

Efficacy Estimates for Various COVID-19 Vaccines: What we Know from the Literature and Reports

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Abstract

In this report, we further provide summary estimates, from publications and reports, of vaccine efficacy (VE) for the COVID-19 vaccines that are being rolled out on a global scale. We find that, on average, the efficacy against any disease with infection is 85.3% (95% CI: 70.6 - 92.7%) after a fully course of vaccination. The VE against severe disease, hospitalization or death averages close to 100%. The average VE against infection, regardless of symptoms, is 83.6% (95% CI: 66.1 - 92.1%). We also find that the average VE against transmission to others for infected vaccinated people is 44.6% (95% CI: 36.1 - 52.0%). Finally, we provide summary estimates of the VE against any disease with infection for some of the variants of concern (VOC). The average VE for the VOC γ (P1) is 61.3% (95% CI: 53.1 - 68.0%). The average VE for the VOC α (B.1.1.7), β (B.1.351), and δ (B.1.617.2) after one dose are 48.4% (95% CI: 45.4 - 51.2%), 34.7% (95% CI: -11.3 - 61.7%), and 30.9% (95% CI: 25.7 - 35.7%), respectively. The average VE for the VOC α (B.1.1.7), β (B.1.351), and δ (B.1.617.2) after two doses are 87.3% (95% CI: 49.9 - 96.8%), 56.5% (95% CI: 13.7 - 78.1%), and 80.1% (95% CI: 46.3 - 92.6%), respectively.

Introduction

In this report, we summarize estimates of vaccine efficacy (VE) for the COVID-19 vaccines that are being rolled out on local and global scales. This includes the Pfizer, Moderna, Johnson & Johnson, AstraZeneca, Sputnik, Novavax, Sinovac, and Sinopharm vaccines. VE estimates are taken from journal articles and media reports for the vaccines that have gone through double-blinded, placebo-controlled, phase III vaccine trials, as well as observational studies. Some of the estimates are based on rigorous, preplanned statistical analyses from double-blinded, placebo-controlled trials, while others are extracted from observational studies with different levels of control. These studies are reported from a variety of sources including publications, reports, and sometimes press releases. Because of this, we do not carry out a formal meta analysis. In all cases, we try to extract estimates for one or more of the triplet of vaccine efficacy parameters (VE_S, VE_P, VE_I) [1], where VE_S is VE against infection; VE_P is VE against disease, given infection; and VE_I is VE against transmission to others, given infection. A fourth parameter, VE_{SP} , which is VE against disease and infection, tends to be available from vaccine trials, and it is the usual primary outcome for those trials (i.e., cases of disease that are confirmed infections). The VE_{SP} is a function of both the VE_S and VE_P . If we believe in a multiplicative and independent relationship, then $VE_{SP} = 1 - (1 - VE_S)(1 - VE_P)$. Thus, if we have two of these VE's, we can always calculate the third.

In the material that follows, we give estimates of these VE's as a function of time when protection is believed to begin to occur after the first and second dose for two-dose vaccines, and after the first dose for one-dose vaccines. We also provide VE_{SP} estimates for protection against the variants of concern (VOC) γ (P1), α (B.1.1.7), β (B.1.351), and δ (B.1.617.2). The methods for creating the forest plots are given in the Appendix. The supporting tables for the analysis are also given in the Appendix. Not all estimates described in the tables are given in the figures, as we have tried to extract the essential information without getting lost in too much detail. However, virtually all the complete information is given in the Appendix tables.

Results

We first consider VE for the original wild type viruses. Figure 1 (Table A1) give the estimates of the VE_{SP} after the second dose for two-dose vaccines. All the estimates are from double-blinded, placebo-controlled vaccine trials. With the exception of the Sinopharm and Sinovac vaccine, they are all over 80%, with a summary estimate of 85.3% (95% CI: 70.6 - 92.7%). The Sinopharm VE_{SP} estimate is 78.1% (95% CI: 64.9 - 86.3%). The Sinovac VE_{SP} estimate is 50.7% (95% CI: 35.7 - 62.2%).

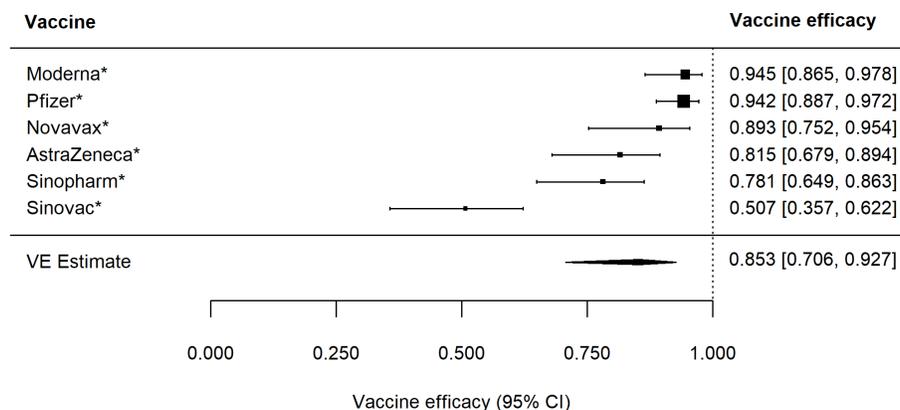


Figure 1: Forest plot of vaccine efficacy to prevent any disease after dose 2, VE_{SP} . * indicates double-blinded, randomized vaccine trial.

The estimated VE_{SP} after one dose, for both two-dose and one-dose vaccines, is given in Figure 2 (Table A2), where the Johnson & Johnson vaccine is the only one-dose vaccine listed. The estimates are generally almost as high as protection after one dose, with summary estimated of 82.0% (95% CI: 72.3 - 88.2%).

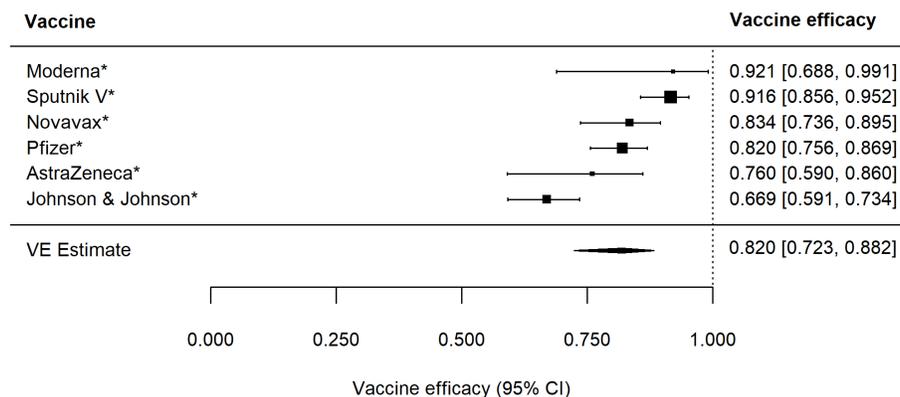


Figure 2: Forest plot of vaccine efficacy to prevent any disease after dose 1, VE_{SP} . * indicates double-blinded, randomized vaccine trial.

Figure 3 (Table A3) give the estimates of the VE_{SP}^S (VE for severe disease with infection) after the second dose for two-dose vaccines. The estimates are very high, and generally close to 100%, with relatively poor precision.

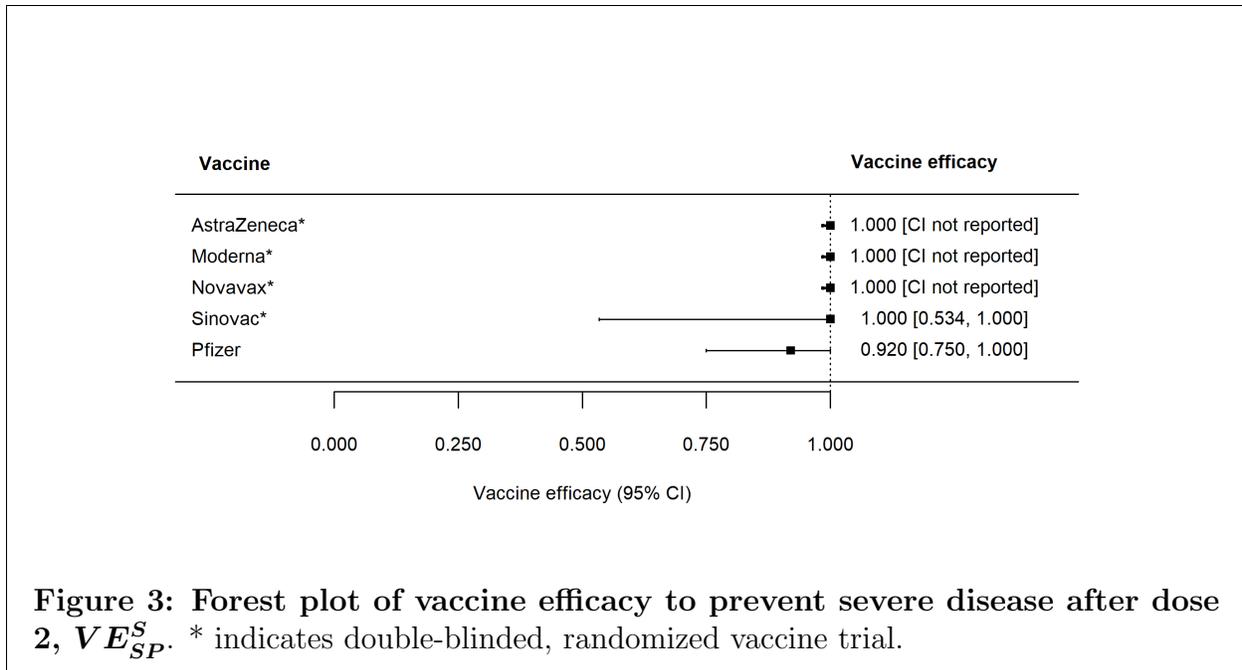
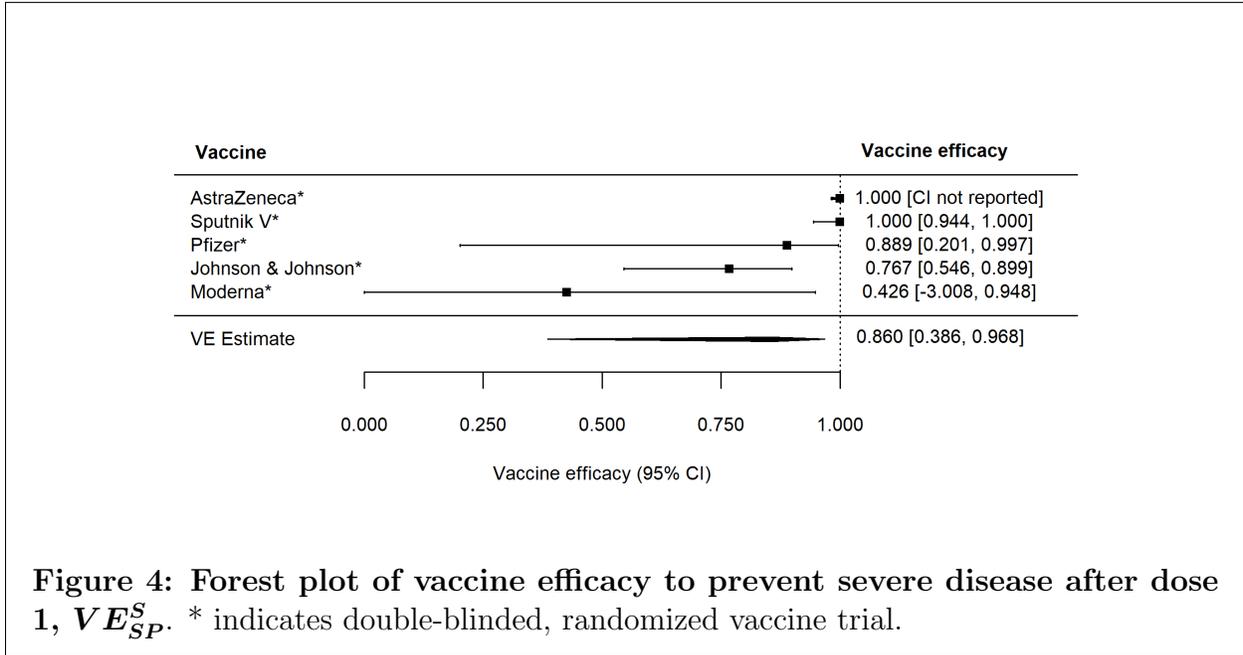
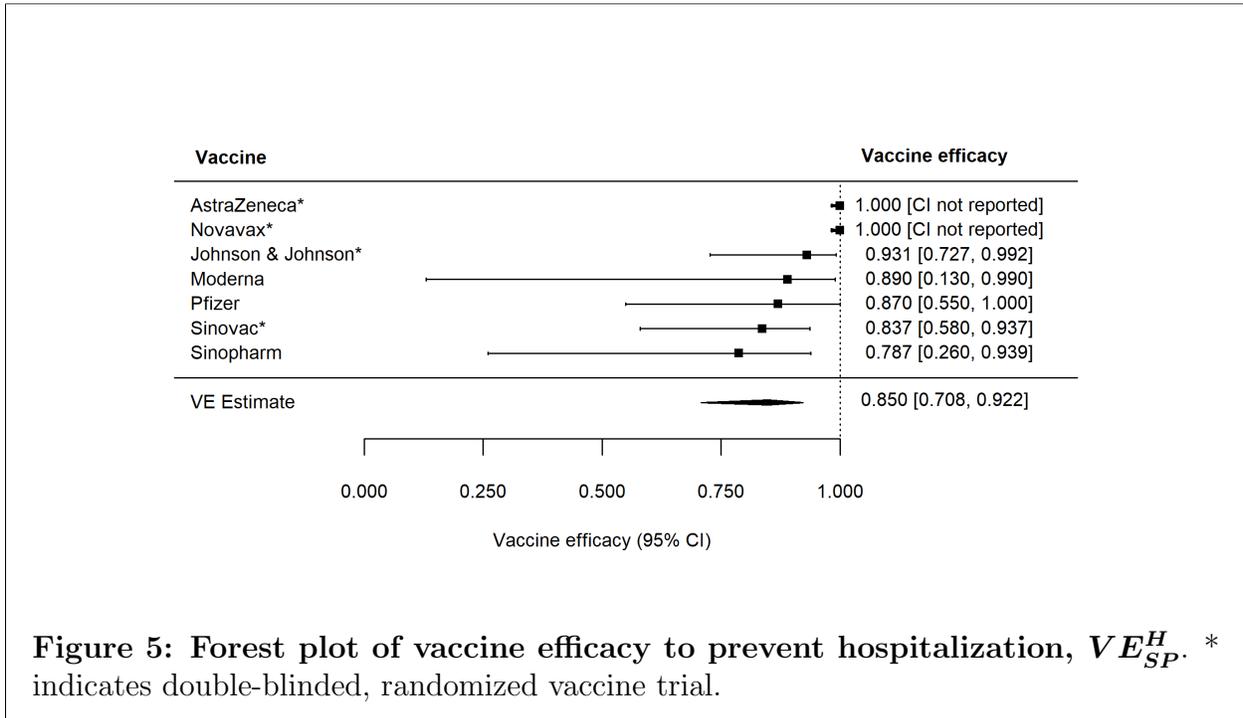


Figure 4 (Table A4) give the estimates of the VE_{SP}^S (VE for severe disease with infection) after the first dose for two-dose vaccines and one dose for the one-dose vaccine. The summary estimated is quite high at 86.0% (95% CI: 38.6 - 96.8%).



Similarly, VE against hospitalization and death were quite high, as shown in Figures 5 and 6 (Tables A5 and A6).



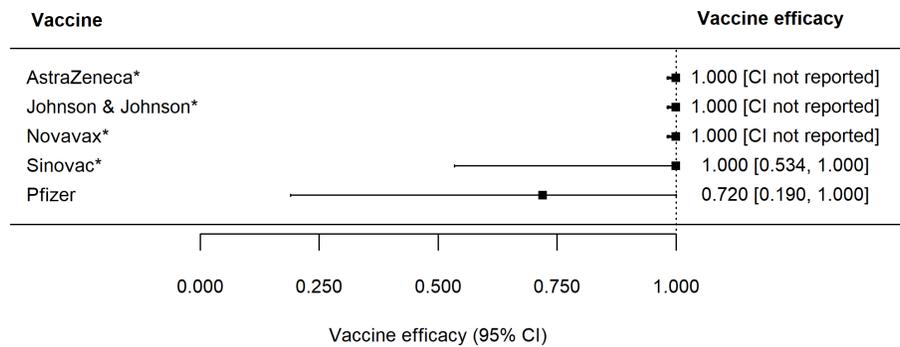


Figure 6: Forest plot of vaccine efficacy to prevent death, VE_{SP}^D . * indicates double-blinded, randomized vaccine trial.

Figure 7 (Table A7) give the estimates of the VE_S , i.e., VE against infection. The estimates were also quite high, with a summary estimate of 83.6% (95% CI: 66.1 - 92.1%).

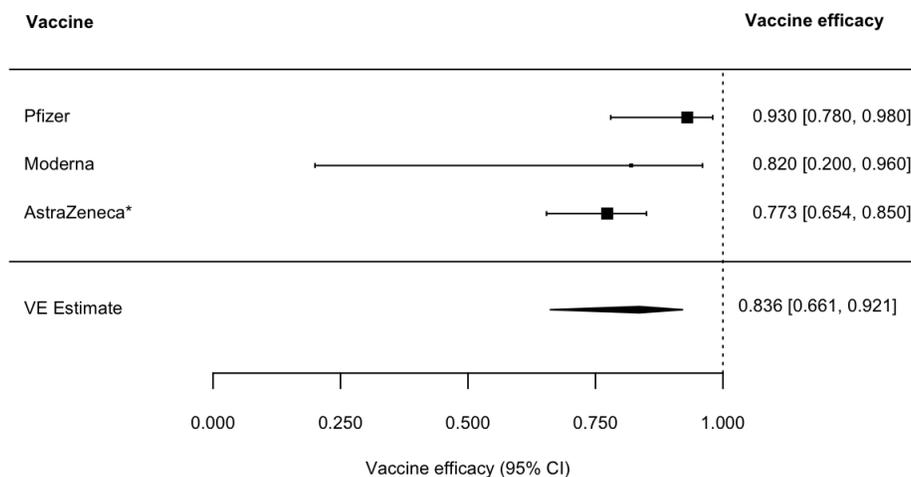
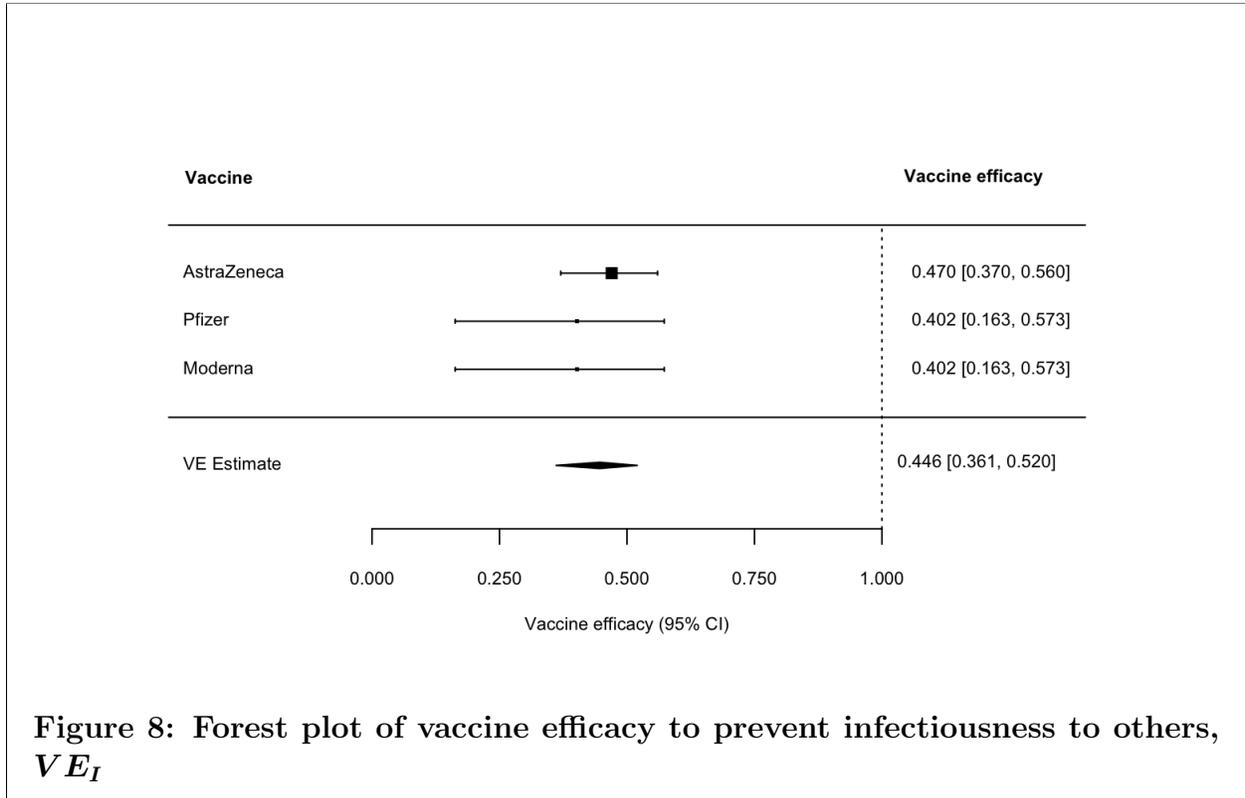


Figure 7: Forest plot of vaccine efficacy to prevent infection, VE_S . * indicates double-blinded, randomized vaccine trial.

(Table A8) give estimates of the VE_I , i.e., VE against infectiousness or direct transmission to others. The summary measure is 44.6% (95% CI: 36.1 - 52.0%), indicating that vaccination reduces direct transmission to others by 44.6% when vaccinated people are infected, compared to unvaccinated people who become infected.



Now we consider VE's for the variants of concern (VOC). Estimates are available for the VE_{SP} , mostly after the first dose for the one dose vaccine and the second dose for the two dose vaccines. These estimates are given in Figures 9-15 (Tables A9-A15).

For α (B.1.1.7), VE is 48.4% (95% CI: 45.4 - 51.2%) after dose 1, and VE is 87.3% (95% CI: 49.9 - 96.8%) after dose 2. The summary estimate for VE after dose 1 is considerably lower than the VE for the wild type virus. In contrast, however, the summary estimate after dose 2 is just somewhat reduced compared to the wild type virus. It is necessary to note that this VOC does not have a mutation that affects immunity, whereas the other VOC's have mutations that affect immune function.

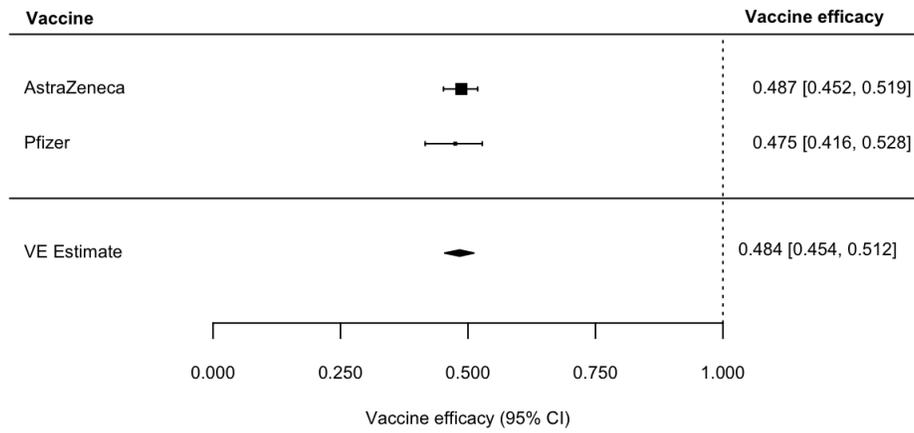


Figure 9: Forest plot of vaccine efficacy against α (B.1.1.7) after dose 1

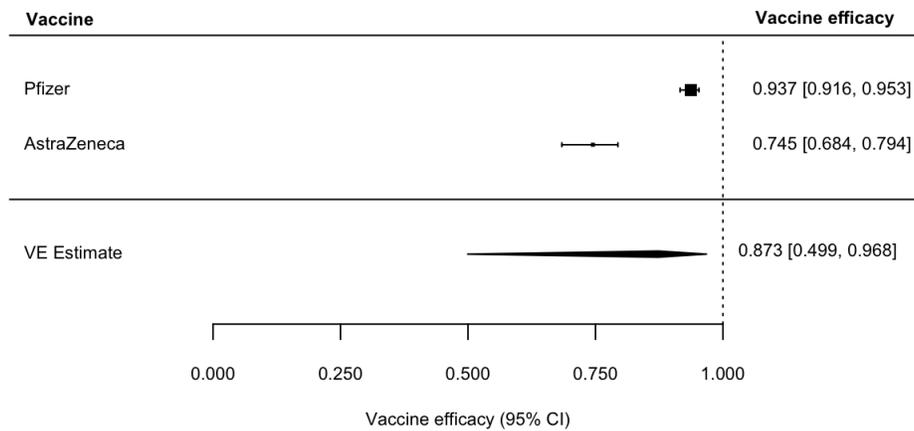


Figure 10: Forest plot of vaccine efficacy against α (B.1.1.7) after dose 2

The average VE for the VOC γ (P1) is 61.3% (95% CI: 53.1 - 68.0%). For β (B.1.351), VE is 34.7% (95% CI: -11.3 - 61.7%) after dose 1, and VE is 56.5% (95% CI: 13.7 - 78.1%) after dose 2. The summary estimates for VE after dose 1 and dose 2 are considerably lower than the VE's for the wild type virus.

For δ (B.1.617.2), VE is 30.9% (95% CI: 25.7 - 35.7%) after dose 1, and VE is 80.1% (95% CI: 46.3 - 92.6%) after dose 2. The summary estimate for VE after dose 1 is considerably lower than the VE for the wild type virus. In contrast, however, the summary estimate after dose 2 is just somewhat reduced compared to the wild type virus.

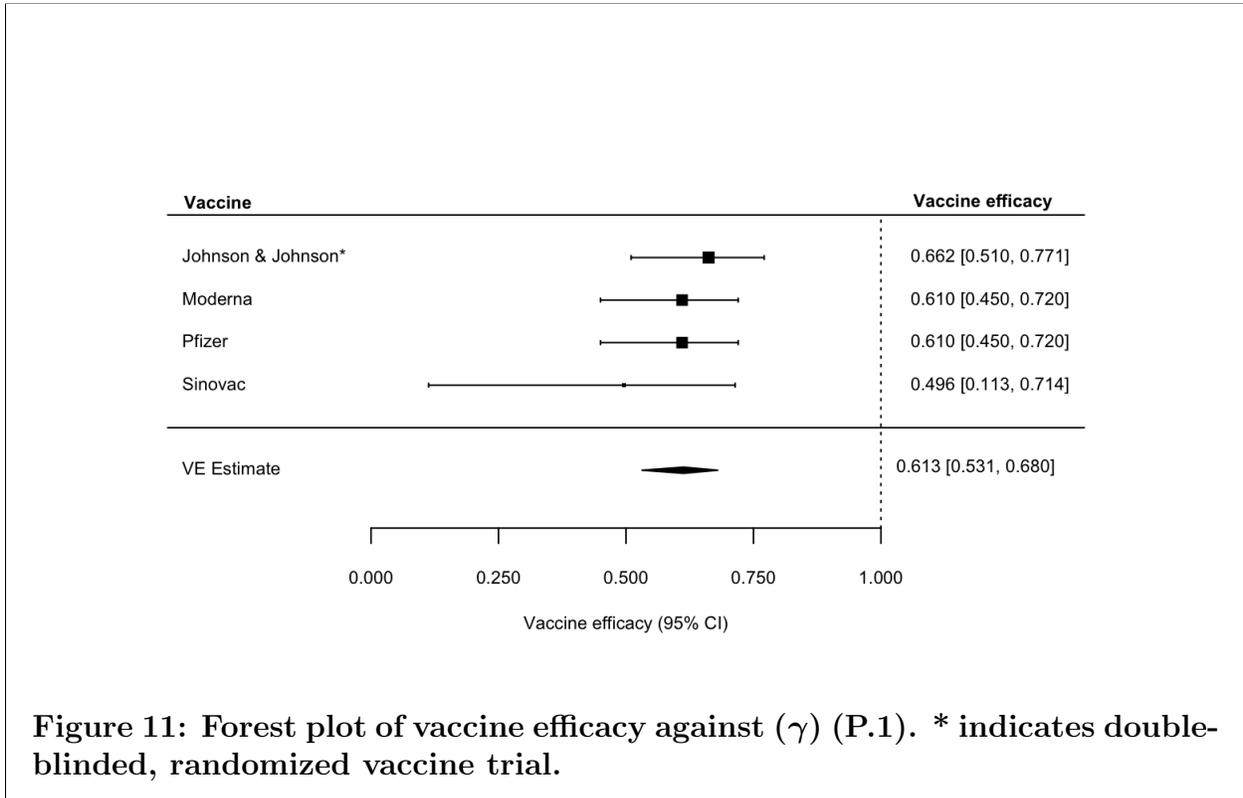


Figure 11: Forest plot of vaccine efficacy against (γ) (P.1). * indicates double-blinded, randomized vaccine trial.

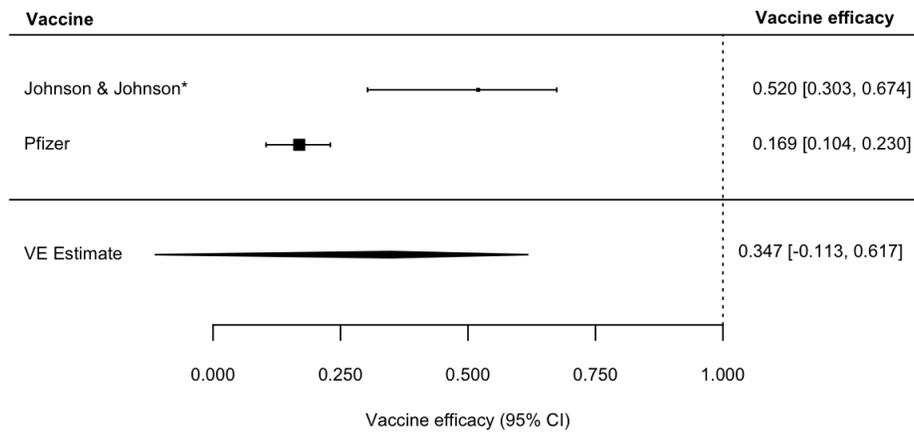


Figure 12: Forest plot of vaccine efficacy against β (B.1.351) after dose 1. * indicates double-blinded, randomized vaccine trial.

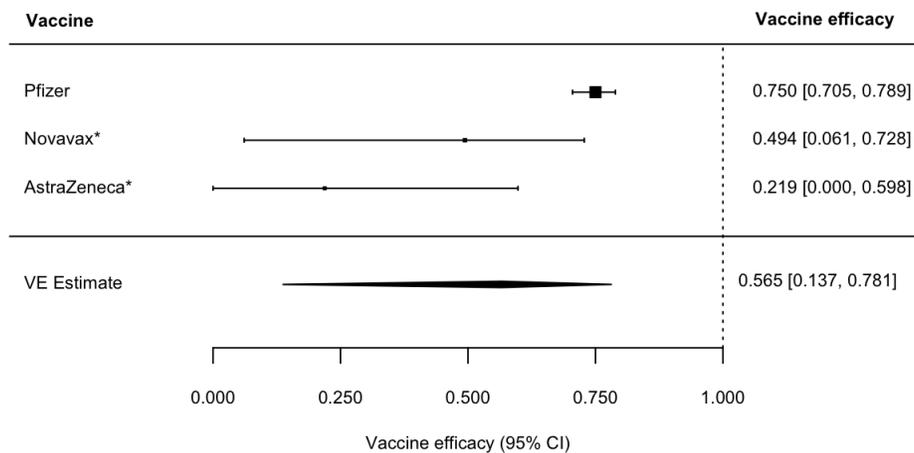


Figure 13: Forest plot of vaccine efficacy against β (B.1.351) after dose 2. * indicates double-blinded, randomized vaccine trial.

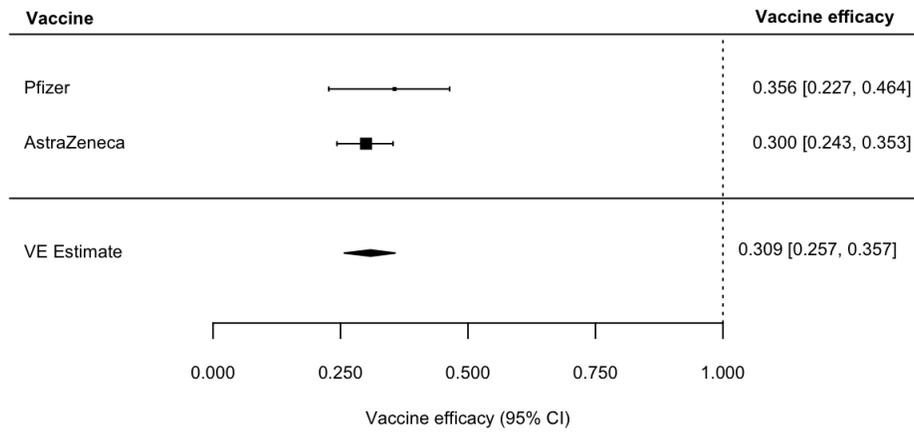


Figure 14: Forest plot of vaccine efficacy against δ (B.1.617.2) after dose 1

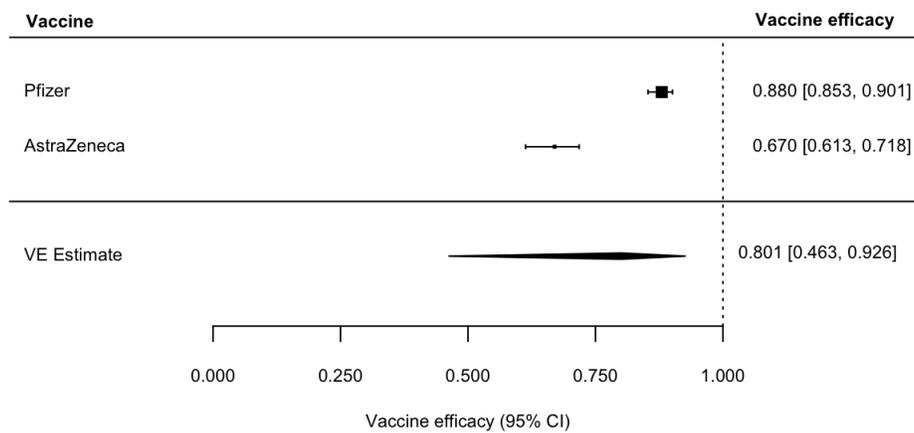


Figure 15: Forest plot of vaccine efficacy against δ (B.1.617.2) after dose 2

Discussion

We have presented the relevant VE estimates for the COVID-19 vaccines that are being rolled out on a global scale and for which there is sufficient quality data. We provide estimates of VE against disease with confirmed infection, infection, and transmission to others. The VE estimates against disease are stratified by disease severity, hospitalization and death. We have also provided VE estimates for three of the VOC.

These estimates should be useful for constructing mathematical models for vaccination impact and for making policy decisions involving vaccination. We plan to keep updating this report as more information becomes available.

Methods

For each vaccine efficacy measure (e.g., severe disease, infection), we first obtained log odds ratios and corresponding sampling variances from each vaccine efficacy estimate and 95% confidence interval (CI). We then fit random-effects models to these data to estimate average log odds ratios, which we back-transformed to obtain VE summary estimates and 95% CIs. All analyses were done in R version 4.0.2 using the package metafor (R Project for Statistical Computing) [2, 3].

Funding

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Appendix

Here we give the details about the studies and data that are summarized in the figures.

Note: * indicates that the VE estimate is based on double-blinded, randomized trials.

Table 1: Vaccine efficacy to prevent any disease after dose 2, VE_{SP}

Company	Efficacy%, (95% CI), time frame of estimate	References
Moderna	94.5*, (86.5, 97.8), 14 or more days after dose 2	[4]
Pfizer	94.2*, (88.7, 97.2), 14 or more days after dose 2	[5]
Johnson & Johnson	One dose vaccine	n/a
AstraZeneca	81.5*, (67.9, 89.4), 14 or more days after dose 2	[6]
Novavax	89.3*, (75.2, 95.4), 7 or more days after dose 2	[7]
Sputnik V	Not reported	n/a
Sinovac	50.7*, (35.7, 62.2), time frame not reported	[8]
Sinopharm	78.1*, (64.9, 86.3), median follow-up time 112 days	[9]

Table 2: Vaccine efficacy to prevent any disease after dose 1, VE_{SP}

Company	Efficacy%, (95% CI), time frame of estimate	References
Moderna	92.1*, (68.8, 99.1), more than 14 days after dose 1	[4]
Pfizer	82.0*, (75.6, 86.9), after dose 1	[5]
	57.0, (50.0, 60.0), 14-20 day period after dose 1	[10]
Johnson & Johnson	66.9*, (59.1, 73.4), 14 or more days after vaccination	[11,12]
	66.5*, (55.5, 75.1), 28 or more days after vaccination	[11,12]
AstraZeneca	76.0*, (59.0, 86.0), 22-90 day period after dose 1	[7]
Novavax	83.4*, (73.6, 89.5), 14 or more days after dose 1	[13]
Sputnik V	91.6*, (85.6, 95.2), 21 days after dose 1	[14]
Sinovac	Not reported	n/a
Sinopharm	Not reported	n/a

Table 3: Vaccine efficacy to prevent severe disease after dose 2, VE_{SP}^S

Company	Efficacy%, (95% CI), time frame of estimate	References
Moderna	100.0*, (CI not reported), 14 or more days after dose 2	[4]
Pfizer	92.0, (75.0, 100.0), 7 or more days after dose 2	[10]
Johnson & Johnson	One dose vaccine	n/a
AstraZeneca	100.0*, (CI not reported), time frame not reported	[7]
Novavax	100.0*, (CI not reported), time frame not reported	[7]
Sputnik V	Not reported	n/a
Sinovac	100.0*, (53.4, 100.0) ^a , time frame not reported	[8]
Sinopharm	Not reported	n/a

^a Combined estimate of VE against hospitalization, severe disease, and death

Table 4: Vaccine efficacy to prevent severe disease after dose 1, VE_{SP}^S

Company	Efficacy%, (95% CI), time frame of estimate	References
Moderna	42.6*, (-300.8, 94.8), 14 or more days after dose 1	[4]
Pfizer	88.9*, (20.1, 99.7), after dose 1	[5]
	62.0, (39.0, 80.0), 14-20 day period after dose 1	[10]
Johnson & Johnson	76.7*, (54.6, 89.9), 14 or more days after vaccination	[11,12]
	85.4*, (54.2, 96.9), 28 or more days after vaccination	[11,12]
AstraZeneca	100.0*, (CI not reported), more than 22 days after dose 1	[15]
Novavax	Not reported	n/a
Sputnik V	100.0*, (94.4, 100.0), 21 or more days after dose 1	[16]
Sinovac	Not reported	n/a
Sinopharm	Not reported	n/a

Table 5: Vaccine efficacy to prevent hospitalization, VE_{SP}^H

Company	Efficacy%, (95% CI), time frame of estimate	References
Moderna	89.0, (13.0, 99.0), time frame not reported	[17]
Pfizer	87.0, (55.0, 100.0), 7 or more days after dose 2	[10]
	74.0, (56.0, 86.0), 14-20 days after dose 1	[10]
	91.0, (85.0, 94.0), 28-34 days after a single dose	[18]
Johnson & Johnson	93.1*, (72.7, 99.2), 14 or more days after vaccination	[11, 12]
	100.0*, (74.3, 100.0), 28 or more days after vaccination	[11, 12]
AstraZeneca	100.0*, (CI not reported), more than 22 days after dose 1	[15]
	88.0, (75.0, 94.0), 28-34 days after a single dose	[18]
Novavax	100.0*, (CI not reported), time frame not reported	[13]
Sputnik V	Not reported	n/a
Sinovac	83.7*, (58.0, 93.7), time frame not reported	[8]
Sinopharm	78.7*, (26.0, 93.9), median follow-up time 112 days	[9]

Table 6: Vaccine efficacy to prevent death, VE_{SP}^D

Company	Efficacy%, (95% CI), time frame of estimate	References
Moderna	Not reported	n/a
Pfizer	72.0, (19.0, 100.0), 14-20 days after dose 1	[10]
Johnson & Johnson	100.0*, (CI not reported), time frame not reported	[11]
AstraZeneca	100.0*, (CI not reported), time frame not reported	[6]
Novavax	100.0*, (CI not reported), time frame not reported	[13]
Sputnik V	Not reported	n/a
Sinovac	100.0*, (53.4, 100.0) ^a , time frame not reported	[8]
Sinopharm	Not reported	n/a

^a Combined estimate of VE against hospitalization, severe disease, and death

Table 7: Vaccine efficacy to prevent infection, VE_S

Company	Efficacy%, (95% CI), time frame of estimate	References
Moderna	83.0, (40.0, 95.0) ^c , partially vaccinated ^x	[19]
	82.0, (20.0, 96.0) ^c , fully vaccinated ^y	[19]
Pfizer	80.0, (60.0, 90.0) ^c , partially vaccinated ^x	[19]
	93.0, (78.0, 98.0) ^c , fully vaccinated ^y	[19]
Johnson & Johnson	Not reported	n/a
AstraZeneca	77.3*, (65.4, 85.0) ^e , more than 14 days after dose 2	[6]
	51.9, (42.0, 60.1) ^d , time frame not reported	[20]
Novavax	Not reported	n/a
Sputnik V	Not reported	n/a
Sinovac	Not reported	n/a
Sinopharm	Not reported	n/a

^c Vaccine effectiveness against RT-PCR-confirmed SARS-CoV-2 infection.

^x Participants considered to be partially vaccinated 14 or more days after dose 1 and less than 14 days after dose 2.

^y Participants considered to be fully vaccinated 14 or more days after dose 2.

^e VE against all (symptomatic and asymptomatic) infection caused by non-B.1.1.7 variants. Asymptomatic infections were detected by weekly swabbing.

^d VE against all (symptomatic and asymptomatic) infection.

Table 8: Vaccine efficacy to prevent infectiousness to others, VE_I

Company	Efficacy%, (95% CI), time frame of estimate	References
Moderna	40.2, (16.3, 57.3) ^w , with at least partial vaccination	[19]
Pfizer	40.2, (16.3, 57.3) ^w , with at least partial vaccination	[19]
Johnson & Johnson	Not reported	n/a
AstraZeneca	47.0, (37.0, 56.0), after dose 2	[21]
Novavax	Not reported	n/a
Sputnik V	Not reported	n/a
Sinovac	Not reported	n/a
Sinopharm	Not reported	n/a

^w “Among participants with SARS-CoV-2 infection, the mean viral RNA load was 40% lower (95% CI, 16 to 57) in partially or fully vaccinated participants than in unvaccinated participants” [19].

Table 9: Vaccine efficacy against α (B.1.1.7) after dose 1

Company	Efficacy%, (95% CI), time frame of estimate	References
Moderna	67.0, (57.0, 75.0) ^y , 21 or more days after dose 1	[22]
Pfizer	29.5, (22.9, 35.5) ⁿ , after dose 1	[23, 24]
	54.1, (26.1, 71.9) ^u , after dose 1	[24]
	47.5, (41.6, 52.8) ^q , after dose 1	[25]
	67.0, (57.0, 75.0) ^y , 21 or more days after dose 1	[22]
Johnson & Johnson	Not reported ^p	[23]
AstraZeneca	48.7, (45.2, 51.9) ^q , after dose 1	[25]
Novavax	85.6 ^{*q} , (CI not reported), time frame not reported	[23, 26]
Sputnik V	Not reported	n/a
Sinovac	Not reported	n/a
Sinopharm	Not reported	n/a

^y Single-dose mRNA VE against PCR confirmed infection with the α (B.1.1.7) variant.

ⁿ VE against PCR-confirmed infection with the α (B.1.1.7) variant.

^u VE against severe, critical, or fatal disease caused by the α (B.1.1.7) variant.

^q VE against symptomatic COVID-19

^p There is no VE estimate reported, but it is important to note that the Johnson & Johnson vaccine was tested in the US after the α (B.1.1.7) variant was circulating.

Table 10: Vaccine efficacy against α (B.1.1.7) after dose 2

Company	Efficacy%, (95% CI), time frame of estimate	References
Moderna	Not reported ^m	[23]
Pfizer	89.5, (85.9, 92.3) ⁿ , 14 or more days after dose 2	[24]
	100.0, (81.7, 100.0) ^u , 14 or more days after dose 2	[24]
	93.7, (91.6, 95.3) ^q , after dose 2	[25]
Johnson & Johnson	One dose vaccine	n/a
AstraZeneca	74.5, (68.4, 79.4) ^q , after dose 2	[25]
	61.7 [*] , (36.7, 76.9) ^r , time frame not reported	[6]
Novavax	85.6 ^{*q} , (CI not reported), time frame not reported	[23, 26]
Sputnik V	Not reported	n/a
Sinovac	Not reported	n/a
Sinopharm	Not reported	n/a

^m Although a VE estimate is unknown, numerous studies have reported that the Moderna vaccine offers protection against the B.1.1.7 variant [26–28].

ⁿ VE against PCR-confirmed infection with the α (B.1.1.7) variant.

^u VE against severe, critical, or fatal disease caused by the α (B.1.1.7) variant.

^q VE against symptomatic COVID-19

^r VE against all (symptomatic and asymptomatic) infection caused by the α (B.1.1.7) variant. Asymptomatic infections were detected by weekly swabbing.

Table 11: Vaccine efficacy against γ (P.1)

Company	Efficacy%, (95% CI), time frame of estimate	References
Moderna	61.0, (45.0, 72.0) ^y , 21 or more days after dose 1	[22]
Pfizer	61.0, (45.0, 72.0) ^y , 21 or more days after dose 1	[22]
Johnson & Johnson	66.2*, (51.0, 77.1) ^s , 14 or more days after vaccination	[12]
	68.1*, (48.8, 80.7) ^s , 28 or more days after vaccination	[12]
AstraZeneca	Not reported	n/a
Novavax	Not reported	n/a
Sputnik V	Not reported	n/a
Sinovac	49.6, (11.3, 71.4) ^t , 14 or more days after dose 1	[29]
Sinopharm	Not reported	n/a

^y Single-dose mRNA VE against PCR confirmed infection with the γ (P.1) variant.

^s VE against moderate to severe Covid-19 caused by the variant from the P.2 lineage carrying the E484K mutation.

^t VE against symptomatic infection

Table 12: Vaccine efficacy against β (B.1.351) after dose 1

Company	Efficacy%, (95% CI), time frame of estimate	References
Moderna	Not reported	n/a
Pfizer	16.9, (10.4, 23.0) ⁿ , after dose 1	[23,24]
	0.0, (0.0, 19.0) ^u , after dose 1	[24]
Johnson & Johnson	52.0*, (30.3, 67.4) ^w , 14 or more days after vaccination	[12]
	64.0*, (41.2, 78.7) ^w , 28 or more days after vaccination	[12]
AstraZeneca	21.9 ^q , (-49.9, 59.8), time frame not reported	[23,30]
Novavax	Not reported	n/a
Sputnik V	Not reported	n/a
Sinovac	Not reported	n/a
Sinopharm	Not reported	n/a

ⁿ VE against PCR-confirmed infection with the β (B.1.351) variant.

^u VE against severe, critical, or fatal disease caused by the β (B.1.351) variant.

^w VE against moderate to severe COVID-19

^q VE against symptomatic COVID-19

Table 13: Vaccine efficacy against β (B.1.351) after dose 2

Company	Efficacy%, (95% CI), time frame of estimate	References
Moderna	Not reported	n/a
Pfizer	75.0, (70.5, 78.9) ⁿ , 14 or more days after dose 2	[24]
Johnson & Johnson	One dose vaccine	n/a
AstraZeneca	21.9*, (-49.9, 59.8) ^q , time frame not reported	[23,30]
Novavax	49.4*, (6.1, 72.8) ^q , 7 days after dose 2	[23,31]
Sputnik V	Not reported	n/a
Sinovac	Not reported	n/a
Sinopharm	Not reported	n/a

ⁿ VE against PCR-confirmed infection with the β (B.1.351) variant.

^q VE against symptomatic COVID-19

Table 14: Vaccine efficacy against δ (B.1.617.2) after dose 1

Company	Efficacy%, (95% CI), time frame of estimate	References
Moderna	Not reported	n/a
Pfizer	35.6, (22.7, 46.4) ^a , after dose 1	[25]
Johnson & Johnson	Not reported	n/a
AstraZeneca	30.0, (24.3, 35.3) ^a , after dose 1	[25]
Novavax	Not reported	n/a
Sputnik V	Not reported	n/a
Sinovac	Not reported	n/a
Sinopharm	Not reported	n/a

^a VE against symptomatic COVID-19

Table 15: Vaccine efficacy against δ (B.1.617.2) after dose 2

Company	Efficacy%, (95% CI), time frame of estimate	References
Moderna	Not reported	n/a
Pfizer	88.0, (85.3, 90.1) ^a , after dose 2	[25]
Johnson & Johnson	Not reported	n/a
AstraZeneca	67.0, (61.3, 71.8) ^a , after dose 2	[25]
Novavax	Not reported	n/a
Sputnik V	Not reported	n/a
Sinovac	Not reported	n/a
Sinopharm	Not reported	n/a

^a VE against symptomatic COVID-19

Table 16: Viral neutralization of the variants of concern as compared with pre-existing variants

Company	Variant of concern	Neutralization by pseudovirion or live viral plaque assay	References
Moderna	B.1.1.7 (α)	Decrease by 1.8x	[23]
	P.1 (γ)	Decrease by 4.5x	[23]
	B.1.351 (β)	Decrease by $\leq 8.6x$	[23]
	B.1.617.2 (δ)	Not reported	n/a
Pfizer	B.1.1.7 (α)	Decrease by 2x	[23]
	P.1 (γ)	Decrease by 6.7x	[32]
	B.1.351 (β)	Decrease by $\leq 6.5x$	[23]
	B.1.617.2 (δ)	Not reported	n/a
Johnson & Johnson	B.1.1.7 (α)	Not reported	n/a
	P.1 (γ)	Not reported	n/a
	B.1.351 (β)	Not reported	n/a
	B.1.617.2 (δ)	Not reported	n/a
AstraZeneca	B.1.1.7 (α)	Decrease by 9x	[6]
	P.1 (γ)	Not reported	n/a
	B.1.351 (β)	Decrease by $\leq 86\%$	[23]
	B.1.617.2 (δ)	Not reported	n/a
Novavax	B.1.1.7 (α)	Decrease by 1.8x	[23]
	P.1 (γ)	Not reported	n/a
	B.1.351 (β)	Not reported	n/a
	B.1.617.2 (δ)	Not reported	n/a
Sputnik V	B.1.1.7 (α)	Not reported	n/a
	P.1 (γ)	Not reported	n/a
	B.1.351 (β)	Not reported	n/a
	B.1.617.2 (δ)	Not reported	n/a
Sinovac	B.1.1.7 (α)	Not reported	n/a
	P.1 (γ)	Not reported	n/a
	B.1.351 (β)	Not reported	n/a
	B.1.617.2 (δ)	Not reported	n/a
Sinopharm	B.1.1.7 (α)	Not reported	n/a
	P.1 (γ)	Not reported	n/a
	B.1.351 (β)	Not reported	n/a
	B.1.617.2 (δ)	Not reported	n/a

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