Additional file 2. Inputs used in the model. This file includes the full parameters used in the model.

Table 1. All scenarios included in our study which were adapted based on Doherty's modelled COVID-19 outcomes

Scenarios	Description
Scenario 1	**70% and low seeding infections**
• Scenario 1A	Baseline PHSMs + Partial TTIQ effectiveness
• Scenario 1B	Baseline PHSMs + Optimal TTIQ effectiveness
• Scenario 1C	Low PHSMs + Partial TTIQ effectiveness
Scenario 2	**70% and high seeding infections**
• Scenario 2A	Baseline PHSM+ Partial TTIQ,
• Scenario 2B	Baseline PHSM+ Optimal TTIQ,
• Scenario 2C	Low PHSM+ Partial TTIQ,
• Scenario 2D	Med/Low + Partial§ TTIQ,
Scenario 3	**80% assuming baseline PHSMs and partial TTIQ**
• Scenario 3A	Low seeding infections
• Scenario 3B	Medium seeding infections
• Scenario 3C	High seeding infections
Scenario 4	**80% assuming baseline PHSMs and optimal TTIQ**
• Scenario 4A	Low seeding infections
• Scenario 4B	Medium seeding infections
• Scenario 4C	High seeding infections

Note: PHSM= public health and social measures, TTIQ= efficacy of test, trace, isolate, quarantine

Source: COVID-19 related deaths, symptomatic infections, ICU admission and ward admissions were reported in tables ES1, ES2, tables 2.3, and table 2.4 of Doherty's Modelling interim report to national cabinet 17th September 2021 [1].

Table 2. Model inputs

Health States	Rates	Duration (Sensitivity Analysis)	DW (Uncertainty Analysis)
Death	Reported in table ES1, ES2, 2.3 and 2.4 from Doherty Modelling report [1]. The rates of Australian total COVID-19 related death as of 03 October 2021 was employed to present deaths in a 10-age group band [2].	Nil	Nil
Asymptomatic	Not considered	Nil	Nil
Moderate	Calculated based on the reported symptomatic infections minus the Ward admission and ICU admission reported in table ES1, ES2, 2.3 and 2.4 from Doherty Modelling report [1].	14 days[3]	0.051 (0.032 – 0.074)*[4, 5]
Severe	Reported in table ES1, ES2, 2.3 and 2.4 from Doherty Modelling report [1].	14 days[3]	0.133 (0.088 – 0.190)*[4, 5]
Critical	Reported in table ES1, ES2, 2.3 and 2.4 from Doherty Modelling report [1].	14 days[3]	0.655 (0.579 – 0.727)*[4, 5]
Post-acute consequences (ONS)	Start at 25.91% (23.2% to 29.0%) 2 weeks after initial COVID infection[6]* See notes below on how we compute for the COVID-19 survivors noted in this calculation.	14 days to 2 years (assumed)	0.219 (0.148-0.308)[4, 5]
Post-acute consequences (NSW)	Start at 33.60% (33.0% to 34.0%%) 2 weeks after initial COVID infection[7] See notes below on how we compute for the COVID-19 survivors noted in this calculation.	14 days to 2 years (assumed)	0.219 (0.148-0.308)[4, 5]
Post-Intensive Care Syndrome (PICS)	90.6% of ICU survivors[8] See notes below on how we compute for the COVID-19 survivors noted in this calculation.	14 days (to remaining lifetime expectancy)[9, 10]	0.224 (0.151-0.312)* (a)[11, 12]

*Note: PICS= Post Intensive Care Syndrome, NSW= New South Wales, ONS= Office of National Statistics, *Used in uncertainty analysis using beta-distribution; a Symptomatic atrial fibrillation and flutter as proxy for PICS; See Appendix Table 6 for the incidence rates used in the study*

Post-acute consequences

COVID-19 survivors were generated by deducting the total number of deaths from the total number of symptomatic infections. Doherty Modelling results reported the total number of patients admitted in the ICU and hospital ward. To get the number of ICU survivors, we applied the probability of dying from ICU[13] to patient's admitted in critical care. For the ward survivors, we directly deducted the ICU related deaths from the total deaths (ward related death) and deduct the total ward numbers from this estimate. Vaccinated individuals were less likely to have Long COVID and therefore a treatment effect of vaccines was applied in this cohort (Odds Ratio=0.51, 95%CI:0.32-0.82 converted to Relative risk). To correctly apply this estimate to our Long COVID health state, we then first convert our Long COVID probability to rates and then multiply RR and then convert it back probability [14-16].

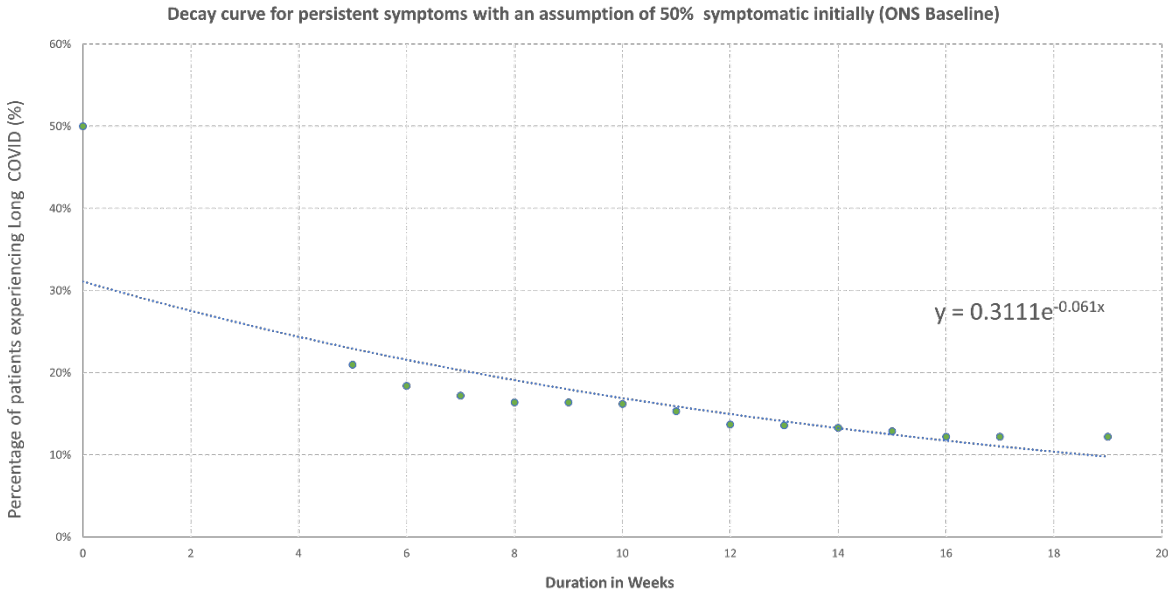
As for the Long COVID probability we have used ONS and NSW datapoints and extrapolated it to 104 weeks. We have used the constant and power term in table 3 which were generated from the plotted data points of COVID Infection Survey and NSW population-based study. The data points for ONS and NSW were published elsewhere [6, 7]. Figures 1 and 2 present the plotted data points using a decay function similar to the methods of Martin et al [17].

Table 3. Data used to extrapolate the % post-acute consequences

CIS data points	Constant	Power term	Extrapolated data at 52 weeks	Extrapolated data at 104 weeks
Baseline	0.3111	-0.061	1.30%	0.1%
LL	0.2887	-0.073	0.60%	0.0%
UL	0.3358	-0.049	2.60%	0.2%
NSW Data points	**Constant**	**Power term**	**Extrapolated data at 52 weeks**	**Extrapolated data at 104 weeks**
Baseline	0.5629	-0.172	0.01%	0.00%
LL	0.5997	-0.199	0.00%	0.00%
UL	0.5276	-0.146	0.03%	0.00%

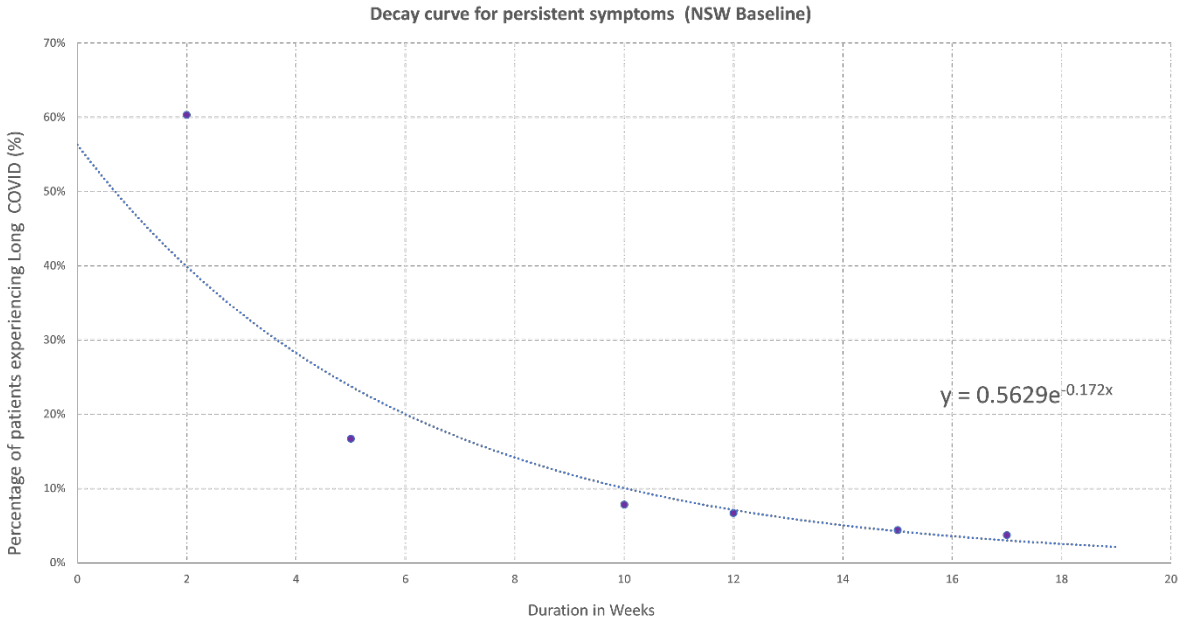
Note: CIS= COVID Infection Survey, NSW= New South Wales

Figure 1. Decay Curve for Long COVID using ONS data



Source: Data sourced from the Office for National Statistics [6]

Figure 2: Decay Curve for Long COVID using NSW data



Source: Data sourced from Liu et al[7]

Post-Intensive Care Syndrome (PICS)

COVID-19 survivors aged 60 and above were considered in this cohort as the characteristics of patients developing PICS included in our chosen literature were in the age group of 65 (54-71) where more than half of the cohort are >65 years and 43.8% were retired [8]. ICU survival distribution per age group was obtained from Australia's Epidemiological report 50 [18].

Permanent functional impairment

COVID-19 survivors were calculated similar to post-acute consequences cohort group.

Table 4. Data used in the permanent disability health states

Permanent Disability	Incidence Rate	Population of Interest	Duration	Australian Incidence	Australian DALYS
Diabetes	2.8% (2.6% to 3.1%)*[19]	COVID-19 survivors who were hospitalised (age greater than 30)	140 days following hospital admission	69,042.78[20]	186,528.44[20]
Parkinson's disease	0.11% (0.08% to 0.14%)*[21]	COVID-19 survivors regardless of hospitalisation status (age greater than 10 years old)	6 months post COVID diagnosis	6,598.01[20]	38,742.45[20]
Dementia	0.67% (0.59% to 0.75%)*[21]	COVID-19 survivors regardless of hospitalisation status (age greater than 10 years old)	6 months post COVID diagnosis	43,968.58[20]	154,293.14[20]
Anxiety Disorders	7.11%(6.82% to 7.41%)*[21]	COVID-19 survivors regardless of hospitalisation status (age greater than 10 years old)	6 months post COVID diagnosis	188,749.60[20]	139,107.98[20]
Ischaemic Stroke	0.76% (0.68% to 0.85%)*[21]	COVID-19 survivors regardless of hospitalisation status (age greater than 10 years old)	6 months post COVID diagnosis	17,984.10[20]	114,238.13[20]

*Note: *Used in uncertainty analysis using beta-distribution*

References

1. Doherty Institute. Doherty Modelling Interim report to National Cabinet 17th September 2021 Australia: Doherty Institute; 2021; Cited 2021 September 20. Available from: https://www.doherty.edu.au/uploads/content_doc/DOHERTY_MODELLING_INTERIM_REPORT_TO_NATIONAL_CABINET_17TH_SEPTEMBER_2021.pdf.
2. Department of Health. Coronavirus (COVID-19) case numbers and statistics Australia2021; Cited 2021 October 04. Available 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.
3. Cuschieri S, Calleja N, Devleesschauwer B, Wyper GMA. Estimating the direct Covid-19 disability-adjusted life years impact on the Malta population for the first full year. BMC Public Health. 2021;21(1):1827.
4. Wyper G, Assunção R, Colzani E, Grant I, Haagsma JA, Lagerweij G, et al. Burden of disease methods: a guide to calculate COVID-19 disability-adjusted life years. International Journal of Public Health. 2021;66:4.
5. European Burden of Disease Network. Burden of disease of COVID-19: Protocol for country studies 2020; Cited 2021 August 01 Available from: https://www.burden-eu.net/docs/covid19-bod-protocol.pdf.
6. Office for National Statistics. Prevalence of ongoing symptoms following coronavirus (COVID-19) infection in the UK: 1 April 2021: Estimates of the prevalence of self-reported "long COVID", and the duration of ongoing symptoms following confirmed coronavirus infection, using UK Coronavirus (COVID-19) Infection Survey data to 6 March 2021. UK: ONS; 2021; Cited 2021 September 01. Available from: https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/conditionsanddiseases/bulletins/prevalenceofongoingsymptomsfollowingcoronaviruscovid19infectionintheuk/1april2021.
7. Liu B, Jayasundara D, Pye V, Dobbins T, Dore GJ, Matthews G, et al. Whole of population-based cohort study of recovery time from COVID-19 in New South Wales Australia. The Lancet Regional Health-Western Pacific. 2021;12:100193.
8. Rousseau A-F, Minguet P, Colson C, Kellens I, Chaabane S, Delanaye P, et al. Post-intensive care syndrome after a critical COVID-19: cohort study from a Belgian follow-up clinic. Annals of intensive care. 2021;11(1):1-9.
9. Hofhuis JG, Schrijvers AJ, Schermer T, Spronk PE. Health-related quality of life in ICU survivors—10 years later. Scientific Reports. 2021;11(1):1-10.
10. Cuthbertson BH, Roughton S, Jenkinson D, Maclennan G, Vale L. Quality of life in the five years after intensive care: a cohort study. Crit Care. 2010;14(1):R6-R.
11. Byrnes J, Ball J, Gao L, Kai Chan Y, Kularatna S, Stewart S, et al. Within trial cost-utility analysis of disease management program for patients hospitalized with atrial fibrillation: results from the SAFETY trial. Journal of medical economics. 2019;22(9):945-52.
12. Global Burden of Disease Collaborative Network. Global Burden of Disease Study 2019 (GBD 2019) Disability Weights Seattle, United States: Institute for Health Metrics and Evaluation (IHME); 2020; Cited 2021 August 01 Available from: http://ghdx.healthdata.org/record/ihme-data/gbd-2019-disability-weights.
13. Knock ES, Whittles LK, Lees JA, Perez-Guzman PN, Verity R, FitzJohn RG, et al. Key epidemiological drivers and impact of interventions in the 2020 SARS-CoV-2 epidemic in England. Sci Transl Med. 2021;13(602).

14. Antonelli M, Penfold RS, Merino J, Sudre CH, Molteni E, Berry S, et al. Risk factors and disease profile of post-vaccination SARS-CoV-2 infection in UK users of the COVID Symptom Study app: a prospective, community-based, nested, case-control study. The Lancet Infectious Diseases.
15. Zhang J, Yu KF. What's the Relative Risk?A Method of Correcting the Odds Ratio in Cohort Studies of Common Outcomes. JAMA. 1998;280(19):1690-1.
16. Fleurence RL, Hollenbeak CS. Rates and Probabilities in Economic Modelling. PharmacoEconomics. 2007;25(1):3-6.
17. Martin CJ, McDonald S, Luteijn M, Robertson J, Letton W. A model framework for projecting the prevalence and impact of Long-COVID in the UK: medRxiv 2021.05.18.21252341 [Preprint]; 2021; Cited 2021 August 01. Available from: https://doi.org/10.1101/2021.05.18.21252341
18. COVID-19 National Incident Room Surveillance Team. COVID-19 Australia: Epidemiology Report 50 reporting period ending 12 September 2021 2021; Cited 2021 October 01. Available from: https://www1.health.gov.au/internet/main/publishing.nsf/Content/C50CAE02452A48A7CA2587320081F7BF/$File/covid_19_australia_epidemiology_report_50_reporting_period_ending_12_september_2021.pdfsib.
19. Ayoubkhani D, Khunti K, Nafilyan V, Maddox T, Humberstone B, Diamond I, et al. Post-covid syndrome in individuals admitted to hospital with covid-19: retrospective cohort study. BMJ. 2021;372:n693.
20. Global Burden of Disease Collaborative Network. Global Burden of Disease Study 2019 (GBD 2019) Results Seattle, United States: Institute for Health Metrics and Evaluation (IHME); 2020; Cited 2021 August 01 Available from: http://ghdx.healthdata.org/gbd-results-tool.
21. Taquet M, Geddes JR, Husain M, Luciano S, Harrison PJ. 6-month neurological and psychiatric outcomes in 236 379 survivors of COVID-19: a retrospective cohort study using electronic health records. The Lancet Psychiatry. 2021;8(5):416-27.