Covid-19 Vaccine Effectiveness Assessment in Chile

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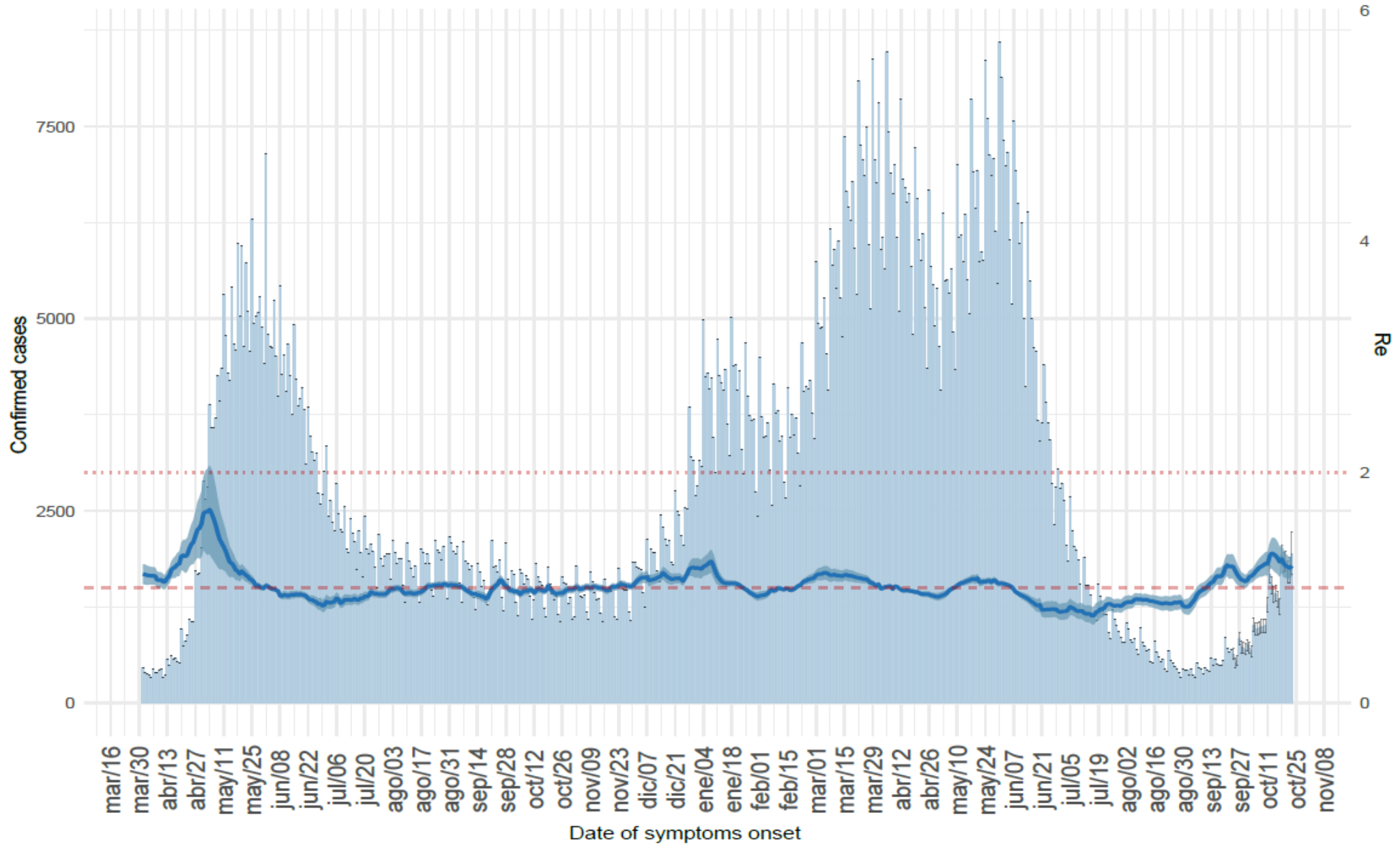
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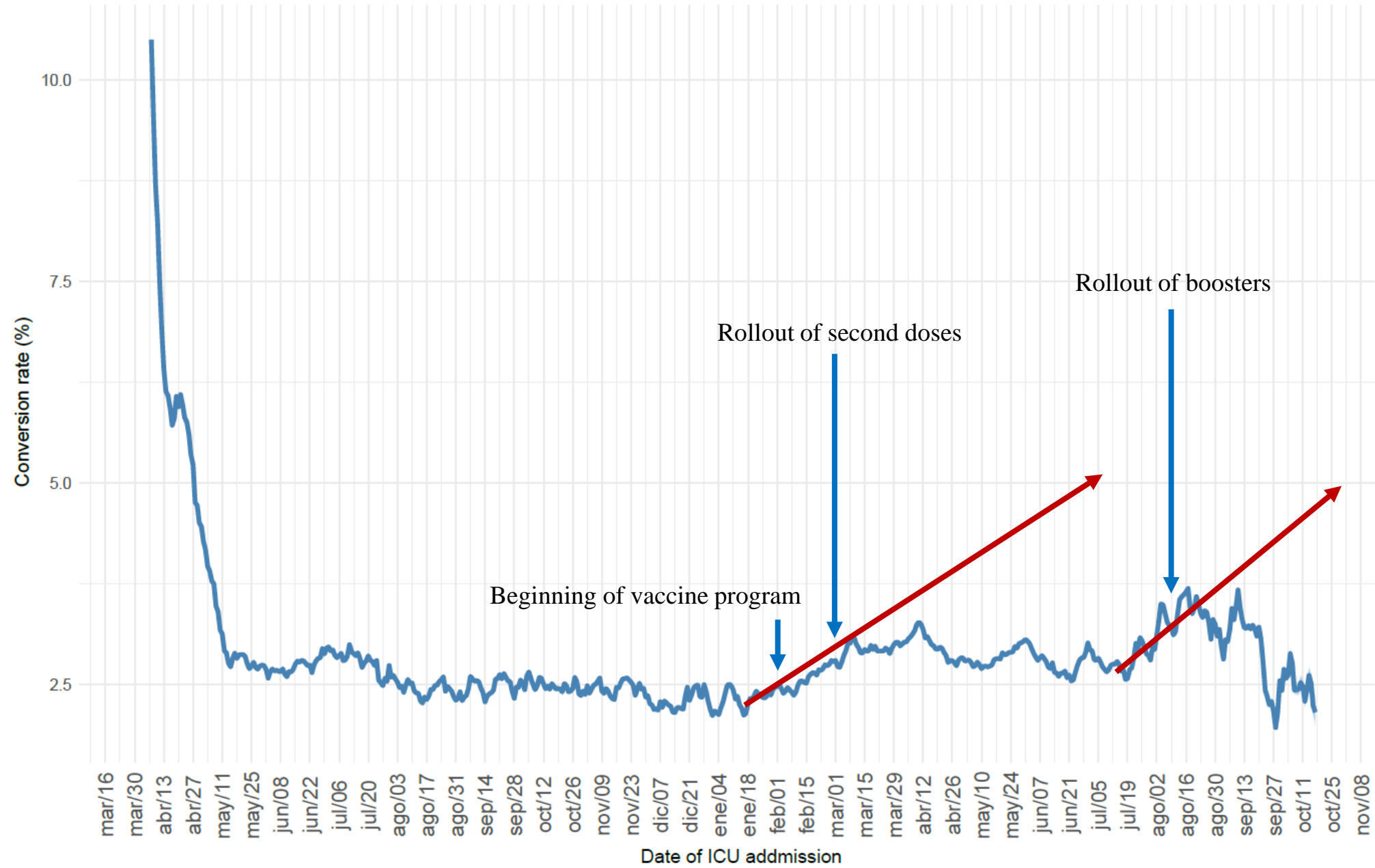# Disclosures

- No COI to disclose

Situation Report
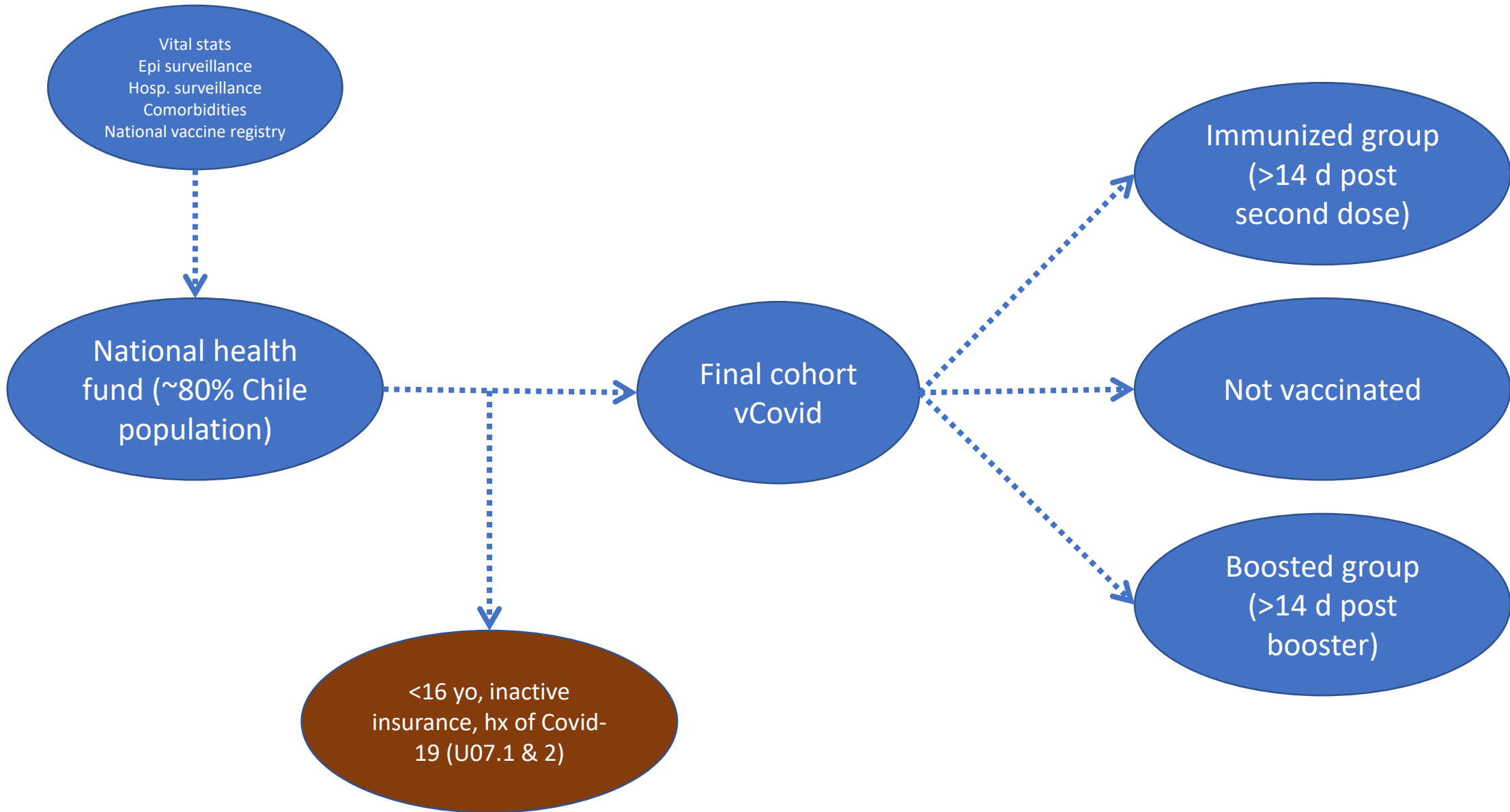
Case-ICU conversion rate

Vaccine Effectiveness Assessments

Grupo para estudio de vacunas SARS-CoV-2 MINSAL (vCovid MINSAL)

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Subsecretaría de Salud Pública - MINSAL

Statistical approach

- We assessed the vaccine effectiveness (VE) by estimating the hazard ratio between exposed and unexposed subjects.

- We used an extension of the Cox proportional model to estimate hazard ratios and to account for subjects' time-dependent vaccination status.

- Where T_i is the time between the beginning of the follow-up and the date of symptoms onset for the i-the subject in the cohort, $i = 1, \ldots, n$.

- Where $\boldsymbol{x}_i$, $i = 1, \ldots, n$, is a vector p-dimensional of the specific characteristics of the subjects (e.g. age and gender) and $z_i(t)$ the time-dependent treatment indicator.

- The Cox model with time-dependent covariates, compares the risk of an event of interest between subjects immunized with CoronaVac or not in each moment of time, and reassesses the risk-group to which each subject belongs depending of their immunization status at that particular time.

- The inference was based on a partial likelihood approach and all analyses were performed using R.

- The hazard ratios between unvaccinated and the primary immunization group (≥ 14 days after the second dose), and the booster group (≥ 14 days after the booster shot) were estimated separately.

- Vaccine effectiveness was estimated as $100\% \times (1 - \exp\{\beta\})$.

Table 2: The Cohort

Characteristic	N (%)	Covid-19 N (row %)	p-value	Unvaccinated N (row %)	Vaccinated 1 dose N (row %)	Vaccinated 2 doses N (%)	Vaccinated 3 doses N (%)	p-value
Total	11,174,762 (100.0)	508,636 (4.6)	-	1,264,658 (11.3171)	650,738 (5.8233)	6,373,193 (57.0320)	2,886,173 (25.8276)	-
Region								
Arica	142,904 (1.3)	6,879 (4.8)	< 2.22e-16	20,491 (14.34)	9,790 (6.851)	85,627 (59.92)	26,996 (18.89)	< 2.22e-16
Tarapacá	200,790 (1.8)	8,990 (4.5)		31,025 (15.45)	12,002 (5.977)	123,269 (61.39)	34,494 (17.18)	
Antofagasta	326,886 (2.9)	10,884 (3.3)		42,117 (12.88)	21,148 (6.47)	198,010 (60.57)	65,611 (20.07)	
Atacama	189,552 (1.7)	6,070 (3.2)		22,447 (11.84)	11,315 (5.969)	115,661 (61.02)	40,129 (21.17)	
Coquimbo	525,718 (4.7)	17,701 (3.4)		57,046 (10.85)	30,471 (5.796)	319,951 (60.86)	118,250 (22.49)	
Valparaíso	1,212,288 (11)	45,122 (3.7)		145,625 (12.01)	64,580 (5.327)	660,489 (54.48)	341,594 (28.18)	
Metropolitana	4,097,968 (37)	189,143 (4.6)		488,298 (11.92)	242,935 (5.928)	2,243,141 (54.74)	1,123,594 (27.42)	
L.G.B. O'Higgins	623,114 (5.6)	24,404 (3.9)		57,386 (9.21)	30,155 (4.839)	372,129 (59.72)	163,444 (26.23)	
Maule	762,407 (6.8)	39,082 (5.1)		69,772 (9.152)	40,843 (5.357)	452,303 (59.33)	199,489 (26.17)	
Ñuble	344,028 (3.1)	14,126 (4.1)		30,746 (8.937)	14,956 (4.347)	202,013 (58.72)	96,313 (28)	
Biobío	1,053,386 (9.4)	54,554 (5.2)		96,582 (9.169)	55,445 (5.264)	611,385 (58.04)	289,974 (27.53)	
Araucanía	682,975 (6.1)	41,595 (6.1)		82,728 (12.11)	39,552 (5.791)	400,171 (58.59)	160,524 (23.5)	
Los Ríos	273,109 (2.4)	17,524 (6.4)		30,704 (11.24)	15,867 (5.81)	164,761 (60.33)	61,777 (22.62)	
Los Lagos	584,792 (5.2)	26,216 (4.5)		72,290 (12.36)	44,106 (7.542)	344,468 (58.9)	123,928 (21.19)	
Aysén	60,167 (0.54)	2,231 (3.7)		6,791 (11.29)	6,991 (11.62)	33,600 (55.84)	12,785 (21.25)	
Magallanes	94,678 (0.85)	4,115 (4.3)		10,610 (11.21)	10,582 (11.18)	46,215 (48.81)	27,271 (28.8)	

Characteristic	N (%)	Covid-19 N (row %)	p-value	Unvaccinated N (row %)	Vaccinated 1 dose N (row %)	Vaccinated 2 doses N (%)	Vaccinated 3 doses N (%)	p-value
Sex								
Female	5,993,951 (54)	277,937 (4.6)	< 2.22e-16	599,243 (9.997)	288,172 (4.808)	3,387,322 (56.51)	1,719,214 (28.68)	< 2.22e-16
Male	5,180,811 (46)	230,699 (4.5)		665,415 (12.84)	362,566 (6.998)	2,985,871 (57.63)	1,166,959 (22.52)	
Age group								
<20	737,009 (6.6)	30,624 (4.2)	< 2.22e-16	106,825 (14.49)	120,379 (16.33)	498,069 (67.58)	11,736 (1.592)	< 2.22e-16
20 - 29	2,121,754 (19)	120,130 (5.7)		291,092 (13.72)	237,107 (11.18)	1,442,988 (68.01)	150,567 (7.096)	
30 - 39	2,001,676 (18)	110,400 (5.5)		284,625 (14.22)	139,281 (6.958)	1,382,281 (69.06)	195,489 (9.766)	
40 - 49	1,735,138 (16)	84,774 (4.9)		190,639 (10.99)	79,939 (4.607)	1,217,292 (70.16)	247,268 (14.25)	
50 - 59	1,795,662 (16)	75,961 (4.2)		154,118 (8.583)	48,065 (2.677)	1,027,286 (57.21)	566,193 (31.53)	
60 - 69	1,421,967 (13)	47,860 (3.4)		106,392 (7.482)	12,512 (0.8799)	469,828 (33.04)	833,235 (58.6)	
70 - 79	881,226 (7.9)	25,074 (2.8)		69,015 (7.832)	7,095 (0.8051)	206,883 (23.48)	598,233 (67.89)	
≥ 80	480,330 (4.3)	13,813 (2.9)		61,952 (12.9)	6,360 (1.324)	128,566 (26.77)	283,452 (59.01)	
Comorbidities								
None	7,587,268 (68)	343,409 (4.5)	< 2.22e-16	988,407 (13.03)	536,171 (7.067)	4,712,374 (62.11)	1,350,316 (17.8)	< 2.22e-16
≥ 1	3,587,494 (32)	165,227 (4.6)		276,251 (7.7)	114,567 (3.194)	1,660,819 (46.29)	1,535,857 (42.81)	
Nacionality								
Chilean	10,428,044 (93)	477,507 (4.6)	0	1,069,679 (10.26)	593,151 (5.688)	5,941,849 (56.98)	2,823,365 (27.07)	< 2.22e-16
Foreigners	746,718 (6.7)	31,129 (4.2)		194,979 (26.11)	57,587 (7.712)	431,344 (57.77)	62,808 (8.411)	

Table 3: The Cohort

Vaccine	Doses		
	1	2	3
AstraZeneca	18,114	238,481	93
CanSino	408,279	105	0
Pfizer	56,021	2,075,209	48,121
Sinovac	168,324	4,059,398	2,837,959

Vaccine	Booster shot		
	AstraZeneca	Pfizer	Sinovac
AstraZeneca	26	64	3
CanSino	5	100	0
Pfizer	1,674	46,328	119
Sinovac	1,706,705	966,137	165,449

Table 5: SARS-CoV-2 Infection

Treatment	No. of Person-days	No. of Events	Incidence rate (1,000 person-days)	Effectiveness (%)		
				Partial-PH[1] (95 % CI)	Full-PH[2] (95 % CI)	Stratified[2] (95 % CI)
Unvaccinated	1,050,423,028	397,132	0.378069	-	-	-
Sinovac	895,573,778	117,481	0.131180	46.42	52.25	50.18
(14 days after second dose)				(45.97 ; 46.86)	(51.85 ; 52.65)	(49.71 ; 50.64)
Pfizer	228,307,220	8,651	0.037892	79.66	81.90	80.59
(14 days after second dose)				(79.21 ; 80.10)	(81.49 ; 82.29)	(80.15 ; 81.02)
AstraZeneca	6,114,400	200	0.032710	65.82	68.14	66.06
(14 days after second dose)				(60.72 ; 70.26)	(63.39 ; 72.28)	(60.94 ; 70.51)
Cansino	32,494,642	1,366	0.042038	54.73	56.94	49.66
(28 days after second dose)				(52.21 ; 57.12)	(54.54 ; 59.21)	(46.81 ; 52.37)
AstraZeneca/Pfizer	11,494,050	227	0.019749	78.22	79.66	75.76
(14 days after second dose)				(75.18 ; 80.89)	(76.82 ; 82.15)	(72.32 ; 78.76)
Sinovac + AstraZeneca 3rd dose	56,193,193	428	0.007617	88.00	89.71	90.53
(14 days after third dose)				(86.78 ; 89.11)	(88.67 ; 90.66)	(89.48 ; 91.47)
Sinovac + Pfizer 3rd dose	12,054,026	82	0.006803	91.07	92.89	93.18
(14 days after third dose)				(88.90 ; 92.81)	(91.16 ; 94.28)	(91.52 ; 94.52)
Sinovac + Sinovac 3rd dose	4,923,671	123	0.024981	60.93	67.62	70.89
(14 days after third dose)				(53.32 ; 67.29)	(61.32 ; 72.90)	(65.02 ; 75.78)

[1]age and gender, y [2]all predictors.

Table 6: Covid-19

Treatment	No. of Person-days	No. of Events	Incidence rate (1,000 person-days)	Effectiveness (%) Partial-PH[1] (95 % CI)	Full-PH[2] (95 % CI)	Stratified[2] (95 % CI)
Unvaccinated	1,056,783,354	310,595	0.293906	-	-	-
Sinovac	905,114,772	89,024	0.098357	49.80	55.35	53.99
(14 days after second dose)				(49.32 ; 50.27)	(54.92 ; 55.78)	(53.50 ; 54.47)
Pfizer	231,175,713	5,628	0.024345	83.50	85.20	84.32
(14 days after second dose)				(83.05 ; 83.94)	(84.79 ; 85.59)	(83.88 ; 84.74)
AstraZeneca	6,241,822	133	0.021308	70.74	72.84	71.43
(14 days after second dose)				(65.30 ; 75.33)	(67.80 ; 77.10)	(66.07 ; 75.95)
Cansino	33,163,825	1,042	0.031420	57.06	59.22	52.27
(28 days after second dose)				(54.32 ; 59.64)	(56.61 ; 61.67)	(49.16 ; 55.19)
AstraZeneca/Pfizer	11,741,427	144	0.012264	82.17	83.43	80.41
(14 days after second dose)				(79.00 ; 84.87)	(80.47 ; 85.93)	(76.87 ; 83.40)
Sinovac + AstraZeneca 3rd dose	56,657,507	249	0.004395	91.83	93.01	93.58
(14 days after third dose)				(90.73 ; 92.80)	(92.06 ; 93.83)	(92.66 ; 94.38)
Sinovac + Pfizer 3rd dose	12,188,272	51	0.004184	93.30	94.65	94.98
(14 days after third dose)				(91.18 ; 94.92)	(92.95 ; 95.94)	(93.38 ; 96.20)
Sinovac + Sinovac 3rd dose	4,968,146	97	0.019524	64.11	70.61	73.58
(14 days after third dose)				(56.15 ; 70.62)	(64.09 ; 75.94)	(67.50 ; 78.52)

[1]age and gender, y [2]all predictors.

Table 7: Hospital Admissions

Treatment	No. of Person-days	No. of Events	Incidence rate (1,000 person-days)	Effectiveness (%)		
				Partial-PH[1] (95 % CI)	Full-PH[2] (95 % CI)	Stratified[2] (95 % CI)
Unvaccinated	1,077,590,939	33,732	0.031303	-	-	-
Sinovac	933,506,610	10,699	0.011461	81.50	83.62	83.34
(14 days after second dose)				(81.03 ; 81.97)	(83.19 ; 84.04)	(82.87 ; 83.79)
Pfizer	239,220,710	337	0.001409	94.38	94.84	94.44
(14 days after second dose)				(93.74 ; 94.96)	(94.25 ; 95.37)	(93.80 ; 95.01)
AstraZeneca	6,543,860	18	0.002751	87.04	87.70	86.69
(14 days after second dose)				(79.40 ; 91.84)	(80.46 ; 92.26)	(78.80 ; 91.65)
Cansino	35,240,029	32	0.000908	86.86	87.40	83.73
(28 days after second dose)				(81.39 ; 90.72)	(82.16 ; 91.10)	(76.88 ; 88.54)
AstraZeneca/Pfizer	12,354,317	1	0.000081	98.85	98.95	98.39
(14 days after second dose)				(92.27 ; 99.83)	(92.61 ; 99.85)	(88.53 ; 99.77)
Sinovac + AstraZeneca 3rd dose	57,749,001	53	0.000918	95.56	96.18	97.06
(14 days after third dose)				(94.13 ; 96.63)	(94.96 ; 97.11)	(96.09 ; 97.80)
Sinovac + Pfizer 3rd dose	12,549,714	24	0.001912	86.60	89.08	91.23
(14 days after third dose)				(79.89 ; 91.07)	(83.61 ; 92.73)	(86.74 ; 94.19)
Sinovac + Sinovac 3rd dose	5,076,311	34	0.006698	67.68	74.92	80.77
(14 days after third dose)				(54.44 ; 77.08)	(64.64 ; 82.21)	(72.57 ; 86.51)

[1]age and gender, y [2]all predictors.

Table 8: ICU Admissions

Treatment	No. of Person-days	No. of Persons	Incidence rate (1,000 person-days)	Effectiveness (%) Partial-PH[1] (95 % CI)	Full-PH[2] (95 % CI)	Stratified[2] (95 % CI)
Unvaccinated	1,079,475,313	12,036	0.011150	-	-	-
Sinovac	935,807,272	3,057	0.003267	84.77	86.92	86.88
(14 days after second dose)				(84.06 ; 85.45)	(86.30 ; 87.52)	(86.22 ; 87.51)
Pfizer	239,663,059	82	0.000342	96.38	96.02	96.56
(14 days after second dose)				(95.50 ; 97.09)	(95.15 ; 96.73)	(95.72 ; 97.24)
AstraZeneca	6,588,723	3	0.000455	94.42	94.92	94.59
(14 days after second dose)				(82.66 ; 98.20)	(84.16 ; 98.37)	(83.16 ; 98.26)
Cansino	35,334,303	3	0.000085	96.03	94.96	95.35
(28 days after second dose)				(87.92 ; 98.69)	(86.70 ; 98.09)	(85.51 ; 98.51)
AstraZeneca/Pfizer	12,377,225	1	0.000081	96.63	96.30	95.85
(14 days after second dose)				(76.42 ; 99.52)	(78.06 ; 99.38)	(70.20 ; 99.42)
Sinovac + AstraZeneca 3rd dose	57,860,565	8	0.000138	97.79	98.21	98.65
(14 days after third dose)				(95.54 ; 98.91)	(96.36 ; 99.12)	(97.22 ; 99.34)
Sinovac + Pfizer 3rd dose	12,592,255	6	0.000476	88.08	89.74	92.68
(14 days after third dose)				(73.22 ; 94.70)	(77.55 ; 95.31)	(83.32 ; 96.78)
Sinovac + Sinovac 3rd dose	5,101,492	9	0.001764	70.26	79.17	85.10
(14 days after third dose)				(42.12 ; 84.72)	(59.24 ; 89.35)	(70.35 ; 92.52)

[1]age and gender, y [2]all predictors.

Table 9: Covid-19 Death?

To early, zero deaths among boosted population

Conclusions

- We provide observational evidence to support that heterologous and homologous booster shots were able to significantly increase the effectiveness of primary immunization among people vaccinated with inactivated vaccines.

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