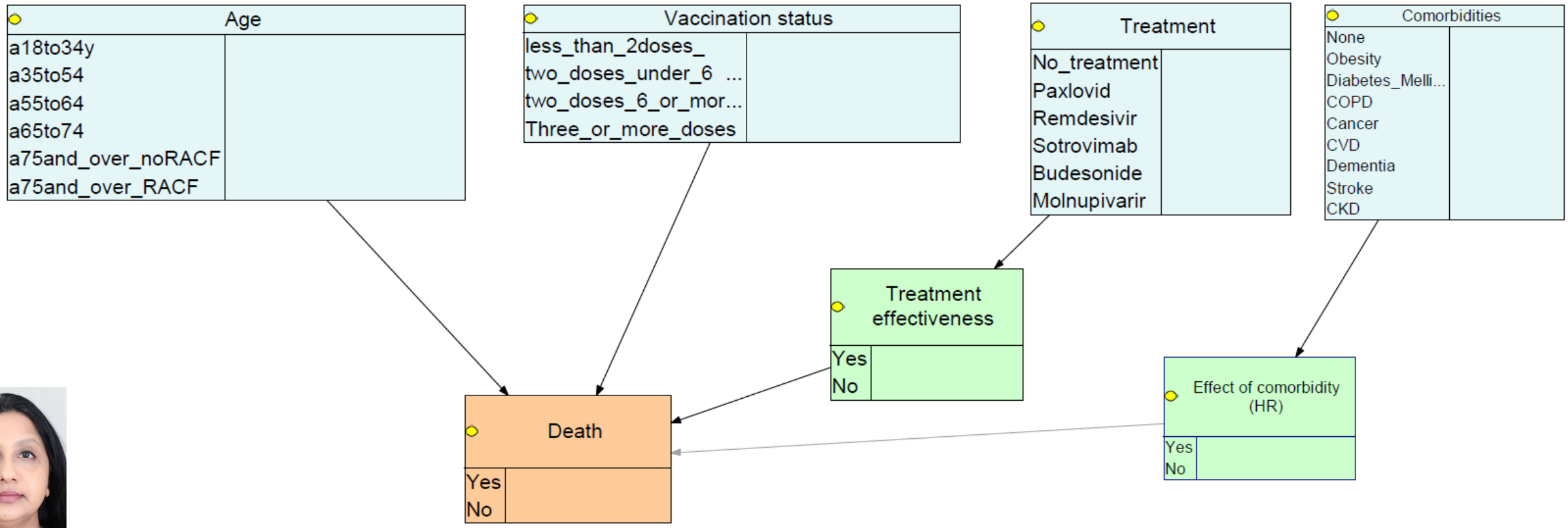
- Chart demonstrates risk of myocarditis following COVID-19 mRNA vaccination or infection. However, causality is not certain - i.e. rates above are inclusive of background myocarditis, which may be due to other causes.
- culations are based on population-level data and do not take into account individual risk factors including a past history of myocarditis following COVID- accine or infection
- e to limitations in data availability, the risk of myocarditis following third doses of vaccine is assumed to approximate that following second doses.
- e to limitations in data availablilty, the risk of myocarditis following vaccination with Moderna COVID-19 vaccine in children aged 5 to 11 years can not timated.
- k of myocarditis post COVID-19 infection assumes rates are consistent for all variants

Estimates based on CoRiCal (COVID-19 Risk Calculator):
https://corical.immunisationcoalition.org.au.
Questions and feedback to:
corical.feedback@immunisationcoalition.org.au



Antiviral treatments

- Antiviral treatments can be given once a patient is infected
- They can reduce the risk of death, particularly in high risk patients
- Effectiveness in each case should be considered when prioritising who to treat



Long COVID

- Persistent, recurring or new symptoms that cannot be attributed to other diagnoses more than 12 weeks post-SARS-CoV-2 infection
- We estimate presence of symptoms at 6 months
- Between <5% to >80% of recovered COVID-19 patients.
- Vaccination is effective at reducing long COVID
- Important to avoid reinfection, as this will increase risk substantially

Main inputs

- Current transmission rates
- Age / sex
- Vaccination status
- Comorbidities
- Number of previous SARS-CoV-2 infections

Main outcomes

- Hospitalisation from COVID-19,
- ICU admission from COVID-19,
- presence of at least one long COVID symptom **at 6 months** post-infection.

Comorbidities

- Comorbidities are associated with increased risk of infection/death
- Risk estimates for multiple permutations of comorbidities
- Comorbidities increase benefit of vaccination compared to individuals living without comorbidities

Risk communication

How can we present CoRiCAL to help people understand?

STUDY 1

Iterative end user testing of revised versions (e.g. simplified language to grade 8 reading level) using “think aloud” interviews with GPs and patients

STUDY 2

Tests different combinations of risk formats to identify the optimal combination for consumer decision making about COVID-19 vaccination

STUDY 3

Evaluate current CoRiCal tool against government information and a layered version that includes audio-visual explanations of rare outcomes to meet the varying health literacy needs of the Australian population.

Watch this space….

https://corical.immunisationcoalition.org.au/