

Going Forward: Potential Impact of Protein-based COVID-19 Vaccination Coverage, Population Outcomes, and Costs in the US

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Supplemental Materials

Table S1. Epidemiology Scenarios Based on Published Confirmed COVID-19 Cases by Month

Month and year	Cumulative cases	Monthly cases	Scenario		
			Most recent year of data	Post Omicron	1 year post Omicron
Dec 2020	643,284				
Jan 2021	1,390,234	746,950			
Feb 2021	1,984,537	594,303			
Mar 2021	3,422,248	1,437,711			
Apr 2021	5,151,596	1,729,348			
May 2021	6,343,192	1,191,596			
Jun 2021	7,888,244	1,545,052			
Jul 2021	10,405,391	2,517,147			
Aug 2021	15,434,890	5,029,499			
Sep 2021	23,101,019	7,666,129			
Oct 2021	27,268,025	4,167,006			
Nov 2021	29,494,069	2,226,044			
Dec 2021	31,297,933	1,803,864		1,803,864	1,803,864
Jan 2022	32,716,870	1,418,937		1,418,937	1,418,937
Feb 2022	33,315,233	598,363		598,363	598,363
Mar 2022	33,971,503	656,270		656,270	656,270
Apr 2022	36,252,931	2,281,428		2,281,428	2,281,428
May 2022	40,560,724	4,307,793	4,307,793	4,307,793	4,307,793
Jun 2022	44,642,805	4,082,081	4,082,081	4,082,081	4,082,081
Jul 2022	46,723,945	2,081,140	2,081,140	2,081,140	2,081,140
Aug 2022	50,312,506	3,588,561	3,588,561	3,588,561	3,588,561
Sep 2022	63,354,105	13,041,599	13,041,599	13,041,599	13,041,599
Oct 2022	77,432,340	14,078,235	14,078,235	14,078,235	14,078,235
Nov 2022	79,727,921	2,295,581	2,295,581	2,295,581	2,295,581
Dec 2022	80,541,713	813,792	813,792	813,792	
Jan 2023	82,263,031	1,721,318	1,721,318	1,721,318	
Feb 2023	85,947,586	3,684,555	3,684,555	3,684,555	
Mar 2023	89,048,044	3,100,458	3,100,458	3,100,458	
Apr 2023	92,462,417	3,414,373	3,414,373	3,414,373	
Cases per week		698,551	449,037	759,398	963,691
Weekly probability		0.2154%	0.1384%	0.2341%	0.2971%
Annualized %		10.61%	6.95%	11.48%	14.34%

Note: Data presented in the table are based on monthly cumulative cases since the start of the pandemic

[1]. Weekly probability utilizes cases per week divided by the size of the US population.

Table S2. Sensitivity Analysis Parameter Values

Input parameter	Low	Base case	High	Notes
Weekly incidence	0.1384%	0.2341%	0.2971%	Derived from [1] in Table S1
COVID-19 severity by age				
Hospitalization, 12-17 years	0.55%	0.68%	0.82%	Assumption on uncertainty range (+/- 20%); Hospitalization probability reported is combined with and without ICU
Hospitalization, 18-64 years, low risk	2.21%	2.77%	3.32%	
Hospitalization, 18-64 years, high risk	10.02%	12.52%	15.03%	
Hospitalization, ≥ 65 years	10.02%	12.52%	15.03%	
COVID-19 mortality by age				
Hospitalization, 12-17 years	0.37%	0.46%	0.56%	Assumption on uncertainty range (+/- 20%); Hospitalization probability reported is combined with and without ICU
Hospitalization, 18-64 years, low risk	1.78%	2.22%	2.67%	
Hospitalization, 18-64 years, high risk	4.45%	5.62%	6.75%	
Hospitalization, ≥ 65 years	4.45%	5.62%	6.75%	
Probability of long COVID	5.8%	7.2%	9.1%	[2]
Vaccine parameters (all updated COVID-19 vaccines)				
Relative efficacy against infection	50%	56%	62%	Confidence intervals around mean for BA.4/BA.5 Bivalent mRNA vaccine [3]
Relative efficacy against hospitalization	64%	73%	80%	
Monthly waning rate of efficacy against infection	0.3%	12.8%	20.0%	Derived from [4]
Monthly waning rate of efficacy against hospitalization	0.9%	6.0%	13.9%	Derived from [5]
Vaccine coverage overall increase in eligible population	2.5%	5.0%	7.5%	Assumption

Note: Ranges provided for parameters utilized in sensitivity analyses and is not inclusive of all model parameters.

Table S3. Detailed Scenario Analysis Results

Summary results	Cases avoided	Hospitalizations avoided	Incremental direct costs (\$MM)	Incremental QALYs gained	Incremental cost per QALY gained
Base case	501,692	66,938	\$690.59	42,785	\$16,141
Uncertainty in COVID-19 epidemiology:					
Decreased incidence	306,325	40,533	\$1,190.08	25,751	\$46,216
Increased incidence	623,374	83,633	\$374.95	53,558	\$7,001
2023-2024 COVID-19 vaccine attributes:					
Increase in relative effectiveness	555,536	73,457	\$565.99	47,059	\$12,027
Decrease in relative effectiveness	446,191	58,554	\$847.40	37,482	\$22,608
Relative increase in durability of protection	956,269	89,618	\$212.41	59,483	\$3,571
Relative decrease in durability of protection	360,781	44,943	\$1,096.24	29,413	\$37,270
Optimistic combination ^a	1,060,695	98,451	\$38.22	65,500	\$583
Pessimistic combination ^a	321,052	39,329	\$1,202.39	25,771	\$46,656
Vaccine coverage scenarios:					
Optimistic increase in coverage	752,538	100,407	\$1,000.39	64,178	\$15,588
Pessimistic increase in coverage	250,846	33,469	\$380.79	21,393	\$17,800

Summary results	Cases avoided	Hospitalizations avoided	Incremental direct costs (\$MM)	Incremental QALYs gained	Incremental cost per QALY gained
Additional scenarios of interest:					
CDC vaccine price [6]	501,692	66,938	-\$251.51	42,785	Cost saving
Increased incidence [7]	1,304,339	181,623	-\$1,474.60	116,801	Cost saving
Clinical trial efficacy [8]	800,418	92,070	\$187.45	60,533	\$3,097

^a Vaccine attribute combinations include efficacy and waning parameter changes (e.g., optimistic = higher relative effectiveness and decrease in waning rate).

References

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