Projected Public Health Benefits of Increasing Vaccine Coverage for COVID-19 Among Adults ≥50 Years of Age in the United States

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BACKGROUND

- COVID-19 continues to cause substantial morbidity and mortality, especially in older adults in the United States.
 Compared to influenza, the cumulative hospitalization rate for COVID-19 for the 2023-2024 season was 166 vs 97 per 100,000 and 814 vs 217 per 100,000 in adults 50-64 and 65+, respectively^{1,2}
- Despite the elevated burden of COVID-19 disease in older adults, COVID-19 vaccination coverage rates (VCR) continue to decline over time. COVID-19 VCR for the 2023-2024 season for adults 50-64 and 65+ were only 23% and 35% respectively,³ compared to 30.1% and 43.3% during the 2022-2023 season⁴
- Childhood VCR have benefitted from the introduction of combination vaccines.⁵ Multiple influenza and COVID-19 adult combination vaccines are in development and could increase COVID-19 VCR among adults
- We aimed to assess the projected public health impact of increasing COVID-19 VCR in adults ≥50 years of age due to the introduction of an adult combination COVID-19 and influenza vaccine

Figure 1. Susceptible-Exposed-Infectious-Recovered (SEIR) Dynamic Transmission Model Structure



 To evaluate the projected public health impact of increasing COVID-19 VCR in adults ≥50 years of age in the United States, compared to observed coverage for the 2023-2024 season, over a 1-year time horizon from September 2024 to August 2025

METHODS

Study Design

- Incidence of SARS-CoV-2 infections (eg., asymptomatic and symptomatic) was estimated using a previously published Susceptible-Exposed-Infected-Recovered (SEIR) dynamic transmission model⁶ (Figure 1). Due to changes in reporting and testing over time, incidence of symptomatic infection was further calibrated to align with observed COVID-19 hospitalization rates from the 2023-2024 season from COVID-NET⁷
- Outcomes associated with symptomatic SARS-CoV-2 infections were estimated using a previously published static decision-analytic model⁸ (Figure 2)
- Baseline age-specific vaccination rates for adults ≥50 years of age for the 2023-2024 season were taken from the Centers for Disease Control and Prevention (CDC) COVID-19 Vaccination Dashboard (COVID VaxView)³
 - The additional public health benefits of increasing baseline VCR by an absolute 1, 5, and 10 percentage points, to
 match observed flu vaccination rates from the 2023-2024 season and to match the WHO-defined 70% healthy people
 target, compared to no vaccination, was assessed. Table 1 provides baseline and increased coverage rates
- In the absence of 2024-2025 vaccine effectiveness (VE) for Spikevax we assumed that both the Spikevax Fall 2023 (XBB1.5) 2023-2024 season and Spikevax 2024-2025 season vaccines are similarly well matched against the circulating strains during each season. Table 2 provides key model input parameters
- Initial VE estimates informed by real-world evidence (RWE) analysis of Omicron XBB1.5 containing mRNA COVID-19 vaccination using Veradigm EHR and Komodo claims data from September December 2023⁹
- Monthly waning of vaccines assumed to be the same as original monovalent vaccines against BA.1 using a systematic literature review and meta regression¹⁰
- The static model predicted the occurrence of COVID-19-related disease outcomes including SARS-Cov-2-associated symptomatic infections, COVID-19-related hospitalizations, deaths, and cases of long COVID for the 2024-2025 season from September 2024 to August 2025

Figure 2. (A) Static Model Structure and (B) Infection Consequence Decision Tree Structure A)



^aSee infection consequence decision tree structure (**Figure 2B**) ^bDeath due to COVID-19.

Key epidemiology and disease burden input parameters were based on US data for the 2023-2024 season (Table 2).
 Disease dynamics for the 2024-2025 season were assumed to follow similar trends

Model Inputs

Table 1. COVID-19 Baseline Coverage and Increased Vaccine Coverage Scenarios

Age group	Baseline COVID-19 VCR ^a	+1% VCR	+5% VCR	+10% VCR	Flu VCR ^b	70% Healthy People target
50-64 years	24.96%	25.96%	29.96%	34.96%	49.10%	70.00%
65-74 years	39.96%	40.96%	44.96%	49.96%	67.60%	70.00%
75-84 years	41.60%	42.60%	46.60%	51.60%	73.70%	70.00%
85+ years	41.60%	42.60%	46.60%	51.60%	73.70%	70.00%

VCR, vaccine coverage rate.

^ahttps://www.cdc.gov/vaccines/imz-managers/coverage/covidvaxview/interactive/adults.html

^bhttps://www.cdc.gov/flu/fluvaxview/dashboard/vaccination-adult-coverage.html

Table 2. Key Input Parameters

Parameter	Value					
Initial vaccine effectiveness						
Infection ^{a,9}						
50-64 years	35.3%					
65+ years	38.7%					
Hospitalization ⁹						
50-64 years	61.1%					
65+ years	60.5%					
Monthly waning of vaccine effectiveness ¹⁰						
Infection	4.75%					
Hospitalization	1.37%					
Hospitalization rate ^{9,11}						
50-64 years	1.90%					
65-74 years	8.50%					
75-84 years	15.75%					
85+ years	23.50%					
In-hospital mortality ¹²						
50-64 years	3.37%					
65-74 years	4.97%					
75-84 years	5.27%					
85+ years	5.27%					

RESULTS

- The model predicted that, when the COVID-19 VCR was increased by 5% and 10% per year, there would be an additional 85,635 to 171,270 SARS-CoV-2 symptomatic infections averted; 13,562 to 27,123 of COVID-19–related hospitalizations averted; 1,494 to 2,987 of COVID-19–related deaths averted; and 24,664 to 49,328 long COVID-19 cases averted (Figure 3)
- When the COVID-19 VCR matched the observed influenza VCR, the model predicted there would be an additional 451,483 SARS-CoV-2 infections averted; 78,625 COVID-19—related hospitalizations averted; 8687 COVID-19—related deaths averted; and 127,824 long COVID cases averted (Figure 3)

Figure 3. Incremental Number of SARS-CoV-2 Symptomatic Infections, Long COVID Cases, COVID-19–Related Hospitalizations and Deaths Averted With Varying Levels of COVID-19 VCR Increase



■ +1% VCR = +5% VCR = +10% VCR = Matches Flu coverage = Matches 70% coverage

^aVaccine effectiveness against medically attended COVID-19 infections used as a proxy for COVID-19 infections.

VCR, vaccine coverage rate

- Results from this modelling analysis show increasing COVID-19 VCR in adults ≥50 years of age in the United States could lead to substantial reductions in COVID-19–related disease burden
- Findings may be limited due to the uncertainty associated with 2023-2024 COVID-19 epidemiology, vaccination uptake, and VE of mRNA-1273
- Full impact of increasing COVID-19 VCR might be underestimated, with the magnitude increasing at higher VCR, as results are based on a static model and do not consider population level benefits due to indirect protection of vaccination
- Adult combination vaccines against influenza and COVID-19 could help increase COVID-19 vaccination rates and reduce burden on the healthcare system, especially during winter surge settings

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Disclosures

KJ, EB, NVV, and DM are employees of Moderna, Inc., and hold stock/stock options in the company.







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