

Transitions in major Omicron sublineages

Update 2022/09/06

Bette Korber, Will Fischer, Hyejin Yoon, James Theiler

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Slide 2: Transitions in the main Omicron variant lineages globally throughout 2022

Slide 3: Transitions in Omicron variants by continent throughout 2022

Slides 4-6: BA.2.75 has rapidly increased in prevalence throughout India, and is now being detected globally.

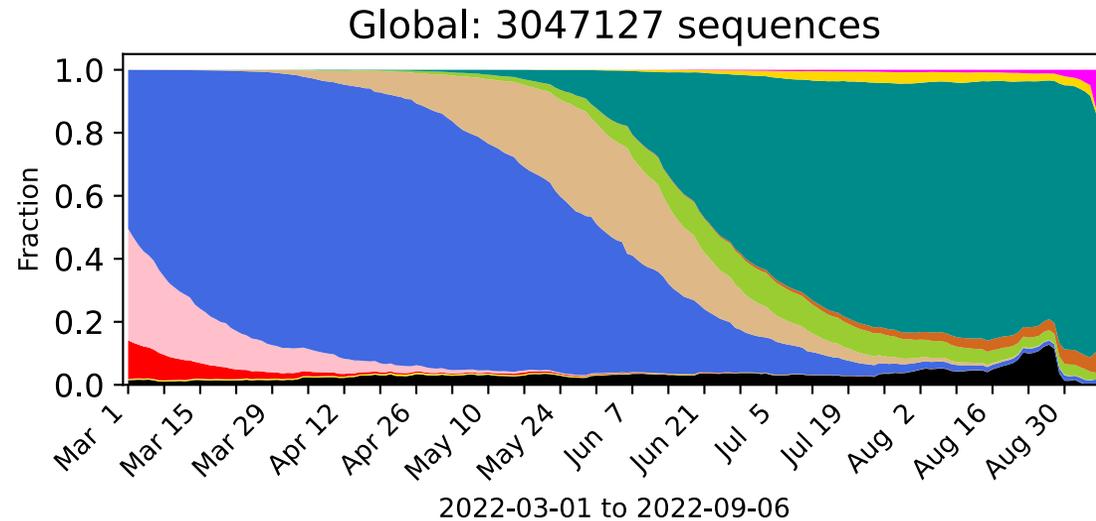
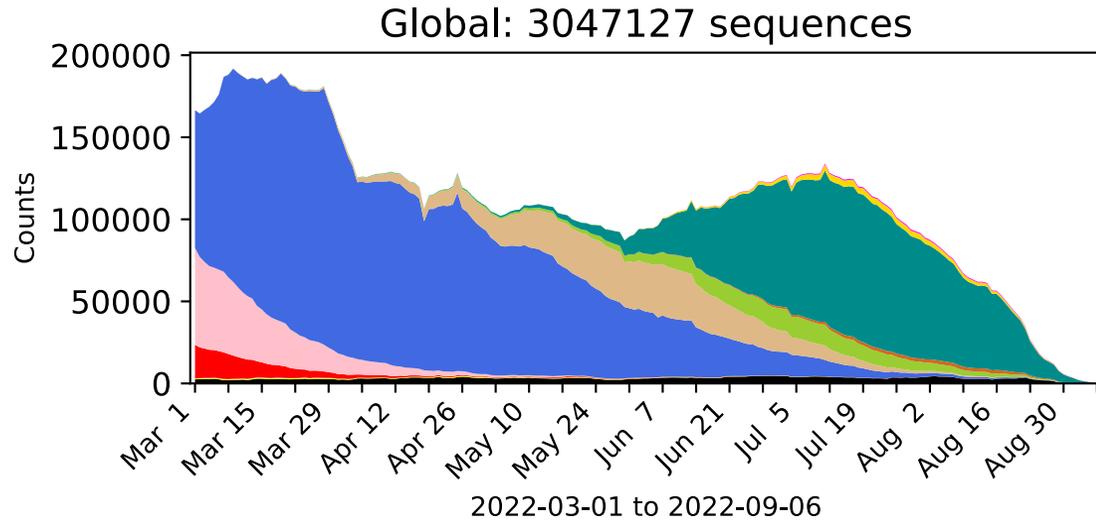
It was declared by the WHO as a VOC-LUM, a variant of concern lineage under monitoring

Slides 7-9: BF.5 is a Pango BA.5 sub-lineage that is common, but this is likely due to founder effects as it isn't increasing relative to other BA.5

Slides 10-12: BA.4.6 is increasing sampled but gaining prevalence less quickly than BA.2.75.

Slide 13: BA.2.75 variants that carry R346T

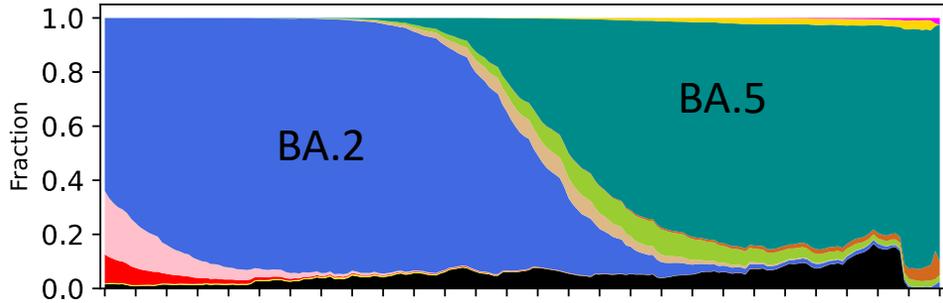
Global Shifts in Variants During the Pandemic



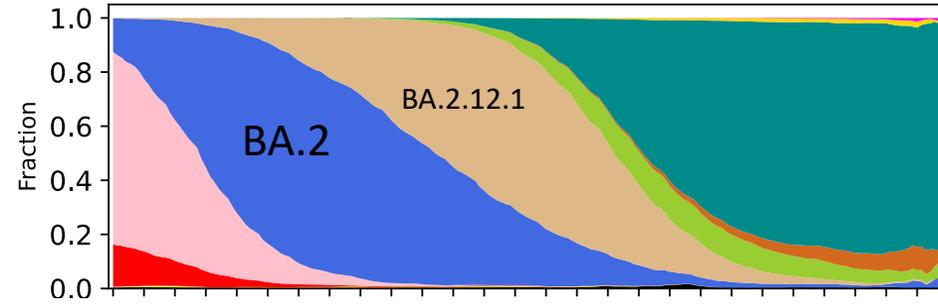
- Omicron_BA.2.75/BL
- Omicron_BF.5
- Omicron_BA.5/BE/BF/BK
- Omicron_BA.4.6
- Omicron_BA.4
- Omicron_BA.2.12.1/BG
- Omicron_BA.2/BH/BJ
- Omicron_BA.1.1/BC
- Omicron_BA.1/BD
- Delta
- Iota
- Epsilon
- Gamma
- Mu
- Beta
- Lambda
- Alpha
- D614G
- Ancestral
- Other

Transitions in major Omicron Pango Lineages by continent in 2022

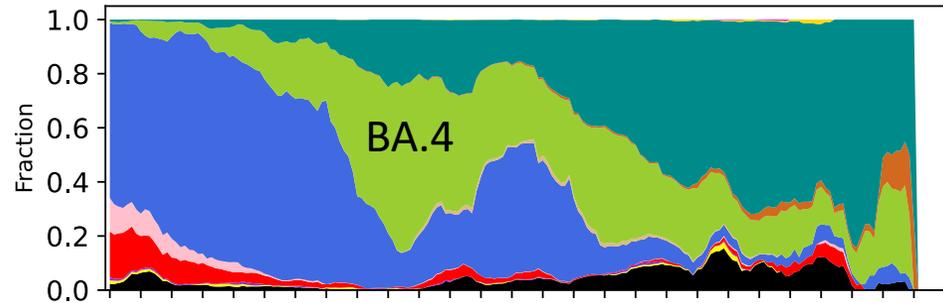
Europe: 1612068 sequences



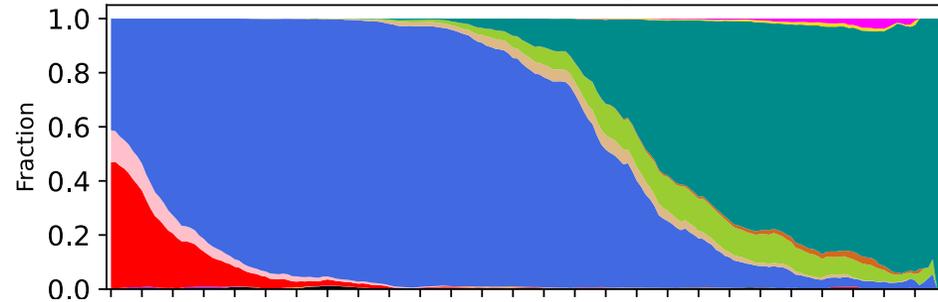
North-America: 935975 sequences



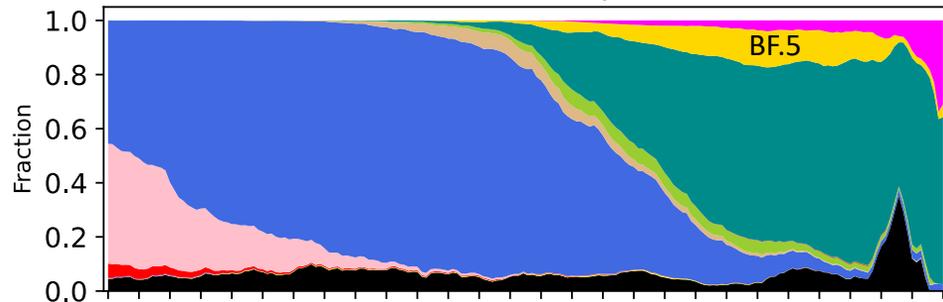
Africa: 20521 sequences



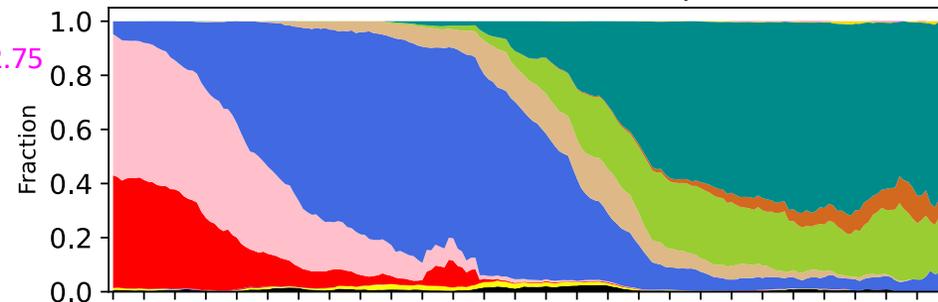
Oceania: 80246 sequences



Asia: 336750 sequences



South-America: 61567 sequences



2022-03-01 to 2022-09-06

2022-03-01 to 2022-09-06

BA.2.12.1:

Establish and expanding in the US prior to BA.5's arrival

B.2.75

Increasing rapidly in India, spreading globally but still rare Other places

BF.4 vs BF.5:

In South Africa BA.4 in early days was the dominant form in some heavily sampled provinces. Both were exported.

- Omicron_BA.2.75/BL
- Omicron_BF.5
- Omicron_BA.5/BE/BF/BK
- Omicron_BA.4.6
- Omicron_BA.4
- Omicron_BA.2.12.1/BG
- Omicron_BA.2/BH/BJ
- Omicron_BA.1.1/BC
- Omicron_BA.1/BD
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- Iota
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- Lambda
- Alpha
- D614G
- Ancestral
- Other

BA.2.75

BA.2.75 was declared by the WHO as a VOC-LUM. The following data support this being an important variant.

BA.2.75 is a BA.2 sublineage that differs from BA.2 in the following positions:
[K147E.W152R.F157L.I210V.G257S.G339H.G446S.N460K]_revert[Q493R]

It started to increase in prevalence in India in late May, and is now approaching about ~80% sampled variants in India.
It is increasing simultaneously in states throughout India.

2022-09-05: 5,435 GISAID entries are BA.2.75, and it is found globally.

It is increasingly prevalent in 17/18 countries where it has been found more than 10 times

In countries where places where BA.5 is co-circulating with BA.2.75, it is increasing at a faster pace than BA.5

BA.2.75 is increasingly sampled in countries where it has become established.

Isotonic regression analysis, cov.lanl.gov

Country level

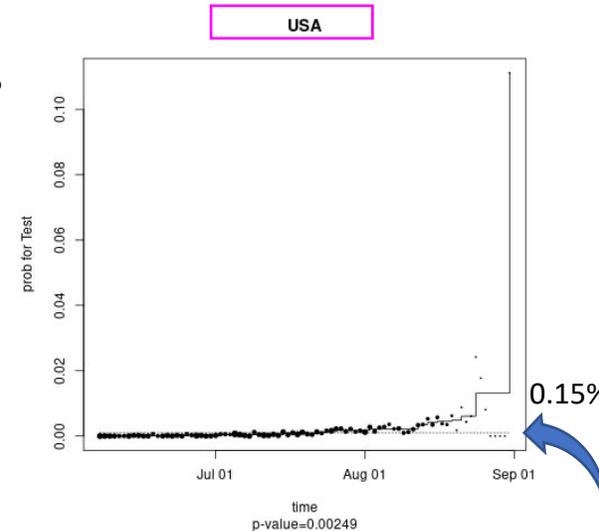
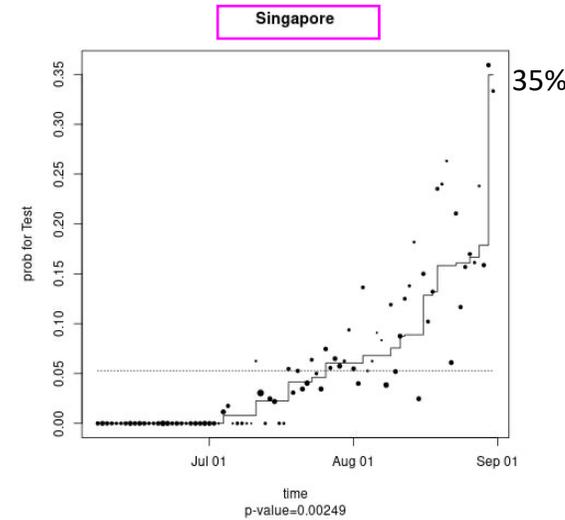
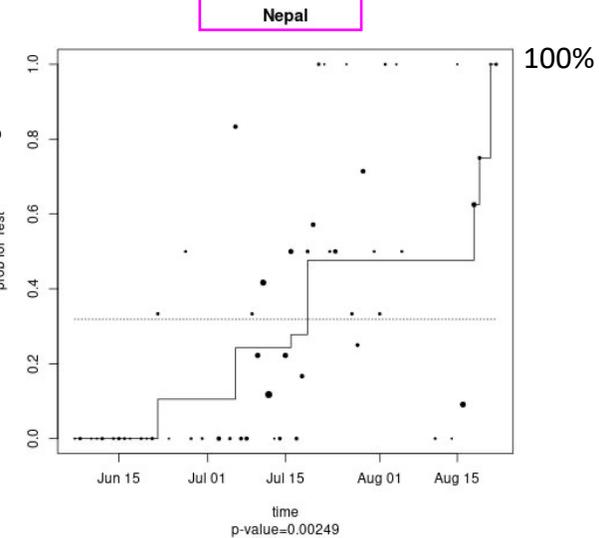
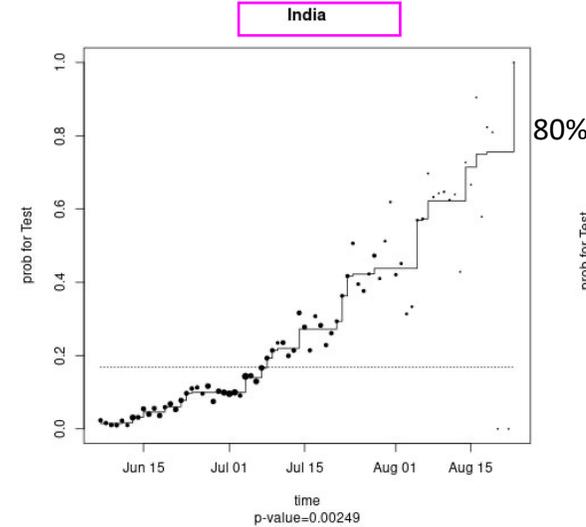
There were 4,796 sequences that matched your search term, the following summarizes the form in locations where it was found more than 10 times. **BA.2.75**

Significantly increasing over time

	# Test	# Others	Total	Test/Total (%)	# days	Time window	p-val
Australia	185	24230	24415	0.76	84	83	0.00249
Austria	64	31379	31443	0.20	77	78	0.00249
Belgium	21	15563	15584	0.13	85	84	0.00249
Canada	117	33458	33575	0.35	79	81	0.00249
Denmark	54	44829	44883	0.12	84	83	0.00249
France	17	52946	52963	0.03	84	83	0.00249
Germany	38	88207	88245	0.04	81	82	0.00249
India	3103	15363	18466	16.80	77	77	0.00249
Israel	73	39045	39118	0.19	76	75	0.00249
Japan	135	61531	61666	0.22	87	87	0.00249
Nepal	67	143	210	31.90	55	76	0.00249
Netherlands	26	11433	11459	0.23	86	85	0.00249
New-Zealand	50	7117	7167	0.70	73	72	0.00249
Russia	11	3350	3361	0.33	76	76	0.80597
Singapore	252	4508	4760	5.29	86	85	0.00249
South-Korea	81	16050	16131	0.50	82	81	0.00249
USA	338	352150	352488	0.10	86	85	0.00249
United-Kingdom	92	96730	96822	0.10	86	86	0.00249

Above: summary of all countries where BA.2.75 was sampled ≥ 10 times. A p-value < 0.05 indicates that BA.2.75 is gaining in sampling frequency between 2022-05-16 and 2022-08-16.

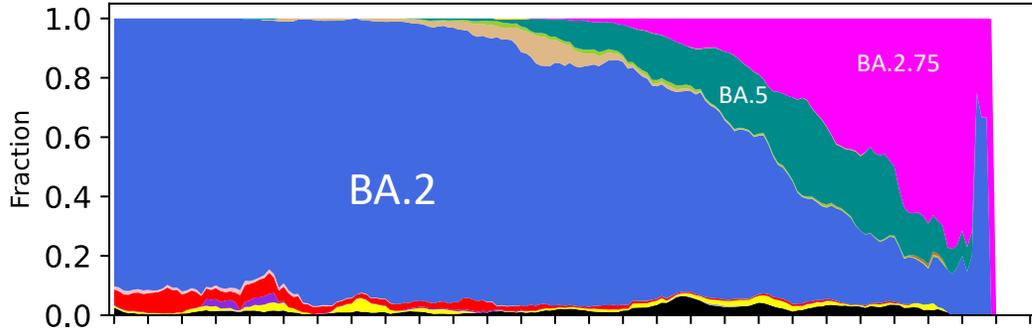
In the examples on the right, size of the dot reflects the sample size on given day and the y axis represents the sampling frequency of BA.2.75



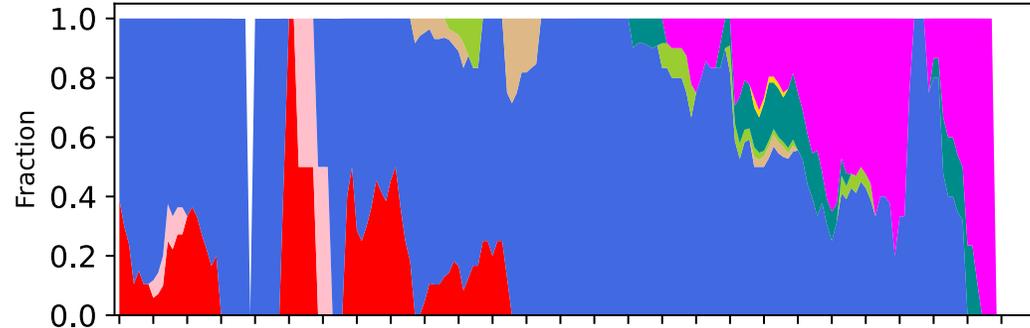
Sampling is very sparse in recent days, so still rare variants go undetected.

3 examples of nations where BA.2.75 is currently relative common, and the US where is newly expanding

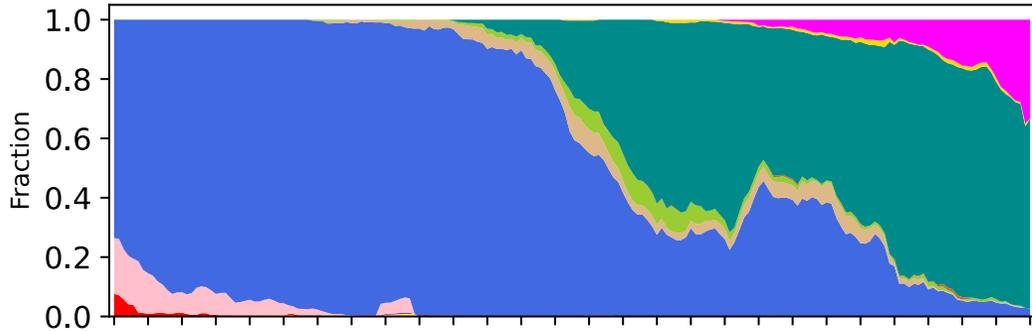
Asia.India: 29336 sequences



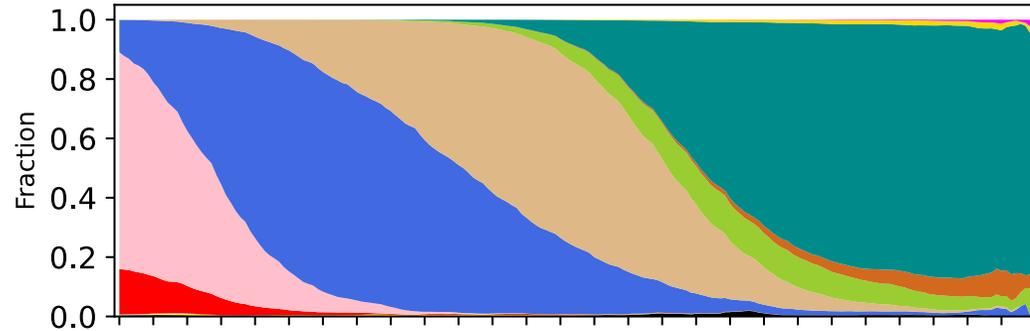
Nepal: 372 sequences



Singapore: 9106 sequences



USA: 806572 sequences



- Omicron_BA.2.75/BL
- Omicron_BF.5
- Omicron_BA.5/BE/BF/BK
- Omicron_BA.4.6
- Omicron_BA.4
- Omicron_BA.2.12.1/BG
- Omicron_BA.2/BH/BJ
- Omicron_BA.1.1/BC
- Omicron_BA.1/BD
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- Other

2022-03-01 to 2022-09-06

2022-03-01 to 2022-09-06

BF.5

BF.5 is a BA.5 sublineage that adds A1020S to BA.5's baseline Spike

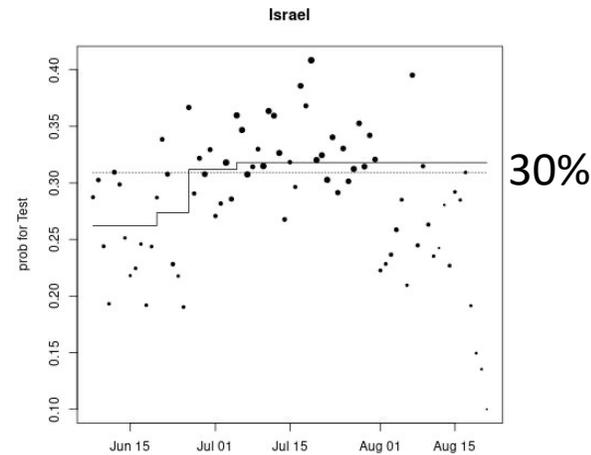
It is very common globally, sampled 25,829 times in GISAID, and is particularly common in Israel.

While it is increasing globally, it is not consistently increasing *faster* than other BA.5s, so its upsweep in prevalence may just be part of the global transition to the BA.5.

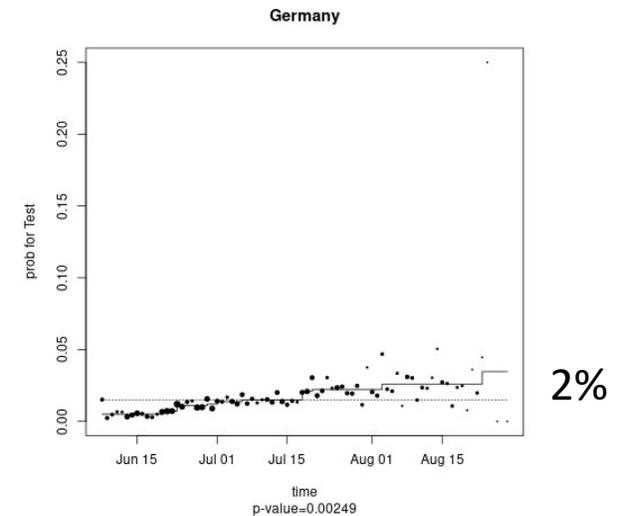
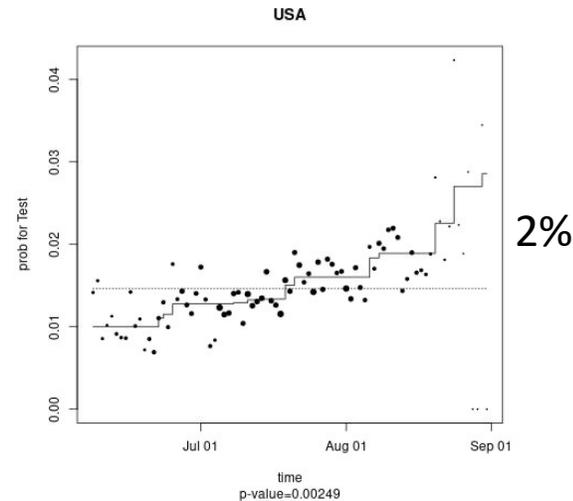
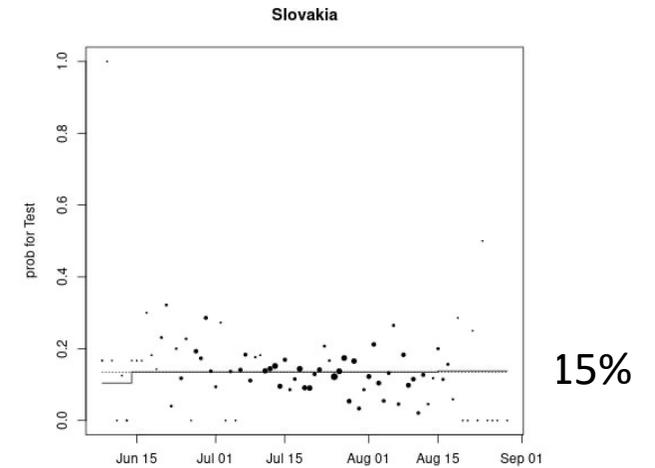
BF.5 has increased overall in 36/37 countries BUT it is not consistently increasing relative to other BA.5s, and where it is increasing it usually is *very* gradual and stable since June, suggesting it is not increasing relative to other BA.5s

	BF.5	BA.5					
	# Test	# Others	Total	Test/Total (%)	# days	Time window	p-val
Australia	148	14844	14992	0.99	87	87	0.01493
Austria	74	4337	4411	1.68	70	77	0.00249
Belgium	254	12584	12838	1.98	85	84	0.00249
Brunei	104	477	581	17.90	45	71	0.99254
Canada	260	20923	21183	1.23	78	80	0.00249
Croatia	43	2777	2820	1.52	71	72	0.00995
Czech-Republic	109	3738	3847	2.83	83	83	0.72139
Denmark	1096	35601	36697	2.99	83	82	0.00249
Finland	28	2415	2443	1.15	69	69	0.07463
France	720	39809	40529	1.78	83	82	0.00249
Georgia	27	215	242	11.16	55	73	0.03731
Germany	1058	69323	70381	1.50	80	81	0.00249
Greece	127	1744	1871	6.79	52	51	0.0796
Iceland	20	1009	1029	1.94	74	74	0.00746
India	11	3537	3548	0.31	72	72	0.48259
Indonesia	288	7499	7787	3.70	79	82	0.84328
Ireland	101	7627	7728	1.31	83	82	0.00249
Israel	9008	20156	29164	30.89	75	74	0.00249
Italy	115	8323	8438	1.36	84	83	0.00249
Japan	5010	35949	40959	12.23	86	86	0.00249
Luxembourg	98	5747	5845	1.68	74	73	0.00249
Malaysia	43	1571	1614	2.66	68	69	0.00995
Mexico	10	7268	7278	0.14	76	77	0.08458
Netherlands	194	9153	9347	2.08	83	82	0.00249
New-Zealand	39	4256	4295	0.91	72	71	0.12687
Norway	28	2654	2682	1.04	75	74	0.00249
Poland	44	1949	1993	2.21	78	84	0.18159
Portugal	40	3610	3650	1.10	75	76	0.00249
Puerto-Rico	25	747	772	3.24	58	72	0.58209
Romania	41	1148	1189	3.45	68	76	0.05473
Russia	99	2927	3026	3.27	66	75	0.19403
Singapore	39	2884	2923	1.33	85	84	0.02985
Slovakia	531	3405	3936	13.49	82	82	0.96517
Slovenia	18	2289	2307	0.78	76	75	0.10945
South-Korea	157	6347	6504	2.41	76	75	0.03234
Spain	77	11749	11826	0.65	84	83	0.00249
Sweden	249	11847	12096	2.06	83	82	0.00249
Switzerland	87	4335	4422	1.97	80	80	0.00249
Turkey	34	1642	1676	2.03	29	62	0.03483
USA	3201	215818	219019	1.46	85	84	0.00249
United-Kingdom	1088	71678	72766	1.50	85	85	0.00249

A significant but slight increase in June, now declining



A significant but slight increase steady at ~15%



Exception: Germany

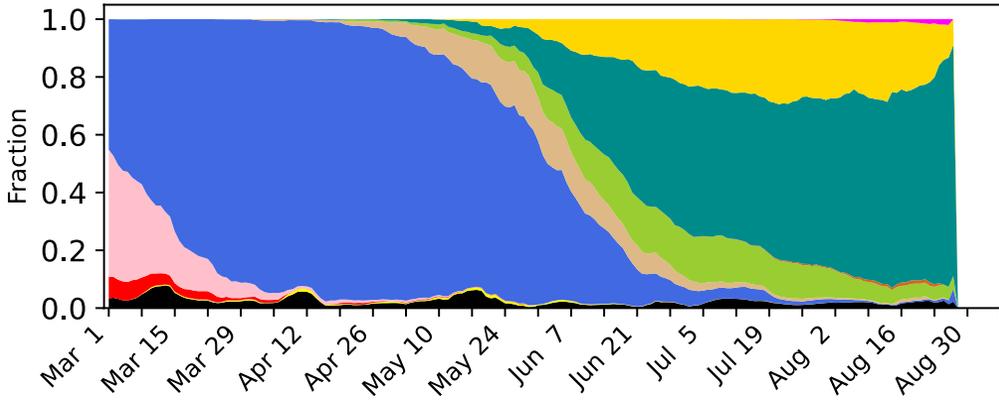
Above: summary of all countries where BF.5 and other BA.5s were co-circulating and BF.5 was found >10 times. A p-value < 0.05 indicates that BF.5 is gaining in sampling frequency relative to other BA.5. Sampling between 2022-05-16 and 2022-08-16.

In the four example graphs on the right, size of the dot reflects the sample size on given day and the y axis represents the sampling frequency of BF.5/BA.5

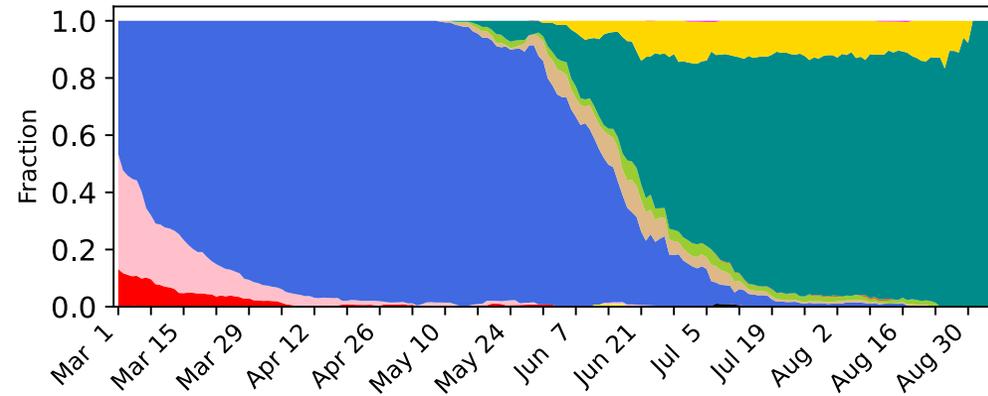
4 examples of nations where BF.5 is currently relative common

It is most common in Israel and Slovakia, but not increasing relative to other BA.5s.

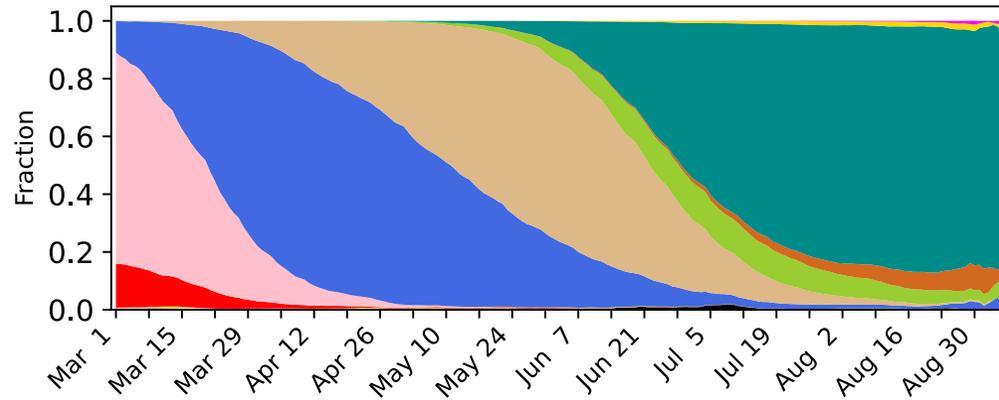
Israel: 73202 sequences



Slovakia: 15220 sequences

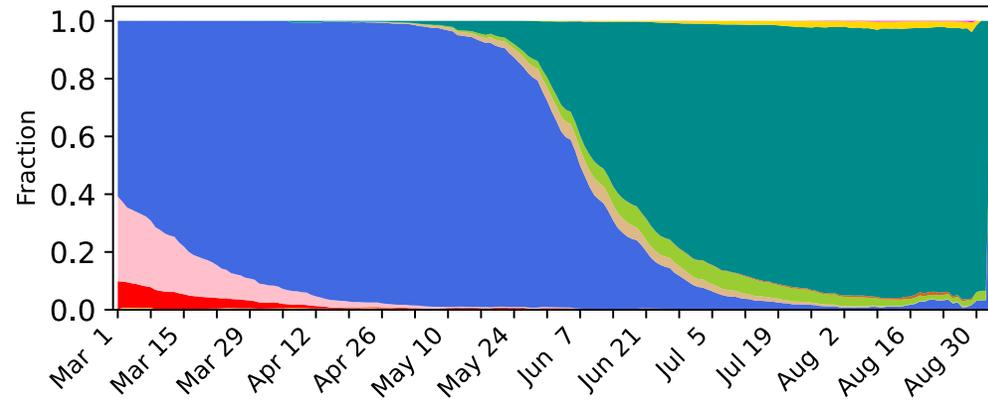


USA: 806572 sequences



2022-03-01 to 2022-09-06

Germany: 291480 sequences



2022-03-01 to 2022-09-06

- Omicron_BA.2.75/BL
- Omicron_BF.5
- Omicron_BA.5/BE/BF/BK
- Omicron_BA.4.6
- Omicron_BA.4
- Omicron_BA.2.12.1/BG
- Omicron_BA.2/BH/BJ
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- Delta
- Iota
- Epsilon
- Gamma
- Mu
- Beta
- Lambda
- Alpha
- D614G
- Ancestral
- Other

BA.4.6

BA.4.6 is a very common BA.4 sublineage that adds R346T, N658S to BA.4

It is common globally, sampled 17,115 times in GISAID.

Although is increasingly sampled, the increase tends to be gradual, and is not as rapid as for BA.2.75, the exception of the Dominican Republic.

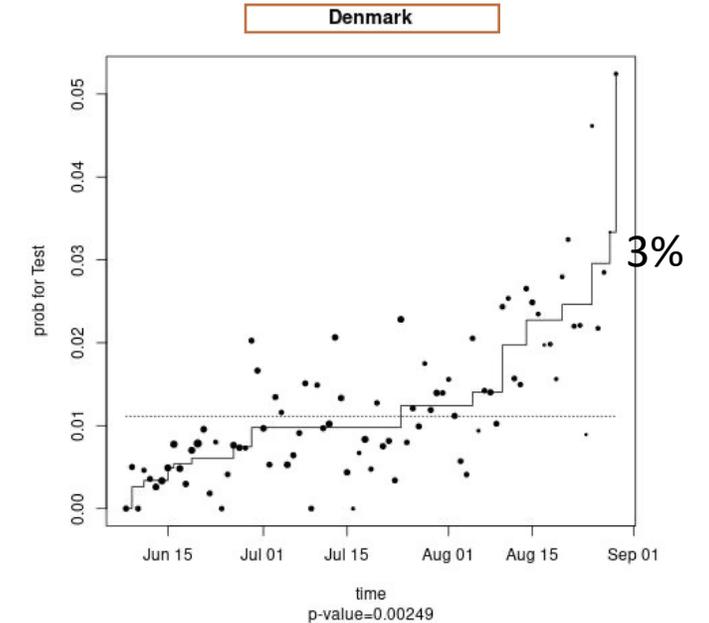
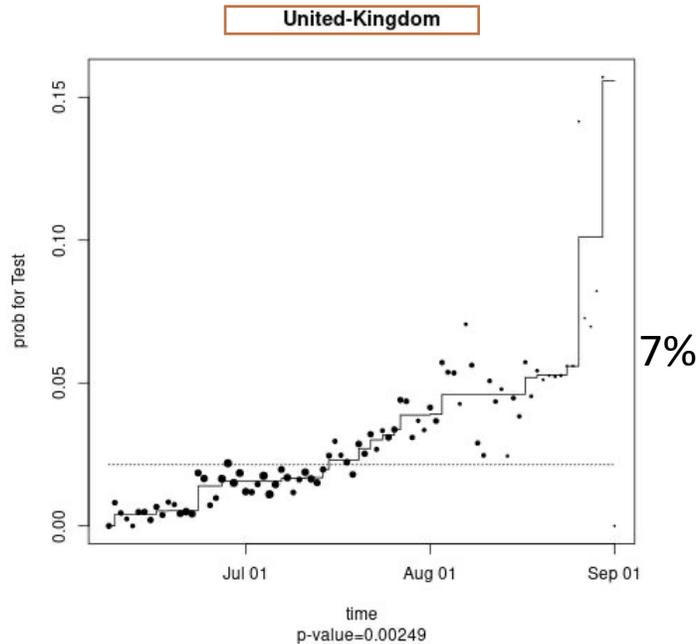
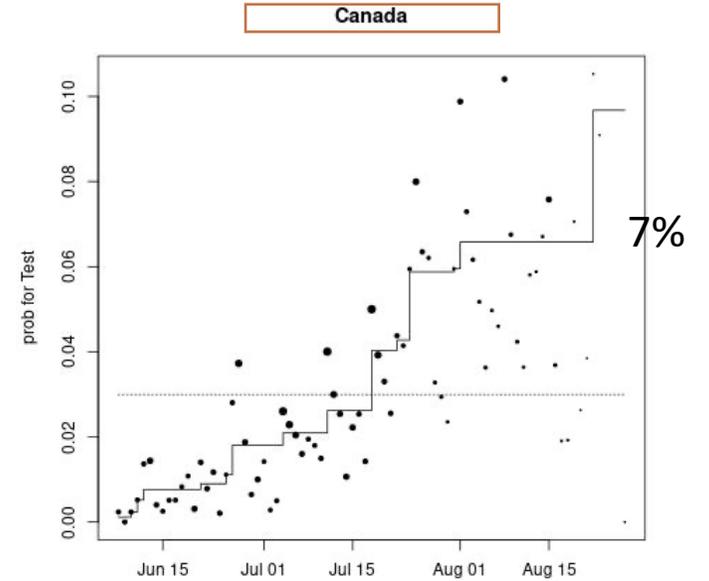
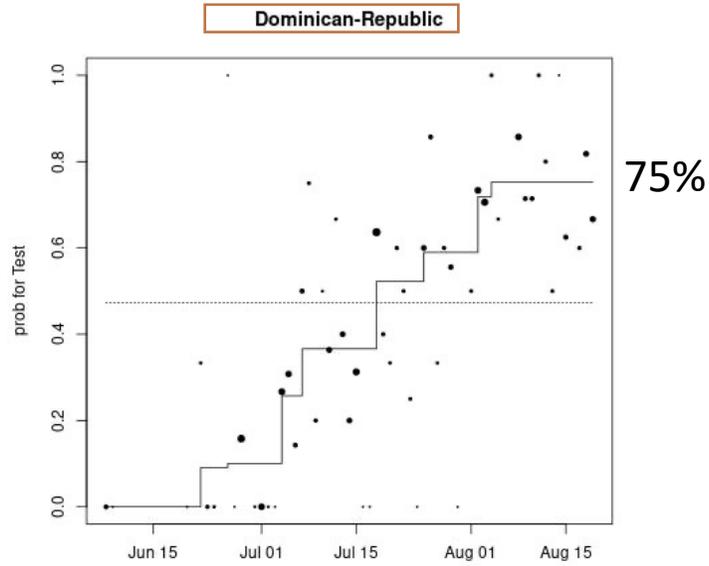
BA.4.6 has increased in sampling frequency overall in 34/39 countries in the last 3 months, it is consistently increasing relative to BA.4, but it is *not* consistently increasing relative to BA.5. Most data is available in the US and UK, and in both countries there is a slow steady relative increase.

Significantly increasing
over time

BA.4.6



	# Test	# Others	Total	Test/Total (%)	# days	Time window	p-val
Argentina	68	493	561	12.12	67	72	0.00249
Australia	283	23646	23929	1.18	87	87	0.00249
Austria	17	32902	32919	0.05	78	77	0.00498
Belgium	102	15381	15483	0.66	85	84	0.00249
Botswana	12	637	649	1.85	40	59	0.95522
Brazil	74	11288	11362	0.65	71	71	0.00249
Canada	992	32133	33125	2.99	78	80	0.00249
Chile	233	5202	5435	4.29	84	83	0.00249
Colombia	34	1831	1865	1.82	56	70	0.00249
Costa-Rica	23	1695	1718	1.34	75	75	0.00249
Czech-Republic	27	4648	4675	0.58	83	83	0.3408
Denmark	495	43903	44398	1.11	83	82	0.00249
Dominican-Republic	173	193	366	47.27	56	72	0.00249
Ecuador	49	1407	1456	3.37	75	82	0.00249
France	388	49252	49640	0.78	83	82	0.00249
Germany	240	86173	86413	0.28	80	81	0.00249
Indonesia	13	8930	8943	0.15	79	82	0.00249
Ireland	93	10403	10496	0.89	83	82	0.00249
Israel	101	38506	38607	0.26	75	74	0.00249
Italy	87	11320	11407	0.76	84	83	0.00249
Jamaica	21	111	132	15.91	30	44	0.00498
Japan	66	61540	61606	0.11	86	86	0.00249
Luxembourg	103	6484	6587	1.56	74	73	0.31095
Mexico	34	11029	11063	0.31	76	77	0.01741
Netherlands	81	11176	11257	0.72	85	84	0.00249
New-Zealand	60	6982	7042	0.85	72	71	0.00249
Peru	148	6458	6606	2.24	68	67	0.00249
Portugal	20	3849	3869	0.52	76	76	0.00249
Puerto-Rico	52	1530	1582	3.29	64	72	0.00249
Senegal	11	285	296	3.72	44	63	0.28109
Sint-Maarten	12	128	140	8.57	44	66	0.00498
South-Africa	30	1171	1201	2.50	77	77	0.00746
South-Korea	19	15840	15859	0.12	81	80	0.10448
Spain	82	14429	14511	0.57	84	83	0.00249
Sweden	92	14169	14261	0.65	83	82	0.00249
Switzerland	50	5141	5191	0.96	80	80	0.00249
Trinidad-and-Tobago	30	690	720	4.17	73	74	0.00249
USA	9253	335824	345077	2.68	85	84	0.00249
United-Kingdom	2076	94840	96916	2.14	85	85	0.00249

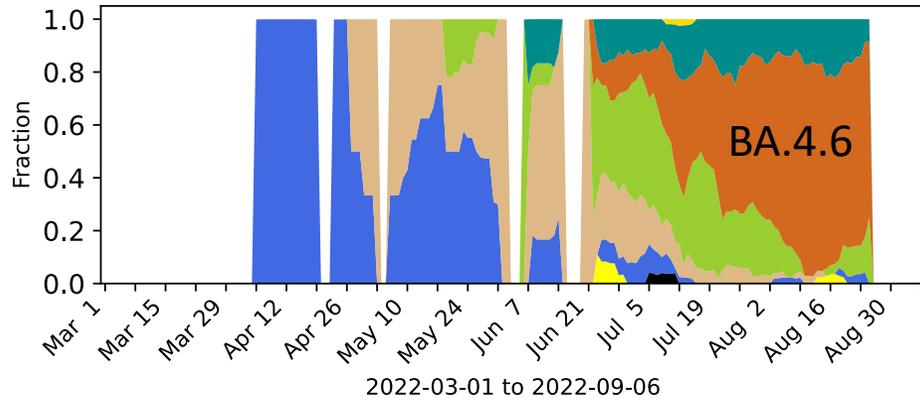


Above: summary of all countries where BA.4.6 was found ≥ 10 times. A p-value < 0.05 indicates that BA.4.6 is increasingly sampled.

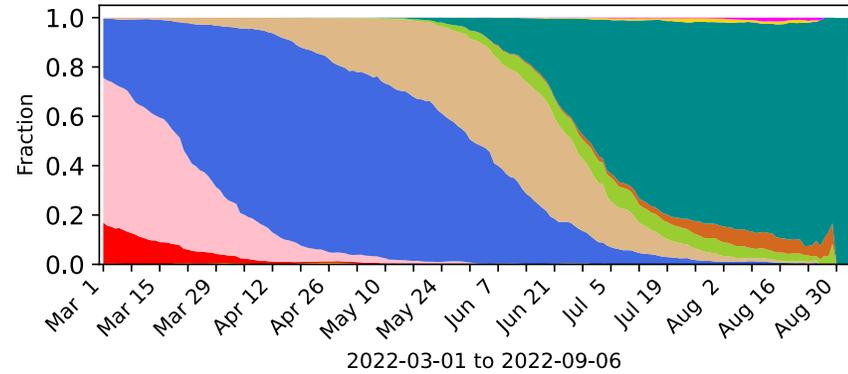
In the graphs on the right, size of the dot reflects the sample size on given day and the y axis represents the sampling frequency of B4.6/[BA.5+BA.4.6]

4 examples of nations where BA.4.6 is increasing:

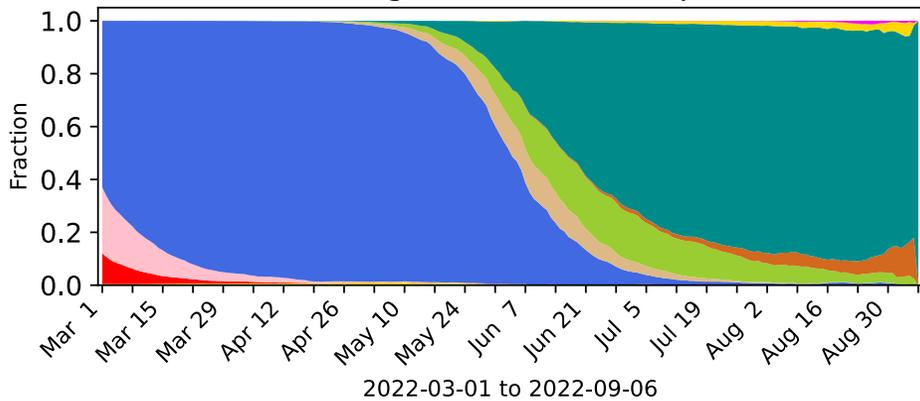
Dominican-Republic: 429 sequences



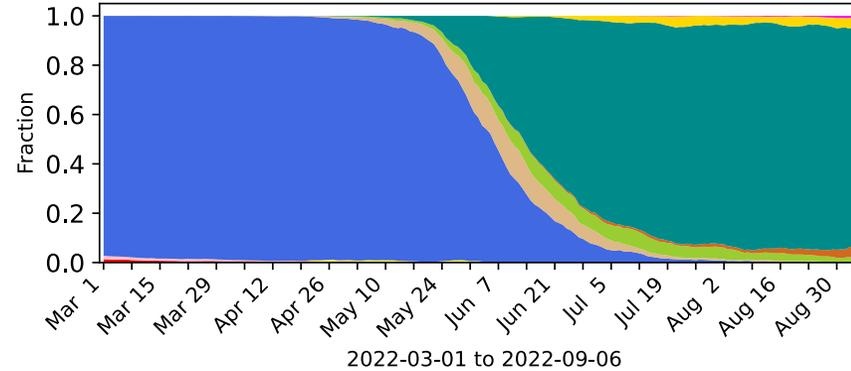
Canada: 99322 sequences



United-Kingdom: 538729 sequences



Denmark: 168460 sequences



- Omicron_BA.2.75/BL
- Omicron_BF.5
- Omicron_BA.5/BE/BF/BK
- Omicron_BA.4.6
- Omicron_BA.4
- Omicron_BA.2.12.1/BG
- Omicron_BA.2/BH/BJ
- Omicron_BA.1.1/BC
- Omicron_BA.1/BD
- Delta
- Iota
- Epsilon
- Gamma
- Mu
- Beta
- Lambda
- Alpha
- D614G
- Ancestral
- Other

Isotonic Regression Results

Last data update: Sep 6, 2022

Position: SPIKE 346 T

Assumption: Test amino acid form is increasing over time

Correlated variant: Do not consider. Include all sequences

Range of dates: 2022-06-08 - 2022-09-06

Pango lineage designation in GISAID : BA.2.75

Hosts: Human

BA.2.75

R346T

Country level

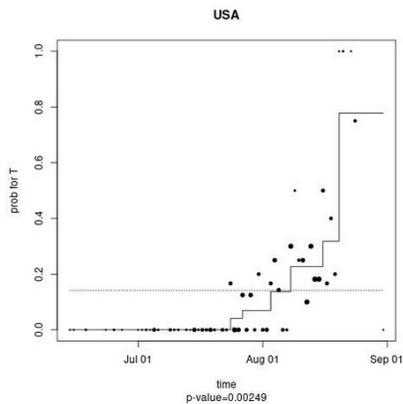
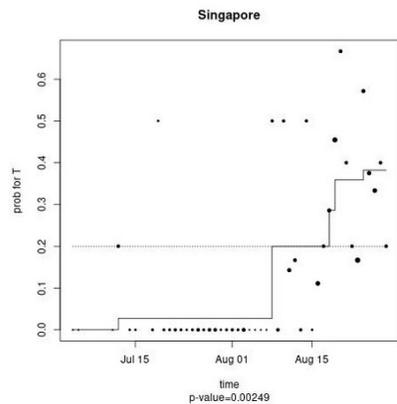
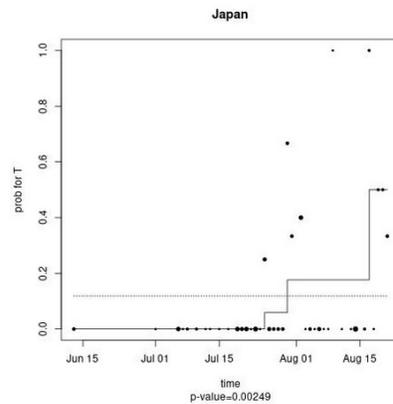
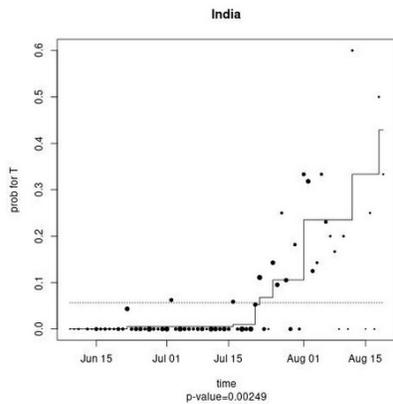
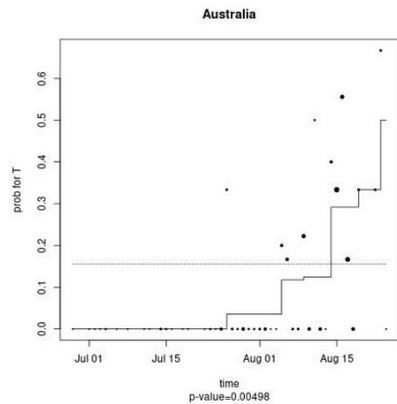
	# T	# Others	Total	T/Total (%)	# days	Time window	p-val
Australia	24	130	154	15.58	46	57	0.00498
India	49	811	860	5.70	69	71	0.00249
Japan	12	89	101	11.88	40	69	0.00249
Singapore	41	164	205	20.00	48	55	0.00249
USA	37	224	261	14.18	57	78	0.00249

There are several BA.2.75 variants that carry R346T. These tend to be increasing relative to other BA.2.75, but they are still very rare.

Omicron_BA.2.75_R346T

Omicron_BA.2.75_R346T.D574V

Omicron_BA.2.75_R346T.F486S.D1199N



The y-axis represent that fraction of [BA.2.75 with R346T] divided by all BA.2.75 in every country where more than 10 were sampled.