Table 1: Number of severe COVID-19 cases, risk, and number needed to treat to avert severe COVID-19 in six risk groups with different frequencies of COVID-19 booster vaccination.

	Total severe COVID-19 cases[a]	Absolute annual risk of severe COVID-19 (cases per 100,000; UI)	Annual risk reduction of severe COVID-19		% Averted severe COVID-19 by infection status[b]		NNT to avert severe COVID-19 case[a]
			Absolute risk averted (cases per 100,000)	Relative risk averted (%)	No Prior Infection[b]	Prior Infection[b]	
One-time booster[c]							
18-49 years	1,954	98 (85-125)	--	--	--	--	--
50-64 years	3,978	199 (185-238)	--	--	--	--	--
65-74 years	10,484	524 (499-562)	--	--	--	--	--
75+ years	27,955	1,398 (1,332-1,501)	--	--	--	--	--
Immunocompromised (Mild)[d]	25,805	1,290 (1,205-1,403)	--	--	--	--	--
Immunocompromised (Moderate/Severe)[d]	27,343	1,367 (1,266-1,503)	--	--	--	--	--
Annual booster							
18-49 years	1,671	84 (74-106)	14	14%	48%	52%	3,534
50-64 years	3,424	171 (159-202)	28	14%	68%	32%	1,806
65-74 years	8,924	446 (425-475)	78	15%	83%	17%	648
75+ years	23,966	1,198 (1,144-1,272)	199	15%	83%	17%	251
Immunocompromised (Mild)[d]	23,609	1,180 (1,088-1,316)	110	9%	67%	33%	456
Immunocompromised (Moderate/Severe)[d]	23,669	1,183 (1,091-1,307)	184	13%	50%	50%	273
Semiannual booster (every 6 months)							
18-49 years	1,432	72 (64-90)	26	27%	46%	54%	1,916
50-64 years	2,944	147 (136-171)	52	26%	67%	33%	968
65-74 years	7,645	382 (365-404)	142	27%	83%	17%	353
75+ years	20,602	1,031 (988-1,088)	368	26%	82%	18%	136
Immunocompromised (Mild)[d]	21,899	1,095 (988-1,255)	195	15%	67%	33%	257

Immunocompromised (Moderate/Severe)[d]	21,138	1,057 (966-1,183)	310	23%	51%	49%	162

[a]Estimated over 2-year simulation period in population of 1 million persons for each risk group.

[b]Prior infection status based on start of simulation. Percent averted estimate refers to number of averted severe COVID-19 cases due to vaccine strategy.

[c]One-time booster is the baseline intervention for risk reduction calculations.

[d]Definitions for each immunocompromised status are available in the Methods. We report age-weighted estimates in this Table. Full age-stratified results for the immunocompromised population are available in the Appendix.

NNT; number needed to treat, which is based on the number of persons (instead of vaccine doses) needing to follow a vaccine schedule to avert one severe COVID-19 case

Scenario with no booster is available in Table S4.

The uncertainty intervals and capture the full range of varied model parameters, while the point estimate uses base case assumptions of model inputs.

Table 2: Baseline cohort characteristics and model parameters for severe COVID-19 risk and vaccine effectiveness.

	Model input	Reference
Cohort characteristics		
Population size (N)		
Each group	1 million	
Group		
Age group	18-49, 50-64, 65-74, 75+ years	
Immune status	Immunocompetent, mild immunocompromised Moderate/severe immunocompromised	
Baseline vaccination status (%)		
Boosted (1 dose)	60%	28
Boosted (2+ doses)	40%	
Seroprevalence[a] (%)		
18-49 years	82.4%	
50-64 years	65.8%	27
65-74 years	46.8%	
75+ years	46.8%	
Severe COVID-19 monthly incidence[b] (cases per 100,000 persons)		
18-49 years	8	25
50-64 years	16	25
65-74 years	41	25
75+ years	113	25
Severe COVID-19 risk ratio for immunocompromised		
Immunocompromised populations (all)	2.8	25,29,32
Relative vaccine effectiveness and waning over time (against infection and severe COVID-19)		
Vaccination		
Booster dose	Time-varying (See Appendix)	1-3,5

[a]Seroprevalence estimated by nucleocapsid antibody to support history of natural infection, with adjustment for number of infections since the last survey (see Appendix)[2].

[b]Incidence estimates for severe COVID-19 (defined by hospitalization or death) were generated using publicly available US CDC data, averaging over 6 months preceding September 2022, coinciding with introduction of the bivalent vaccine.

See Appendix for further methodologic description.