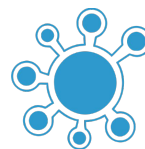# Understanding SARS-CoV-2 Omicron (B.1.1.529) Lineage Dynamics in South Africa
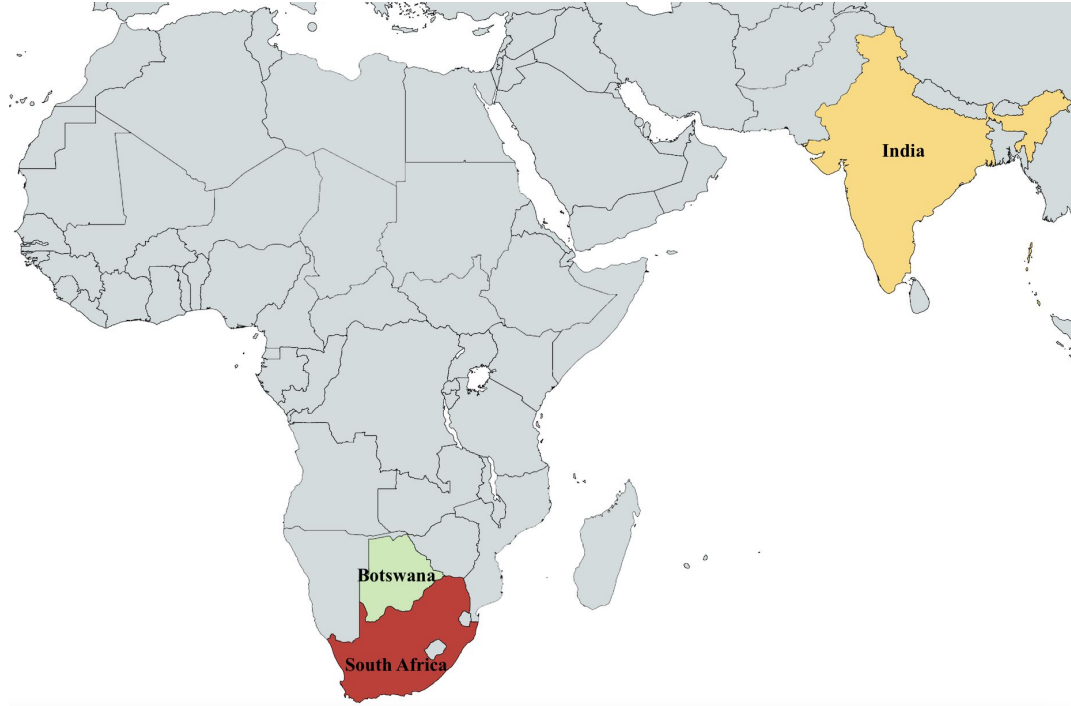
Carol Zhou
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Andersen Lab

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The Scripps Research Institute

Introduction

- The Omicron (B.1.1.529) variant of SARS-CoV-2 was first identified in November 2021 in South Africa [1].

- Being more transmissible than previous variants, Omicron soon spread around the world [2].

Goal

To understand the spread and evolution of Omicron in South Africa and help prevent future outbreaks, we analyzed data from...

Epidemiology

Geospatial Connectivity

Among South Africa, Botswana, and India

Phylogenetics

Methods

The epidemiological data for South Africa were analyzed using the Outbreak.info R package [3].

We analyzed geospatial and connectivity data across locations.

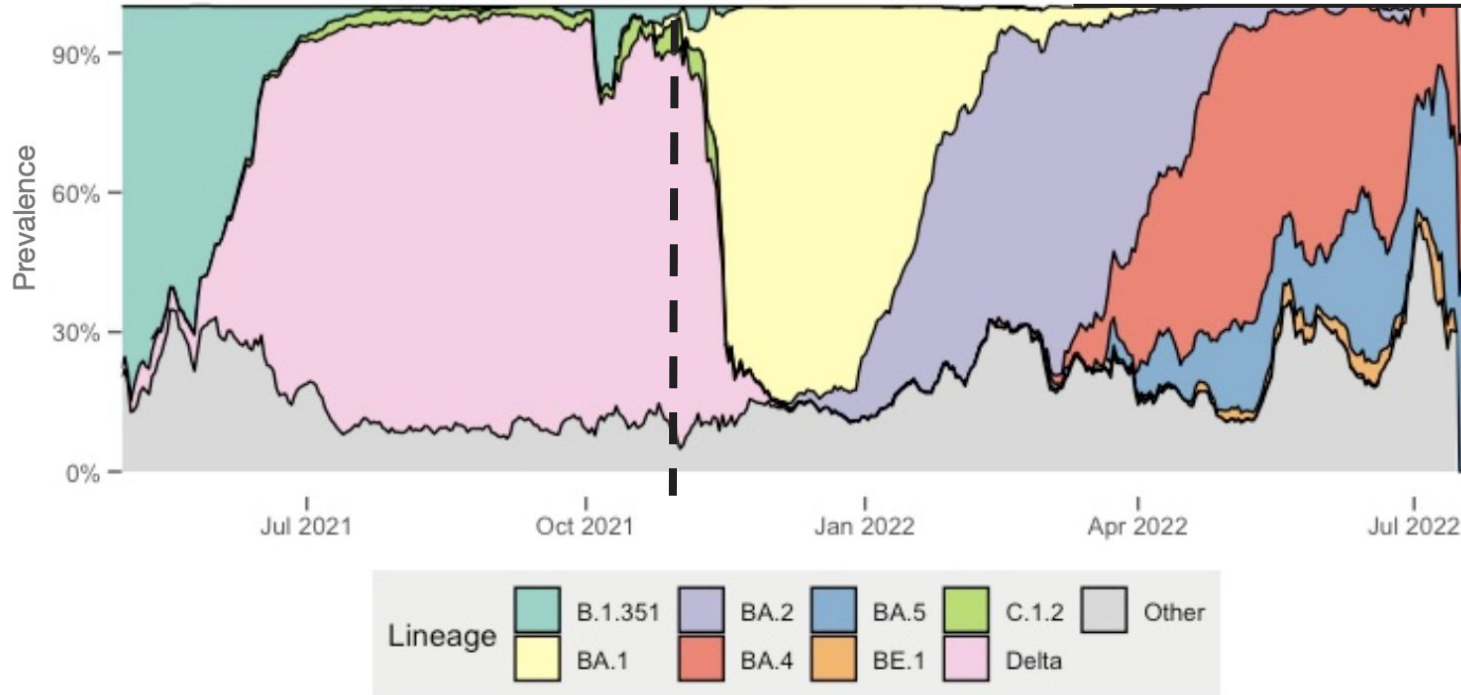A phylogenetic analysis using maximum likelihood tree inference was performed.

RESULTS

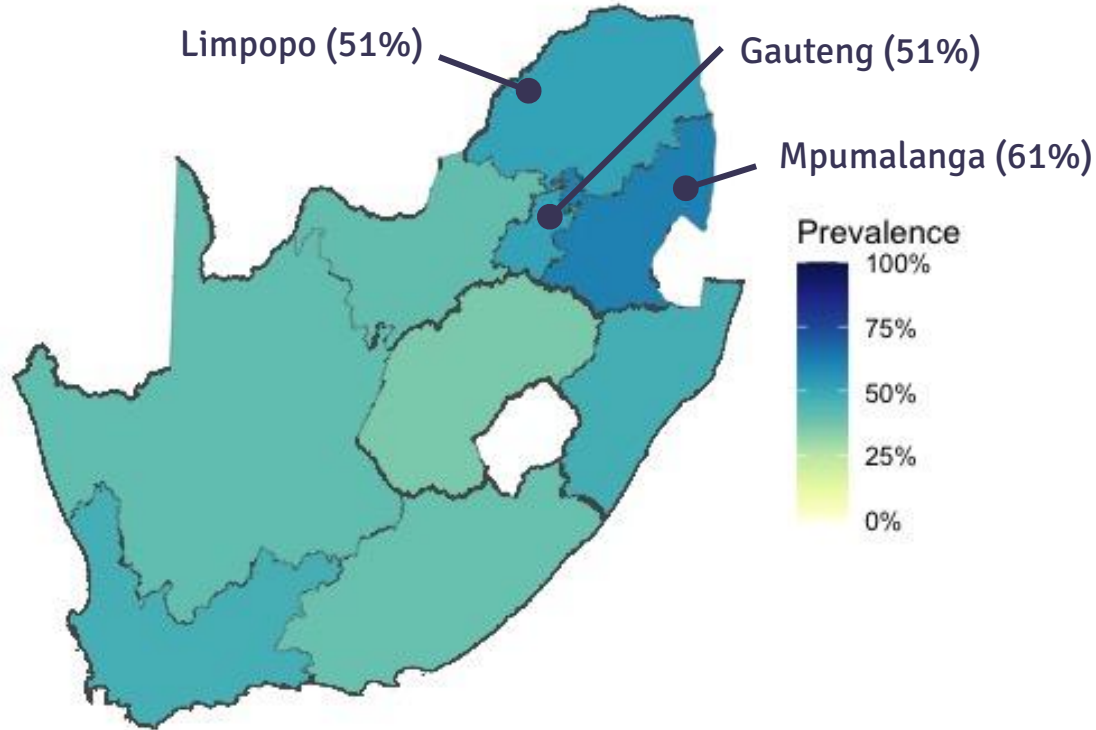# Daily Lineage Prevalence

This data was obtained from GISAID via the outbreak.info API

Estimated Omicron Lineage Prevalence

Limpopo (51%)

Gauteng (51%)

Mpumalanga (61%)

Prevalence
100%

75%

50%

25%

0%

This data was obtained from GISAID via the outbreak.info API

Social Connectedness Index (SCI)

< 1x (Country 20th percentile)   1-2x   2-3x   3-5x   5-10x   10-25x   25-100x   >= 100x   NA
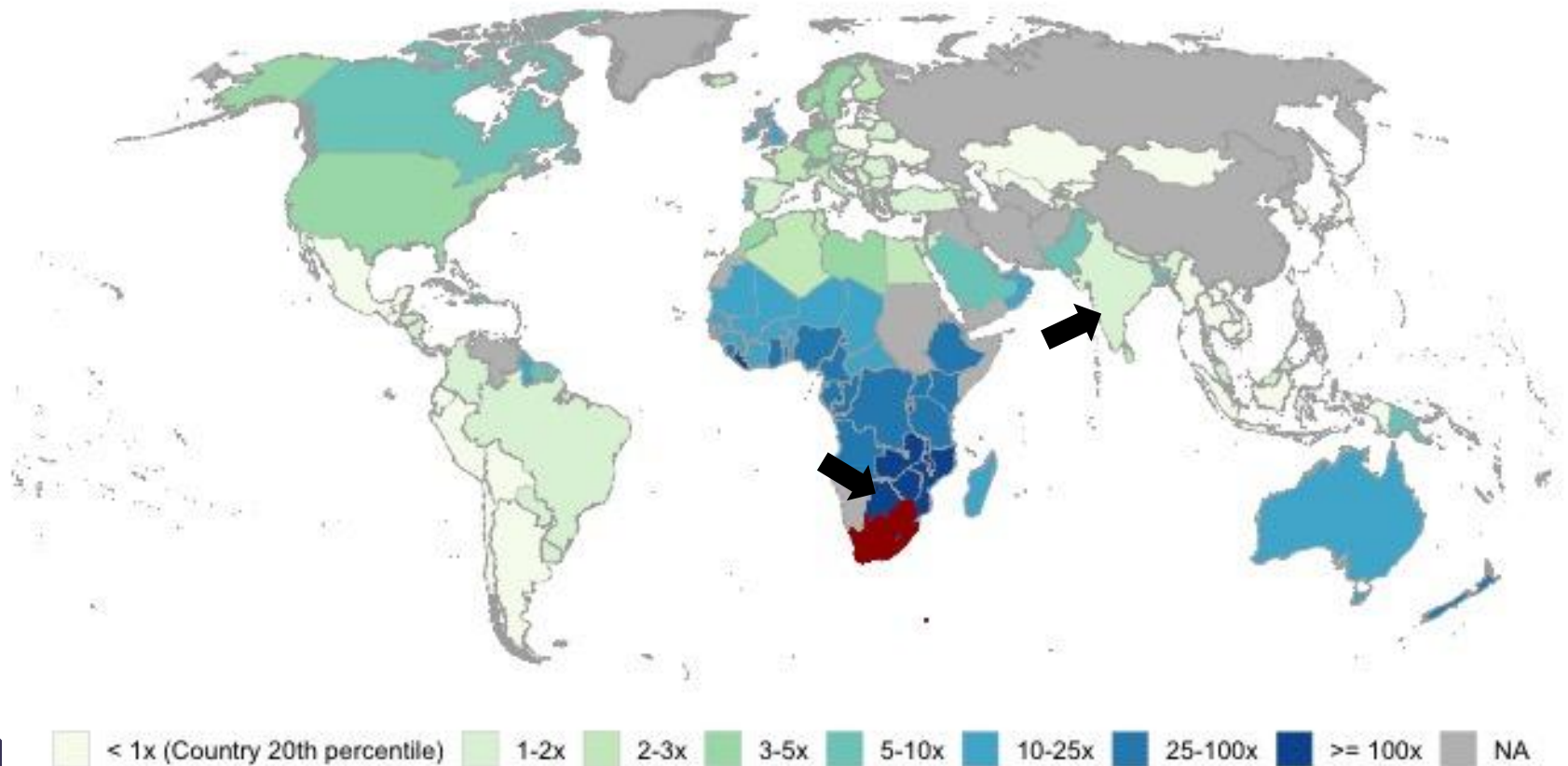
Top 5 Export and Import Partners in 2019

Country	Exporter	Partner Share (%)	Importer	Partner Share (%)
South Africa	China	18.47%	China	10.73%
	Germany	9.87%	Germany	8.01%
	United States	6.57%	United States	7%
	India	4.91%	Unspecified	5.59%
	Saudi Arabia	4.15%	United Kingdom	5.24%
Botswana	South Africa	57.93%	India	21.60%
	Namibia	7.94%	Belgium	19.59%
	Canada	6.92%	United Arab Emirates	18.19%
	India	4.11%	South Africa	9.61%
	Belgium	3.29%	Israel	7.14%
India	China	14.28%	United States	16.79%
	United States	7.29%	United Arab Emirates	9.14%
	United Arab Emirates	6.33%	China	5.35%
	Saudi Arabia	5.64%	Hong Kong, China	3.55%
	Iraq	4.61%	Singapore	3.32%

This data was obtained from the World Integrated Trade Solution website
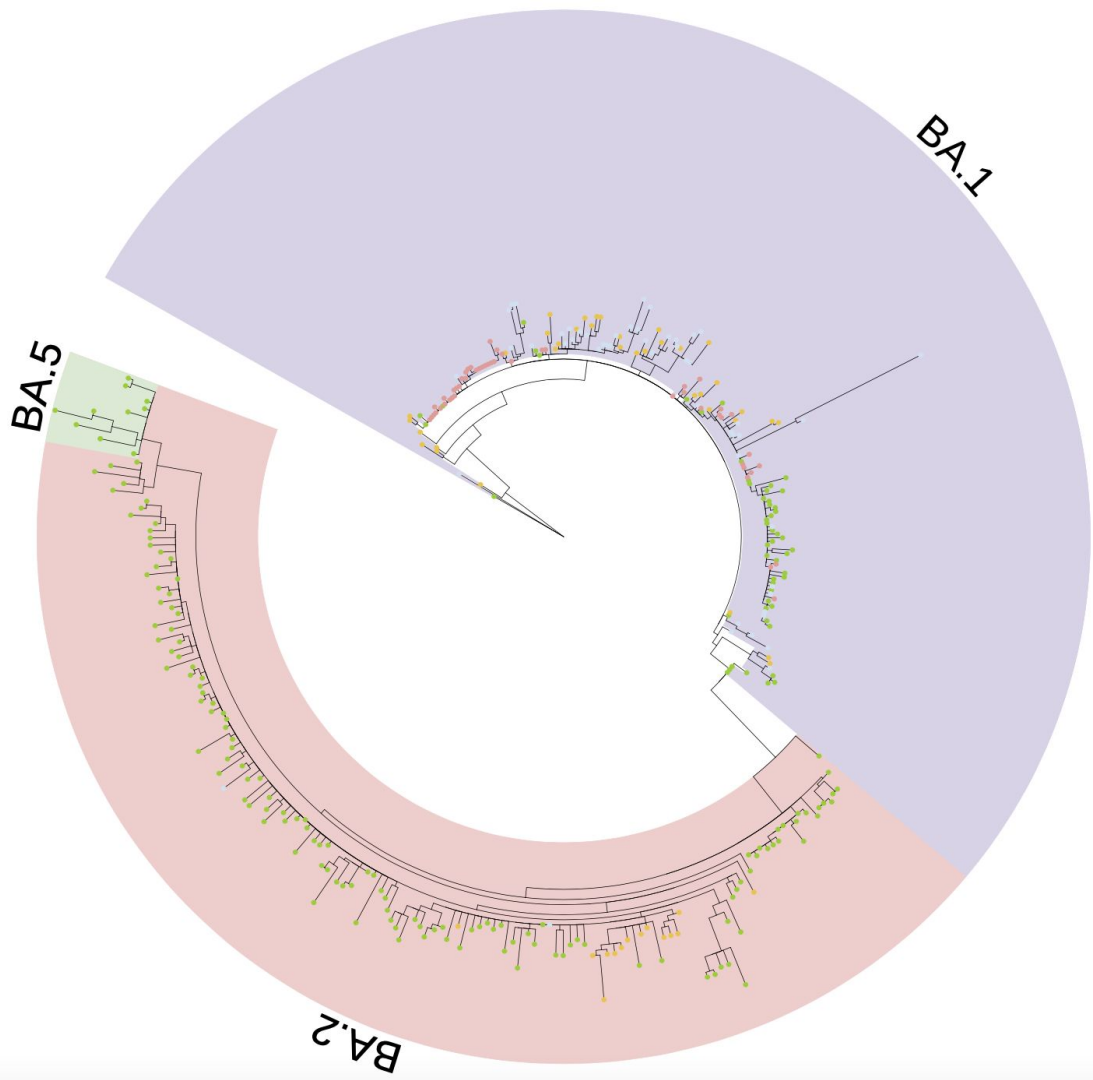
Phylogenetic Analysis

Tree scale: 0.001

Colored ranges
- BA.1
- BA.2
- BA.5

Countries
- South Africa
- Botswana
- India
- Elsewhere

BA.1

BA.5

BA.2

Conclusion

- Omicron quickly swept through South Africa, and Mpumalanga, Gauteng, and Limpopo were primarily hit.

- Trade data indicate strong relationships across all three countries.

- Phylogenetic analysis gives us insights into the early evolutionary history of Omicron.

References

[1] "Omicron Variant: What You Need to Know." Centers for Disease Control and Prevention, Centers for Disease Control and Prevention, https://www.cdc.gov/coronavirus/2019-ncov/variants/omicron-variant.html.

[2] Petersen, Eskild et al. "Emergence of new SARS-CoV-2 Variant of Concern Omicron (B.1.1.529) - highlights Africa's research capabilities, but exposes major knowledge gaps, inequities of vaccine distribution, inadequacies in global COVID-19 response and control efforts." International journal of infectious diseases : IJID : official publication of the International Society for Infectious Diseases vol. 114 (2022): 268-272. doi:10.1016/j.ijid.2021.11.040

[3] Ginger Tsueng, Julia L. Mullen, Manar Alkuzweny, Marco Cano, Benjamin Rush, Emily Haag, Outbreak Curators, Alaa Abdel Latif, Xinghua Zhou, Zhongchao Qian, Emory Hufbauer, Mark Zeller, Kristian G. Andersen, Chunlei Wu, Andrew I. Su, Karthik Gangavarapu, Laura D. Hughes. Outbreak.info Research Library: A standardized, searchable platform to discover and explore COVID-19 resources. bioRxiv 2022.01.20.477133, doi: https://doi.org/10.1101/2022.01.20.477133

[4] Bailey, Michael, Rachel Cao, Theresa Kuchler, Johannes Stroebel, and Arlene Wong. 2018. "Social Connectedness: Measurement, Determinants, and Effects." Journal of Economic Perspectives, 32 (3): 259-80.

[5] Li, Z., Huang, X., Ye, X. et al. Measuring global multi-scale place connectivity using geotagged social media data. Sci Rep 11, 14694 (2021). https://doi.org/10.1038/ s41598-021-94300-7
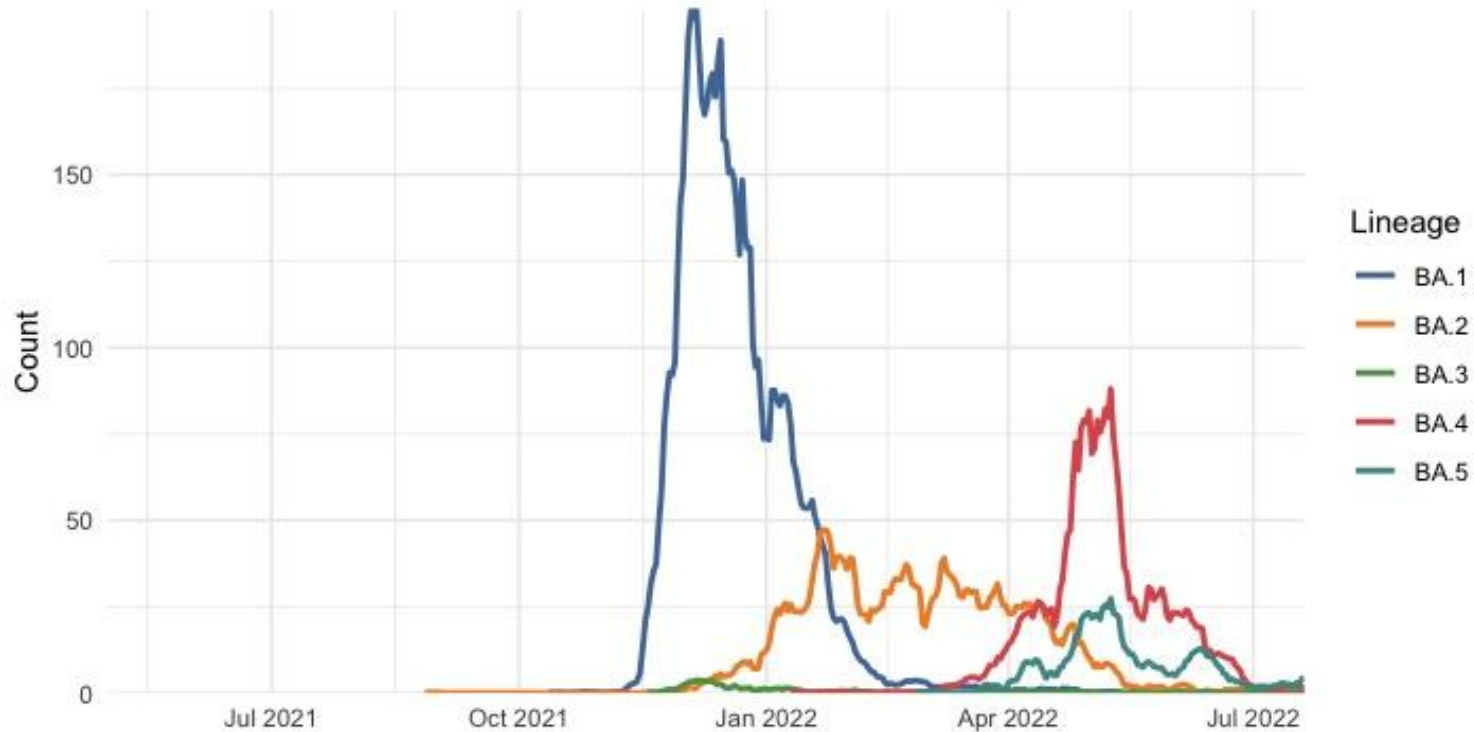
Daily COVID-19 Cases and Deaths

Omicron first detected
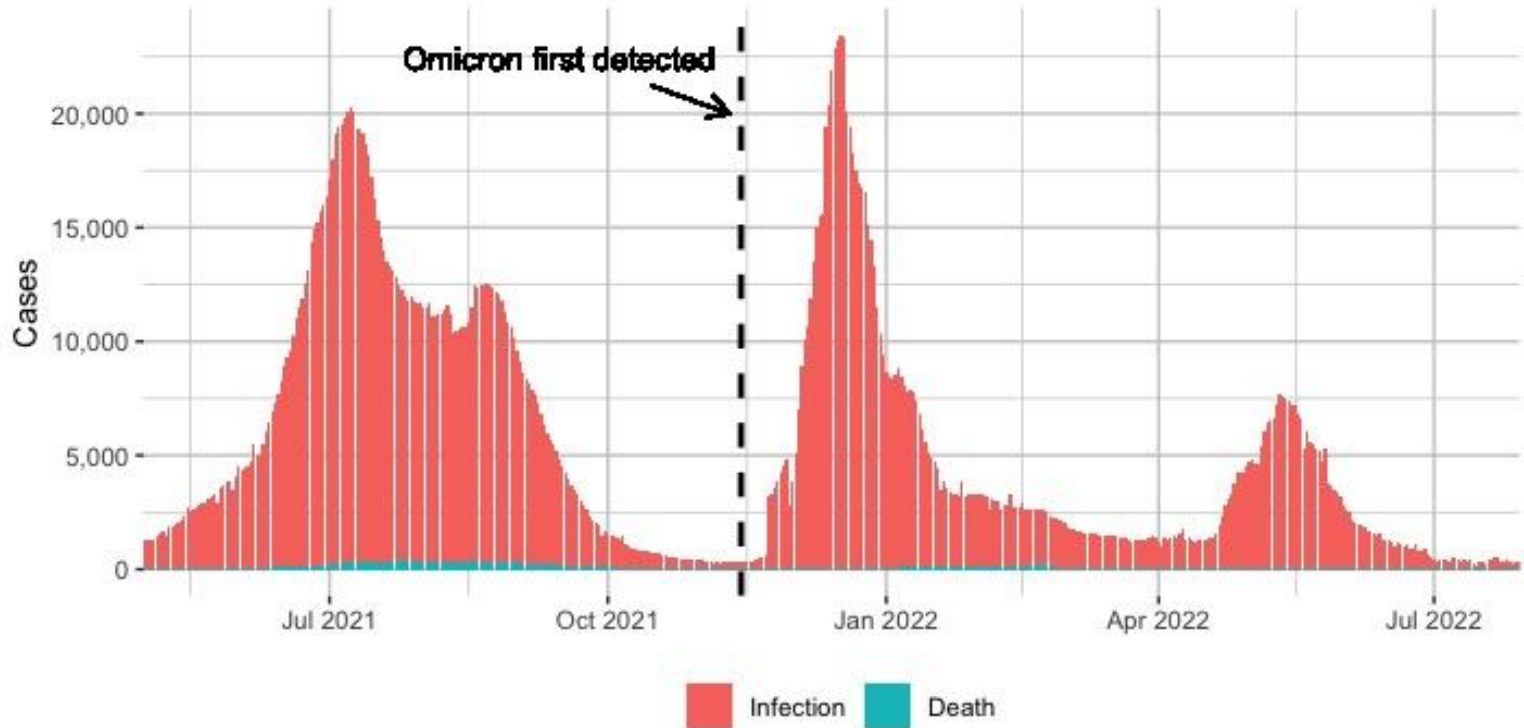
This data was obtained from JHU CSSE COVID-19 Data via the outbreak.info API

Daily Omicron Lineage Count

This data was obtained from GISAID via the outbreak.info API