Current Status of the Most Dominant SARS-CoV-2 Variant

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and
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AIRU
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NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES
Division in the National Health Laboratory Service

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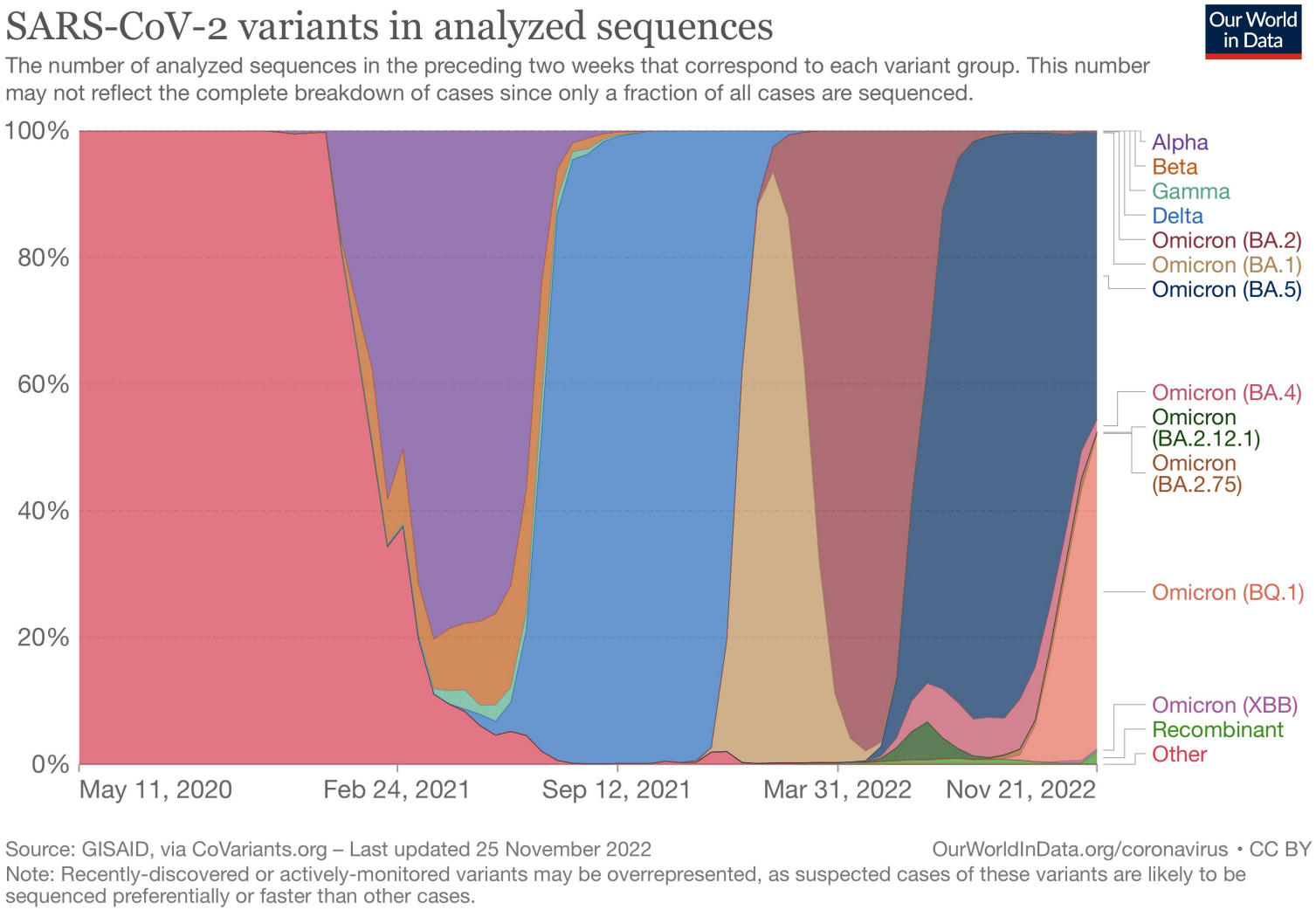
GISER: GLOBAL IMMUNOLOGY & IMMUNE SEQUENCING FOR EPIDEMIC RESPONSE

What is the most dominant variant?



That depends on when, and where you look…

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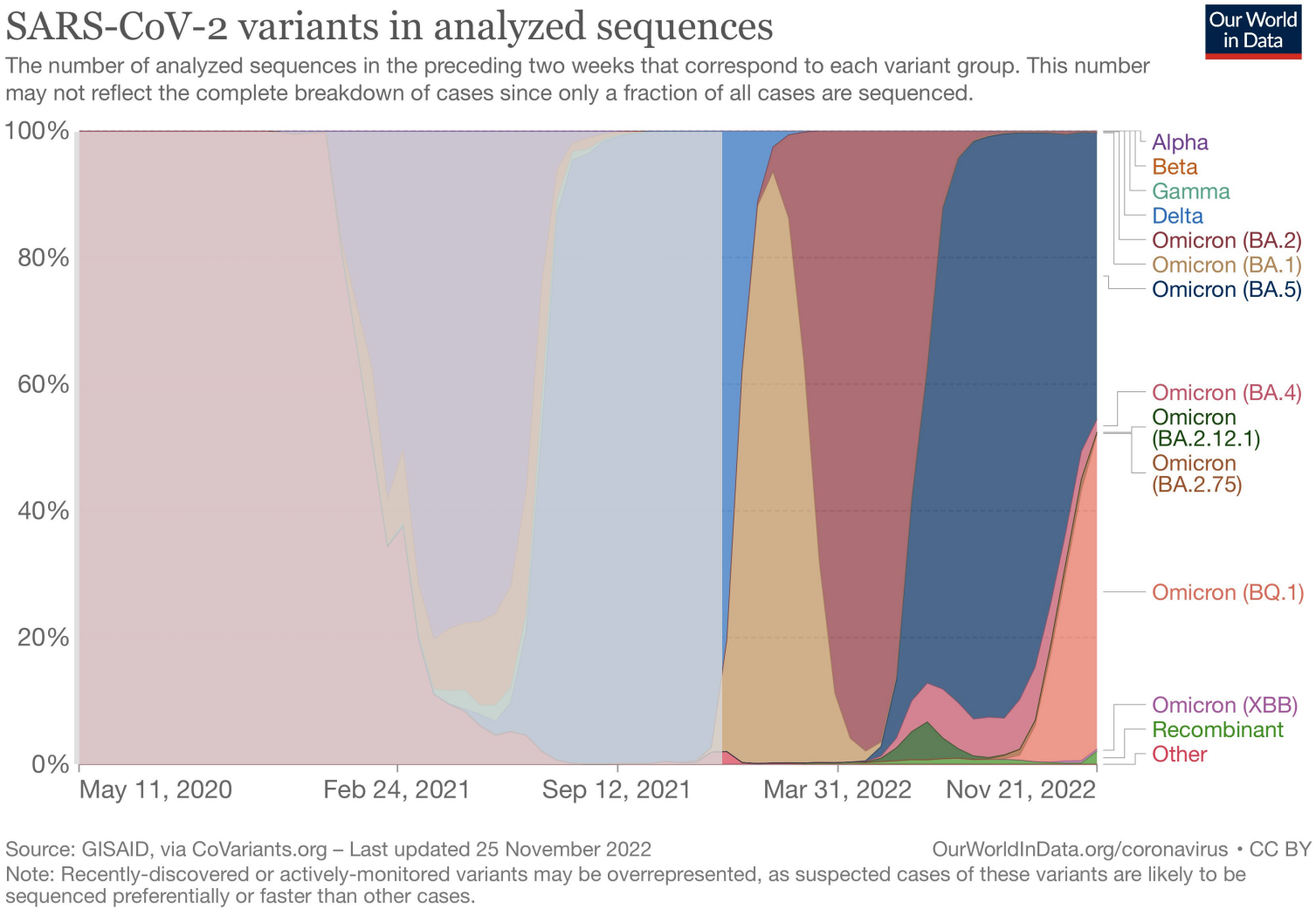

Omicron BA.1

Omicron BA.2

Omicron BA.5

Omicron BQ.1

Omicron XBB

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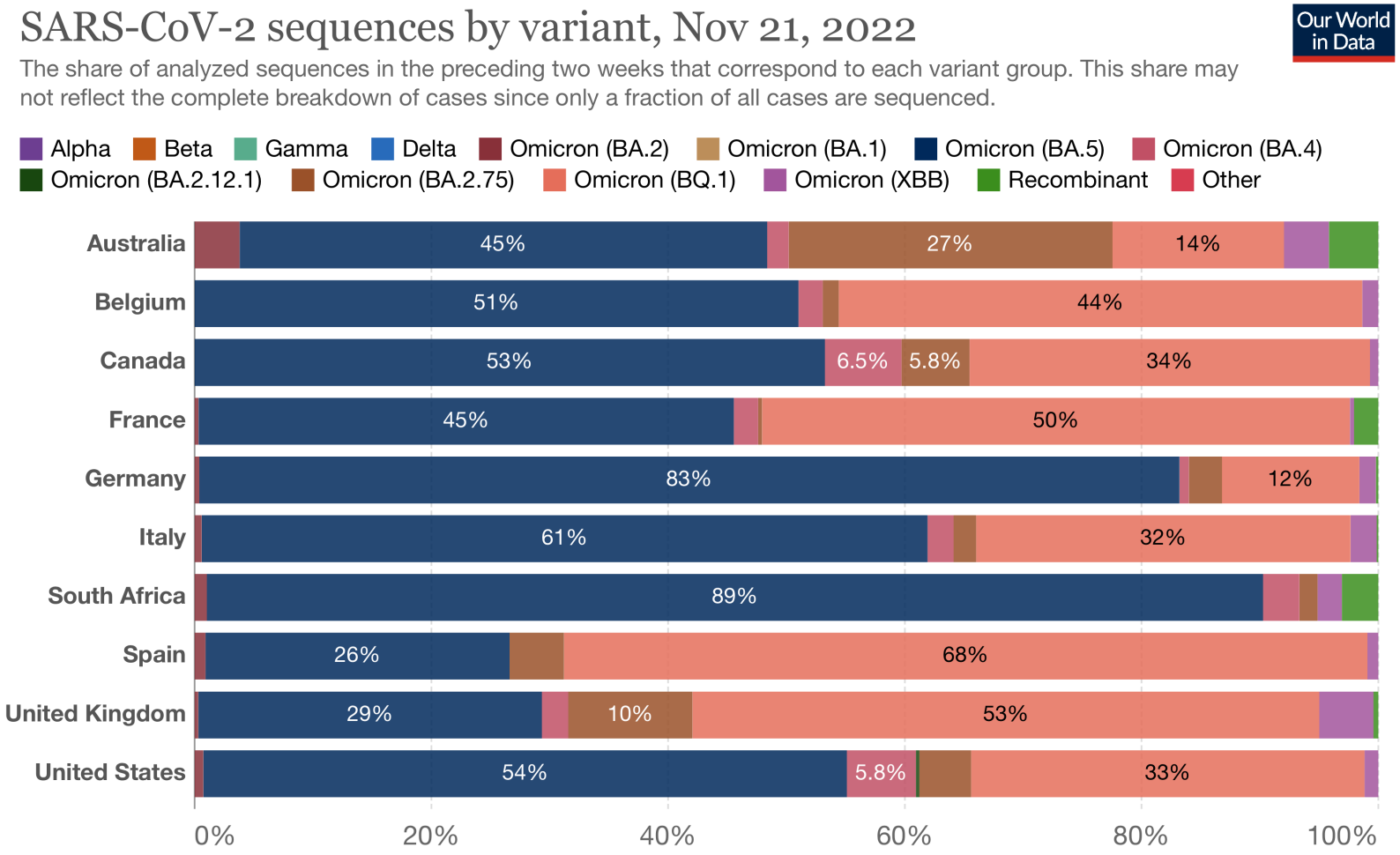

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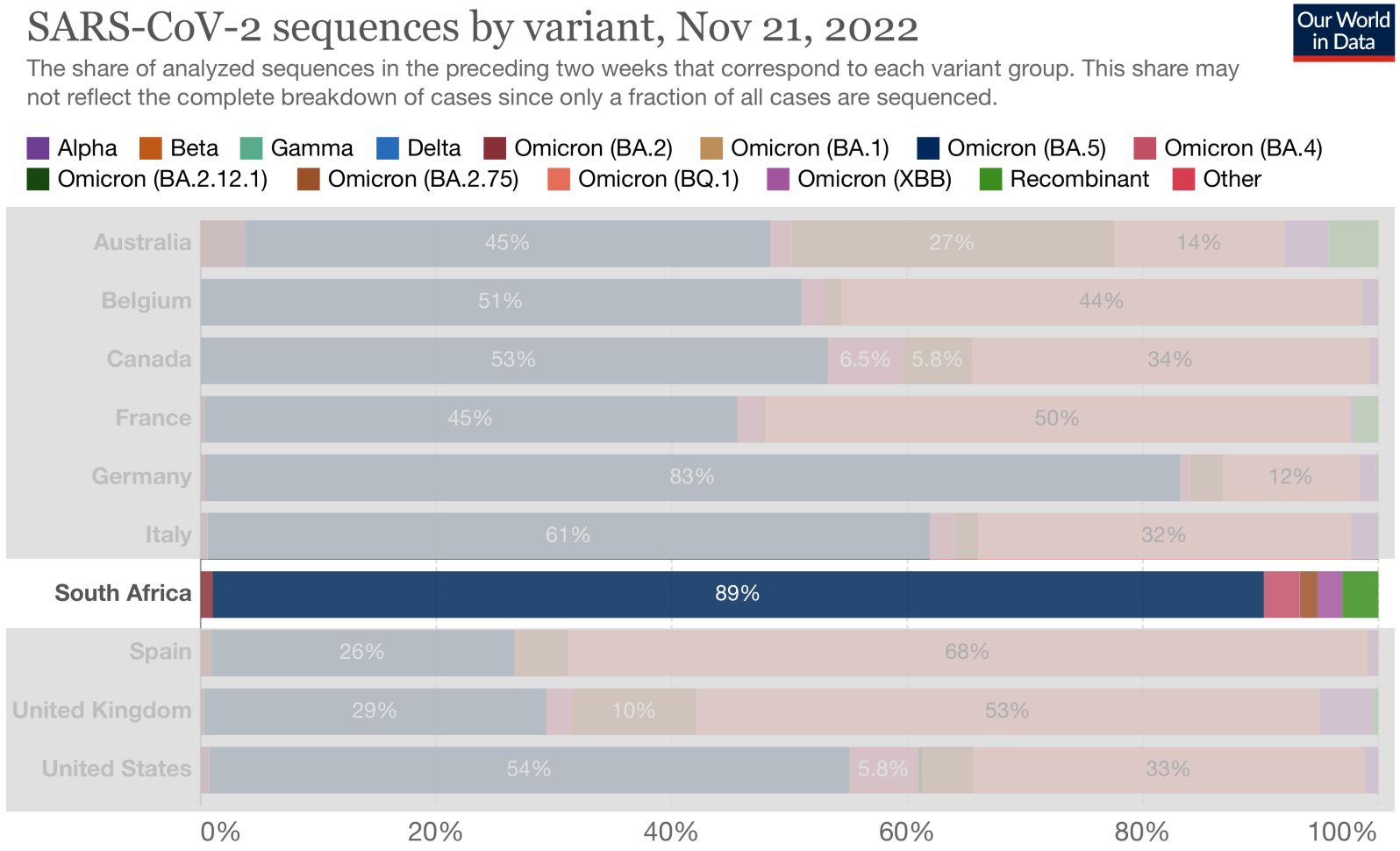

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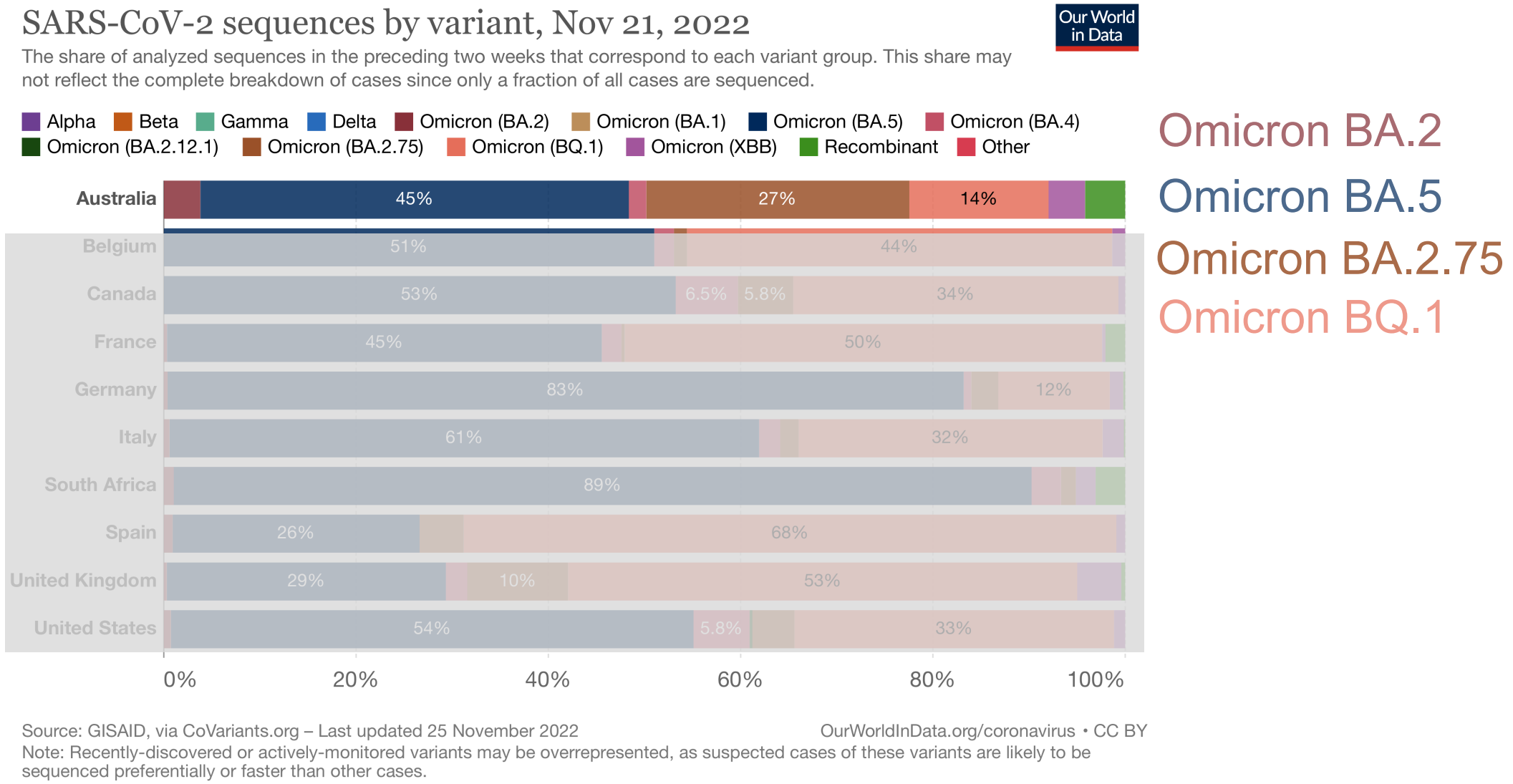

Omicron BA.2

Omicron BA.5

Omicron BA.2.75

Omicron BQ.1

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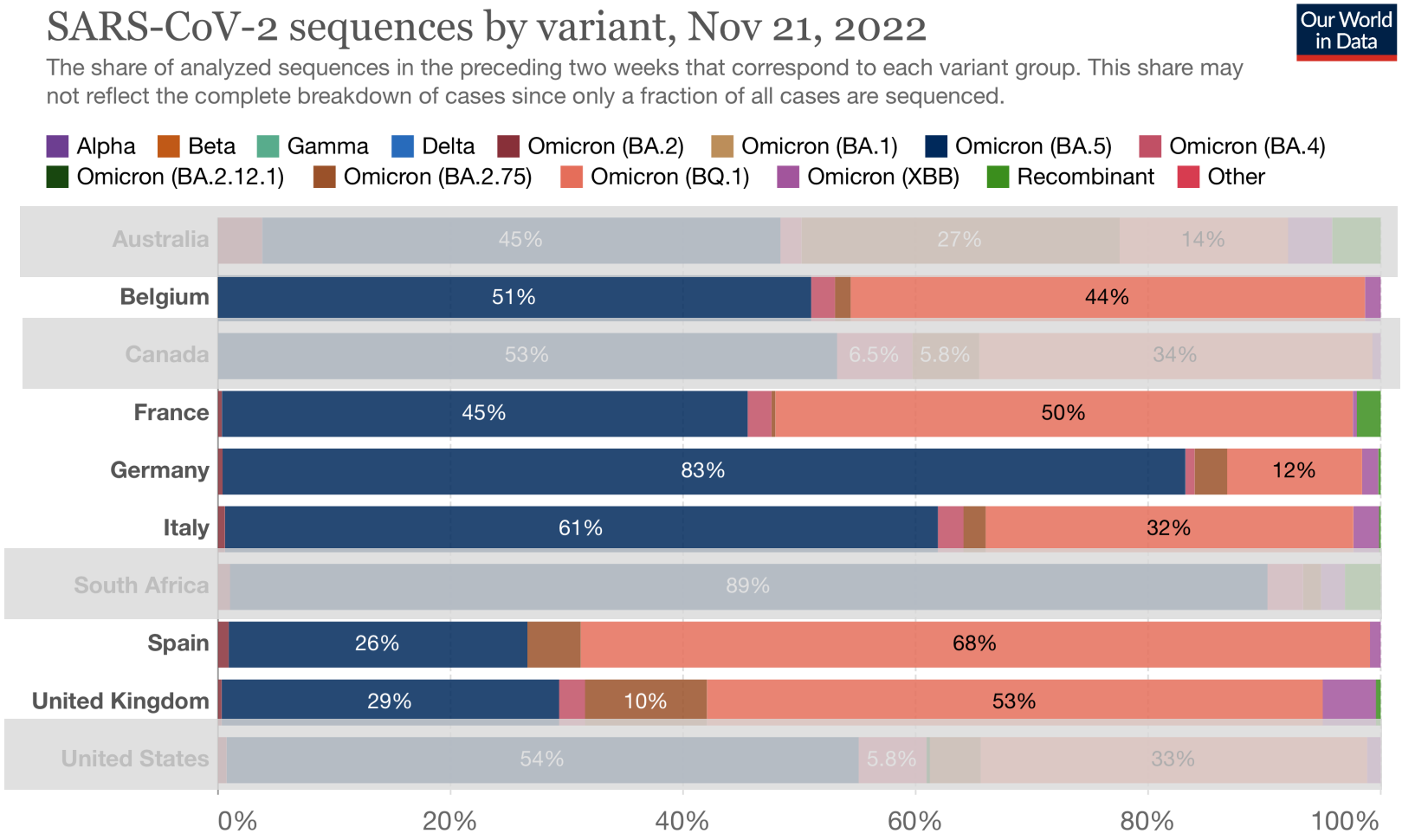

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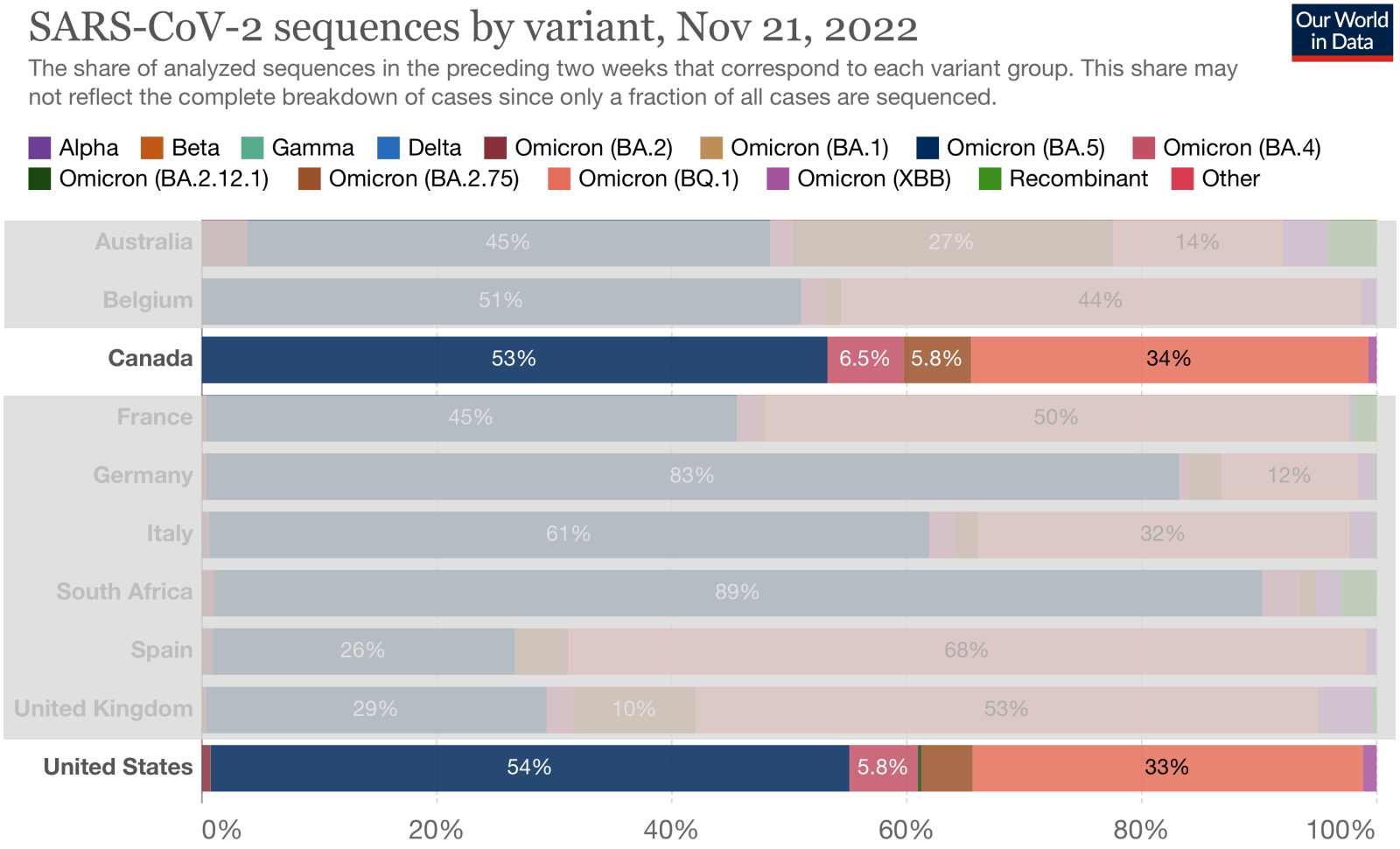
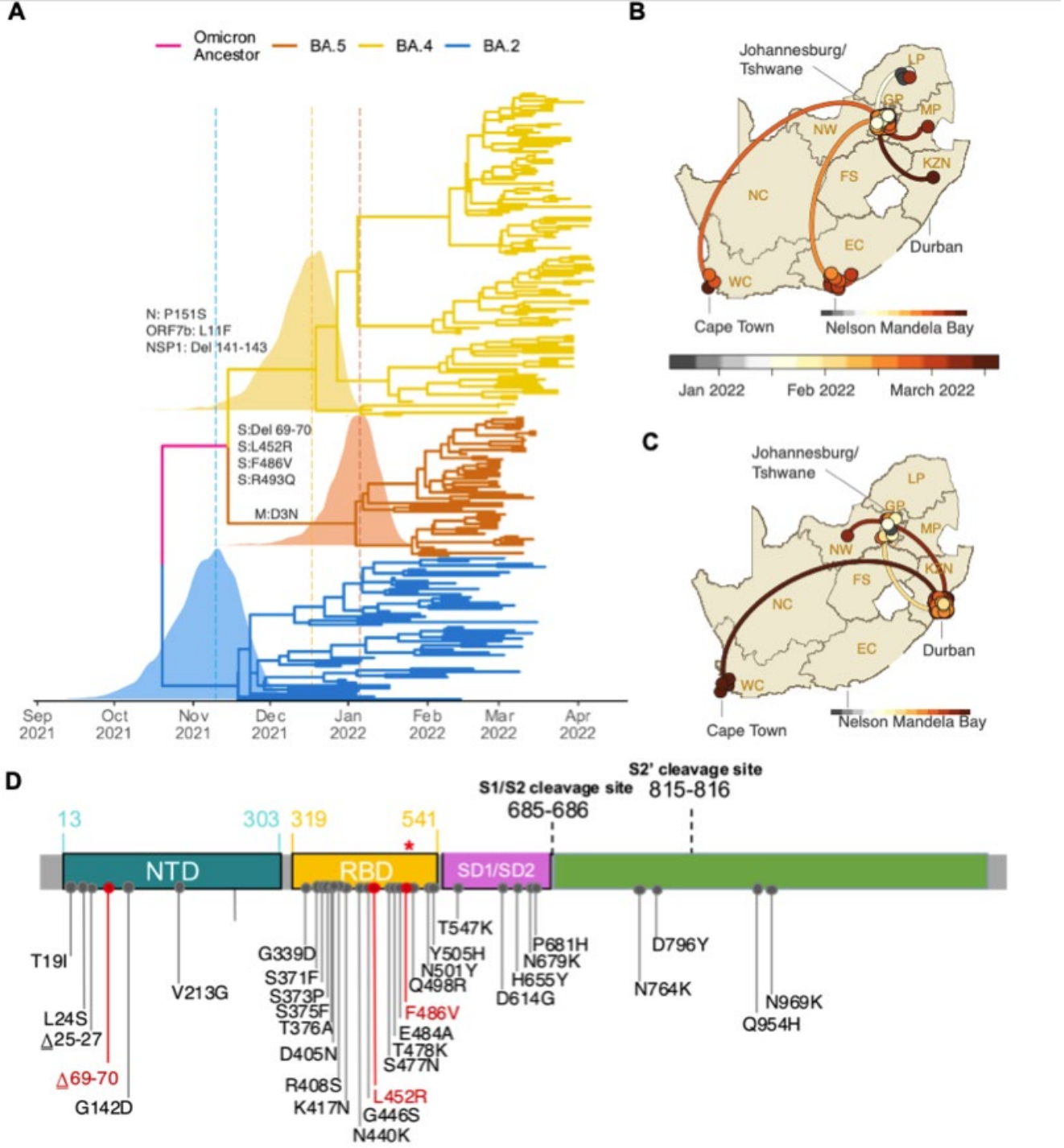


Omicron BA.5
Omicron BA.4**
Omicron BA2.75
Omicron BQ.1

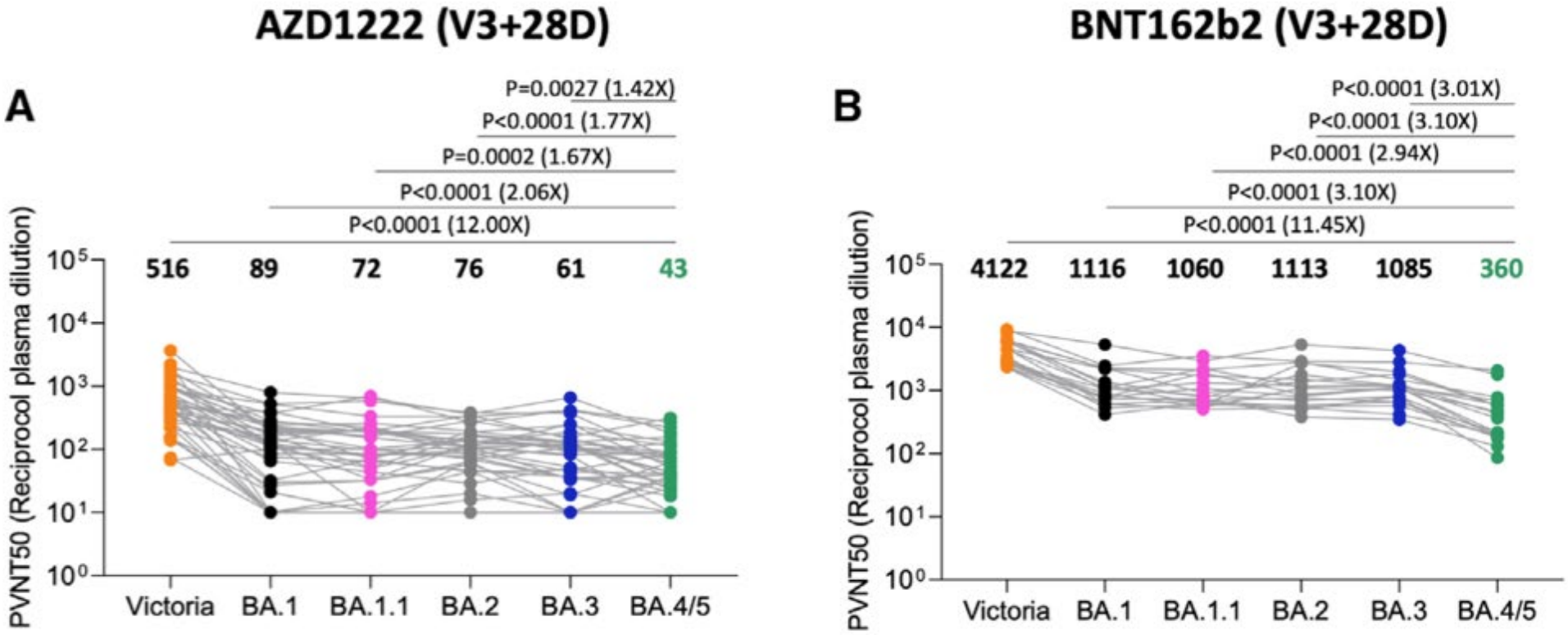
That depends on when, and where you look…

How did BA.4/5 sweep across the world so fast?



Tegally et al, 2022

High level resistance of BA.4/5 to vaccine sera



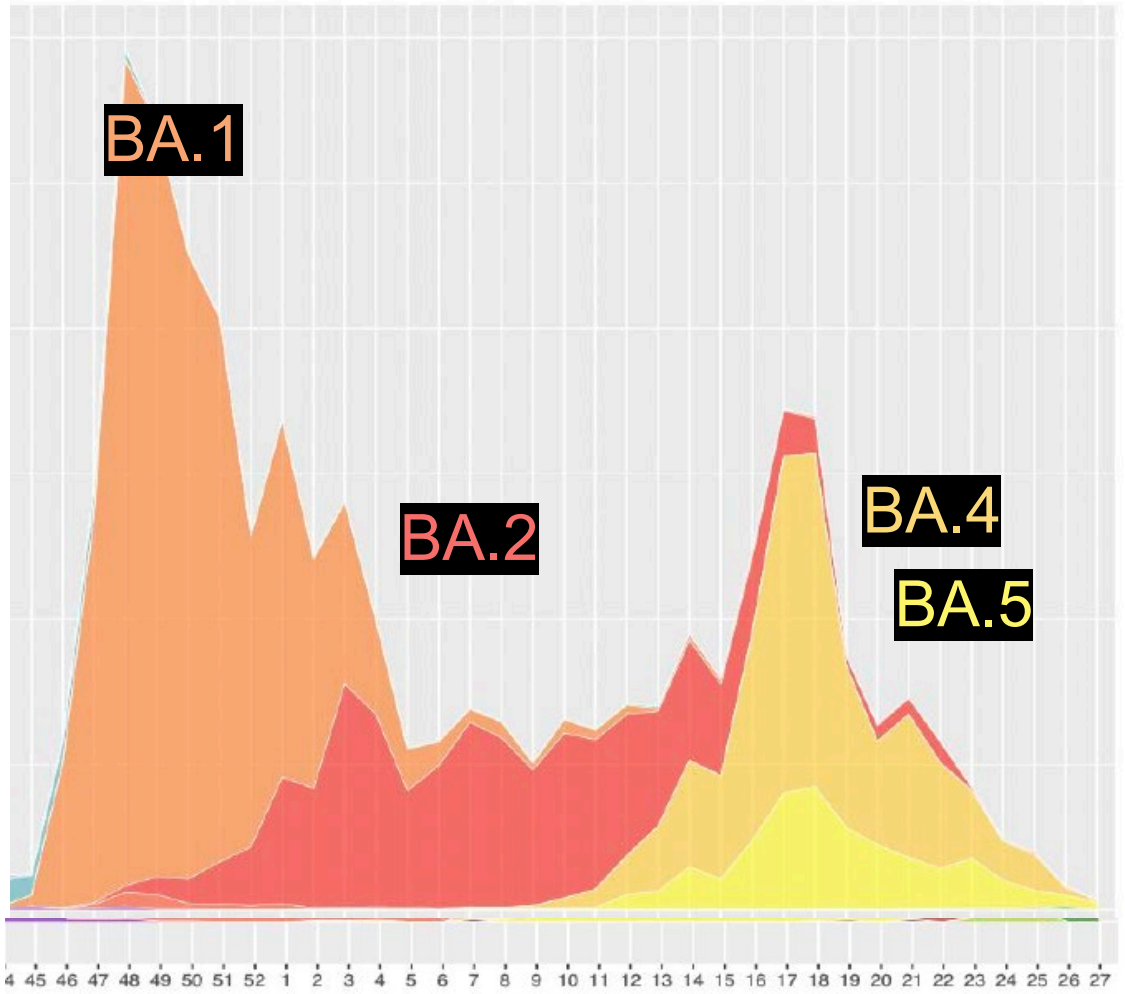
Tuekprakhon, Screaton et al, Cell 2022

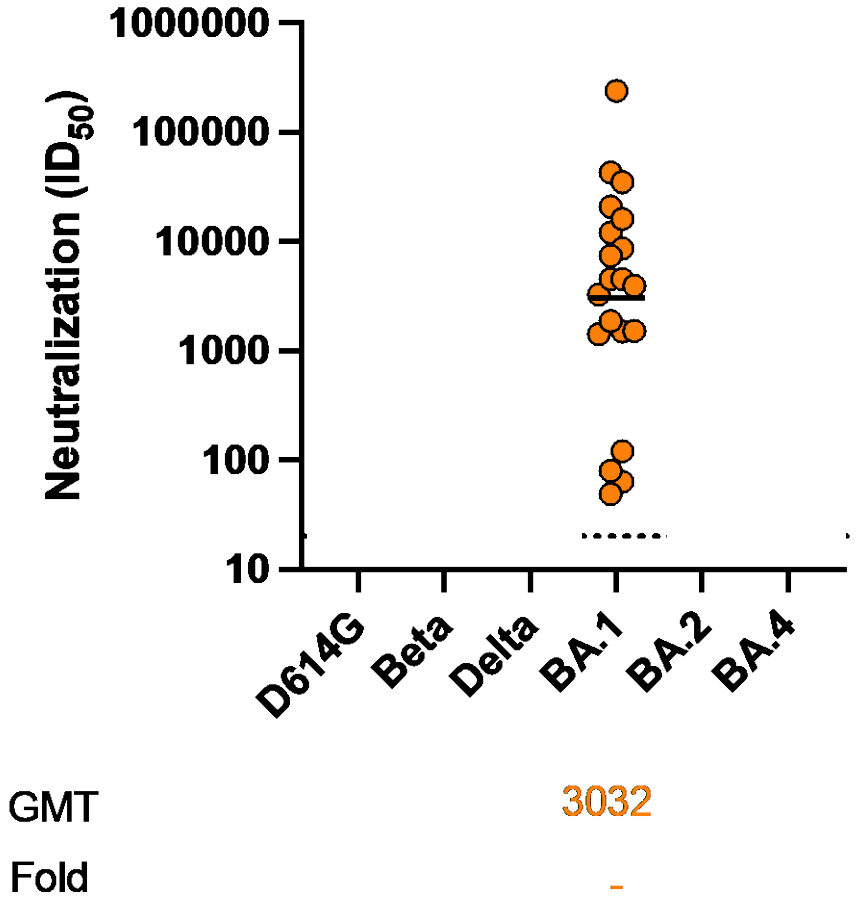
High level resistance of BA.4/5 to therapeutically relevant mAbs

	IC50 (µg/mL)					
	Pseudoviruses					
mAbs	Victoria	BA.1	BA.1.1	BA.2	BA.3	BA.4/5
REGN10987	0.002	10	10	0.616	10	10
REGN10933	0.001	10	10	10	10	10
AZD1061	0.002	0.308	10	0.008	0.019	0.015
AZD8895	0.001	0.246	0.1	1.333	10	10
AZD7442	0.001	0.232	0.806	0.008	0.065	0.065
ADG10	0.007	10	10	10	10	10
ADG20	0.003	0.348	0.253	10	10	10
ADG30	0.014	10	10	10	10	10
Ly-CoV-555	0.002	10	10	10	10	10
Ly-CoV16	0.014	10	10	10	10	10
S309	0.13	0.094	0.138	0.638	0.228	1.041

Tuekprakhon, Screaton et al, Cell 2022

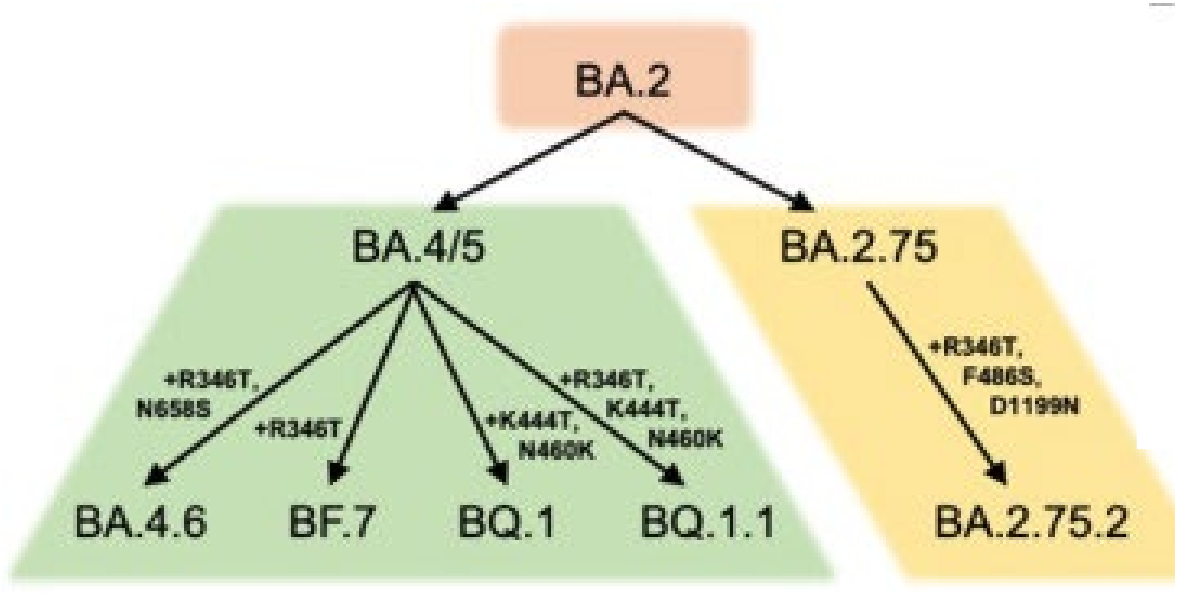
Omicron BA.1 triggered strain-specific responses, and was rapidly followed by a BA.4/5 wave



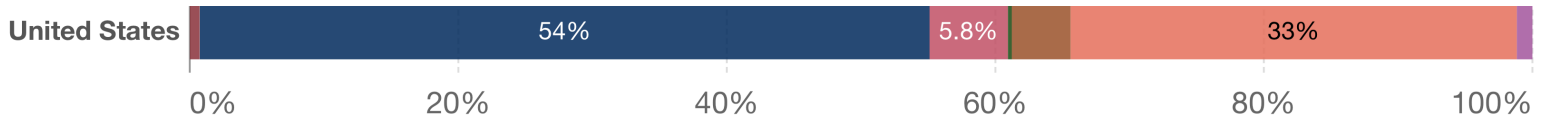


Simone Richardson, Penny Moore, Cell Host Microbe, 2022

Neutralization profile of Omicron BQ.1 and Omicron BA2.75, and their offspring



Panke Qu, Shan-Lu Liu et al, BioRxiv, 2022



Source: GISAID, via CoVariants.org – Last updated 25 November 2022 OurWorldInData.org/coronavirus • CC BY
Note: Recently-discovered or actively-monitored variants may be overrepresented, as suspected cases of these variants are likely to be sequenced preferentially or faster than other cases.

Omicron BA.5
Omicron BA.4**
Omicron BA2.75
Omicron BQ.1

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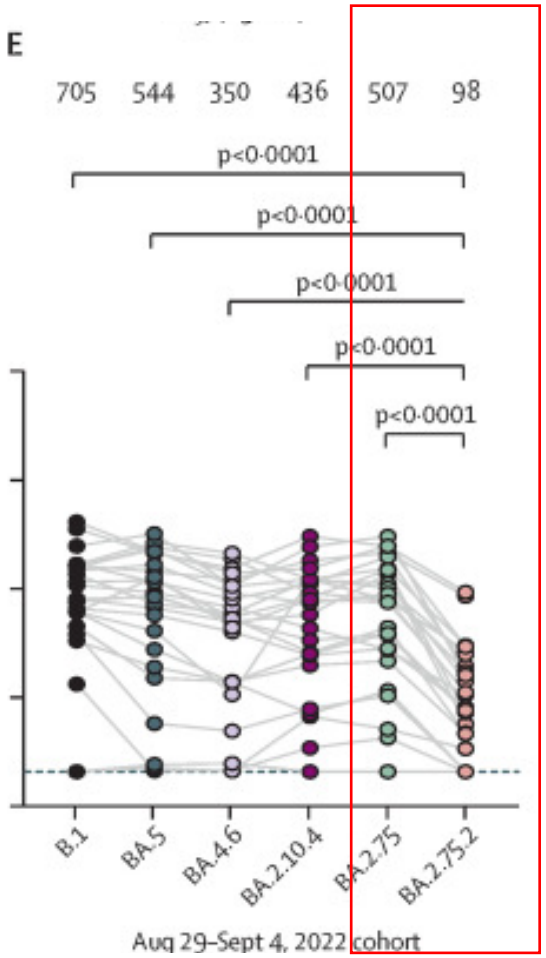

B

	B.1	BA.5	BA.4.6	BA.2.10.4	BA.2.75.2
Sotrovimab (S309)	119	559	925	560	442
Cilgavimab	12	71	>1000	168	>1000
Tixagevimab	4	>1000	>1000	>1000	>1000
Tixagevimab–cilgavimab combination	6	120	>1000	816	>1000
Bebtelovimab (LY-CoV1404)	4	1	2	3	2
Casirivimab (REGN10933)	14	>1000	>1000	>1000	>1000
Imdevimab (REGN10987)	10	>1000	>1000	>1000	>1000
Etesevimab (LY-CoV016)	29	>1000	>1000	>1000	>1000
Bamlanivimab (LY-CoV555)	9	>1000	>1000	>1000	>1000
Adintrevimab (ADG-20)	56	>1000	>1000	>1000	>1000
S2E12	4	>1000	>1000	>1000	>1000
S2K146	18	118	78	207	62
A23-58.1	6	>1000	>1000	>1000	>1000

Danny Sheward, Ben Murrell et al, Lancet Infectious Diseases, 2022

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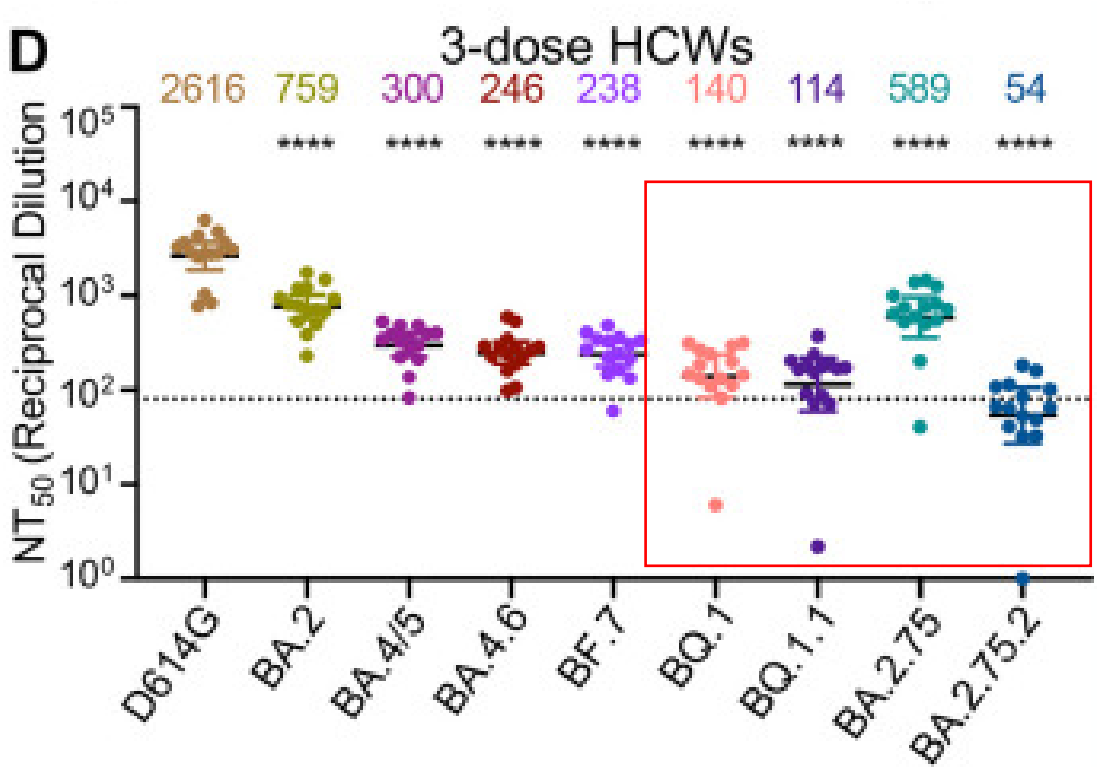
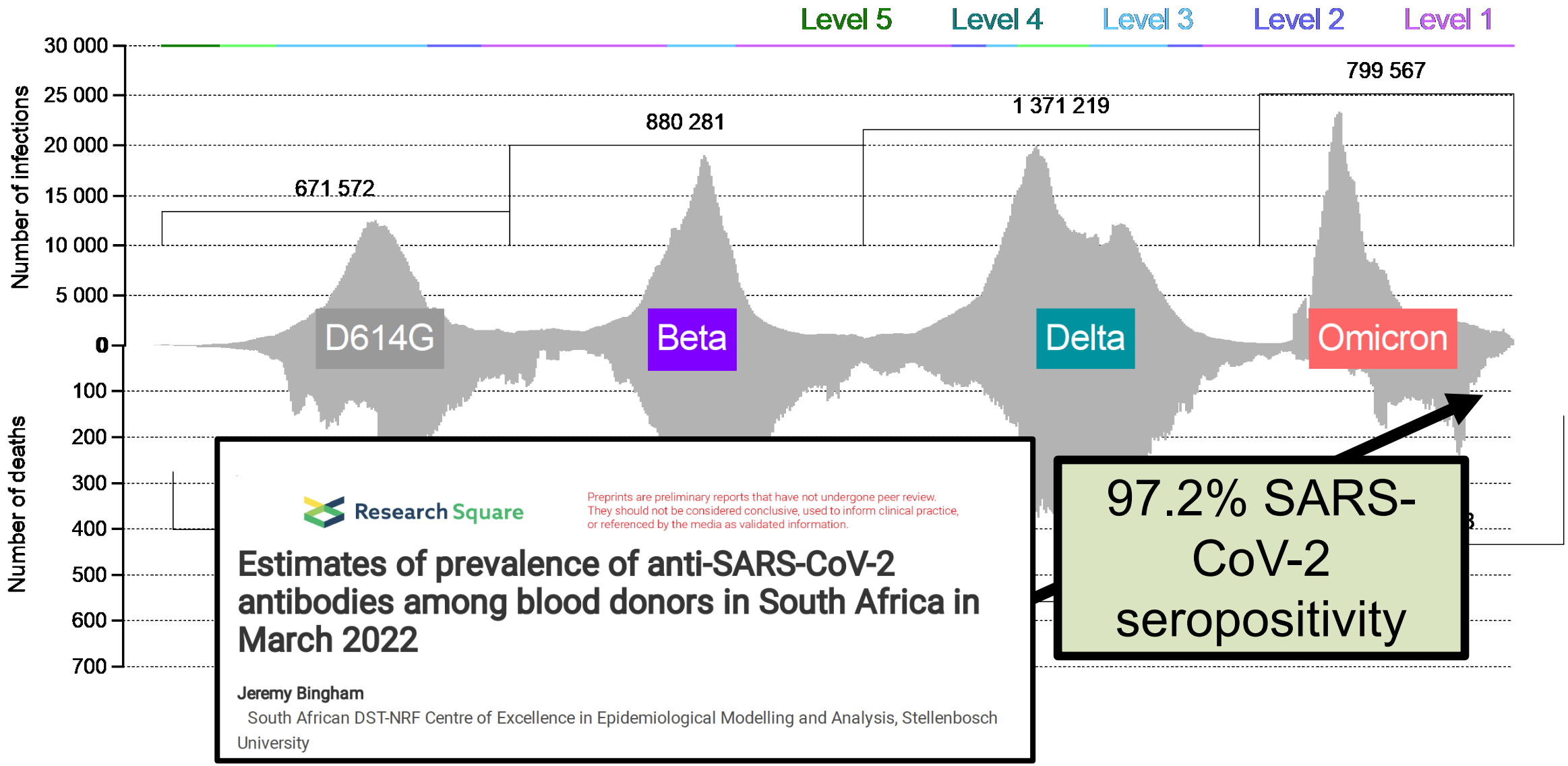


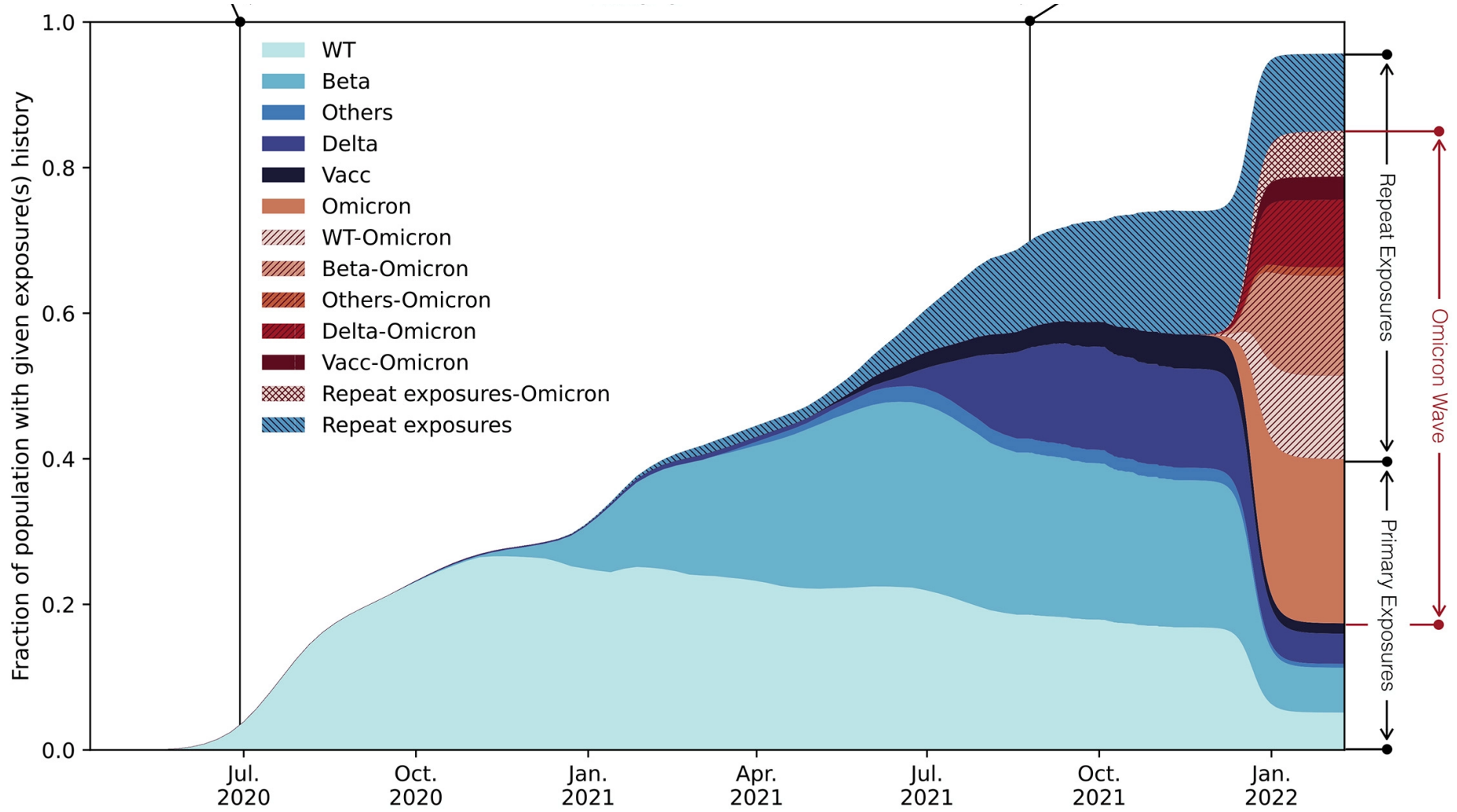
Panke Qu, Shan-Lu Liu et al, BioRxiv, 2022

South Africa's epidemic waves and variants…



Bingham et al, Research Square

However, its a very complex hybrid immune landscape



Sun, Cohen et al, STM, 2022

Decoupling of infections and hospitalizations

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Population Immunity and Covid-19 Severity with Omicron Variant in South Africa

Shabir A. Madhi, Ph.D., Gaurav Kwatra, Ph.D., Jonathan E. Myers, M.D., Waasila Jassat, M.Med., Nisha Dhar, Ph.D., Christian K. Mukendi, M.Sc., Amit J. Nana, B.Sc., Lucille Blumberg, M.Med., Richard Welch, B.Sc., Nicoletta Ngorima-Mabhena, M.B., Ch.B., and Portia C. Mutevedzi, Ph.D.

Few deaths in SA in the Omicron waves, due to high population immunity

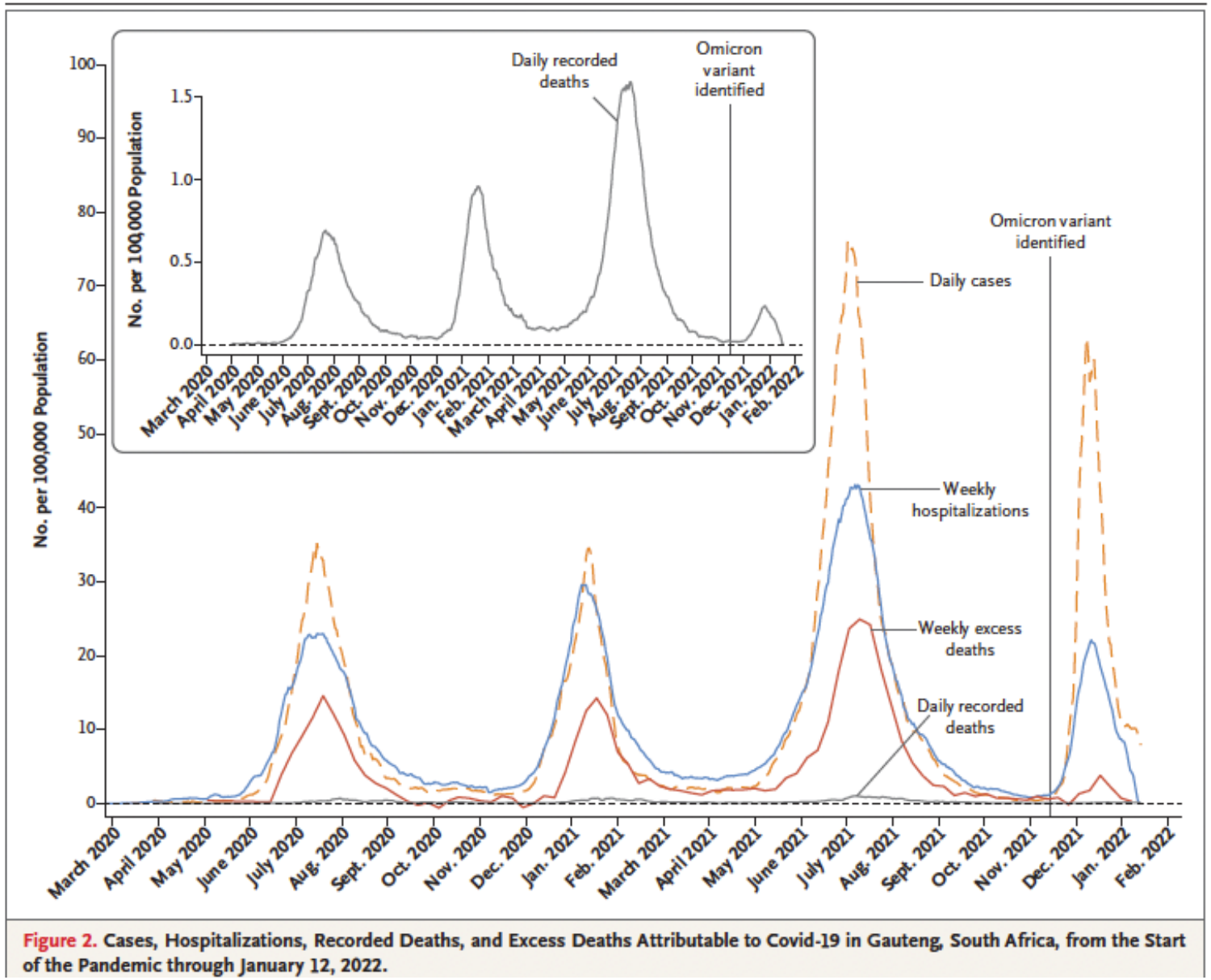


Figure 2. Cases, Hospitalizations, Recorded Deaths, and Excess Deaths Attributable to Covid-19 in Gauteng, South Africa, from the Start of the Pandemic through January 12, 2022.

Madhi, et al, NEJM, 2022
Moore and Baden, NEJM, 2022

Summary

- New variants continue to emerge, and there is local variation in which variant dominates
- This may be related to prior immune histories, as well as intrinsic virologic factors
- Emerging variants show high levels of neutralization escape, compromising mAb treatments
- However, population immunity is extremely high (mostly) and T cells and non-neutralizing antibodies remain resilient against emerging VOCs, reducing severity of clinical outcomes

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Michael Boswell
Veronica Ueckermann

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Patrick Arbuthnot

MRC
Glenda Gray
Linda-Gail Bekker

Malawi
Kondwani Jambo

SANBS
Marion Vermeulen
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