

### **Reply Declaration of Dr. Joseph Bick**

I declare, under penalty of perjury and pursuant to 28 U.S.C. § 1746, as follows:

1. I am Dr. Joseph Bick, Director, Healthcare Services at California Correctional Health Care Services (CCHCS). I oversee all healthcare services, including medical, nursing, quality management, mental health, and dental. In that capacity, I have also led healthcare's response to COVID-19 since I assumed this role in July 2020.
2. Since the Receiver filed his Report on August 4, 2021, COVID infection rates have continued to increase nationwide, in California, and in CDCR institutions at a dramatic pace. In August 2021, 1,607 CDCR employees were diagnosed with COVID-19, an increase of 305% over July 2021. The number of patients with active COVID infections rose even more sharply, from 20 per day in March, April, and May 2021 to more than 100 per day since July 2021. This most recent wave of COVID-19 infection has already caused severe harm to incarcerated persons. Twelve patients have been hospitalized since June 1, 2021, and two have died.
3. While 75% of incarcerated persons and 74% of medical staff are fully vaccinated, only 52% of CDCR institutional staff as a whole are fully vaccinated.<sup>1</sup> The rate is even lower amongst correctional officers: only 42% statewide are fully vaccinated. The rate is still lower at some institutions, such as High Desert State Prison, where only 18% of correctional officers are fully vaccinated.
4. Vaccination significantly reduces the likelihood that an individual exposed to SARS-CoV-2 will become infected and, therefore, the likelihood that they will expose those around them to the virus. Although infections of vaccinated people do occur, vaccination is the most effective means available of limiting transmission of COVID-19. Because COVID-19 spreads so easily within prisons and is so disruptive to prison operations once outbreaks begin, it is particularly important that all people going between the community and institutions without quarantining are fully vaccinated to prevent the introduction of COVID-19 to institutions.
5. The August 19 California Department of Public Health (CDPH) order requiring workers in certain healthcare facilities integrated in correctional institutions to be fully vaccinated covers only a fraction of institutional staff. Most of those it does cover are healthcare staff, 74% of whom are already vaccinated. Incarcerated persons spend the vast majority of their time outside of healthcare settings, where staff with whom they come into contact are vaccinated at much lower rates. Outbreak tracing data confirms that staff in these settings are a much more significant vector for infection than staff in healthcare settings.
6. CCHCS has completed its evaluation of 48 outbreaks in CDCR institutions since July 31, 2021, that have been traced back to institutional staff. In just 14 of those 48 outbreaks (29%), the outbreak was traced back to a person that the August 19 CDPH order would require to be vaccinated. By contrast, the outbreak was traced back to a person who

---

<sup>1</sup> Exhibit A.

would be covered by the Receiver's recommendation in all 48 of those outbreaks (100%). The Receiver's recommendation would be far more effective at preventing COVID-19 from entering CDCR institutions and causing outbreaks than the much more limited August 19 CDPH order.

7. CCHCS developed a COVID risk scoring system to help identify those patients who are at greatest risk for severe illness, hospitalization, and death if they become infected with COVID. Each patient is assigned a COVID risk score. The score is computed by adding pre-determined points for each known risk factor. For example, age of 65 or older increases the score by four points, high risk cancer raises the score by two points, and chronic kidney disease, high risk diabetes, and poorly controlled HIV/AIDS each increase the risk score by one point. A COVID risk score of 3 or higher indicates that a patient is at high risk of serious disease and likely has multiple significant risk factors. For example, a patient under 65 years old with high-risk cancer *and* poorly-controlled HIV/AIDS would have a risk score of 3. 17,886 patients in CDCR custody have a COVID risk score of 3 or higher, indicating a high risk for serious disease if they become infected with COVID.
8. Of the 17,886 patients in CDCR custody with a COVID risk score of 3 or higher, 15,246 (85%) live in a space not covered by the August 19 CDPH order. Of the 2,640 incarcerated persons who do live in an area of an institution covered by the August 19 CDPH order, 313 live in a medical facility located within an institution that is not fully covered by the order. The August 19 CDPH order does not provide significant protection from outbreaks for either of these two groups.
9. While available vaccines are highly effective at reducing the likelihood of hospitalization and death, fully vaccinated incarcerated persons continue to face a substantial risk of serious harm. The Delta variant causes breakthrough infections—infections of fully vaccinated patients—significantly more often than prior COVID-19 variants. Through September 1, 2021, 385 fully vaccinated patients in CDCR custody have suffered COVID-19 breakthrough infections, and 94 of those patients had a COVID risk score of 3 or higher, indicating a high risk of severe disease.<sup>2</sup> One patient who CCHCS believes was fully vaccinated has died of COVID-19.<sup>3</sup> Other patients with breakthrough infections have also experienced serious symptoms and there are early indications that some may have long-term symptoms.
10. The Delta variant has continued to cause outbreaks that require program modifications and restrict services and programming, including routine medical care. There are

---

<sup>2</sup> Exhibit B.

<sup>3</sup> In my Supplementary Declaration of August 20, I stated that two fully vaccinated patients had died of COVID-19 in CDCR custody. *See* ECF No. 3652 ¶ 4. This was reflected in CCHCS records. *See* ECF No. 3652, Ex. B at 5. Since the filing of that declaration, my staff has learned that one of those two patients, believed to be fully vaccinated, had received two doses of the vaccine but contracted the virus so soon after his second dose of the vaccine that it was not yet fully effective.

currently major outbreaks at Sierra Conservation Center, Pelican Bay State Prison, North Kern State Prison, California Rehabilitation Center, and California Correctional Center, and at least three cases in six more institutions. As a result, 38 facilities are currently under modified operations in the Roadmap to Reopening framework.

11. Recent efforts to increase the level of staff vaccination through voluntary programs have had minimal success, with the rate of vaccination increasing by just 1% in July (from 52% to 53%) and 2% in August 2021 (from 53% to 55%). One such effort was a program of mandatory one-on-one vaccine counseling. After nearly one month, 5,135 staff members attended a counseling appointment. Of those, 262 staff members agreed to become vaccinated and 4,385 signed a formal declination, refusing to become vaccinated. The one-on-one program has been halted to redirect resources to complying with the August 19 CDPH order.
12. There is no modern precedent for mandating vaccination for incarcerated persons and doing so would risk contravening internationally-recognized basic principles on the treatment of incarcerated persons.<sup>4</sup> No vaccine is currently mandatory for patients incarcerated in CDCR institutions. Requiring CDCR medical staff to administer mandatory vaccines could irreparably damage the doctor-patient relationship with many incarcerated in CDCR—including those who voluntarily became vaccinated but whose perceptions of CDCR medical personnel would be shaped by the implementation of such a policy—and risk destroying the trust between patients and doctors that is necessary to provide constitutionally adequate healthcare.

Executed on this 10th day of September, 2021, at Sacramento, California.

DocuSigned by:  
**Joseph Bick**  
347467202A8A404...  
\_\_\_\_\_  
Joseph Bick, M.D.

---

<sup>4</sup> A/Res/70/175, United Nations Standard Minimum Rules for the Treatment of Prisoners (the Nelson Mandela Rules), Rule 32, <https://undocs.org/A/RES/70/175>, at 14 (8 January 2016) (“The relationship between the physician or other health-care professionals and the prisoners shall be governed by the same ethical and professional standards as those applicable to patients in the community, in particular: . . . (b) Adherence to prisoners’ autonomy with regard to their own health and informed consent in the doctor-patient relationship . . .”).

# EXHIBIT A

Institution	ALL					Healthcare					Custody				
	Total number of staff	Completely Vaccinated		Vaccinated with at Least 1 Dose		Total number of staff	Completely Vaccinated		Vaccinated with at Least 1 Dose		Total number of staff	Completely Vaccinated		Vaccinated with at Least 1 Dose	
		#	%	#	%		#	%	#	%		#	%	#	%
<b>SW</b>	<b>55627</b>	<b>28699</b>	<b>52%</b>	<b>30361</b>	<b>55%</b>	<b>10727</b>	<b>7898</b>	<b>74%</b>	<b>8189</b>	<b>76%</b>	<b>26580</b>	<b>11176</b>	<b>42%</b>	<b>11972</b>	<b>45%</b>
ASP	1400	660	47%	709	51%	176	102	58%	111	63%	726	314	43%	336	46%
CAC	742	337	45%	361	49%	109	90	83%	94	86%	386	123	32%	129	33%
CAL	1296	808	62%	875	68%	145	102	70%	106	73%	725	434	60%	479	66%
CCC	1055	352	33%	368	35%	100	69	69%	69	69%	590	155	26%	162	27%
CCI	1668	632	38%	688	41%	215	129	60%	138	64%	963	286	30%	312	32%
CCWF	1333	724	54%	765	57%	297	204	69%	209	70%	531	223	42%	244	46%
CEN	1322	885	67%	936	71%	152	104	68%	111	73%	737	489	66%	519	70%
CHCF	3924	2438	62%	2613	67%	1735	1368	79%	1415	82%	1062	507	48%	582	55%
CIM	1842	1065	58%	1107	60%	362	279	77%	287	79%	849	421	50%	435	51%
CIW	1378	800	58%	841	61%	364	281	77%	289	79%	488	270	55%	286	59%
CMC	1942	1084	56%	1140	59%	395	317	80%	329	83%	888	371	42%	395	44%
CMF	2782	1680	60%	1744	63%	817	682	83%	701	86%	879	505	57%	526	60%
COR	2190	989	45%	1038	47%	377	272	72%	282	75%	1144	392	34%	412	36%
CRC	1320	698	53%	729	55%	181	132	73%	138	76%	744	333	45%	350	47%
CTF	1463	931	64%	990	68%	206	174	84%	182	88%	723	382	53%	416	58%
CVSP	891	435	49%	468	53%	111	75	68%	83	75%	432	178	41%	193	45%
DVI	170	111	65%	111	65%	26	22	85%	22	85%	12	6	50%	6	50%
FSP	1201	667	56%	683	57%	168	139	83%	140	83%	598	299	50%	308	52%
HDSP	1290	352	27%	374	29%	191	100	52%	107	56%	727	128	18%	138	19%
ISP	1360	643	47%	682	50%	129	81	63%	86	67%	688	279	41%	294	43%
KVSP	1629	777	48%	828	51%	235	166	71%	169	72%	981	374	38%	409	42%
LAC	1678	840	50%	918	55%	338	226	67%	238	70%	813	331	41%	357	44%
MCSP	1826	885	48%	928	51%	389	276	71%	283	73%	870	282	32%	302	35%
NKSP	1472	722	49%	774	53%	262	174	66%	183	70%	771	310	40%	339	44%
PBSP	1359	425	31%	459	34%	141	61	43%	63	45%	860	195	23%	208	24%
PVSP	1325	533	40%	570	43%	174	100	57%	105	60%	767	235	31%	258	34%
RJD	2242	1235	55%	1305	58%	484	373	77%	392	81%	1046	483	46%	516	49%
SAC	1934	961	50%	995	51%	393	289	74%	296	75%	906	363	40%	380	42%
SATF	1975	889	45%	955	48%	385	226	59%	239	62%	994	375	38%	405	41%
SCC	1189	484	41%	514	43%	135	95	70%	95	70%	667	214	32%	233	35%
SOL	1441	789	55%	817	57%	207	177	86%	180	87%	724	323	45%	336	46%
SQ	2144	1272	59%	1362	64%	344	281	82%	295	86%	998	601	60%	652	65%
SVSP	1993	1125	56%	1181	59%	411	328	80%	338	82%	932	440	47%	471	51%
VSP	1196	715	60%	734	61%	260	190	73%	194	75%	536	275	51%	281	52%
WSP	1655	756	46%	799	48%	313	214	68%	220	70%	823	280	34%	303	37%

Institution	Administrative, Maintenance & Operations Services					Contractor Staff				
	Total number of staff	Completely Vaccinated		Vaccinated with at Least 1 Dose		Total number of staff	Completely Vaccinated		Vaccinated with at Least 1 Dose	
		#	%	#	%		#	%	#	%
<b>SW</b>	<b>12134</b>	<b>7614</b>	<b>63%</b>	<b>7904</b>	<b>65%</b>	<b>6183</b>	<b>2009</b>	<b>32%</b>	<b>2294</b>	<b>37%</b>
ASP	399	203	51%	220	55%	98	41	42%	42	43%
CAC	155	87	56%	95	61%	92	37	40%	43	47%
CAL	321	229	71%	234	73%	105	43	41%	56	53%
CCC	263	96	37%	101	38%	102	32	31%	36	35%
CCI	337	169	50%	173	51%	153	48	31%	65	42%
CCWF	385	252	65%	260	68%	120	45	38%	52	43%
CEN	341	262	77%	270	79%	92	30	33%	36	39%
CHCF	579	392	68%	412	71%	548	171	31%	204	37%
CIM	411	278	68%	288	70%	220	87	40%	97	44%
CIW	280	203	73%	210	75%	246	46	19%	56	23%
CMC	466	335	72%	342	73%	193	61	32%	74	38%
CMF	413	309	75%	318	77%	673	184	27%	199	30%
COR	431	257	60%	266	62%	237	67	28%	77	32%
CRC	289	204	71%	209	72%	106	29	27%	32	30%
CTF	394	292	74%	300	76%	140	83	59%	92	66%
CVSP	272	159	58%	168	62%	76	23	30%	24	32%
DVI	101	68	67%	68	67%	31	15	48%	15	48%
FSP	316	196	62%	200	63%	119	33	28%	35	29%
HDSP	301	111	37%	115	38%	71	13	18%	14	20%
ISP	299	177	59%	182	61%	244	106	43%	120	49%
KVSP	366	214	58%	225	61%	47	23	49%	25	53%
LAC	331	199	60%	207	63%	195	83	43%	115	59%
MCSP	451	275	61%	283	63%	116	52	45%	60	52%
NKSP	340	201	59%	211	62%	99	37	37%	41	41%
PBSP	303	148	49%	165	54%	55	21	38%	23	42%
PVSP	312	173	55%	178	57%	72	25	35%	29	40%
RJD	383	288	75%	298	78%	329	91	28%	99	30%
SAC	339	225	66%	231	68%	296	84	28%	88	30%
SATF	450	243	54%	258	57%	146	45	31%	53	36%
SCC	309	152	49%	157	51%	78	23	29%	29	37%
SOL	380	244	64%	253	67%	130	45	35%	48	37%
SQ	340	270	79%	279	82%	462	120	26%	136	29%
SVSP	413	276	67%	286	69%	237	81	34%	86	36%
VSP	308	217	70%	222	72%	92	33	36%	37	40%
WSP	356	210	59%	220	62%	163	52	32%	56	34%

# EXHIBIT B

## Breakthrough COVID Infections - CDCR Patients

COVID Risk Score	COVID Vaccine Brand	Final Vaccine Dose Date	Fully Vaccinated Date (14 days after final dose)	First Positive PCR Test Date	Break-through Postive PCR Test Date	Breakthrough Type	COVID Related Hospitalization After Break-through Positive	Hospital Length of Stay
4	Pfizer	1/26/2021	2/9/2021	2/9/2021	2/9/2021	Breakthrough was first positive		
10	Pfizer	1/20/2021	2/3/2021	2/24/2021	2/24/2021	Breakthrough was first positive		
7	Moderna	2/12/2021	2/26/2021	3/1/2021	3/1/2021	Breakthrough was first positive		
5	Moderna	2/16/2021	3/2/2021	3/2/2021	3/2/2021	Breakthrough was first positive		
2	Moderna	2/4/2021	2/18/2021	3/10/2021	3/10/2021	Breakthrough was first positive		
3	Pfizer	1/29/2021	2/12/2021	3/15/2021	3/15/2021	Breakthrough was first positive		
1	Moderna	2/24/2021	3/10/2021	3/17/2021	3/17/2021	Breakthrough was first positive		
9	Pfizer	1/27/2021	2/10/2021	3/18/2021	3/18/2021	Breakthrough was first positive		
3	Moderna	2/26/2021	3/12/2021	3/20/2021	3/20/2021	Breakthrough was first positive		
0	Moderna	3/5/2021	3/19/2021	3/20/2021	3/20/2021	Breakthrough was first positive		
3	Moderna	2/26/2021	3/12/2021	3/21/2021	3/21/2021	Breakthrough was first positive		
0	Moderna	2/23/2021	3/9/2021	3/22/2021	3/22/2021	Breakthrough was first positive		



0	Pfizer	1/21/2021	2/4/2021	3/22/2021	3/22/2021	Breakthrough was first positive		
13	Moderna	1/25/2021	2/8/2021	3/23/2021	3/23/2021	Breakthrough was first positive		
3	Moderna	1/25/2021	2/8/2021	3/23/2021	3/23/2021	Breakthrough was first positive		
3	Moderna	2/24/2021	3/10/2021	3/24/2021	3/24/2021	Breakthrough was first positive		
0	Moderna	3/3/2021	3/17/2021	3/24/2021	3/24/2021	Breakthrough was first positive		
6	Pfizer	2/12/2021	2/26/2021	3/25/2021	3/25/2021	Breakthrough was first positive		
5	Moderna	1/25/2021	2/8/2021	3/26/2021	3/26/2021	Breakthrough was first positive		
7	Moderna	2/11/2021	2/25/2021	3/26/2021	3/26/2021	Breakthrough was first positive		
2	Moderna	3/2/2021	3/16/2021	3/26/2021	3/26/2021	Breakthrough was first positive		
9	Moderna	2/11/2021	2/25/2021	3/26/2021	3/26/2021	Breakthrough was first positive		
2	Moderna	3/2/2021	3/16/2021	3/26/2021	3/26/2021	Breakthrough was first positive		
13	Pfizer	2/25/2021	3/11/2021	12/16/2020	3/26/2021	Breakthrough positive was at least 90 days after first positive		
2	Moderna	2/16/2021	3/2/2021	3/26/2021	3/26/2021	Breakthrough was first positive		
2	Moderna	3/2/2021	3/16/2021	3/27/2021	3/27/2021	Breakthrough was first positive		
1	Pfizer	2/23/2021	3/9/2021	3/30/2021	3/30/2021	Breakthrough was first positive		
2	Pfizer	2/1/2021	2/15/2021	12/29/2020	3/30/2021	Breakthrough positive was at least 90 days after first positive		

7	Moderna	2/1/2021	2/15/2021	3/31/2021	3/31/2021	Breakthrough was first positive		
0	Moderna	1/30/2021	2/13/2021	3/31/2021	3/31/2021	Breakthrough was first positive		
2	Moderna	3/15/2021	3/29/2021	12/28/2020	4/2/2021	Breakthrough positive was at least 90 days after first positive		
1	Moderna	3/18/2021	4/1/2021	12/10/2020	4/5/2021	Breakthrough positive was at least 90 days after first positive		
2	Pfizer	3/17/2021	3/31/2021	1/5/2021	4/6/2021	Breakthrough positive was at least 90 days after first positive		
3	Pfizer	3/3/2021	3/17/2021	12/22/2020	4/6/2021	Breakthrough positive was at least 90 days after first positive		
1	Moderna	3/5/2021	3/19/2021	4/7/2021	4/7/2021	Breakthrough was first positive		
6	Pfizer	2/26/2021	3/12/2021	12/17/2020	4/8/2021	Breakthrough positive was at least 90 days after first positive		
2	Pfizer	2/17/2021	3/3/2021	4/9/2021	4/9/2021	Breakthrough was first positive		
1	Moderna	3/4/2021	3/18/2021	4/13/2021	4/13/2021	Breakthrough was first positive		
4	Moderna	3/11/2021	3/25/2021	8/11/2020	4/14/2021	Breakthrough positive was at least 90 days after first positive		
1	Moderna	3/16/2021	3/30/2021	12/31/2020	4/14/2021	Breakthrough positive was at least 90 days after first positive		
2	Pfizer	1/29/2021	2/12/2021	4/15/2021	4/15/2021	Breakthrough was first positive		

9	Moderna	3/16/2021	3/30/2021	11/16/2020	4/17/2021	Breakthrough positive was at least 90 days after first positive		
0	Janssen	4/1/2021	4/15/2021	12/21/2020	4/17/2021	Breakthrough positive was at least 90 days after first positive		
0	Moderna	4/5/2021	4/19/2021	1/5/2021	4/19/2021	Breakthrough positive was at least 90 days after first positive		
10	Pfizer	2/26/2021	3/12/2021	12/23/2020	4/20/2021	Breakthrough positive was at least 90 days after first positive		
2	Moderna	3/2/2021	3/16/2021	4/21/2021	4/21/2021	Breakthrough was first positive		
0	Pfizer	4/7/2021	4/21/2021	12/18/2020	4/21/2021	Breakthrough positive was at least 90 days after first positive		
2	Moderna	3/3/2021	3/17/2021	4/21/2021	4/21/2021	Breakthrough was first positive		
3	Pfizer	2/27/2021	3/13/2021	4/22/2021	4/22/2021	Breakthrough was first positive		
0	Moderna	3/1/2021	3/15/2021	4/23/2021	4/23/2021	Breakthrough was first positive		
0	Moderna	3/26/2021	4/9/2021	4/23/2021	4/23/2021	Breakthrough was first positive		
7	Pfizer	2/9/2021	2/23/2021	12/12/2020	4/23/2021	Breakthrough positive was at least 90 days after first positive		
9	Moderna	2/24/2021	3/10/2021	1/25/2021	4/28/2021	Breakthrough positive was at least 90 days after first positive		
8	Pfizer	1/18/2021	2/1/2021	4/29/2021	4/29/2021	Breakthrough was first positive		

7	Janssen	4/9/2021	4/23/2021	12/3/2020	4/30/2021	Breakthrough positive was at least 90 days after first positive		
7	Moderna	3/19/2021	4/2/2021	12/18/2020	5/1/2021	Breakthrough positive was at least 90 days after first positive		
4	Pfizer	3/12/2021	3/26/2021	12/4/2020	5/1/2021	Breakthrough positive was at least 90 days after first positive		
1	Moderna	3/18/2021	4/1/2021	5/4/2021	5/4/2021	Breakthrough was first positive		
0	Pfizer	3/19/2021	4/2/2021	12/22/2020	5/5/2021	Breakthrough positive was at least 90 days after first positive		
10	Pfizer	2/26/2021	3/12/2021	12/23/2020	5/10/2021	Breakthrough positive was at least 90 days after first positive	Yes	9 Days
3	Pfizer	2/12/2021	2/26/2021	5/10/2021	5/10/2021	Breakthrough was first positive		
8	Moderna	3/8/2021	3/22/2021	12/30/2020	5/18/2021	Breakthrough positive was at least 90 days after first positive		
8	Moderna	3/16/2021	3/30/2021	11/30/2020	5/23/2021	Breakthrough positive was at least 90 days after first positive		
4	Moderna	2/25/2021	3/11/2021	5/27/2021	5/27/2021	Breakthrough was first positive		
4	Moderna	2/25/2021	3/11/2021	5/27/2021	5/27/2021	Breakthrough was first positive		
0	Moderna	3/3/2021	3/17/2021	5/27/2021	5/27/2021	Breakthrough was first positive		
3	Moderna	2/25/2021	3/11/2021	5/28/2021	5/28/2021	Breakthrough was first positive		

7	Moderna	2/22/2021	3/8/2021	6/1/2021	6/1/2021	Breakthrough was first positive		
13	Moderna	2/23/2021	3/9/2021	6/1/2021	6/1/2021	Breakthrough was first positive		
3	Pfizer	2/17/2021	3/3/2021	6/1/2021	6/1/2021	Breakthrough was first positive		
3	Moderna	2/25/2021	3/11/2021	6/1/2021	6/1/2021	Breakthrough was first positive		
0	Moderna	3/3/2021	3/17/2021	6/1/2021	6/1/2021	Breakthrough was first positive		
1	Moderna	3/12/2021	3/26/2021	6/1/2021	6/1/2021	Breakthrough was first positive		
1	Pfizer	1/25/2021	2/8/2021	6/1/2021	6/1/2021	Breakthrough was first positive		
0	Moderna	3/12/2021	3/26/2021	6/1/2021	6/1/2021	Breakthrough was first positive		
0	Moderna	3/12/2021	3/26/2021	6/1/2021	6/1/2021	Breakthrough was first positive		
2	Moderna	3/22/2021	4/5/2021	6/3/2021	6/3/2021	Breakthrough was first positive		
2	Moderna	3/23/2021	4/6/2021	1/7/2021	6/3/2021	Breakthrough positive was at least 90 days after first positive		
2	Pfizer	2/27/2021	3/13/2021	6/4/2021	6/4/2021	Breakthrough was first positive		
0	Moderna	3/11/2021	3/25/2021	6/4/2021	6/4/2021	Breakthrough was first positive		
2	Pfizer	2/26/2021	3/12/2021	6/4/2021	6/4/2021	Breakthrough was first positive		
1	Pfizer	2/27/2021	3/13/2021	6/4/2021	6/4/2021	Breakthrough was first positive		
6	Moderna	2/17/2021	3/3/2021	6/4/2021	6/4/2021	Breakthrough was first positive		

0	Moderna	5/1/2021	5/15/2021	6/4/2021	6/4/2021	Breakthrough was first positive		
0	Moderna	3/11/2021	3/25/2021	6/4/2021	6/4/2021	Breakthrough was first positive		
13	Moderna	2/17/2021	3/3/2021	6/8/2021	6/8/2021	Breakthrough was first positive		
6	Pfizer	3/29/2021	4/12/2021	12/8/2020	6/8/2021	Breakthrough positive was at least 90 days after first positive		
3	Moderna	2/17/2021	3/3/2021	6/8/2021	6/8/2021	Breakthrough was first positive		
1	Pfizer	1/25/2021	2/8/2021	6/8/2021	6/8/2021	Breakthrough was first positive		
8	Moderna	2/17/2021	3/3/2021	6/8/2021	6/8/2021	Breakthrough was first positive		
2	Pfizer	2/26/2021	3/12/2021	6/8/2021	6/8/2021	Breakthrough was first positive		
2	Pfizer	2/26/2021	3/12/2021	6/8/2021	6/8/2021	Breakthrough was first positive		
1	Pfizer	2/27/2021	3/13/2021	6/8/2021	6/8/2021	Breakthrough was first positive		
11	Pfizer	1/26/2021	2/9/2021	6/9/2021	6/9/2021	Breakthrough was first positive		
6	Moderna	3/17/2021	3/31/2021	8/27/2020	6/10/2021	Breakthrough positive was at least 90 days after first positive		
16	Pfizer	1/26/2021	2/9/2021	2/2/2021	6/11/2021	Breakthrough positive was at least 90 days after first positive		
2	Pfizer	2/27/2021	3/13/2021	6/11/2021	6/11/2021	Breakthrough was first positive		
3	Moderna	5/7/2021	5/21/2021	7/15/2020	6/12/2021	Breakthrough positive was at least 90 days after first positive		

7	Pfizer	3/11/2021	3/25/2021	12/12/2020	6/14/2021	Breakthrough positive was at least 90 days after first positive		
0	Pfizer	2/27/2021	3/13/2021	6/16/2021	6/16/2021	Breakthrough was first positive		
1	Janssen	3/15/2021	3/29/2021	6/17/2021	6/17/2021	Breakthrough was first positive		
1	Janssen	3/15/2021	3/29/2021	6/18/2021	6/18/2021	Breakthrough was first positive		
4	Janssen	5/20/2021	6/3/2021	11/6/2020	6/18/2021	Breakthrough positive was at least 90 days after first positive		
8	Moderna	2/16/2021	3/2/2021	6/21/2021	6/21/2021	Breakthrough was first positive		
0	Janssen	5/5/2021	5/19/2021	6/22/2021	6/22/2021	Breakthrough was first positive		
0	Janssen	3/17/2021	3/31/2021	6/23/2021	6/23/2021	Breakthrough was first positive		
0	Janssen	5/1/2021	5/15/2021	6/23/2021	6/23/2021	Breakthrough was first positive		
0	Moderna	6/10/2021	6/24/2021	6/24/2021	6/24/2021	Breakthrough was first positive		
14	Moderna	2/16/2021	3/2/2021	6/25/2021	6/25/2021	Breakthrough was first positive		
4	Pfizer	2/17/2021	3/3/2021	6/25/2021	6/25/2021	Breakthrough was first positive		
0	Pfizer	2/24/2021	3/10/2021	6/27/2021	6/27/2021	Breakthrough was first positive		
4	Moderna	3/9/2021	3/23/2021	9/25/2020	6/29/2021	Breakthrough positive was at least 90 days after first positive		
1	Janssen	4/12/2021	4/26/2021	12/1/2020	6/30/2021	Breakthrough positive was at least 90 days after first positive		

0	Moderna	5/25/2021	6/8/2021	6/30/2021	6/30/2021	Breakthrough was first positive		
0	Moderna	3/4/2021	3/18/2021	7/4/2021	7/4/2021	Breakthrough was first positive		
0	Moderna	3/3/2021	3/17/2021	7/4/2021	7/4/2021	Breakthrough was first positive		
1	Moderna	3/3/2021	3/17/2021	7/12/2021	7/12/2021	Breakthrough was first positive		
10	Moderna	1/26/2021	2/9/2021	7/16/2021	7/16/2021	Breakthrough was first positive		
0	Moderna	5/5/2021	5/19/2021	12/16/2020	7/16/2021	Breakthrough positive was at least 90 days after first positive		
10	Moderna	2/16/2021	3/2/2021	7/18/2021	7/18/2021	Breakthrough was first positive		
0	Janssen	6/3/2021	6/17/2021	7/18/2021	7/18/2021	Breakthrough was first positive		
1	Moderna	3/26/2021	4/9/2021	7/19/2021	7/19/2021	Breakthrough was first positive		
0	Janssen	3/16/2021	3/30/2021	7/19/2021	7/19/2021	Breakthrough was first positive		
13	Pfizer	1/13/2021	1/27/2021	7/20/2021	7/20/2021	Breakthrough was first positive		
0	Pfizer	4/19/2021	5/3/2021	7/21/2021	7/21/2021	Breakthrough was first positive		
1	Moderna	3/5/2021	3/19/2021	7/21/2021	7/21/2021	Breakthrough was first positive		
0	Moderna	3/5/2021	3/19/2021	7/21/2021	7/21/2021	Breakthrough was first positive		
14	Pfizer	2/2/2021	2/16/2021	12/24/2020	7/21/2021	Breakthrough positive was at least 90 days after first positive		



4	Moderna	5/4/2021	5/18/2021	11/30/2020	7/21/2021	Breakthrough positive was at least 90 days after first positive		
0	Janssen	3/24/2021	4/7/2021	7/21/2021	7/21/2021	Breakthrough was first positive		
1	Janssen	5/19/2021	6/2/2021	7/21/2021	7/21/2021	Breakthrough was first positive		
13	Moderna	3/8/2021	3/22/2021	11/12/2020	7/22/2021	Breakthrough positive was at least 90 days after first positive		
3	Janssen	3/17/2021	3/31/2021	7/22/2021	7/22/2021	Breakthrough was first positive		
0	Moderna	4/26/2021	5/10/2021	12/28/2020	7/22/2021	Breakthrough positive was at least 90 days after first positive		
0	Janssen	6/17/2021	7/1/2021	7/22/2021	7/22/2021	Breakthrough was first positive		
0	Moderna	3/16/2021	3/30/2021	7/22/2021	7/22/2021	Breakthrough was first positive		
0	Moderna	3/2/2021	3/16/2021	7/22/2021	7/22/2021	Breakthrough was first positive		
0	Pfizer	4/29/2021	5/13/2021	7/22/2021	7/22/2021	Breakthrough was first positive		
1	Janssen	6/19/2021	7/3/2021	7/22/2021	7/22/2021	Breakthrough was first positive		
10	Moderna	2/11/2021	2/25/2021	7/23/2021	7/23/2021	Breakthrough was first positive		
1	Janssen	3/16/2021	3/30/2021	7/23/2021	7/23/2021	Breakthrough was first positive		
2	Pfizer	3/18/2021	4/1/2021	12/7/2020	7/23/2021	Breakthrough positive was at least 90 days after first positive		
2	Moderna	2/1/2021	2/15/2021	7/23/2021	7/23/2021	Breakthrough was first positive		

1	Moderna	3/26/2021	4/9/2021	7/23/2021	7/23/2021	Breakthrough was first positive		
0	Moderna	3/8/2021	3/22/2021	7/24/2021	7/24/2021	Breakthrough was first positive		
1	Moderna	3/1/2021	3/15/2021	7/25/2021	7/25/2021	Breakthrough was first positive		
1	Janssen	4/2/2021	4/16/2021	7/25/2021	7/25/2021	Breakthrough was first positive		
0	Janssen	3/29/2021	4/12/2021	7/25/2021	7/25/2021	Breakthrough was first positive		
0	Moderna	3/23/2021	4/6/2021	7/26/2021	7/26/2021	Breakthrough was first positive		
3	Moderna	2/22/2021	3/8/2021	7/26/2021	7/26/2021	Breakthrough was first positive		
0	Moderna	3/2/2021	3/16/2021	7/26/2021	7/26/2021	Breakthrough was first positive		
3	Moderna	2/17/2021	3/3/2021	7/26/2021	7/26/2021	Breakthrough was first positive		
0	Janssen	5/29/2021	6/12/2021	7/26/2021	7/26/2021	Breakthrough was first positive		
0	Moderna	2/25/2021	3/11/2021	7/26/2021	7/26/2021	Breakthrough was first positive		
1	Moderna	5/6/2021	5/20/2021	7/26/2021	7/26/2021	Breakthrough was first positive		
0	Moderna	3/4/2021	3/18/2021	7/26/2021	7/26/2021	Breakthrough was first positive		
1	Janssen	3/11/2021	3/25/2021	7/26/2021	7/26/2021	Breakthrough was first positive		
1	Janssen	4/6/2021	4/20/2021	7/26/2021	7/26/2021	Breakthrough was first positive		
0	Janssen	7/8/2021	7/22/2021	7/26/2021	7/26/2021	Breakthrough was first positive		
1	Janssen	3/19/2021	4/2/2021	7/26/2021	7/26/2021	Breakthrough was first positive		

0	Moderna	3/3/2021	3/17/2021	7/26/2021	7/26/2021	Breakthrough was first positive		
0	Moderna	3/23/2021	4/6/2021	12/3/2020	7/26/2021	Breakthrough positive was at least 90 days after first positive		
0	Moderna	3/17/2021	3/31/2021	12/28/2020	7/26/2021	Breakthrough positive was at least 90 days after first positive		
0	Janssen	5/21/2021	6/4/2021	7/26/2021	7/26/2021	Breakthrough was first positive		
0	Janssen	6/18/2021	7/2/2021	7/26/2021	7/26/2021	Breakthrough was first positive		
1	Janssen	3/22/2021	4/5/2021	7/26/2021	7/26/2021	Breakthrough was first positive		
1	Moderna	4/27/2021	5/11/2021	1/12/2021	7/27/2021	Breakthrough positive was at least 90 days after first positive		
1	Pfizer	2/23/2021	3/9/2021	7/27/2021	7/27/2021	Breakthrough was first positive		
0	Pfizer	2/26/2021	3/12/2021	7/27/2021	7/27/2021	Breakthrough was first positive		
1	Moderna	3/17/2021	3/31/2021	12/16/2020	7/27/2021	Breakthrough positive was at least 90 days after first positive		
0	Janssen	6/15/2021	6/29/2021	7/28/2021	7/28/2021	Breakthrough was first positive		
0	Moderna	4/21/2021	5/5/2021	1/19/2021	7/28/2021	Breakthrough positive was at least 90 days after first positive		
1	Janssen	3/31/2021	4/14/2021	7/28/2021	7/28/2021	Breakthrough was first positive		
3	Moderna	7/9/2021	7/23/2021	7/28/2021	7/28/2021	Breakthrough was first positive		

0	Moderna	3/3/2021	3/17/2021	7/28/2021	7/28/2021	Breakthrough was first positive		
0	Moderna	6/10/2021	6/24/2021	7/28/2021	7/28/2021	Breakthrough was first positive		
0	Janssen	3/1/2021	3/15/2021	7/28/2021	7/28/2021	Breakthrough was first positive		
1	Janssen	6/23/2021	7/7/2021	7/28/2021	7/28/2021	Breakthrough was first positive		
0	Janssen	3/31/2021	4/14/2021	7/28/2021	7/28/2021	Breakthrough was first positive		
0	Moderna	3/4/2021	3/18/2021	7/29/2021	7/29/2021	Breakthrough was first positive		
0	Moderna	3/3/2021	3/17/2021	7/29/2021	7/29/2021	Breakthrough was first positive		
0	Moderna	3/3/2021	3/17/2021	7/29/2021	7/29/2021	Breakthrough was first positive		
0	Moderna	7/5/2021	7/19/2021	7/29/2021	7/29/2021	Breakthrough was first positive		
0	Janssen	4/2/2021	4/16/2021	7/29/2021	7/29/2021	Breakthrough was first positive		
1	Moderna	3/3/2021	3/17/2021	7/29/2021	7/29/2021	Breakthrough was first positive		
0	Janssen	7/13/2021	7/27/2021	7/29/2021	7/29/2021	Breakthrough was first positive		
1	Moderna	4/28/2021	5/12/2021	7/30/2021	7/30/2021	Breakthrough was first positive		
2	Moderna	2/22/2021	3/8/2021	7/30/2021	7/30/2021	Breakthrough was first positive		
5	Moderna	2/17/2021	3/3/2021	7/30/2021	7/30/2021	Breakthrough was first positive		
2	Moderna	2/8/2021	2/22/2021	7/30/2021	7/30/2021	Breakthrough was first positive		
0	Moderna	3/3/2021	3/17/2021	7/30/2021	7/30/2021	Breakthrough was first positive		

0	Moderna	4/22/2021	5/6/2021	12/8/2020	7/30/2021	Breakthrough positive was at least 90 days after first positive		
0	Moderna	3/5/2021	3/19/2021	7/30/2021	7/30/2021	Breakthrough was first positive		
1	Janssen	6/30/2021	7/14/2021	7/30/2021	7/30/2021	Breakthrough was first positive		
0	Janssen	4/6/2021	4/20/2021	7/30/2021	7/30/2021	Breakthrough was first positive		
0	Moderna	2/25/2021	3/11/2021	7/30/2021	7/30/2021	Breakthrough was first positive		
1	Moderna	3/16/2021	3/30/2021	12/11/2020	7/30/2021	Breakthrough positive was at least 90 days after first positive		
0	Janssen	6/30/2021	7/14/2021	7/30/2021	7/30/2021	Breakthrough was first positive		
0	Moderna	3/26/2021	4/9/2021	7/30/2021	7/30/2021	Breakthrough was first positive		
1	Moderna	2/26/2021	3/12/2021	7/30/2021	7/30/2021	Breakthrough was first positive		
0	Moderna	3/4/2021	3/18/2021	7/30/2021	7/30/2021	Breakthrough was first positive		
0	Moderna	4/28/2021	5/12/2021	12/21/2020	7/30/2021	Breakthrough positive was at least 90 days after first positive		
1	Janssen	3/22/2021	4/5/2021	7/30/2021	7/30/2021	Breakthrough was first positive		
0	Moderna	3/4/2021	3/18/2021	7/30/2021	7/30/2021	Breakthrough was first positive		
0	Moderna	3/16/2021	3/30/2021	7/30/2021	7/30/2021	Breakthrough was first positive		
0	Moderna	3/8/2021	3/22/2021	7/30/2021	7/30/2021	Breakthrough was first positive		

1	Pfizer	4/9/2021	4/23/2021	7/30/2021	7/30/2021	Breakthrough was first positive		
0	Janssen	4/7/2021	4/21/2021	7/30/2021	7/30/2021	Breakthrough was first positive		
0	Moderna	6/7/2021	6/21/2021	7/30/2021	7/30/2021	Breakthrough was first positive		
1	Janssen	6/16/2021	6/30/2021	7/31/2021	7/31/2021	Breakthrough was first positive		
1	Moderna	3/2/2021	3/16/2021	8/2/2021	8/2/2021	Breakthrough was first positive		
1	Moderna	3/3/2021	3/17/2021	8/2/2021	8/2/2021	Breakthrough was first positive		
1	Moderna	3/12/2021	3/26/2021	8/2/2021	8/2/2021	Breakthrough was first positive		
1	Moderna	3/12/2021	3/26/2021	8/2/2021	8/2/2021	Breakthrough was first positive		
0	Moderna	3/4/2021	3/18/2021	8/2/2021	8/2/2021	Breakthrough was first positive		
2	Moderna	3/11/2021	3/25/2021	8/3/2021	8/3/2021	Breakthrough was first positive		
1	Moderna	3/1/2021	3/15/2021	8/3/2021	8/3/2021	Breakthrough was first positive		
2	Janssen	4/12/2021	4/26/2021	8/3/2021	8/3/2021	Breakthrough was first positive		
1	Moderna	4/9/2021	4/23/2021	8/3/2021	8/3/2021	Breakthrough was first positive		
0	Janssen	3/19/2021	4/2/2021	8/3/2021	8/3/2021	Breakthrough was first positive		
1	Janssen	3/25/2021	4/8/2021	8/3/2021	8/3/2021	Breakthrough was first positive		
1	Moderna	3/4/2021	3/18/2021	8/3/2021	8/3/2021	Breakthrough was first positive		
0	Moderna	3/11/2021	3/25/2021	8/3/2021	8/3/2021	Breakthrough was first positive		

1	Moderna	3/5/2021	3/19/2021	8/3/2021	8/3/2021	Breakthrough was first positive		
1	Moderna	3/6/2021	3/20/2021	8/3/2021	8/3/2021	Breakthrough was first positive		
1	Pfizer	4/8/2021	4/22/2021	11/10/2020	8/3/2021	Breakthrough positive was at least 90 days after first positive		
1	Janssen	4/9/2021	4/23/2021	8/3/2021	8/3/2021	Breakthrough was first positive		
1	Moderna	3/4/2021	3/18/2021	8/3/2021	8/3/2021	Breakthrough was first positive		
1	Moderna	3/4/2021	3/18/2021	8/3/2021	8/3/2021	Breakthrough was first positive		
1	Moderna	5/7/2021	5/21/2021	8/3/2021	8/3/2021	Breakthrough was first positive		
1	Moderna	5/20/2021	6/3/2021	8/3/2021	8/3/2021	Breakthrough was first positive		
0	Moderna	3/5/2021	3/19/2021	8/3/2021	8/3/2021	Breakthrough was first positive		
0	Moderna	4/13/2021	4/27/2021	8/3/2021	8/3/2021	Breakthrough was first positive		
0	Janssen	4/7/2021	4/21/2021	8/3/2021	8/3/2021	Breakthrough was first positive		
0	Pfizer	5/6/2021	5/20/2021	8/3/2021	8/3/2021	Breakthrough was first positive		
0	Moderna	3/1/2021	3/15/2021	8/4/2021	8/4/2021	Breakthrough was first positive		
0	Moderna	3/4/2021	3/18/2021	8/4/2021	8/4/2021	Breakthrough was first positive		
0	Janssen	7/9/2021	7/23/2021	11/30/2020	8/4/2021	Breakthrough positive was at least 90 days after first positive		

1	Moderna	4/20/2021	5/4/2021	12/9/2020	8/4/2021	Breakthrough positive was at least 90 days after first positive		
11	Moderna	4/13/2021	4/27/2021	10/23/2020	8/4/2021	Breakthrough positive was at least 90 days after first positive		
0	Moderna	3/3/2021	3/17/2021	8/5/2021	8/5/2021	Breakthrough was first positive		
0	Moderna	3/3/2021	3/17/2021	8/5/2021	8/5/2021	Breakthrough was first positive		
0	Moderna	3/3/2021	3/17/2021	8/6/2021	8/6/2021	Breakthrough was first positive		
0	Moderna	3/17/2021	3/31/2021	8/6/2021	8/6/2021	Breakthrough was first positive		
0	Janssen	6/29/2021	7/13/2021	8/6/2021	8/6/2021	Breakthrough was first positive		
0	Moderna	3/5/2021	3/19/2021	8/6/2021	8/6/2021	Breakthrough was first positive		
3	Moderna	2/27/2021	3/13/2021	8/6/2021	8/6/2021	Breakthrough was first positive		
1	Moderna	2/28/2021	3/14/2021	8/6/2021	8/6/2021	Breakthrough was first positive		
2	Janssen	3/25/2021	4/8/2021	8/6/2021	8/6/2021	Breakthrough was first positive		
1	Moderna	3/2/2021	3/16/2021	8/6/2021	8/6/2021	Breakthrough was first positive		
2	Moderna	4/11/2021	4/25/2021	8/6/2021	8/6/2021	Breakthrough was first positive		
6	Moderna	2/19/2021	3/5/2021	8/7/2021	8/7/2021	Breakthrough was first positive		
0	Moderna	3/1/2021	3/15/2021	8/7/2021	8/7/2021	Breakthrough was first positive		



12	Moderna	4/27/2021	5/11/2021	8/7/2021	8/7/2021	Breakthrough was first positive	Yes	13 days (patient died during this hospitalization)
1	Moderna	3/8/2021	3/22/2021	8/8/2021	8/8/2021	Breakthrough was first positive		
0	Janssen	3/25/2021	4/8/2021	11/10/2020	8/9/2021	Breakthrough positive was at least 90 days after first positive		
3	Moderna	4/30/2021	5/14/2021	5/28/2020	8/9/2021	Breakthrough positive was at least 90 days after first positive		
1	Moderna	3/11/2021	3/25/2021	8/9/2021	8/9/2021	Breakthrough was first positive		
0	Moderna	4/21/2021	5/5/2021	9/21/2020	8/9/2021	Breakthrough positive was at least 90 days after first positive		
0	Moderna	3/3/2021	3/17/2021	8/9/2021	8/9/2021	Breakthrough was first positive		
0	Pfizer	3/5/2021	3/19/2021	8/9/2021	8/9/2021	Breakthrough was first positive		
1	Janssen	4/8/2021	4/22/2021	8/9/2021	8/9/2021	Breakthrough was first positive		
9	Moderna	4/23/2021	5/7/2021	8/10/2021	8/10/2021	Breakthrough was first positive	Yes	2 Days
0	Moderna	5/5/2021	5/19/2021	8/10/2021	8/10/2021	Breakthrough was first positive		
1	Moderna	3/3/2021	3/17/2021	8/10/2021	8/10/2021	Breakthrough was first positive		
1	Moderna	3/11/2021	3/25/2021	8/10/2021	8/10/2021	Breakthrough was first positive		

0	Moderna	3/3/2021	3/17/2021	8/10/2021	8/10/2021	Breakthrough was first positive		
3	Moderna	3/3/2021	3/17/2021	8/10/2021	8/10/2021	Breakthrough was first positive		
1	Moderna	3/3/2021	3/17/2021	8/10/2021	8/10/2021	Breakthrough was first positive		
0	Moderna	3/3/2021	3/17/2021	8/10/2021	8/10/2021	Breakthrough was first positive		
1	Moderna	3/3/2021	3/17/2021	8/10/2021	8/10/2021	Breakthrough was first positive		
0	Moderna	3/3/2021	3/17/2021	8/10/2021	8/10/2021	Breakthrough was first positive		
1	Moderna	4/21/2021	5/5/2021	6/2/2020	8/11/2021	Breakthrough positive was at least 90 days after first positive		
2	Moderna	4/22/2021	5/6/2021	7/14/2020	8/11/2021	Breakthrough positive was at least 90 days after first positive		
3	Pfizer	3/3/2021	3/17/2021	8/11/2021	8/11/2021	Breakthrough was first positive		
0	Pfizer	4/20/2021	5/4/2021	8/11/2021	8/11/2021	Breakthrough was first positive		
1	Moderna	3/3/2021	3/17/2021	8/12/2021	8/12/2021	Breakthrough was first positive		
0	Moderna	3/3/2021	3/17/2021	8/12/2021	8/12/2021	Breakthrough was first positive		
0	Moderna	3/3/2021	3/17/2021	8/12/2021	8/12/2021	Breakthrough was first positive		
0	Moderna	4/27/2021	5/11/2021	8/13/2021	8/13/2021	Breakthrough was first positive		
0	Janssen	5/7/2021	5/21/2021	11/12/2020	8/13/2021	Breakthrough positive was at least 90 days after first positive		

0	Moderna	3/3/2021	3/17/2021	8/13/2021	8/13/2021	Breakthrough was first positive		
1	Moderna	3/11/2021	3/25/2021	8/13/2021	8/13/2021	Breakthrough was first positive		
0	Moderna	6/29/2021	7/13/2021	8/13/2021	8/13/2021	Breakthrough was first positive		
6	Moderna	2/10/2021	2/24/2021	8/13/2021	8/13/2021	Breakthrough was first positive		
1	Moderna	3/3/2021	3/17/2021	8/13/2021	8/13/2021	Breakthrough was first positive		
0	Janssen	7/30/2021	8/13/2021	8/13/2021	8/13/2021	Breakthrough was first positive		
0	Pfizer	5/21/2021	6/4/2021	8/13/2021	8/13/2021	Breakthrough was first positive		
0	Janssen	5/17/2021	5/31/2021	8/13/2021	8/13/2021	Breakthrough was first positive		
6	Moderna	2/16/2021	3/2/2021	8/14/2021	8/14/2021	Breakthrough was first positive		
0	Moderna	3/2/2021	3/16/2021	8/14/2021	8/14/2021	Breakthrough was first positive		
8	Moderna	2/19/2021	3/5/2021	8/15/2021	8/15/2021	Breakthrough was first positive		
0	Moderna	3/2/2021	3/16/2021	8/16/2021	8/16/2021	Breakthrough was first positive		
0	Moderna	3/3/2021	3/17/2021	8/16/2021	8/16/2021	Breakthrough was first positive		
1	Moderna	2/27/2021	3/13/2021	8/16/2021	8/16/2021	Breakthrough was first positive		
0	Moderna	3/9/2021	3/23/2021	8/17/2021	8/17/2021	Breakthrough was first positive		
0	Janssen	3/24/2021	4/7/2021	8/17/2021	8/17/2021	Breakthrough was first positive		
0	Moderna	4/13/2021	4/27/2021	8/17/2021	8/17/2021	Breakthrough was first positive		

0	Moderna	3/3/2021	3/17/2021	8/17/2021	8/17/2021	Breakthrough was first positive		
3	Janssen	7/30/2021	8/13/2021	8/17/2021	8/17/2021	Breakthrough was first positive		
0	Moderna	3/3/2021	3/17/2021	8/17/2021	8/17/2021	Breakthrough was first positive		
2	Moderna	4/20/2021	5/4/2021	8/17/2021	8/17/2021	Breakthrough was first positive		
0	Moderna	3/3/2021	3/17/2021	8/17/2021	8/17/2021	Breakthrough was first positive		
0	Moderna	3/3/2021	3/17/2021	8/17/2021	8/17/2021	Breakthrough was first positive		
2	Moderna	3/7/2021	3/21/2021	8/18/2021	8/18/2021	Breakthrough was first positive		
0	Moderna	3/3/2021	3/17/2021	8/18/2021	8/18/2021	Breakthrough was first positive		
1	Moderna	3/17/2021	3/31/2021	8/18/2021	8/18/2021	Breakthrough was first positive		
6	Pfizer	1/21/2021	2/4/2021	8/18/2021	8/18/2021	Breakthrough was first positive		
0	Janssen	7/23/2021	8/6/2021	8/18/2021	8/18/2021	Breakthrough was first positive		
0	Moderna	3/25/2021	4/8/2021	8/18/2021	8/18/2021	Breakthrough was first positive		
0	Moderna	3/12/2021	3/26/2021	8/19/2021	8/19/2021	Breakthrough was first positive		
2	Janssen	5/5/2021	5/19/2021	8/19/2021	8/19/2021	Breakthrough was first positive		
0	Janssen	6/17/2021	7/1/2021	8/19/2021	8/19/2021	Breakthrough was first positive		
3	Moderna	3/4/2021	3/18/2021	8/19/2021	8/19/2021	Breakthrough was first positive		
1	Moderna	3/4/2021	3/18/2021	8/19/2021	8/19/2021	Breakthrough was first positive		

0	Moderna	3/3/2021	3/17/2021	8/20/2021	8/20/2021	Breakthrough was first positive		
2	Moderna	3/1/2021	3/15/2021	8/20/2021	8/20/2021	Breakthrough was first positive		
0	Moderna	2/25/2021	3/11/2021	8/20/2021	8/20/2021	Breakthrough was first positive		
1	Moderna	3/16/2021	3/30/2021	8/20/2021	8/20/2021	Breakthrough was first positive		
1	Moderna	3/3/2021	3/17/2021	8/20/2021	8/20/2021	Breakthrough was first positive		
0	Moderna	3/3/2021	3/17/2021	8/20/2021	8/20/2021	Breakthrough was first positive		
2	Pfizer	3/12/2021	3/26/2021	12/22/2020	8/20/2021	Breakthrough positive was at least 90 days after first positive		
1	Janssen	4/1/2021	4/15/2021	8/20/2021	8/20/2021	Breakthrough was first positive		
3	Moderna	2/15/2021	3/1/2021	8/20/2021	8/20/2021	Breakthrough was first positive		
1	Moderna	3/25/2021	4/8/2021	8/20/2021	8/20/2021	Breakthrough was first positive		
3	Moderna	3/10/2021	3/24/2021	6/10/2020	8/20/2021	Breakthrough positive was at least 90 days after first positive		
0	Moderna	3/4/2021	3/18/2021	8/20/2021	8/20/2021	Breakthrough was first positive		
1	Moderna	3/9/2021	3/23/2021	8/21/2021	8/21/2021	Breakthrough was first positive		
2	Janssen	6/9/2021	6/23/2021	8/21/2021	8/21/2021	Breakthrough was first positive		
0	Moderna	3/2/2021	3/16/2021	8/22/2021	8/22/2021	Breakthrough was first positive		

1	Moderna	5/17/2021	5/31/2021	9/23/2020	8/23/2021	Breakthrough positive was at least 90 days after first positive		
1	Janssen	6/11/2021	6/25/2021	8/23/2021	8/23/2021	Breakthrough was first positive		
2	Moderna	2/24/2021	3/10/2021	8/23/2021	8/23/2021	Breakthrough was first positive		
4	Moderna	4/30/2021	5/14/2021	8/23/2021	8/23/2021	Breakthrough was first positive		
0	Moderna	3/11/2021	3/25/2021	8/23/2021	8/23/2021	Breakthrough was first positive		
0	Pfizer	3/22/2021	4/5/2021	1/5/2021	8/23/2021	Breakthrough positive was at least 90 days after first positive		
1	Moderna	2/2/2021	2/16/2021	8/23/2021	8/23/2021	Breakthrough was first positive		
0	Moderna	4/20/2021	5/4/2021	12/3/2020	8/23/2021	Breakthrough positive was at least 90 days after first positive		
1	Moderna	3/3/2021	3/17/2021	8/24/2021	8/24/2021	Breakthrough was first positive		
3	Moderna	4/27/2021	5/11/2021	11/26/2020	8/24/2021	Breakthrough positive was at least 90 days after first positive		
0	Moderna	4/16/2021	4/30/2021	8/24/2021	8/24/2021	Breakthrough was first positive		
9	Moderna	2/12/2021	2/26/2021	8/24/2021	8/24/2021	Breakthrough was first positive		
1	Moderna	3/4/2021	3/18/2021	8/24/2021	8/24/2021	Breakthrough was first positive		
0	Moderna	3/3/2021	3/17/2021	8/24/2021	8/24/2021	Breakthrough was first positive		
1	Moderna	3/3/2021	3/17/2021	8/24/2021	8/24/2021	Breakthrough was first positive		

1	Moderna	2/28/2021	3/14/2021	8/24/2021	8/24/2021	Breakthrough was first positive		
0	Moderna	3/11/2021	3/25/2021	8/24/2021	8/24/2021	Breakthrough was first positive		
0	Janssen	5/6/2021	5/20/2021	8/24/2021	8/24/2021	Breakthrough was first positive		
1	Moderna	3/4/2021	3/18/2021	8/24/2021	8/24/2021	Breakthrough was first positive		
0	Janssen	6/10/2021	6/24/2021	8/24/2021	8/24/2021	Breakthrough was first positive		
1	Moderna	3/3/2021	3/17/2021	8/24/2021	8/24/2021	Breakthrough was first positive		
1	Janssen	4/9/2021	4/23/2021	8/24/2021	8/24/2021	Breakthrough was first positive		
0	Moderna	4/26/2021	5/10/2021	8/12/2020	8/25/2021	Breakthrough positive was at least 90 days after first positive		
1	Moderna	3/4/2021	3/18/2021	8/25/2021	8/25/2021	Breakthrough was first positive		
0	Janssen	3/31/2021	4/14/2021	7/17/2020	8/25/2021	Breakthrough positive was at least 90 days after first positive		
1	Moderna	4/23/2021	5/7/2021	12/20/2020	8/25/2021	Breakthrough positive was at least 90 days after first positive		
10	Moderna	2/11/2021	2/25/2021	8/25/2021	8/25/2021	Breakthrough was first positive		
0	Moderna	6/8/2021	6/22/2021	8/26/2021	8/26/2021	Breakthrough was first positive		
0	Moderna	3/1/2021	3/15/2021	8/26/2021	8/26/2021	Breakthrough was first positive		
0	Pfizer	2/27/2021	3/13/2021	8/27/2021	8/27/2021	Breakthrough was first positive		

0	Janssen	3/18/2021	4/1/2021	8/27/2021	8/27/2021	Breakthrough was first positive		
4	Moderna	3/16/2021	3/30/2021	9/14/2020	8/27/2021	Breakthrough positive was at least 90 days after first positive		
4	Moderna	2/27/2021	3/13/2021	8/27/2021	8/27/2021	Breakthrough was first positive		
0	Moderna	3/5/2021	3/19/2021	8/28/2021	8/28/2021	Breakthrough was first positive		
1	Moderna	3/4/2021	3/18/2021	8/28/2021	8/28/2021	Breakthrough was first positive		
0	Moderna	3/2/2021	3/16/2021	8/28/2021	8/28/2021	Breakthrough was first positive		
3	Moderna	3/3/2021	3/17/2021	8/28/2021	8/28/2021	Breakthrough was first positive		
0	Moderna	3/3/2021	3/17/2021	8/28/2021	8/28/2021	Breakthrough was first positive		
0	Janssen	4/7/2021	4/21/2021	8/28/2021	8/28/2021	Breakthrough was first positive		
5	Pfizer	2/15/2021	3/1/2021	8/29/2021	8/29/2021	Breakthrough was first positive		
5	Moderna	2/12/2021	2/26/2021	8/30/2021	8/30/2021	Breakthrough was first positive		
0	Janssen	3/31/2021	4/14/2021	8/30/2021	8/30/2021	Breakthrough was first positive		
1	Janssen	7/8/2021	7/22/2021	8/31/2021	8/31/2021	Breakthrough was first positive		
3	Moderna	3/3/2021	3/17/2021	8/31/2021	8/31/2021	Breakthrough was first positive		
0	Moderna	3/3/2021	3/17/2021	8/31/2021	8/31/2021	Breakthrough was first positive		
0	Moderna	7/6/2021	7/20/2021	8/31/2021	8/31/2021	Breakthrough was first positive		



1	Moderna	3/3/2021	3/17/2021	8/31/2021	8/31/2021	Breakthrough was first positive		
0	Moderna	3/4/2021	3/18/2021	8/31/2021	8/31/2021	Breakthrough was first positive		
0	Moderna	3/15/2021	3/29/2021	8/31/2021	8/31/2021	Breakthrough was first positive		
0	Janssen	7/30/2021	8/13/2021	8/31/2021	8/31/2021	Breakthrough was first positive		
0	Pfizer	2/24/2021	3/10/2021	9/1/2021	9/1/2021	Breakthrough was first positive		
3	Pfizer	2/8/2021	2/22/2021	1/6/2021	9/1/2021	Breakthrough positive was at least 90 days after first positive		
1	Moderna	3/4/2021	3/18/2021	9/1/2021	9/1/2021	Breakthrough was first positive		
0	Moderna	4/14/2021	4/28/2021	9/1/2021	9/1/2021	Breakthrough was first positive		
0	Moderna	3/26/2021	4/9/2021	9/1/2021	9/1/2021	Breakthrough was first positive		