
Supplementary information

**Vaccine effectiveness of heterologous
CoronaVac plus BNT162b2 in Brazil**

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Supplementary Tables and Figures

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Supplementary table 1. Clinical and sociodemographic characteristics of individuals included in the sensitivity analysis, by SARS-CoV-2 RT-PCR or Antigen test positivity. Vaccination status for CoronaVac is categorized by days since receiving a CoronaVac dose and a booster dose of BNT162b2.

Characteristic	Controls, N = 9,486,742 ¹	Cases, N = 6,269,322 ¹	Overall, N = 15,756,064 ¹
Individuals	8,395,355 (88%)	5,967,127 (95%)	14,362,482 (91%)
Type of test			
Antigen	5,113,357 (54%)	2,895,586 (46%)	8,008,943 (51%)
RT-PCR	4,373,385 (46%)	3,373,736 (54%)	7,747,121 (49%)
Age, years	37 (28, 49)	40 (30, 53)	38 (29, 50)
Sex-Female	5,317,888 (56%)	3,253,911 (52%)	8,571,799 (54%)
Race			
White	4,364,533 (46%)	2,617,487 (42%)	6,982,020 (44%)
Black	368,831 (3.9%)	236,576 (3.8%)	605,407 (3.8%)
Asian	127,970 (1.3%)	79,872 (1.3%)	207,842 (1.3%)
Mixed	2,576,712 (27%)	1,948,936 (31%)	4,525,648 (29%)
Indigenous	10,428 (0.1%)	5,047 (<0.1%)	15,475 (<0.1%)
(Missing)	2,038,268 (21%)	1,381,404 (22%)	3,419,672 (22%)
Age group			
18-59	8,376,735 (88%)	5,308,579 (85%)	13,685,314 (87%)
60-79	967,771 (10%)	829,608 (13%)	1,797,379 (11%)
≥80	142,236 (1.5%)	131,135 (2.1%)	273,371 (1.7%)
Region of residence			
Central west	2,294,571 (24%)	1,199,143 (19%)	3,493,714 (22%)
North	418,477 (4.4%)	279,051 (4.5%)	697,528 (4.4%)
Northeast	1,381,162 (15%)	1,146,083 (18%)	2,527,245 (16%)
South	742,602 (7.8%)	645,499 (10%)	1,388,101 (8.8%)
Southeast	4,649,930 (49%)	2,999,546 (48%)	7,649,476 (49%)

Pregnancy	71,709 (0.8%)	30,679 (0.5%)	102,388 (0.6%)
Postpartum period	4,697 (<0.1%)	3,380 (<0.1%)	8,077 (<0.1%)
Diabetes Mellitus	276,714 (2.9%)	305,548 (4.9%)	582,262 (3.7%)
Obesity	106,694 (1.1%)	136,156 (2.2%)	242,850 (1.5%)
Immunosuppression	61,497 (0.6%)	41,183 (0.7%)	102,680 (0.7%)
Cardiac Disease	518,680 (5.5%)	500,168 (8.0%)	1,018,848 (6.5%)
Chronic Kidney Disease	30,552 (0.3%)	32,815 (0.5%)	63,367 (0.4%)
Number of comorbidities			
0	8,684,596 (92%)	5,501,782 (88%)	14,186,378 (90%)
1	632,592 (6.7%)	554,802 (8.8%)	1,187,394 (7.5%)
≥2	169,554 (1.8%)	212,738 (3.4%)	382,292 (2.4%)
Previous confirmed infection	508,897 (5.4%)	60,778 (1.0%)	569,675 (3.6%)
Hospitalization	118,669 (1.3%)	650,219 (10%)	768,888 (4.9%)
Death	30,448 (0.3%)	187,428 (3.0%)	217,876 (1.4%)
Hospitalization or Death	121,373 (1.3%)	659,775 (11%)	781,148 (5.0%)
Vaccination Status			
Unvaccinated	5,909,368 (62%)	4,776,983 (76%)	10,686,351 (68%)
CoronaVac	1,244,837 (13.1%)	610,999 (9.7%)	1,855,836 (11.8%)
Other Vaccines	2,335,042 (25%)	881,775 (14%)	3,216,817 (20%)

¹ Median (IQR); n (%)

Supplementary table 2- Vaccine effectiveness against SARS-CoV-2 RT-PCR confirmed symptomatic infection and hospitalization/death using RT-PCR plus antigen detection tests for the diagnosis of COVID-19, by time (days) since second dose of CoronaVac or after BNT162b2 booster dose.

Period post vaccine (days)	Effectiveness against Infection	Effectiveness against severe outcomes
Second dose		
0-13	34.4% (33.6-35.2)	65.4% (64.4-66.4)
14-30	51.7% (51.1-52.2)	81.8% (81.2-82.4)
31-60	47.2% (46.7-47.7)	82.1% (81.7-82.5)
61-90	43.2% (42.7-43.8)	79.9% (79.4-80.4)
91-120	41.8% (41.2-42.4)	78.6% (78.0-79.1)
121-150	39.3% (38.6-40.0)	76.8% (76.2-77.5)
151-180	37.0% (36.2-37.9)	75.5% (74.7-76.3)
>180	34.3% (33.2-35.3)	73.3% (72.1-74.5)
Booster (BNT162b2)		
0-6	45.9% (42.6-49.0)	83.3% (80.6-85.6)
7-13	84.3% (82.7-85.8)	92.6% (90.8-94.1)
14-30	93.1% (92.2-93.9)	97.3% (96.4-98.0)
>30	89.8% (87.5-91.7)	96.7% (94.8-97.9)

Supplementary table 3: Characteristics of individuals who received a BNT162b2 booster dose

Characteristic	18-59, N = 4,086¹	60-79, N = 2,339¹	≥80, N = 1,438¹	Overall, N = 7,863¹
Individuals	4,080 (99.9%)	2,335 (99.8%)	1,435 (99.8%)	7,850 (99.8%)
Age, years	37 (29, 44)	73 (70, 76)	86 (83, 90)	56 (37, 77)
Sex-Female	3,265 (79.9%)	1,275 (54.5%)	839 (58.3%)	5,379 (68.4%)
Race				
White	2,335 (57.1%)	1,096 (46.9%)	730 (50.8%)	4,161 (52.9%)
Black	177 (4.3%)	51 (2.2%)	32 (2.2%)	260 (3.3%)
Asian	75 (1.8%)	38 (1.6%)	13 (0.9%)	126 (1.6%)
Mixed	913 (22.3%)	458 (19.6%)	283 (19.7%)	1,654 (21.0%)
Indigenous	0 (0.0%)	0 (0.0%)	2 (0.1%)	2 (0.0%)
(Missing)	586 (14.3%)	696 (29.8%)	378 (26.3%)	1,660 (21.1%)
Region of residence				
Central-west	847 (20.7%)	422 (18.0%)	432 (30.0%)	1,701 (21.6%)
North	136 (3.3%)	42 (1.8%)	30 (2.1%)	208 (2.6%)
Northeast	583 (14.3%)	247 (10.6%)	168 (11.7%)	998 (12.7%)
South	203 (5.0%)	279 (11.9%)	138 (9.6%)	620 (7.9%)
Southeast	2,317 (56.7%)	1,349 (57.7%)	670 (46.6%)	4,336 (55.1%)
Pregnancy	8 (0.2%)	0 (0.0%)	0 (0.0%)	8 (0.1%)
Post partum period	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Diabetes Mellitus	107 (2.6%)	442 (18.9%)	281 (19.5%)	830 (10.6%)
Obesity	85 (2.1%)	48 (2.1%)	40 (2.8%)	173 (2.2%)
Immunossupression	32 (0.8%)	47 (2.0%)	39 (2.7%)	118 (1.5%)
Cardiac Disease	229 (5.6%)	632 (27.0%)	576 (40.1%)	1,437 (18.3%)
Chronic Kidney Disease	9 (0.2%)	69 (2.9%)	58 (4.0%)	136 (1.7%)

Number of comorbidities

0	3,702 (90.6%)	1,487 (63.6%)	749 (52.1%)	5,938 (75.5%)
1	315 (7.7%)	535 (22.9%)	437 (30.4%)	1,287 (16.4%)
≥2	69 (1.7%)	317 (13.6%)	252 (17.5%)	638 (8.1%)
Previous confirmed infection	736 (18.0%)	127 (5.4%)	67 (4.7%)	930 (11.8%)
Positive Test (Study Period)	384 (9.4%)	423 (18.1%)	254 (17.7%)	1,061 (13.5%)
Hospitalisation	27 (0.7%)	405 (17.3%)	598 (41.6%)	1,030 (13.1%)
Death	2 (0.0%)	72 (3.1%)	139 (9.7%)	213 (2.7%)
Hospitalisation or Death	27 (0.7%)	410 (17.5%)	607 (42.2%)	1,044 (13.3%)

1 Median (IQR); n (%);

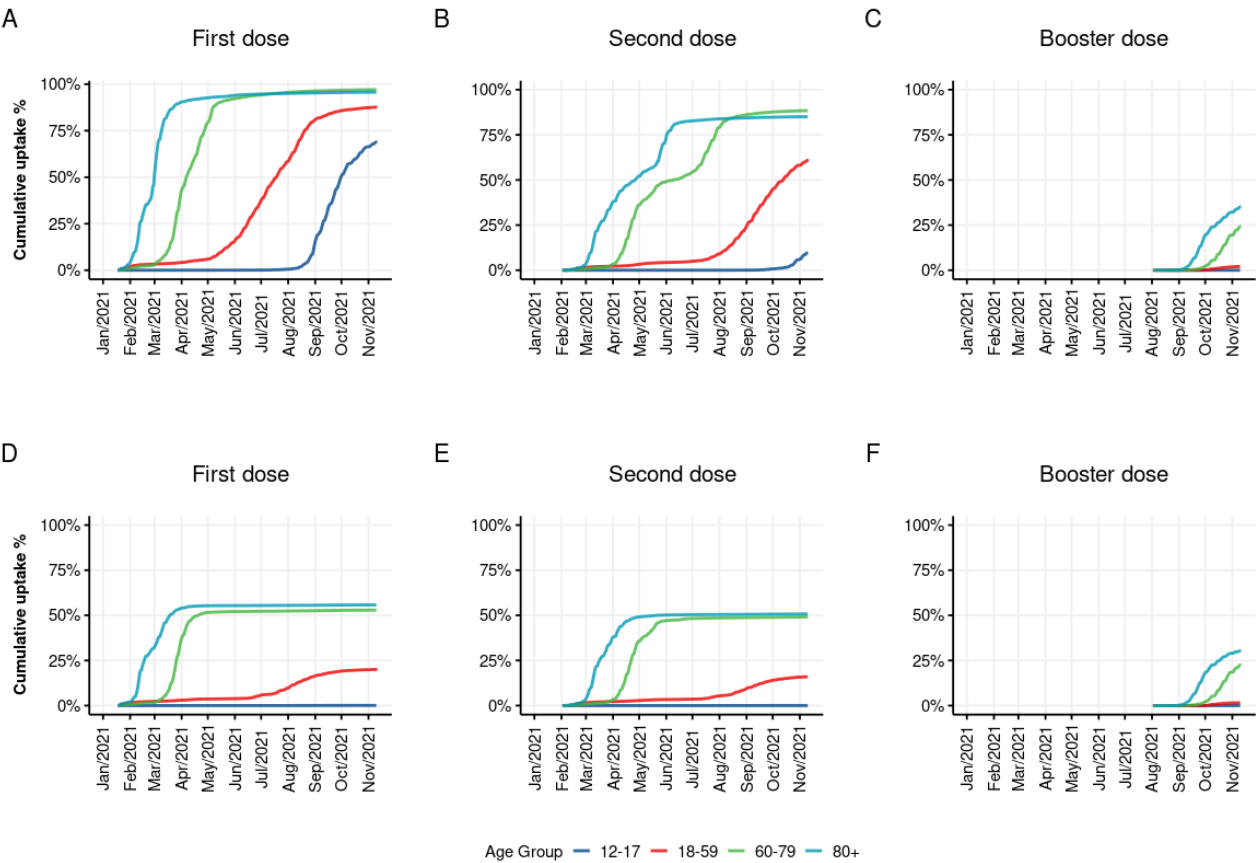
Supplementary table 4 - Relative VE after booster against SARS-CoV-2 infection compared to individuals with second dose of CoronaVac >180 days.

		Overall	18-59	60-79	≥80
	CoronaVac >180 days- 2 nd dose	Ref			
	Booster (BNT162b2)				
Only	0-6	7.4 % (-1.7 - 15.7)	9.4% (-3.9- 21.0)	1.9% (- 14.5-16.0)	1.5% (- 24.5-22.1)
RT-PCR	7-13	69.6 % (64.8 - 73.8)	76.6% (69.9-81.8)	63.2% (53.5-70.8)	55.1% (39.0-67.0)
	14-30	88.8 % (86.3 - 90.8)	90.2% (85.9-93.1)	89.9% (85.2-93.1)	80.0% (72.3-85.5)
	>30	73.4 % (64.6 - 80.0)	42.0% (- 10.5-69.6)	71.4% (50.5-83.4)	62.6% (44.2-74.9)
	CoronaVac >180 days- 2 nd dose				
	Booster (BNT162b2)				
RT-PCR	0-6	17.7% (12.6- 22.5)	18.3% (10.5-25.4)	17.5% (9.1- 25.1)	-1.7% (- 19.8-13.7)
+	7-13	76.1% (73.7- 78.4)	81.4% (77.9-84.4)	75.6% (71.5-79.1)	55.4% (44.8-63.9)
Rapid antigen test	14-30	89.6% (88.2- 90.8)	90.4% (88.1-92.2)	91.4% (89.2-93.1)	80.5% (75.6-84.5)
	>30	84.5% (81.0- 87.4)	77.9% (65.3-86.0)	88.6% (82.8-92.5)	74.6% (66.0-81.0)

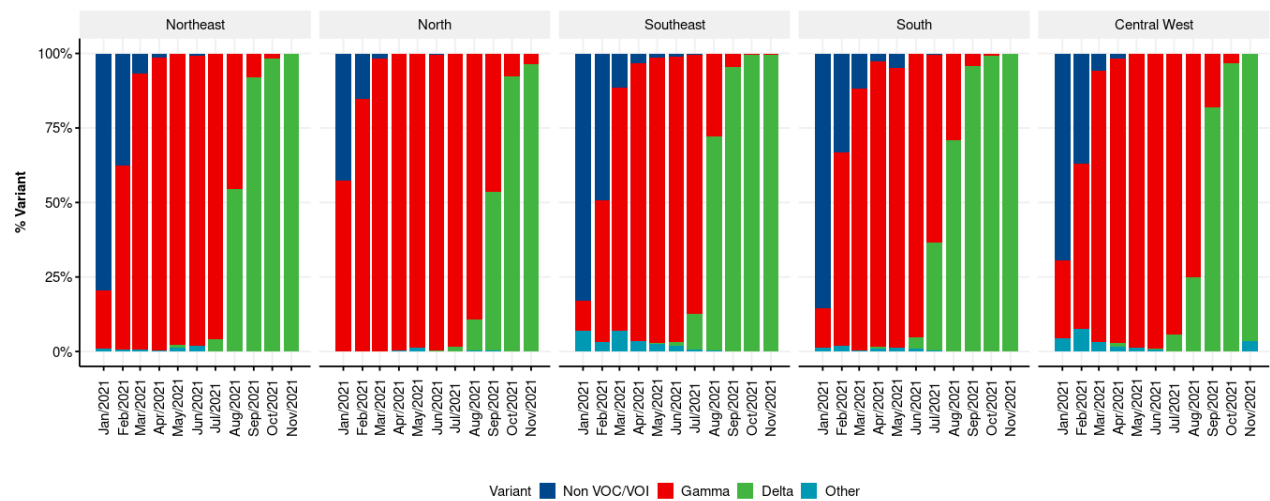
Supplementary table 5 - Relative VE after booster against COVID-19 hospitalizations or death compared to individuals with second dose of CoronaVac >180 days

		Overall	18-59	60-79	≥80
Only	CoronaVac >180 days- 2 nd dose	Ref			
	Booster (BNT162b2)				
	0-6	28.9% (13.2-41.7)	56.7% (6.7-79.9)	25.4% (2.8-42.8)	12.8% (-16.6-34.7)
	7-13	68.4% (57.9-76.3)	83.3% (32.1-95.9)	57.2% (38.2-70.3)	62.5% (44.1-74.8)
	14-30	90.1% (85.7-93.1)	91.7% (40.5-98.8)	89.6% (80.6-94.4)	82.0% (72.6-88.2)
RT-PCR	>30	88.3% (78.5-93.7)	99.7% (*)	70.9% (25.6-88.6)	81.8% (63.7-90.9)
	CoronaVac >180 days- 2 nd dose	Ref			
	Booster (BNT162b2)				
	0-6	37.4% (27.0-46.3)	70.4% (40.0-85.4)	42.4% (29.2-53.1)	15.6% (-6.3-32.9)
	7-13	72.4% (65.5-77.9)	90.2% (60.6-97.6)	72.5% (62.6-79.8)	62.9% (49.5-72.8)
Rapid antigen test	14-30	89.8% (86.4-92.3)	91.6% (66.1-97.9)	92.4% (87.4-95.4)	83.1% (76.3-88.0)
	>30	87.7% (80.5-92.3)	43.9% (-306.7-92.3)	87.7% (69.7-95.0)	82.4% (70.5-89.5)

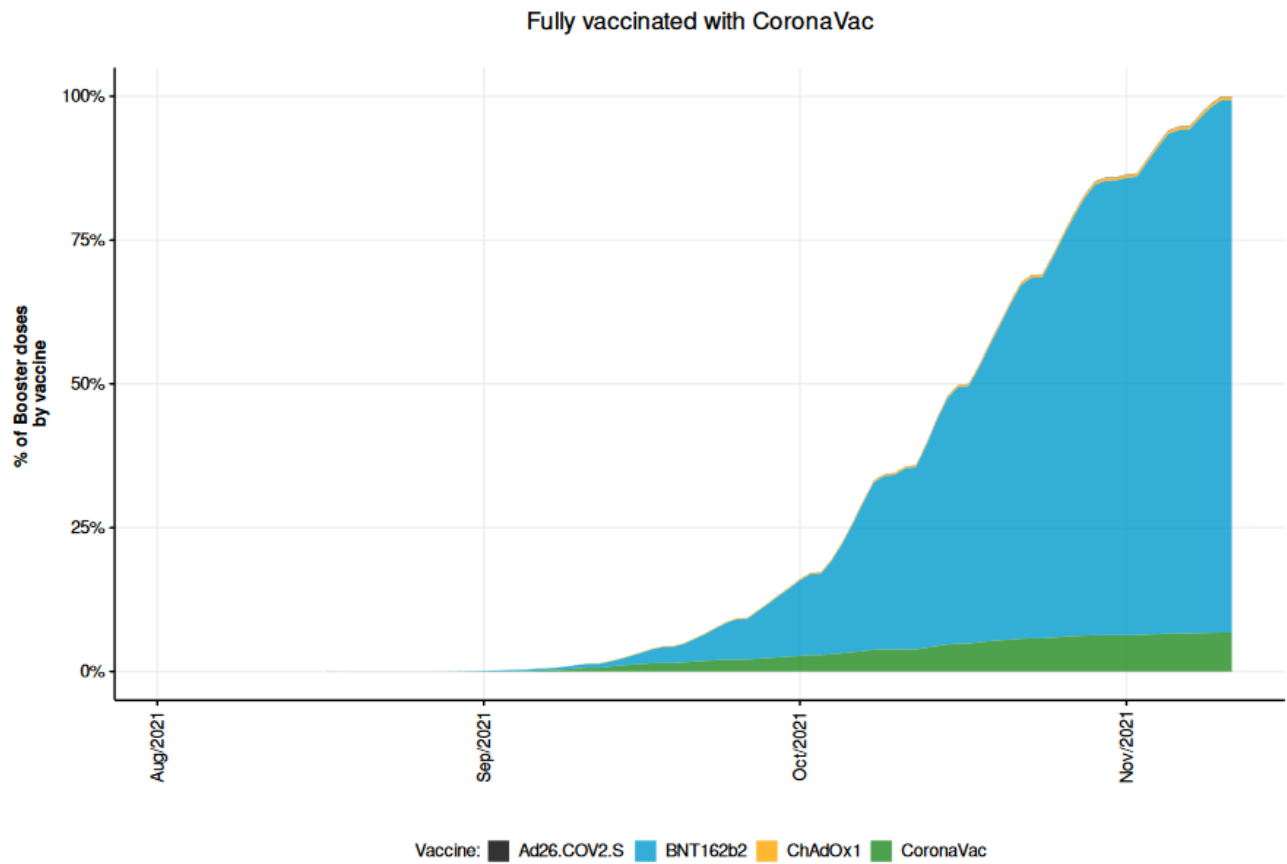
Supplementary Figure 1: Cumulative uptake of vaccination in Brazil. A, B, C: uptake of all vaccines available in Brazil. D, E, F uptake of only CoronaVac. C: (Booster dose) refers to people who have completed vaccine series with any vaccine (CoronaVac, ChAdOx1, Ad26.COV2.S or BNT162b2) and have received a third dose with any vaccine. F: Refers to people who have two doses of CoronaVac and received a booster dose with any vaccine.



Supplementary Figure 2: Distribution of variant of concern (VOC) in Brazil from January to November 2021, stratified by region. Data obtained at Fiocruz Genomic Network and/or GISAID- (Visited 2021/12/12). VOI =variant of interest



Supplementary figure 3. Percentage by vaccine type in the population with third dose by vaccine in people who have received two doses of CoronaVac in Brazil.



Supplementary figure 4- Diagram showing the data linkage process

