Covid Risk Calculator (CoRiCal)

Model assumptions for a Bayesian network model for risk-benefit analysis of the Pfizer COVID-19 vaccine
21 December 2021

Table 1. Summary of data sources, assumptions, and prior distributions

Model inputs	Data sources, assumptions, rationale (references)
Vaccine effectiveness against symptomatic infection	1 dose [1] • Data from 503,875 individuals in Israel • Age <60 years: 53.1% effective. Age ≥60 years 46.8% effective • Study conducted when delta was dominant variant. 2 doses [2] • Data from large integrated health system in the USA • Data not specifically for delta variant but for a mix so we assumed there would be negligible difference between variants. • Our model focuses on risk of symptomatic infection, but this study reports estimates for total risk of infection (not necessarily symptomatic). Our model may therefore have underestimated vaccine effectiveness against symptomatic infection. • The study reports vaccine effectiveness at <1 month, 1 to <2 months, 2 to <3 months, 3 to <4 months, 4 to <5 months, and ≥5 months since the second dose. When transforming these data to the time categories used in our model (0 to <2 months, 2 to <4 months and 4 to <6 months), we averaged the reported vaccine effectiveness of the respective months in each group. • In transforming the reported age groups to those used in our model, we assumed that in age group 12-19 years, 50% were aged 12-15 years and 50% were aged 16-19 years. Likewise for age group 40-49 years we assumed that 50% of people were aged 40-44 years and 50% were aged 45-49 years. Similar assumptions were used for 50-59 and 60-69 year-olds. • See Table S1 for summary of final assumptions. 3 doses [3] • Data from Pfizer booster efficacy study conducted in the USA, Brazil and South Africa • Age 16-55 years: 96.5% effective. Age ≥56 years: 93.1% effective • Study conducted when delta was the dominant variant. • We assumed vaccine effectiveness in ages 12-15 years was the same as in ages 16-55 years. • In transforming reported age groups to those used in our model, we assumed that in age group 50-59 years, 60% were 50-55 years and 40% were 56-59 years. • See Table S1 for summary of final assumptions.
Vaccine effectiveness against death if infected	1 dose [4] • Data from Ontario study, reporting vaccine effectiveness against hospitalisation or death from delta variant. These data may therefore underestimate effectiveness against death. • Age <60 years: 89% effective. Age ≥60 years: 74% effective. 2 doses [5] • Data from Public Health England reporting vaccine effectiveness against death from delta variant. • In transforming reported time since second dose into the categories used in our model, we used weighted averages of the vaccine effectiveness in different time groups reported in the study, with weighting being proportionate to the number of weeks in each category.

	• In transforming the reported age groups to the categories used in our model, we assumed that for age group 60-69 years, 50% were 60-64 years and 50% were 65-69 years. • Data were reported only for age groups ≥16 years (which includes ≥65 years) and ≥65 years. As data were not provided for ages 16-64 years only, we assumed estimates were the same as for the ≥16 years age group. It is therefore possible that vaccine effectiveness for this age group was underestimated due to influence of the lower effectiveness within the ≥65-year-olds. • As no data were reported for age <16 years, we assumed that ages 12-15 years had the same vaccine effectiveness as ages 16-64 years. • See Table S2 for summary of final assumptions. 3 doses [5] • As no data have yet been published on the effectiveness of a third dose against death, we assumed the same effectiveness as 'Two doses (last dose 0 to <2 months ago)'.
Relative risk of symptomatic infection by age and sex	Data from Australian National Interoperable Notifiable Diseases Surveillance System (NINDSS) [6] reports age and sex distribution of all COVID-19 cases in Australia up to 8 Dec 2021. We subtracted data from the Australian Government Department of Health Epidemiology Reports 32 and 43 [7] reporting age and sex distribution of COVID-19 cases in Australia in 2020, and Jan to June 2021, respectively, to obtain age and sex distribution of cases from 6 June to 8 Dec 2021 to represent the delta variant. We calculated relative risk of infection by age group and sex by estimating the probability of infection in each age-sex group if overall probability of infection in the community was 1%. See Table S3 for final assumptions.
Risk of symptomatic infection under current transmission and vaccination status	Definitions of low, medium, and high transmission as defined by Australian Technical Advisory Group on Immunisation (ATAGI) [8]. Low – similar to first wave in Australia (equivalent to 0.016% of population infected over 2 months). Medium – similar to second wave in Victoria, Australia in 2020 (equivalent to 0.149% of population infected over 2 months). High – similar to Europe in January 2021 (equivalent to 1.920% of population infected over 2 months). Also included transmission scenarios equivalent to: zero transmission; 1% and 2% chance of infection over 2 months; and 1000 cases/day in New South Wales; 1000 cases/day in Victoria; 1000 cases/day in Queensland. Chance of infection over 2 months calculated for different levels of community transmission. See Table S4 for final assumptions.
Risk of dying from COVID-19	COVID-19 cases reported in Australia from January 2020 to 18/11/2021 were used to provide estimates of age-sex-specific case fatality rates. Data sourced from Australian NINDSS [6]. To convert reported age groups into those used in our model, calculations were based on age distribution of the Australian population [9]. See Table S5 for final assumptions.
Risk of getting (background) myocarditis	Multinational network cohort study from Australia, France, Germany, Japan, Netherlands, Spain, the UK and the USA reports background incidence of myocarditis and pericarditis per 100,000 person-years by age group and sex [10]. We assumed that 65% of reported myopericarditis cases were myocarditis, based on proportions from other studies [11,12]. We converted incidence to probability of infection per person over 2 months. To convert reported age groups into those used in the model, calculations were based on age distribution of the Australian population [9]. See Table S6 for final assumptions.
Risk of dying from (background) myocarditis	Study reports incidence of fatal myocarditis in Finland per 100,000 person-years by age group and sex as total risk [13], but not as case fatality rate. We converted incidence per 100,000 person-years to probability per person over 2 months (in the general population), then used these values for each age-sex subgroup as the numerator and the respective values for node 'Risk of getting (background) myocarditis' as the denominator to calculate case fatality rate. When converting reported age groups to the age groups used in our model, calculations were based on the age distribution of the Australian population [9]. See Table S6 for final assumptions.
Risk of getting Pfizer vaccine-associated myocarditis	Therapeutic Goods Administration (TGA) reports rates of myocarditis from the Pfizer vaccine per 100,000 doses in Australia, from all doses and second doses [14]. From this we calculated rates from first doses. As no data were available for the third dose in Australia at the time of writing, we assumed the same rate of vaccine-associated myocarditis as the second dose. This assumption was based on data from Israel reporting that rates of Pfizer vaccine-induced myocarditis from the third dose was higher than after the first dose but lower than after the second dose [15]. To provide a conservative estimate and avoid underestimating the potential risk of myocarditis after the third dose, we assumed the same rates as the second dose, i.e. the 'worst case scenario'. See Table S7 for final assumptions.

Risk of dying from Pfizer vaccine-associated myocarditis	Case fatality rate from mRNA vaccine-associated myocarditis has not been reported widely, in part due to very low numbers. Data from Centers for Disease Control and Prevention (CDC) Vaccine Adverse Event Reporting System (VAERS) [16]. Reported 877 myocarditis cases after mRNA vaccination in those aged under 30 years, of which three likely died from myocarditis, giving a case fatality rate of 0.34% (3/877). We assumed the same case fatality rate for Pfizer and other mRNA COVID-19 vaccines, and the same case fatality rate in those aged ≥30 years.
Risk of getting SARS-CoV-2 infection-induced myocarditis	Study reports a 14% pooled prevalence of myocarditis in 890 patients who recovered from COVID-19 from 16 studies [17]. All cardiac magnetic resonance scans were performed within 22 weeks of recovery. Data were insufficient to stratify by age and sex.
Risk of dying from SARS-CoV-2 infection-induced myocarditis	Study reports a six-month all-cause mortality of 3.9% in COVID-19 patients with myocarditis, assuming that deaths were attributable to myocarditis [18]. Published data were insufficient to stratify by age and sex. Age-sex breakdown of the myocarditis cases and deaths were provided by the authors through personal communication. For males aged 20-29 years, there were zero deaths out of 661 cases of myocarditis (case fatality rate 0%, 95% CI 0-0.6%). To avoid using a 0% case fatality rate in the model, we assumed that 20-29 year old males had the same case fatality rate as 30-39 year old males (0.98%, 95% CI 0.5-1.8%). We believe this is a reasonable assumption due to the rate being slightly higher than for 20-29 year old females (0.76%), and because in females there was no significant difference in case fatality rate between ages 20-29 years and 30-39 years. For those aged 12-19 years, we assumed the same case fatality rate as those aged 20-29 years. See Table S8 for final assumptions.
Prior distributions	
Age distribution of population	Distribution based on Australian Bureau of Statistics (ABS) national population estimates from September 2021 [9]. See Table S9 for final assumptions.. Note age group 0-11 years was excluded from this version of the model because they were not yet eligible for vaccination in Australia at time of writing. This age group can be added into the model when vaccine coverage increases and data on vaccine effectiveness become available.
Sex distribution of population	Assumed 50% male, 50% female.
Pfizer vaccine coverage in population*	Assumed 5% had no doses, 5% had one dose only, 60% had two doses only, 30% had three doses for ages ≥12 years. These approximations were based on vaccine coverage data from Australian Government Department of Health COVID-19 vaccination data on 9 Dec 2021 [19], and our estimates of how coverage will increase over the coming months.
Community transmission at x% over 2 months*	Chance of infection (x%) over 2 months, based on different levels of community transmission. Priors set to even distribution between categories, assuming that community transmission level will be selected when using the CoRiCal tool or running public health-level scenario analyses. See explanation above under 'Risk of symptomatic infection under current transmission and vaccination status'.

*Note that prior distributions do not affect results of scenario analysis but enables the model to provide population-level estimates. Assumptions can be changed as the situation evolves.

Table 2. Summary of nodes and relationships between nodes in a Bayesian network for assessing risks versus benefits of the Pfizer COVID-19 vaccine.

Node name (number)	Description	Potential values	Node type	Parent nodes	Child nodes
Pfizer vaccine dose & time since dose 2 (n1)	Vaccine dose number	None, 1st dose (<3 weeks ago), 2nd dose (last dose 0 to <2 months ago), 2nd dose (last dose 2 to <4 months ago), 2nd dose (last dose 4 to <6 months ago), 3rd dose (2 plus booster)	Input	N/A – Default priors: Vaccine dose distribution of Australia by age	n5, n7, n8
Age group (n2)	Age group (years)	12-19, 20-29,30-39, 40-49, 50-59, 60-69, 70+	Input	N/A – Default priors: population distribution of Australia by age	n1, n5-9, n13, n14
Sex (n3)	Sex	Male, female	Input	N/A – Defaults to uniform distribution	n5, n6, n9, n13, n14
Community transmission at x% over 2 months (n4)	Probability of infection over 2 months based on different levels of community transmission	None, ATAGI definitions of low, med, high, 1%, 2%, NSW 1000 cases/day, VIC 1000 cases/day, QLD 1000 cases/day	Input	N/A – Defaults set to uniform distribution	n10
Vaccine-associated myocarditis (n5)	Probability of developing myocarditis from the Pfizer COVID-19 vaccine	Yes, no	Intermediate	Pfizer COVID-19 vaccine dose & time since dose 2 (n1), Age group (n2), Sex (n3)	n12
Background myocarditis over 2 months (n6)	Probability of developing myocarditis over 2 months (background rate in those who have not had vaccine or infection)	Yes, no	Outcome	Age group (n2), Sex (n3)	n13
Vaccine effectiveness against symptomatic infection (n7)	Effectiveness of the vaccine at preventing symptomatic SARS-CoV-2 infection	Effective, ineffective	Intermediate	Pfizer COVID-19 vaccine dose & time since dose 2 (n1), Age group (n2)	n10
Vaccine effectiveness against death (n8)	Effectiveness of the vaccine at preventing deaths from symptomatic SARS-CoV-2 infection	Effective, ineffective	Intermediate	Pfizer COVID-19 vaccine dose & time since dose 2 (n1), Age (n2)	n14
Relative risk of symptomatic infection by age and sex (n9)	Relative risk of symptomatic SARS-CoV-2 infection depending on age and sex	Yes, no	Intermediate	Age group (n2), Sex (n3)	n10
Risk of symptomatic infection under current transmission and vaccination status (n10)	Probability of symptomatic COVID-19	Yes, no	Intermediate	Community transmission at x% over 2 months (n4), Vaccine effectiveness against symptomatic infection (n7), Risk of symptomatic infection by age and sex (n9)	n11, n14

Myocarditis from COVID-19 (n11)	Probability of developing myocarditis related to SARS-CoV-2 infection	Yes, no	Intermediate	Risk of symptomatic infection under current transmission and vaccination status (n10)	n15
Die from vaccine-associated myocarditis (n12)	Probability of dying from COVID-19 vaccine-associated myocarditis	Yes, no	Outcome	Vaccine-associated myocarditis (n5)	N/A
Die from myocarditis (background) (n13)	Probability of dying from myocarditis (background rate in those who have not had COVID-19 vaccine or SARS-CoV-2 infection)	Yes, no	Outcome	Age group (n2), Sex (n3), Background myocarditis over 2 months (n6)	N/A
Die from COVID-19 (n14)	Probability of dying from COVID-19	Yes, no	Outcome	Age group (n2), Sex (n3), Vaccine effectiveness against death (n8), Risk of symptomatic infection under current transmission and vaccination status (n10)	N/A
Die from COVID-19-related myocarditis (n15)	Probability of dying from COVID-19-related myocarditis	Yes, no	Outcome	Myocarditis from COVID-19 (n11)	N/A

Supplementary Tables

Table S1. Pfizer COVID-19 vaccine effectiveness against symptomatic infection with SARS-CoV-2 delta variant, by age group.

Age (years)	1 dose[a]	2 doses (last dose 0 to <2 months ago)[b]	2 doses (last dose 2 to <4 months ago)[b]	2 doses (last dose 4 to <6 months ago)[b]	3 doses (<4 months post 3rd dose)[c]
12-19	53.1%	89.0%	79.5%	74.0%	96.5%
20-29	53.1%	86.5%	73.0%	48.0%	96.5%
30-39	53.1%	86.5%	73.0%	48.0%	96.5%
40-49	53.1%	86.3%	72.8%	51.8%	96.5%
50-59	53.1%	86.0%	72.5%	55.5%	95.1%
60-69	46.8%	82.8%	69.0%	50.8%	93.1%
70+	46.8%	79.5%	65.5%	46.0%	93.1%

Sources:

[a]Chodick, G., Tene, L., Patalon, T., Gazit, S., Tov, A.B., Cohen, D., and Muhsen, K. (2021). Assessment of effectiveness of 1 dose of BNT162b2 vaccine for SARS-CoV-2 infection 13 to 24 days after immunization. *JAMA Network Open* 4(6):e2115985. doi: 10.1001/jamanetworkopen.2021.15985. [1]

[b]Tartof, S.Y., Slezak, J.M., Fischer, H., Hong, V., Ackerson, B.K., Ranasinghe, O.N., et al. (2021). Effectiveness of mRNA BNT162b2 COVID-19 vaccine up to 6 months in a large integrated health system in the USA: a retrospective cohort study. *The Lancet* 398(10309):1407–1416. doi: 10.1016/S0140-6736(21)02183-8. [2]

[c]Perez, J.L. (2021). Efficacy and safety of BNT162b2 booster – C4591031 2 month interim analysis. *Centers for Disease Control and Prevention*. Accessed 17 December 2021 from https://www.cdc.gov/vaccines/acip/meetings/downloads/slides-2021-11-19/02-COVID-Perez-508.pdf. [3]

Table S2. Pfizer COVID-19 vaccine effectiveness against death if infected with SARS-CoV-2 delta variant, by age group.

Age (years)	1 dose[a]	2 doses (last dose 0 to <2 months ago)[b]	2 doses (last dose 2 to <4 months ago)[b]	2 doses (last dose 4 to <6 months ago)[b]	3 doses (<2 months post 3rd dose)[b]
12-59	89%	98.2%	95.3%	91.7%	98.2%
60-69	74%	97.6%	95.2%	92.0%	97.6%
70+	74%	97.0%	95.2%	92.2%	97.0%

Sources:

[a]Nasreen, S., Chung, H., He, S., Brown, K.A., Gubbay, J.B., Buchan, S.A., et al. (2021). Effectiveness of mRNA and ChAdOx1 COVID-19 vaccines against symptomatic SARS-CoV-2 infection and severe outcomes with variants of concern in Ontario. *medRxiv*. doi: 10.1101/2021.06.28.21259420. [4]

[b]Andrews, N., Tessier, E., Stowe, J., Gower, C., Kirsebom, F., Simmons, R., et al. (2021). *medRxiv*. doi: 10.1101/2021.09.15.21263583. [5]

Table S3. Relative probability of infection by age group and sex for SARS-CoV-2 delta variant (chance of infection in each age-sex group if overall probability of infection of 1%).

Age (years)	Male	Female
0-11	1.37%	1.30%
12-19	1.41%	1.34%
20-29	1.41%	1.29%
30-39	1.18%	1.12%
40-49	0.98%	0.94%
50-59	0.76%	0.72%
60-69	0.51%	0.49%
≥70	0.39%	0.42%
Overall	**1.03%**	**0.97%**

Sources:

Australian Government Department of Health. (2021). Coronavirus (COVID-19) case numbers and statistics – cases and deaths by age and sex. *Australian Government Department of Health.* Accessed 17 December 2021 from https://www.health.gov.au/news/health-alerts/novel-coronavirus-2019-ncov-health-alert/coronavirus-covid-19-case-numbers-and-statistics#covid19-summary-statistics. [6]

Australian Government Department of Health. (2021). Coronavirus disease 2019 (COVID-19) epidemiology reports, Australia, 2020-2021. *Australian Government Department of Health.* Accessed 17 December 2021 from https://www1.health.gov.au/internet/main/publishing.nsf/Content/novel_coronavirus_2019_ncov_weekly_epidemiology_reports_australia_2020.htm. [7]

Table S4. Probability of infection (over 2 months) based on different intensities of community transmission.

Intensity of community transmission	Cases per 100,000 over 16 weeks*	Cases per million over 2 months	Estimated % of population infected over 2 months
Zero	0	0	0%
Low*	29	157	0.016%
Medium*	275	1,490	0.149%
High*	3,544	19,197	1.920%
1% over 2 months		10,000	1%
2% over 2 months		20,000	2%
1000 cases/day in NSW[a]		7,425	0.743%
1000 cases/day in VIC[b]		9,096	0.910%
1000 cases/day in QLD[c]		11,689	1.169%

* Definitions of low, medium, and high transmission (cases per 100,000 over 16 weeks) as defined by [8]. Low: similar to first wave in Australia. Medium: similar to second wave in VIC. High: similar to Europe in January 2021.

[a]Based on NSW population of 8.17 million. [b]Based on VIC population of 6.67 million. [c]Based on QLD population of 5.19 million.

Source:

Australian Technical Advisory Group on Immunisation. (2021). Weighing up the potential benefits and risk of harm from COVID-19 vaccine AstraZeneca. *Australian Government Department of Health.* Accessed 17 December 2021 from https://www.health.gov.au/sites/default/files/documents/2021/06/covid-19-vaccination-weighing-up-the-potential-benefits-against-risk-of-harm-from-covid-19-vaccine-astrazeneca_2.pdf. [8]

Table S5. Cases, deaths, and case fatality rate of COVID-19 in Australia in ages ≥12 years by age and sex, 1/1/2020 to 18/11/2021.

	Male			Female		
Age (years)	**Cases**	**Deaths**	**Case fatality rate**	**Cases**	**Deaths**	**Case fatality rate**
12-19	11,934	1	0.01%	11,286	1	0.01%
20-29	20,066	6	0.03%	18,755	3	0.02%
30-39	17,324	12	0.07%	16,104	7	0.04%
40-49	12,277	28	0.23%	11,452	12	0.10%
50-59	9252	70	0.76%	8837	39	0.44%
60-69	5598	144	2.57%	5375	58	1.08%
≥70	5059	789	15.60%	5786	752	13.00%
Total	**81,510**	**1,050**	**1.29%**	**77,595**	**872**	**1.12%**

Sources:

Australian Government Department of Health. (2021). Coronavirus (COVID-19) case numbers and statistics – cases and deaths by age and sex. *Australian Government Department of Health.* Accessed 17 December 2021 from https://www.health.gov.au/news/health-alerts/novel-coronavirus-2019-ncov-health-alert/coronavirus-covid-19-case-numbers-and-statistics#covid19-summary-statistics. [6]

Australian Bureau of Statistics. (2021). National, state and territory population. *Australian Bureau of Statistics.* Accessed 17 December 2021 from https://www.abs.gov.au/statistics/people/population/national-state-and-territory-population/latest-release. [9]

Table S6. Estimated background incidence and fatality of myocarditis over 2 months (in populations who have not received the Pfizer COVID-19 vaccine and have not been diagnosed with COVID-19).

	Incidence of myocarditis over 2 months (per million population)[b]		Incidence of fatal myocarditis over 2 months (per million population)[c]		Case fatality rates from myocarditis	
Age (years)[a]	Male	Female	Male	Female	Male	Female
12-19	19.0	10.0	0.3	0.3	1.3%	2.5%
20-29	40.1	17.3	0.5	0.3	1.2%	1.7%
30-39	40.1	20.6	0.9	0.4	2.3%	2.2%
40-49	40.1	23.8	1.3	0.7	3.3%	3.0%
50-59	44.4	28.7	1.1	0.9	2.6%	3.1%
60-69	50.9	35.8	1.3	1.0	2.5%	2.9%
≥70	53.9	39.6	1.6	1.7	3.0%	4.3%

Sources:

[a]Australian Bureau of Statistics. (2021). National, state and territory population. *Australian Bureau of Statistics.* Accessed 17 December 2021 from https://www.abs.gov.au/statistics/people/population/national-state-and-territory-population/latest-release. [9]

[b]Li, X., Ostropolets, A., Makadia, R., Shoaibi, A., Rao, G., Sena, A.G., et al. (2021). Characterising the background incidence rates of adverse events of special interest COVID-19 vaccines in eight countries: multinational network cohort study. *The BMJ* 2021(373):n1435. doi: 10.1101/2021.03.25.21254315. [10]

[c]Barda, N., Dagan, N., Ben-Shlomo, Y., Kepten, E., Waxman, J., Ohana, R., et al. (2021). Safety of the BNT162b2 mRNA COVID-19 vaccine in a nationwide setting. *The New England Journal of Medicine* 385:1078–1090. doi: 10.1056/NEJMoa2110475. [13]

Table S7. Rates of myocarditis cases per 1,000,000 Pfizer COVID-19 vaccine doses in Australia by age and sex.

	First dose		Second dose		Third dose[a]	
Age (years)	Male	Female	Male	Female	Male	Female
12-19	24	6	103	25	103	25
20-29	17	7	59	19	59	19
30-39	17	8	15	6	15	6
40-49	5	5	11	9	11	9
50-59	7	2	1	4	1	4
60-69	4	6	0	0	0	0
≥70	0	4	0	0	0	0

[a]Assumed the same rates as after second dose because no data were available for rates after third dose.

Source:

Therapeutic Goods Administration. (2021). COVID-19 vaccine weekly safety report – 09-12-2021. *Australian Government Department of Health.* Accessed 17 December 2021 from https://www.tga.gov.au/periodic/covid-19-vaccine-weekly-safety-report-09-12-2021. [14]

Table S8. COVID-19-related myocarditis cases, deaths, and case fatality rate in ages ≥12 years by age and sex, up to 6 months post-myocarditis diagnosis.

	Male			Female		
Age (years)	Cases	Deaths	Case fatality	Cases	Deaths	Case fatality
12-19[a]	-	-	0.98%	-	-	0.76%
20-29[b]	-	-	0.98%	1321	10	0.76%
30-39	1025	10	0.98%	1849	10	0.54%
40-49	1044	18	1.72%	1690	10	0.59%
50-59	1242	44	3.54%	1644	23	1.40%
60-69	1286	95	7.39%	1458	59	4.05%
≥70	1314	199	15.14%	1452	183	12.60%
Total	**6572**	**366**	**5.57%**	**9414**	**295**	**3.13%**

[a]Cases and deaths were not reported for ages 12-19 years, assumed to be the same as for ages 20-29 years.

[b]For males aged 20-29 years, there were zero deaths out of 661 cases of myocarditis (case fatality rate 0%, 95% CI 0-0.6%). To avoid using a 0% case fatality rate in the model, we assumed that 20-29 year old males had the same case fatality rate as 30-39 year old males (0.98%, 95% CI 0.5-1.8%). For those aged 12-19 years, we assumed the same case fatality rate as those aged 20-29 years.

Source:

Personal communication from authors regarding patient cohort described in: Buckley, B.J.R., et al. (2021). Prevalence and clinical outcomes of myocarditis and pericarditis in 718,365 COVID-19 patients. *European Journal of Clinical Investigation* 51(11):e13669. doi: 10.1111/eci.13679. [18]

Table S9. Age distribution of Australian population, September 2021.

Age (years)	Population	% of total population
0-11	3,828,247	14.90%
12-19	2,438,423	9.49%
20-29	3,617,689	14.08%
30-39	3,757,954	14.63%
40-49	3,296,519	12.83%
50-59	3,120,900	12.15%
60-69	2,696,731	10.50%
≥70	2,936,879	11.43%
Total	**25,693,342**	**100.00%**

Source:

[a]Australian Bureau of Statistics. (2021). National, state and territory population. *Australian Bureau of Statistics.* Accessed 17 December 2021 from https://www.abs.gov.au/statistics/people/population/national-state-and-territory-population/latest-release. [9]

References

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2. Tartof, S.Y., Slezak, J.M., Fischer, H., Hong, V., Ackerson, B.K., Ranasinghe, O.N., et al. (2021). Effectiveness of mRNA BNT162b2 COVID-19 vaccine up to 6 months in a large integrated health system in the USA: a retrospective cohort study. *The Lancet* 398(10309):1407–1416. doi: 10.1016/S0140-6736(21)02183-8.
3. Perez, J.L. (2021). Efficacy and safety of BNT162b2 booster – C4591031 2 month interim analysis. *Centers for Disease Control and Prevention*. Accessed 17 December 2021 from https://www.cdc.gov/vaccines/acip/meetings/downloads/slides-2021-11-19/02-COVID-Perez-508.pdf.
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