Comparison of the Clinical and Economic Impact of Two COVID-19 Vaccines in Immunocompromised Patients in France

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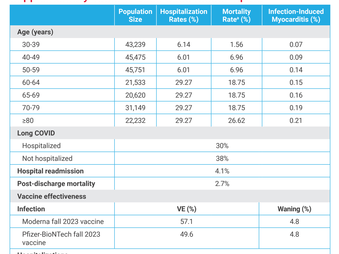
SUPPLEMENTARY MATERIAL

Supplementary Methods

- The immunocompromised (IC) population in France is estimated to be 230,000 individuals[1,2]
  - French population estimates for 2020 were obtained from the United Nations Department of Economic and Social Affairs[3]; the population distribution of the general population was calculated and applied to 230,000 people to obtain the number of IC individuals by age group
- A static model was used for the analysis, as the IC population in France accounts for <1%; vaccinating this population would not impact transmission in the greater population[4]

Supplementary Figure 1. Model Diagram



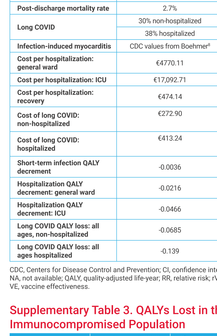
AE, adverse event.

Supplementary Table 1. Base Case Model Inputs

	Population Size	Hospitalization Rates (%)	Mortality Rate[a] (%)	Infection-Induced Myocarditis (%)
Age (years)				
30-39	43,239	6.14	1.56	0.07
40-49	45,475	6.01	6.96	0.09
50-59	45,751	6.01	6.96	0.14
60-64	21,533	29.27	18.75	0.15
65-69	20,620	29.27	18.75	0.16
70-79	31,149	29.27	18.75	0.19
≥80	22,232	29.27	26.62	0.21
Long COVID				
Hospitalized	30%			
Not hospitalized	38%			
Hospital readmission	4.1%			
Post-discharge mortality	2.7%			
Vaccine effectiveness				
Infection	**VE (%)**			**Waning (%)**
Moderna fall 2023 vaccine	57.1			4.8
Pfizer-BioNTech fall 2023 vaccine	49.6			4.8
Hospitalizations				
Moderna fall 2023 vaccine	71.8			1.4
Pfizer-BioNTech fall 2023 vaccine	68.0			1.4
	QALY Parameters			
QALY decrement				
Short-term infection	-0.0036			
Hospitalization				
General ward	-0.0216			
ICU	-0.0466			
Long COVID (QALY loss)				
Hospitalized[b]	-0.1390			
Non-hospitalized[b]	-0.0685			
	Cost Parameters (€)			
Outpatient visit	277.73			
Hospitalization				
General ward	4770.11			
ICU	17,092.71			
Hospitalization recovery	474.14			
Long COVID				
Hospitalized[b]	413.24			
Non-hospitalized[b]	272.9			

CI, confidence interval; IC, immunocompromised; ICU, intensive care unit; QALY, quality-adjusted life-year; VE, vaccine effectiveness.
[a]Odds ratio from Turtle et al[5] to adjust for IC population.
[b]All ages.

Supplementary Figure 2. Base Case Model Input (COVID-19 Incidence Rates)



Supplementary Table 2. Sensitivity Analysis Parameters

Parameter	Base Case	Sensitivity Analysis
Moderna fall 2023 vaccine initial VE	Tseng et al;[6] Kaiser Permanente IC value	Upper and lower 95% CI
rVE between Moderna and Pfizer-BioNTech fall 2023 vaccine	Wang et al[7]	Upper and lower 95% CI
Waning (fall 2023 vaccine)	Higdon et al[7] (4.75% infection; 1.37% severe)	Upper and lower 95% CI
Differential waning between Moderna and Pfizer fall 2023 vaccines	Waning rates for both set to Higdon[7]	Waning rates for Pfizer adjusted so that the RR observed between Moderna and Pfizer (Wang et al[7] for infection and hospitalization) are maintained
Fall booster hospitalization waning data	Higdon et al[7] (1.37%)	Epi-phare data (3.99%)
Hospitalization rate	RR for IC population not applied to general population aged ≥80 years, as they are assumed to be high-risk already	RR applied to ≥80 years
	RR for IC population applied to general population to inflate values	General population hospitalization rates
		Upper and lower 95% CI
Mortality rate	NA	Upper and lower 95% CI
Hospital readmission rate	4.1%	Upper and lower 95% CI
Post-discharge mortality rate	2.7%	Upper and lower 95% CI
Long COVID	30% non-hospitalized	± 25%
	38% hospitalized	± 25%
Infection-induced myocarditis	CDC values from Boehmer[8]	Upper and lower 95% CI
Cost per hospitalization: general ward	€4770.11	± 25%
Cost per hospitalization: ICU	€17,092.71	± 25%
Cost per hospitalization: recovery	€474.14	± 25%
Cost of long COVID: non-hospitalized	€272.90	± 25%
Cost of long COVID: hospitalized	€413.24	± 25%
Short-term infection QALY decrement	-0.0036	± 25%
Hospitalization QALY decrement: general ward	-0.0216	± 25%
Hospitalization QALY decrement: ICU	-0.0466	± 25%
Long COVID QALY loss: all ages, non-hospitalized	-0.0685	± 25%
Long COVID QALY loss: all ages hospitalized	-0.139	± 25%

CDC, Centers for Disease Control and Prevention; CI, confidence interval; ICU, intensive care unit; NA, not available; QALY, quality-adjusted life-year; RR, relative risk; rVE, relative vaccine effectiveness; VE, vaccine effectiveness.

Supplementary Table 3. QALYs Lost in the Immunocompromised Population

QALY Losses[a]	Moderna Fall 2023 Vaccine	Pfizer-BioNTech Fall 2023 Vaccine	Difference[a]
Mortality			
In-hospital	4395	4872	-477
Post-discharge	779	864	-84
Morbidity			
Not hospitalized	118	131	-13
Hospitalized	82	90	-9
Hospital re-admission	26	28	-3
Adverse events	22	22	0
Long COVID	790	875	-85
Total	6213	6883	-670

IC, immunocompromised; QALY, quality-adjusted life-year.
[a]Total IC population aged ≥30 years.
[b]Moderna fall 2023 vaccine – Pfizer-BioNTech fall 2023 vaccine.

Supplementary Table 4. Cost-Effective Analysis

Vaccination Strategy	Total Costs (€)	Total QALYs Lost	Δ Costs (€)	Δ QALYs Gained[a]	ICER[b]
Healthcare Perspective					
Moderna fall 2023 vaccine	47,284,284	6213	-	-	Ref
Pfizer-BioNTech fall 2023 vaccine	50,145,138	6883	2,860,853	-670	Moderna fall 2023 vaccine dominates the Pfizer-BioNTech fall 2023 vaccine
Societal Perspective					
Moderna fall 2023 vaccine	261,888,955	6213	-	-	Ref
Pfizer-BioNTech fall 2023 vaccine	279,505,513	6883	17,616,558	-670	Moderna fall 2023 vaccine dominates the Pfizer-BioNTech fall 2023 vaccine

Δ, difference; ICER, incremental cost-effectiveness ratio; QALY, quality-adjusted life-year.
[a]A (a QALYs gained is equivalent to -1 x the difference in QALYs lost.
[b]Δ in costs/QALY gained.

Supplementary References

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Presented at ISPOR Europe; November 12-15, 2023; Copenhagen, Denmark