COVID–19 Weekly Report

Prepared for the IFPMA

12 April 2022

Contents

→ Efficacy update

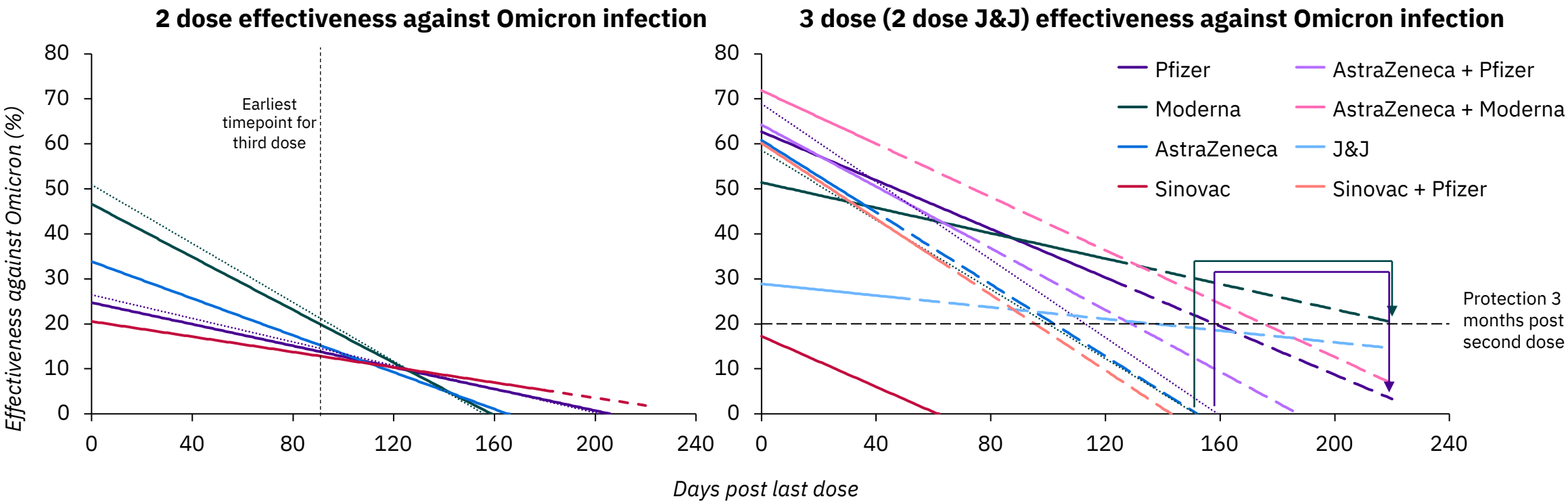
New data shows Sinovac and J&J start at lower effectiveness against Omicron infection than other vaccines

Airfinity estimates of protection against Omicron infection over time

This week data on the duration of protection against Omicron infection was released for Sinovac, Sinovac+Pfizer and 2 doses of J&J. Due to only having 1 study each, caution should be used when interpreting results compared to other vaccines, especially 2 doses of Sinovac. Nevertheless, both vaccines appear to start at a lower level of protection than other vaccines and wane to a similar degree. 2 doses of J&J did appear to show more modest waning compared to other vaccines, however, given the relatively short follow up period, further data, at a longer time post second dose, is needed to confirm any such trend. In addition to new data for Sinovac and J&J, there was also data for 3 doses of Pfizer and Moderna suggesting greater durability for both.

Limitations:

- → Relatively few studies, especially for Sinovac and J&J.
- → Model assumes decay is linear.
- → 3 dose decay extrapolated beyond last data point due to lack of data points at longer time periods post dose.
- → Confidence intervals not plotted (please see platform for CI).
- → Lower confidence intervals for Sinovac 2 doses <0% at all timepoints.



Dotted lines show prior week (if changed)

Dashed lines show extrapolation beyond final data point

Data and visualisations: Airfinity

Increased protection against infection from fourth dose wanes within ~2 months

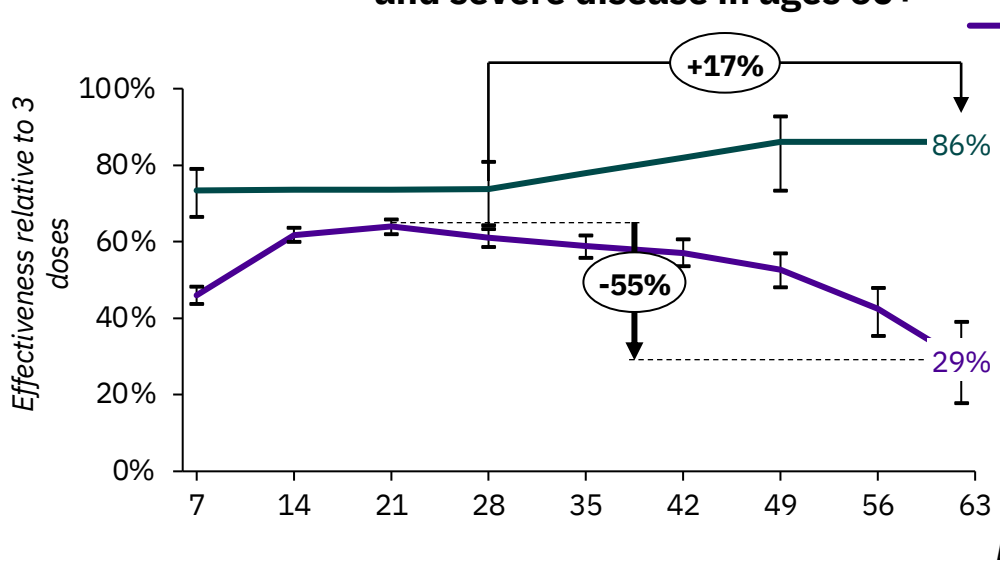
Overview of recent Israel fourth dose effectiveness data

Data on the effectiveness of a fourth dose from Israel suggests a second booster dose increases protection against both severe disease and infection, however, protection against the former is increased more substantially. In addition to this lower initial impact, two recent studies also suggest that the increased protection, relative to 3 doses, against infection wanes significantly within two months, to a relative VE of 29% in one study and to no significant reduction in infections in the other. In contrast, protection against hospitalisation remained stable in both studies, albeit with greater uncertainty around estimates. This relatively small and short-lived impact on increasing protection against infection, compared to severe disease, suggests a fourth dose is likely to have limited utility in populations at low risk of severe COVID-19.

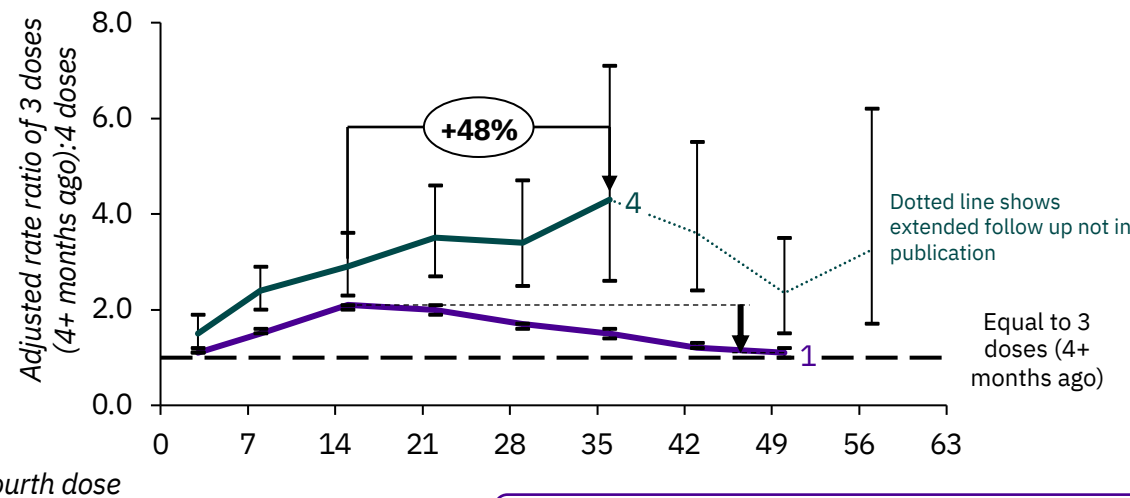
Limitations:

- → Studies restricted to over 60s, may not be applicable to overall population.
- → Both studies adjusted for confounders but residual biases could remain.
- → Lower incidence of severe outcomes results in greater uncertainty over estimates compared to infection, as evidenced by wider confidence intervals.
- → NEJM study had shorter follow up for severe disease – data beyond day 35 taken from non-peer reviewed further follow up by Israel Ministry of Health.

Relative effectiveness of a fourth dose against infection and severe disease in ages 60+



Relative rate ratios of severe disease and infection in 3 and 4 dose vaccinees aged 60+



Data: Preprint (left), NEJM study + Israel Ministry of Health (right)
Visualisations: Airfinity

→ Alternative surveillance systems may be required to monitor COVID-19 risk long-term

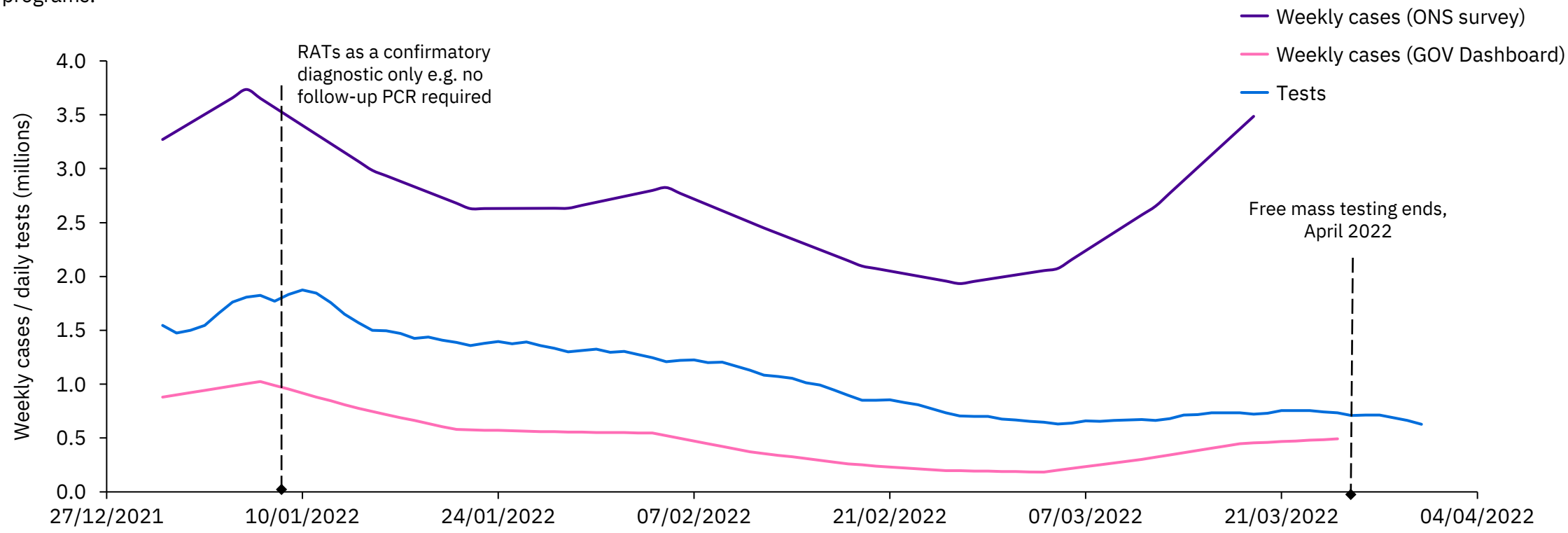
Reduced testing in England has led to an under estimation of cases

Testing and case rate data in England, January-April 2022

Testing in England has gradually declined since January 2022, culminating in free testing being ended in England for most of the population in April 2022. Testing will now only take place in certain healthcare settings and for those classified as clinically vulnerable. This reduction in testing has meant that daily reported case numbers are less reliable and are an under estimation of true prevalence. This is highlighted by comparing reported case rates to weekly cases estimated by the ONS Infection Survey, which uses random sampling to estimate cases. In contrast to cases reported from mass testing, the Infection Survey data shows that cases are at a record high in England. This highlights the importance of ongoing surveillance following the cessation of mass testing programs.

Limitations:

- → Confidence intervals for weekly case estimates not included in plot.
- → Reported testing numbers only, real value likely to be higher due to under-reporting.



Data: COVID-19 Infection Survey, UK Gov dashboard
Visualisations: Airfinity

Random sampling studies can estimate population infection levels using much smaller testing volumes

COVID-19 Infection Survey methodology and data

As most free testing in England has now ended, the only way to monitor infection levels in the population is through surveillance studies. The UK COVID-19 infection survey, run by the Office of National Statistics (ONS) since April 2020, aims to determine how many people in the UK would test positive for a COVID-19 infection at a given point in time, regardless of whether they report experiencing symptoms. Through random sampling of the population, an accurate estimate of infection levels can be obtained without the ongoing cost of mass testing . However, such data will always lag ~7-14 days behind actual cases rises. This would delay any public health response that might be required in the event of a sudden wave of cases and hospitalisations.

Limitations:

- → Studies are based on samples, which may not be representative of entire population.
- → Studies take longer to perform and are therefore not as real-time as national diagnostic testing.

Study design

- → 273,505 Households registered for survey (31 Jan 2022).
- → Children over the age of 2 years, adolescents and adults eligible to take part.
- → Target of 150,000 nose and throat swab samples every 2 weeks and 125,500 blood sample every month.

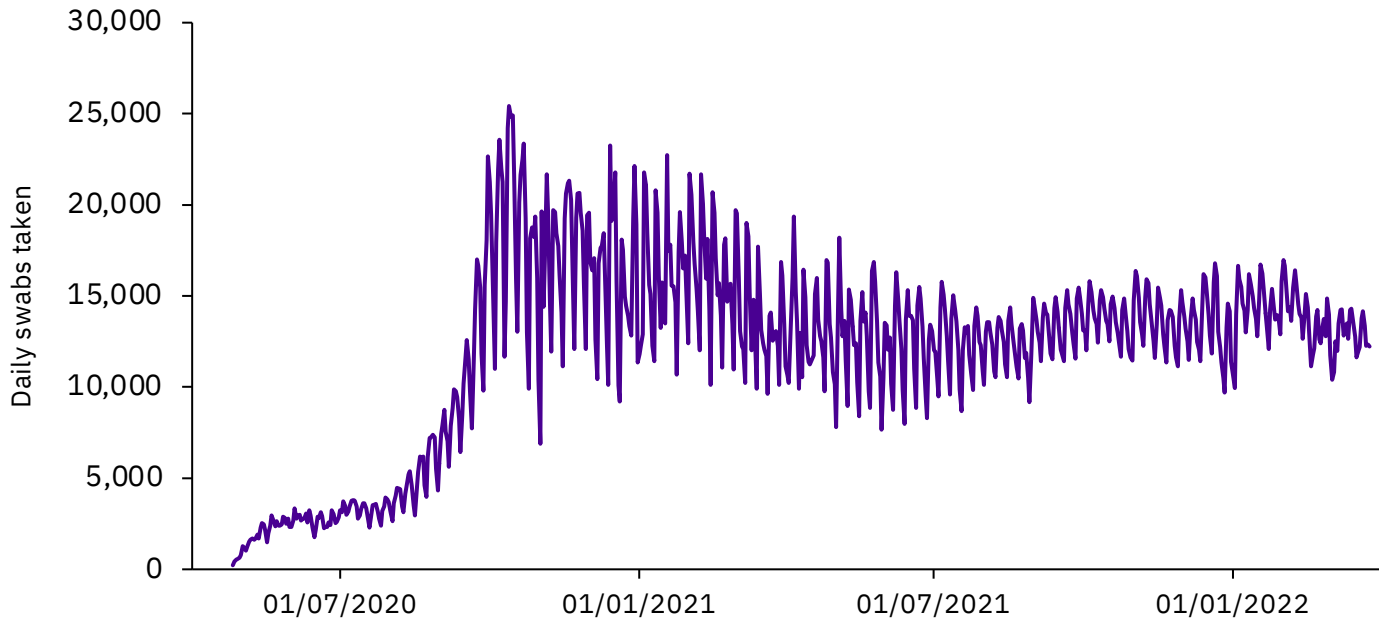
Testing

- → Swab samples tested for SARS-CoV-2 using RT-PCR tests.
- → Each positive test is sequenced by whole genome sequencing to determine variant.
- → Blood samples are tested by ELISA to detect SARS-CoV-2 specific antibodies.

Data analysis and reporting

- → Several different modelling techniques are used to estimate the number of people testing positive for SARS-CoV-2 and antibody positivity in the population.
- → These results can be stratified by age and region.

Approximately 15,000 samples per day are taken and analysed for the COVID-19 Infection Survey to generate an estimate of infection levels. At the peak of mass testing in the UK, over 600,000 daily PCR tests were being performed.



Data: COVID-19 Infection Survey
Visualisations: Airfinity

Wastewater surveillance can provide an early indication of rising infection rates without mass testing

Analysis of Denmark's wastewater surveillance program

SARS-CoV-2 can be found in the faeces of approximately 50% of infected persons, thus making wastewater a viable sample for surveillance of the virus. Many countries have developed wastewater surveillance programs that track viral RNA concentration. Denmark has reported wastewater measurements since July 2021; in this time, viral concentration in wastewater has correlated with infection levels determined by mass testing and with hospitalisation rates. As wastewater testing requires fewer resources than mass testing or surveillance through random sampling, it has been suggested as a good surveillance strategy for lower income countries. However, sampling and data analysis methodology are still developing. Wastewater is an inherently variable material and so there must be a robust process for normalising data so that changes over time can be reliably detected.

Limitations:

- → Does not count infection numbers but show increases in prevalence.
- → Studies take longer to perform and are therefore not as real-time as national diagnostic testing.

Wastewater testing process in Denmark

Sample collection

- → Samples auto-collected from 198 treatment plants across Denmark.
- → Four Airports also included in monitoring for variant analysis.

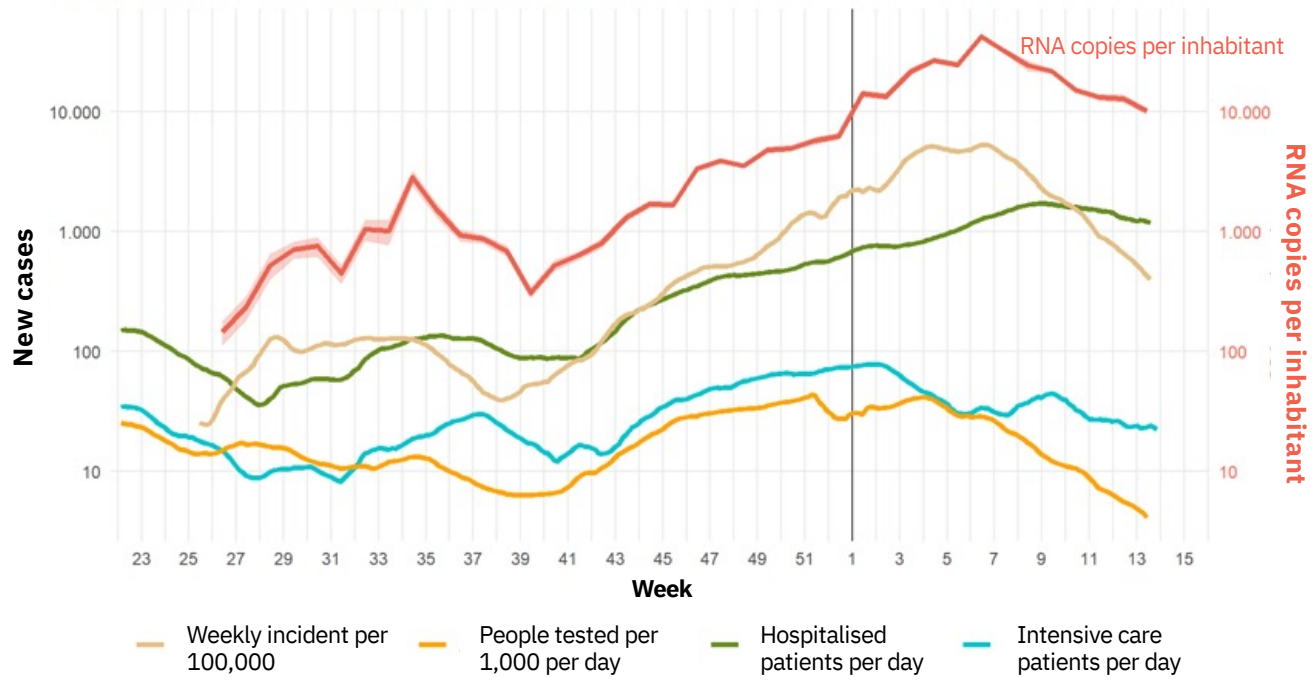
Testing

- → Samples processed and analysed by RT-PCR within 24 hours of collection.
- → Positive samples are sequenced to determine SARS-CoV-2 variant.

Data analysis and reporting

- → Data are normalized to account for variance in water flow (e.g. if high levels of rainwater).
- → Result reported as average number of/ RNA copies per L of wastewater over a week.
- → Cannot infer how many people are infected, but provides an early warning of a sudden rise in viral RNA.

Occurrence of SARS-CoV-2 in wastewater closely matches weekly incidence as determined by mass testing in Denmark 2021-22



Data & Visualisation: Statens Serum Institut (adapted by Airfinity)

Wastewater surveillance can provide an early indication of rising infection rates without mass testing

Wastewater surveillance of COVID-19

64 countries have sites that monitor COVID-19 using wastewater across over 3,000 sites, however only 15 countries have comprehensive coverage of sampling sites.

Limitations:

→ Based on countries reporting data publicly.
→ Some countries have very few site, which may not give true reflection for the country.

Countries

64

Last update: 4 minutes ago

Sites

3,393

Data & Visualisation: Statens Serum Institut (adapted by Airfinity)

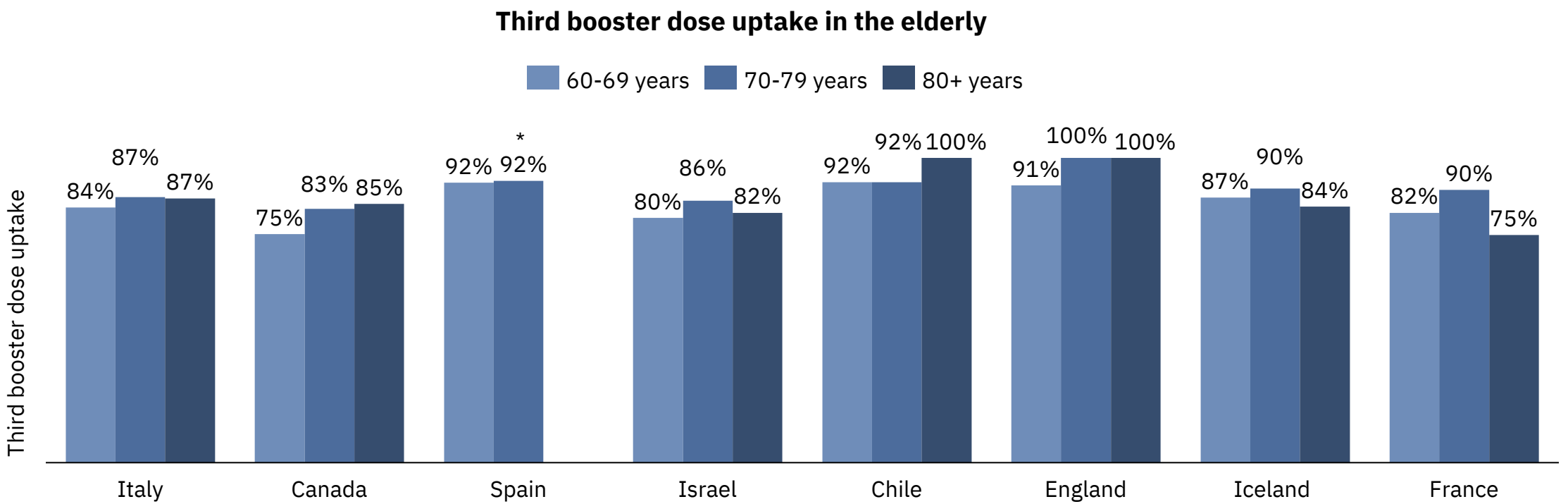
→ Uptake in the Elderly and Children

Third booster dose uptake in the elderly populations is over 75% in most high-income countries

Third dose uptake in the elderly

In countries in which boosters have been widely available for at least four months, third booster dose uptake in the elderly populations is over ~75%. Although third dose coverage in this group is very high, it is slightly lower (~10%) than second dose coverage. Currently, most of these countries are now offering fourth doses to some individuals within these populations. Among over 60s in Israel and Chile, for whom a fourth dose has been available for at least ~2 months, the uptake of a fourth dose is ~50% less than that of a third dose. While this data may be more preliminary than data for third dose uptake, this potentially suggests the uptake of a fourth dose could be significantly less than a third dose and further supports a trend of diminishing uptake with each additional dose.

Limitations:
→ Publicly available information.
→ Some of the values are estimates.



* Over 70

Data: Iceland, Italy, Canada, Spain, Israel, Chile, England, France
Visualisations: Airfinity

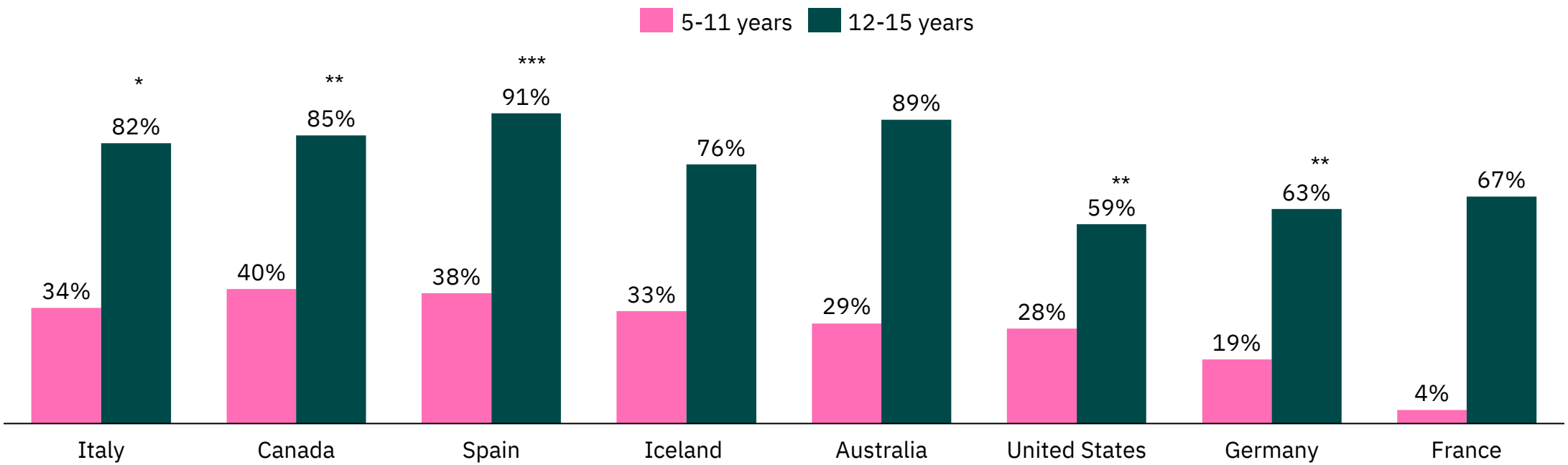
Full vaccination of 5-11 year olds has plateaued at ~20-40% in several countries

Vaccinations in under 18 years old

This week, the US has announced they will donate more than 100 million children's doses to poorer countries. Although vaccination coverage in people over 12 is very high in most high income countries (> 60%), vaccine uptake in 5-11 year olds has plateaued in many of them. While in January 2022, the uptake in 5-11 year olds increased following the rise of Omicron cases, it has now plateaued (~20%-40%) in most countries. Some of the reasons behind this include the relatively low risk for children 5-11 years old developing severe COVID-19 disease, as well as the low vaccine effectiveness against Omicron infection recently released by some studies.

Limitations:
→ Publicly available information.
→ Some of the values are estimates.

Percentage of children and adolescents fully vaccinated



* 12-18 years ** 12-17 years *** 12-19 years

Data: Iceland, Italy, Canada, Spain, Israel, Chile, France, Australia, Germany
Visualisations: Airfinity

- → USA is not seeing a BA.2 driven wave on a national scale, however some North Eastern states are beginning to see an incline
- → A BA.2 surge may lead to high cases and hospitalisations in the USA, due to a decline in people protected against Omicron infection

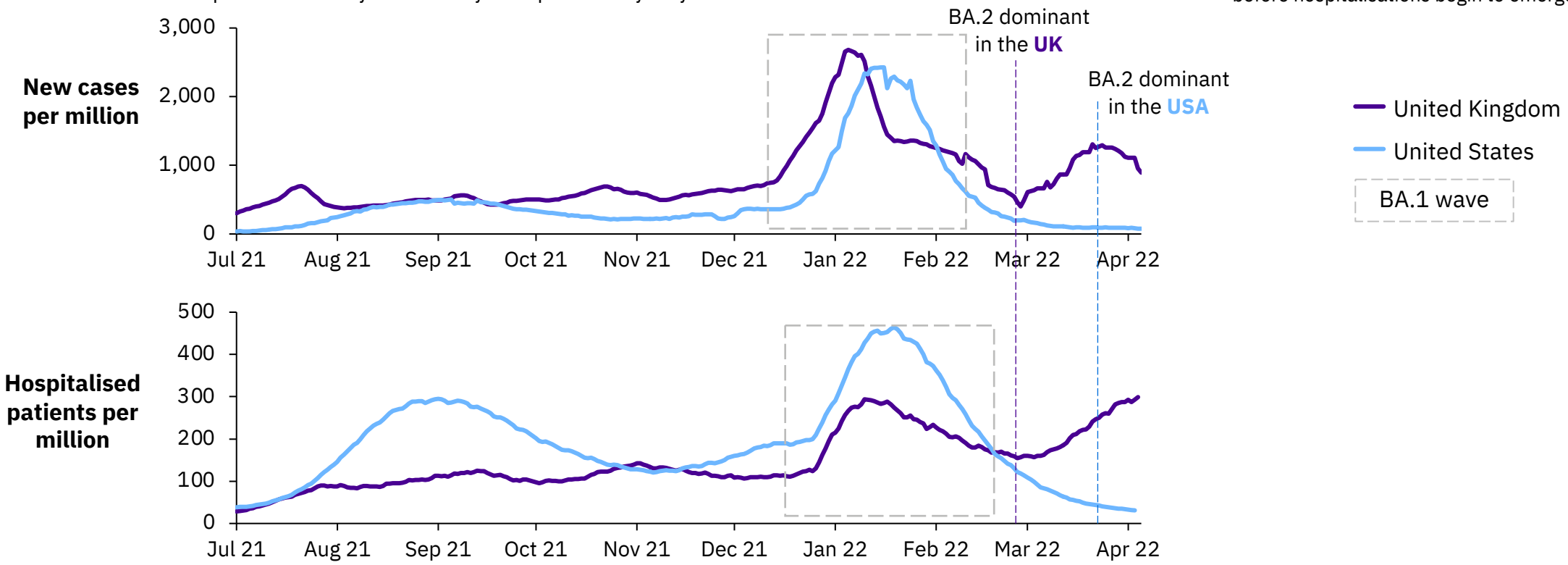
Despite BA.2 dominance, the US is not seeing a new wave of infections or hospitalisations so far

Overview of cases and hospitalisations in the US and UK during BA.1 and BA.2 prevalence

Following Omicron sublineage BA.2 becoming most prevalent in the UK and other European countries, both cases and hospitalisations began to rise, likely due to BA.2 being more infectious than BA.1, waning immunity, easing of stringency, and Omicron's inherent ability to reinfect. BA.2 has recently become the most prevalent variant in the United States, making up around 72% of current cases, and although cases are expected to rise similar to what has been seen in the UK, this has yet to be the case on the national level. As BA.2 continues to increase in the USA, it is possible we will see cases begin to climb nationally in coming days or weeks, and if that rise mirrors what is seen in the UK, it would take ~22 days for cases to peak, which could mean the USA will see its peak in cases by the last days of April or early May.

Limitations:

- → Case rates are reliant on testing which has seen a decline since the BA.1 wave in the US and UK.
- → Sequencing in limited in the United States, timing of true BA.2 dominance may vary.
- → Although hospitalisations have continued to decrease in the USA, there is an expected delay before hospitalisations begin to emerge.



Data: CDC, Sanger OWID
Visualisation: Airfinity

States with the highest BA.2 prevalence in the North East are seeing small case increases

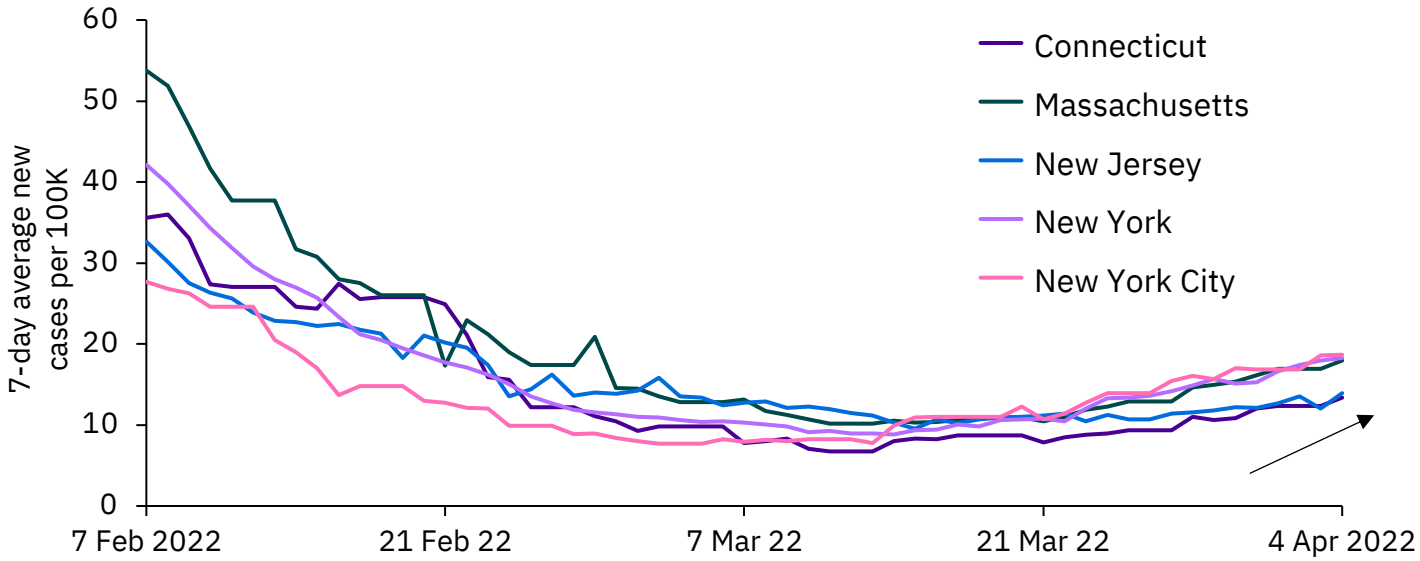
BA.2 prevalence and case rate by HHS region and state respectively

Although a rise in cases is not currently observable on a national level in the United States, a few states in the North East have recently seen a small increase, which is also the region of highest BA.2 prevalence (~84%), indicating that this small influx may be driven by the high levels of BA.2. These states have not yet seen any increases in hospitalisations or deaths during this time frame, however the UK had a 7 day delay between cases and hospitalisations rising. This may be an early indicator that a BA.2 wave will be observable in the US in the coming weeks as BA.2 prevalence continues to rise across the country.

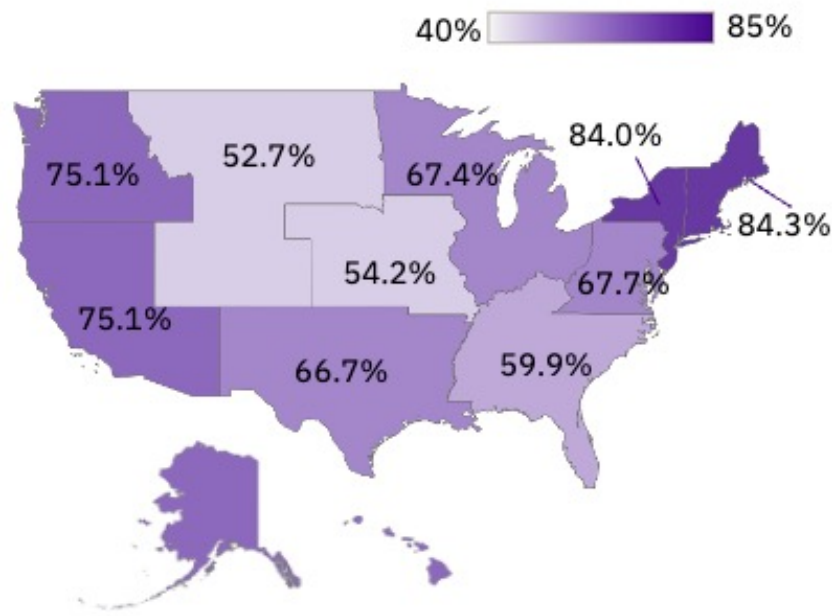
Limitations:

- → Sequencing in limited in the United States, timing of true BA.2 dominance may vary.
- → Suspected BA.2 samples may be preferentially sequenced, altering true prevalence.

New cases by state



BA.2 Prevalence by HHA Region



Data: CDC
Visualisation: Airfinity

COVID-19 test positivity among individuals in England was the highest ever during BA.2 surge

Overview of findings from the REACT-1, round 19 study in England

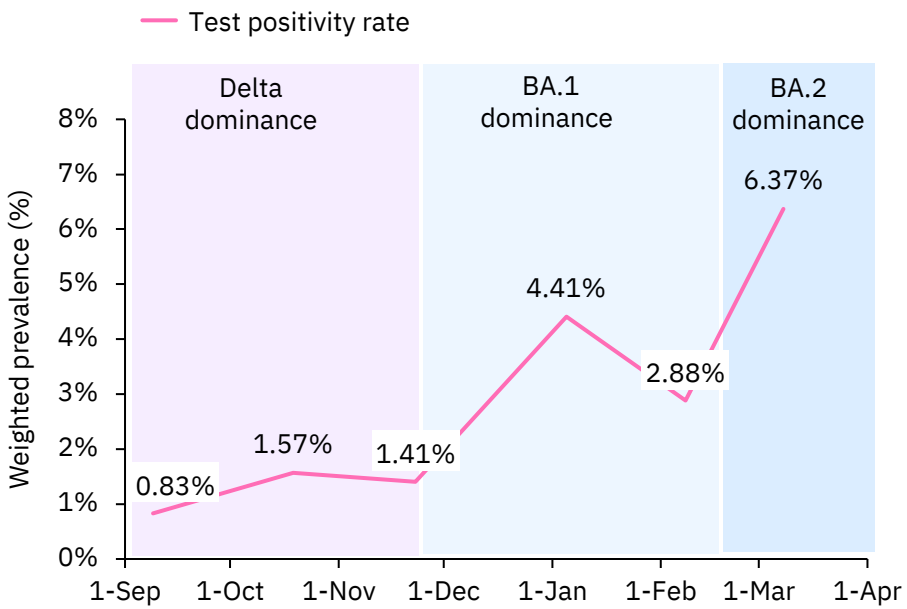
The most recent round of the REACT-1 investigated SARS-CoV-2 transmission and infection rates in England during March 2022 when BA.2 made up ~90% of sequenced samples, and found a test positivity rate of 6.37%, higher than the test positivity rate of 4.41% seen during the peak of BA.1 dominance. Infection incidence remains the highest among children 5-11 years old, but a drop in positivity rate in adolescents relative to children is observed and could possibly be explained by the approval of vaccination of adolescents. During Omicron dominance, two distinct peaks can be distinguished, the first driven by BA.1 outcompeting Delta in December (growth advantage ~20.7%), and the second by the recent displacement of BA.1 by BA.2 (growth advantage ~10.8%). The increased prevalence of infection in the older age groups in round 19 aligns with the recent rise seen in hospitalisations and deaths in the UK, and may indicate what is to come in countries like the USA with growing BA.2 prevalence.

Limitations:

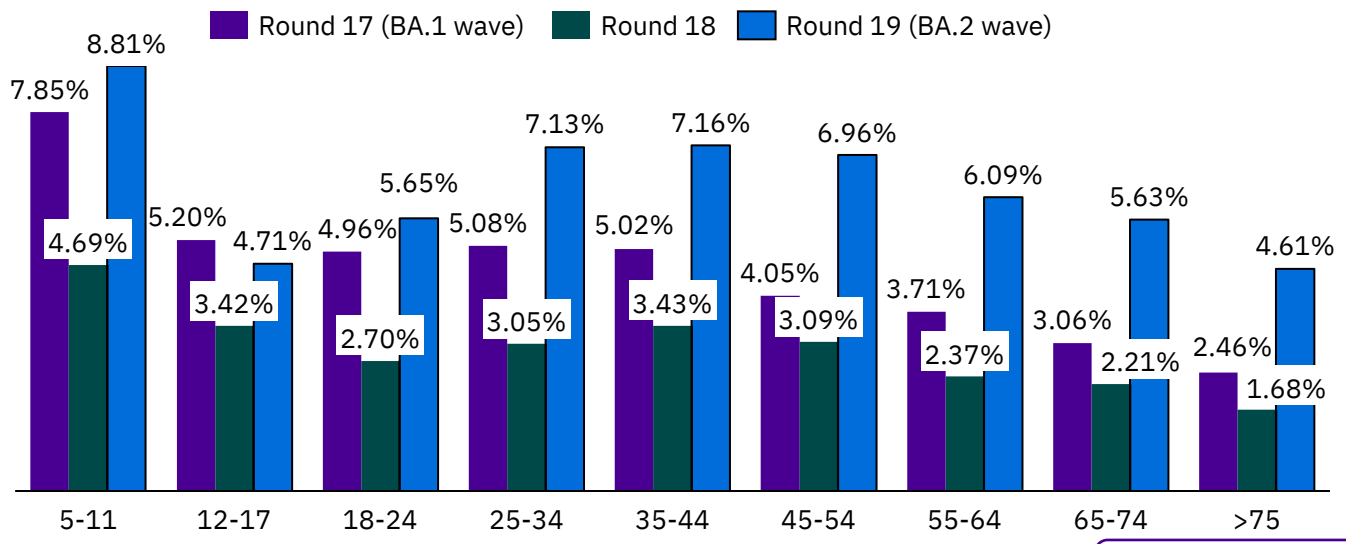
→ The study relies on at-home self-swabbing.

→ Differences in sample size number between study rounds due to difference in response rate.

Weighted prevalence of test positivity over time



Weighted prevalence of test positivity by age group



Data: REACT-1 study
Visualisation: Airfinity

If cases surge due to BA.2 in the USA, hospitalisations will mirror the UK due to a decline in people protected

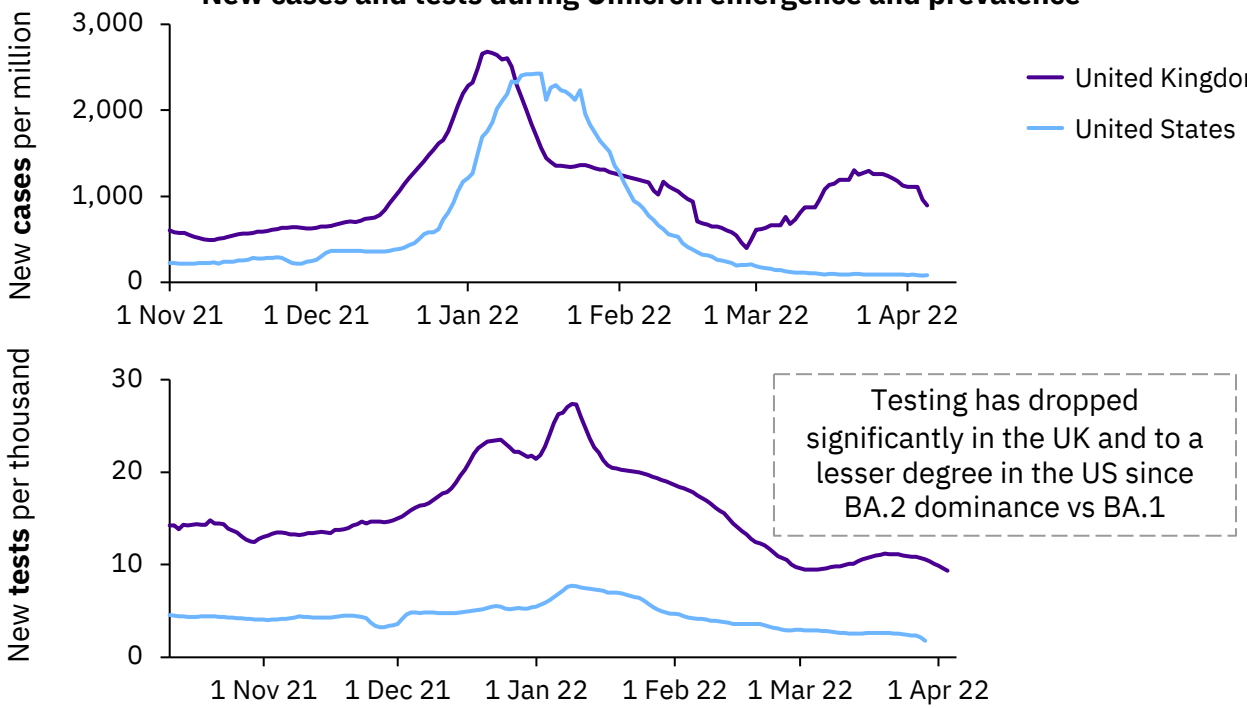
Overview of testing rates and number of people protected in the UK and USA since the emergence of Omicron

Although new cases per million can give an estimate of the time frame of disease waves, the recent number of cases in the UK is likely a large underestimation due to a decline in testing, demonstrated recently in the most recent REACT-1 study which showed higher test positivity during the BA.2 wave, with 6.37% of tests returning positive. The peak of the UK BA.2 wave saw 1,304 cases per million, so using this lower estimate value (compared to the REACT-1 results), the USA could see a peak of nearly 430,000 new daily cases and 98,500 hospitalisation during the BA.2 wave, although most cases may go undetected due to very low testing. As the proportion of people protected against infection has dropped quickly in both the UK and USA, it is likely the USA will mirror the UK's rise in hospitalisations, particularly in those elderly and most vulnerable who have not been boosted.

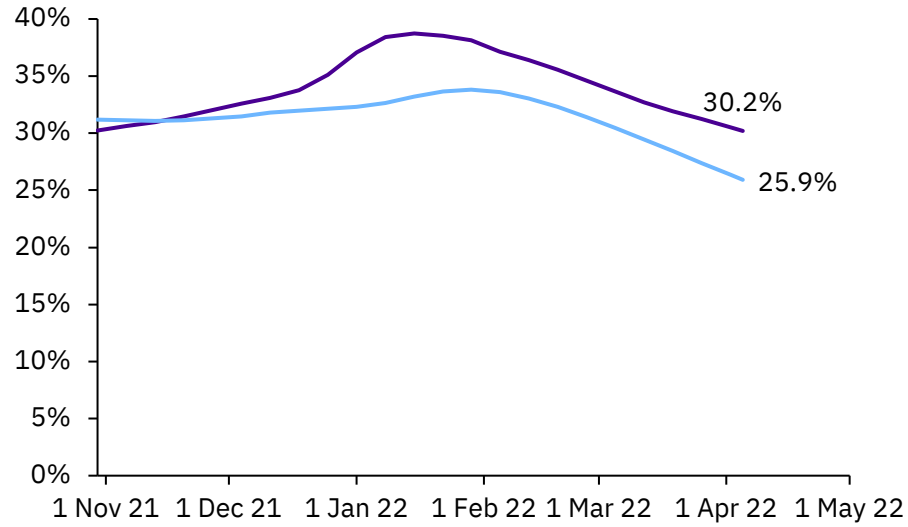
Limitations:

- → While the UK's BA.2 wave occurred at the end of winter, the USA will likely not experience a wave until Spring at the earliest, which will likely impact case rates.
- → The UK will see a further drop in testing as a result of the end of the universal free testing program.
- → There are countries such as South Africa which did not experience a BA.2 wave, despite high prevalence and low people protected.

New cases and tests during Omicron emergence and prevalence



Proportion of people protected against Omicron infection



Data: OWID Airfinity
Visualisation: Airfinity

→ Production forecast this year

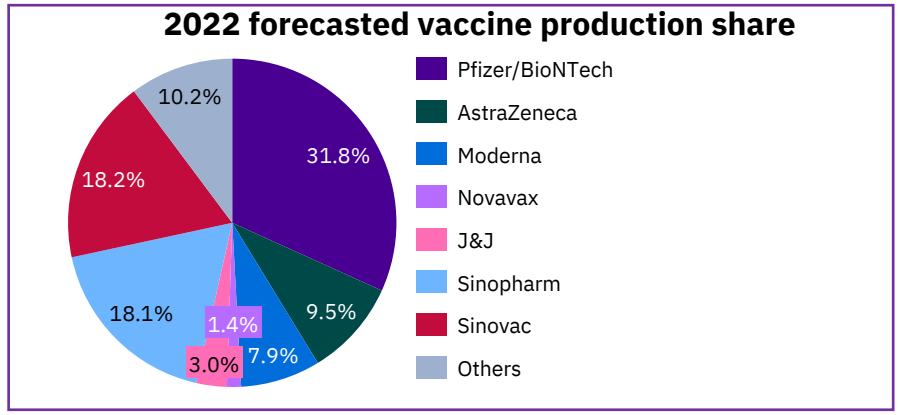
AstraZeneca production drops significantly with news that SII cuts production

Analysis of vaccine production forecasts for each vaccine manufacturer in 2022

Based on the COVID-19 vaccine production forecast for 2022, Pfizer/BioNTech, Sinovac and Sinopharm comprise the top vaccine producers, accounting for 31.8%, 18.2% and 18.1% of forecasted 2022 production, respectively. Recent accountments stating that SII will no longer produce Covishield has resulted in a reduced production forecast for Astrazeneca of 759 million (9.5% global production share). Other significant vaccine producers include Moderna (7.9%), J&J (3%) and Novavax (1.4%). Other vaccines are expected to make up 10.2% of the total production in 2022.

Limitations:

→ Production share of each vaccine is determined using their 6-week average rate, with the exception of AstraZeneca where a 4-week average has been used to exclude SII production due to recent announcements. These shares are applied to a continuing weekly global production rate and thus may change as observed weekly production rates change.



Data updated: 03/04/2022

Data: COVID dashboard,
Visualisations: Airfinity

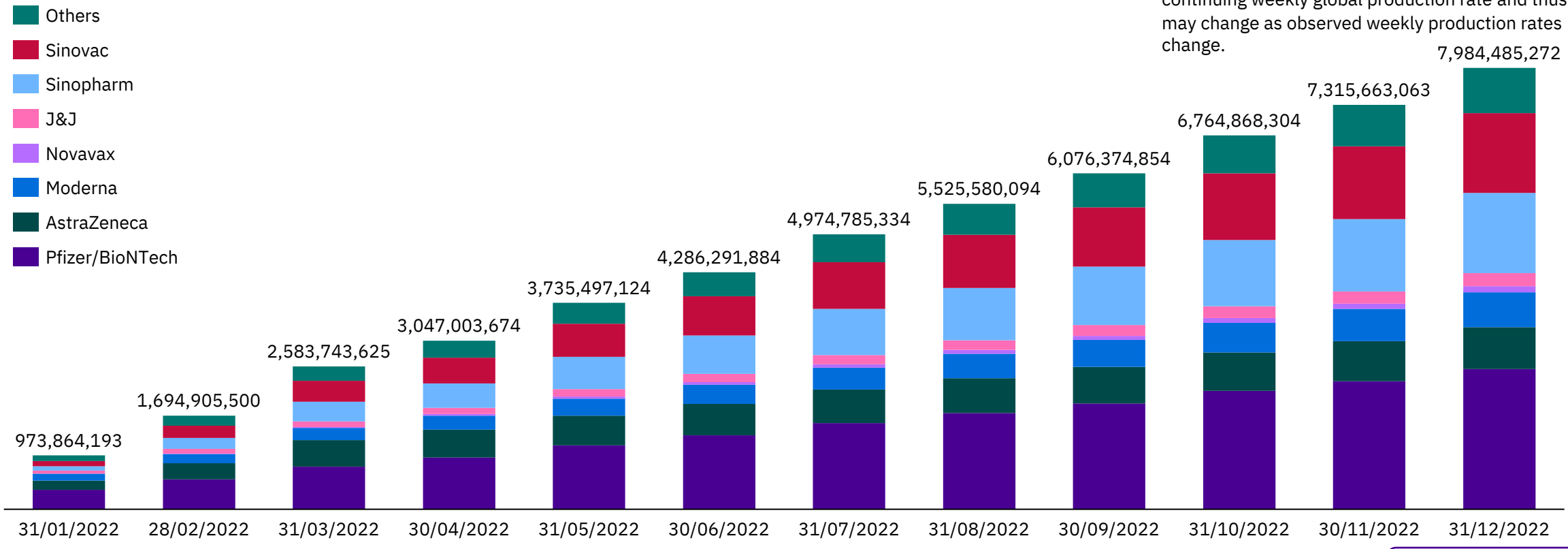
Approximately 8 billion doses of COVID-19 vaccines could be produced this year

Vaccine production forecast split by candidate

By end the of 2022 COVID-19 vaccine production could be ~8 billion doses. Pfizer/BioNTech is expected to produce the most vaccines (~2.5 billion doses), followed by Sinovac (~1.5 billion doses) and Sinopharm (~1.4 billion). Following the recent announcement that SII will halt production of Covishield, AstraZeneca's production forecast for 2022 has subsequently dropped (from 1.9 billion doses in our previous forecast, to 759 million doses) leading to a reduced global production forecast of ~8 billion doses.

Limitations:

→ Production share of each vaccine is determined using their 6-week average rate, with the exception of AstraZeneca where a 4-week average has been used to exclude SII production due to recent announcements. These shares are applied to a continuing weekly global production rate and thus may change as observed weekly production rates change.



Data updated: 03/04/2022

Data: COVID dashboard, Visualisations: Airfinity

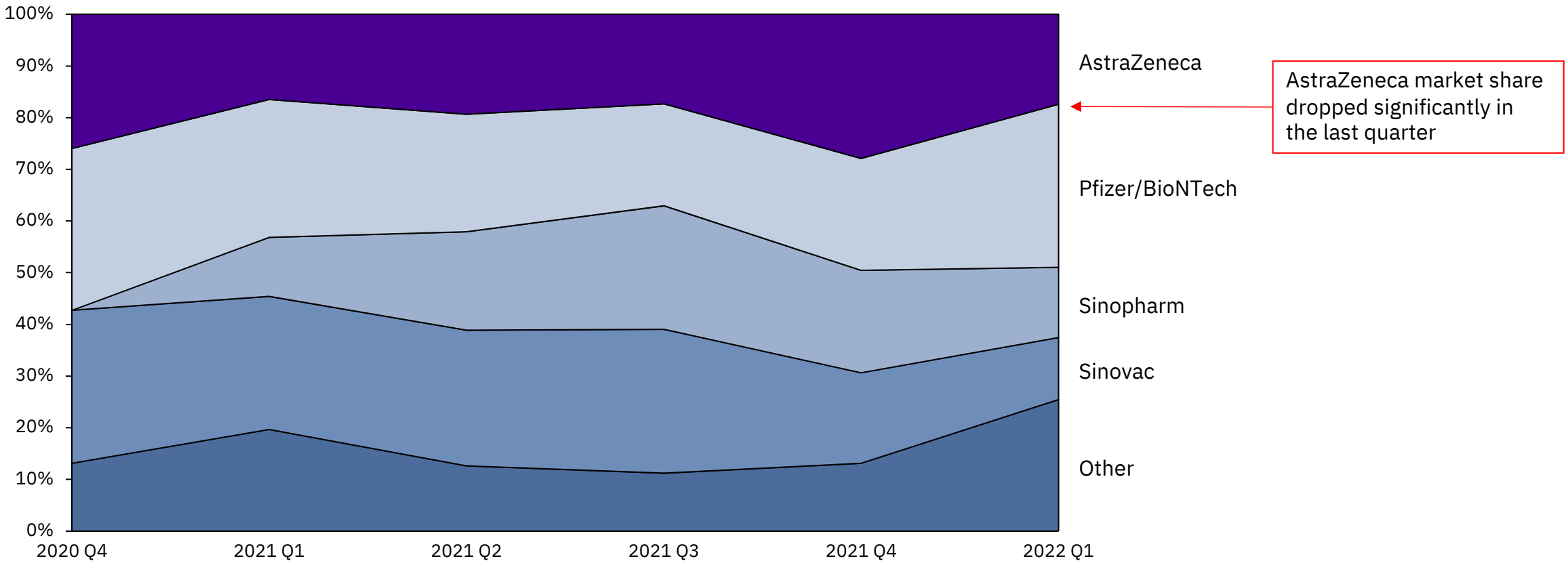
→ AZ production reduction

AstraZeneca market dropped considerably from 2021 Q4 to 2022 Q1

Market share of COVID-19 vaccines per quarter

Market share per quarter has been determined based on deliveries in each quarter. Market share has remained relatively stable each quarter across the for biggest global manufacturers however, in the last quarter AstraZeneca dropped significantly, with Pfizer/BioNTech capatalising and the remaining vaccines also took more share as production ramped up from Moderna, J&J and Novavax.

Limitations:
- → Based on publicly announced deliveries of COVID-19 vaccines.
- → Data is based on delivered doses, not revenue.



Data updated: 07/04/2022

Data: Airfinity
Visualisations: Airfinity

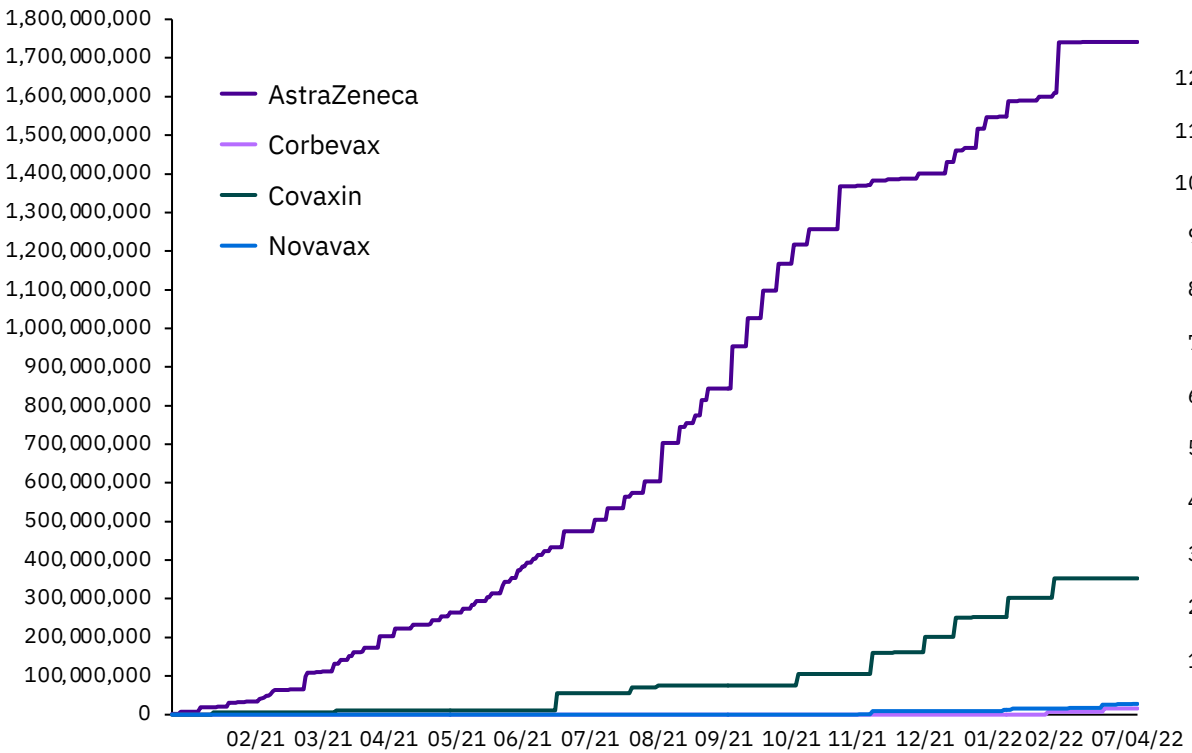
Despite the recent slow down, more than 1.7 billion AstraZeneca COVID-19 vaccines have been produced by SII

COVID-19 vaccine production and export from India

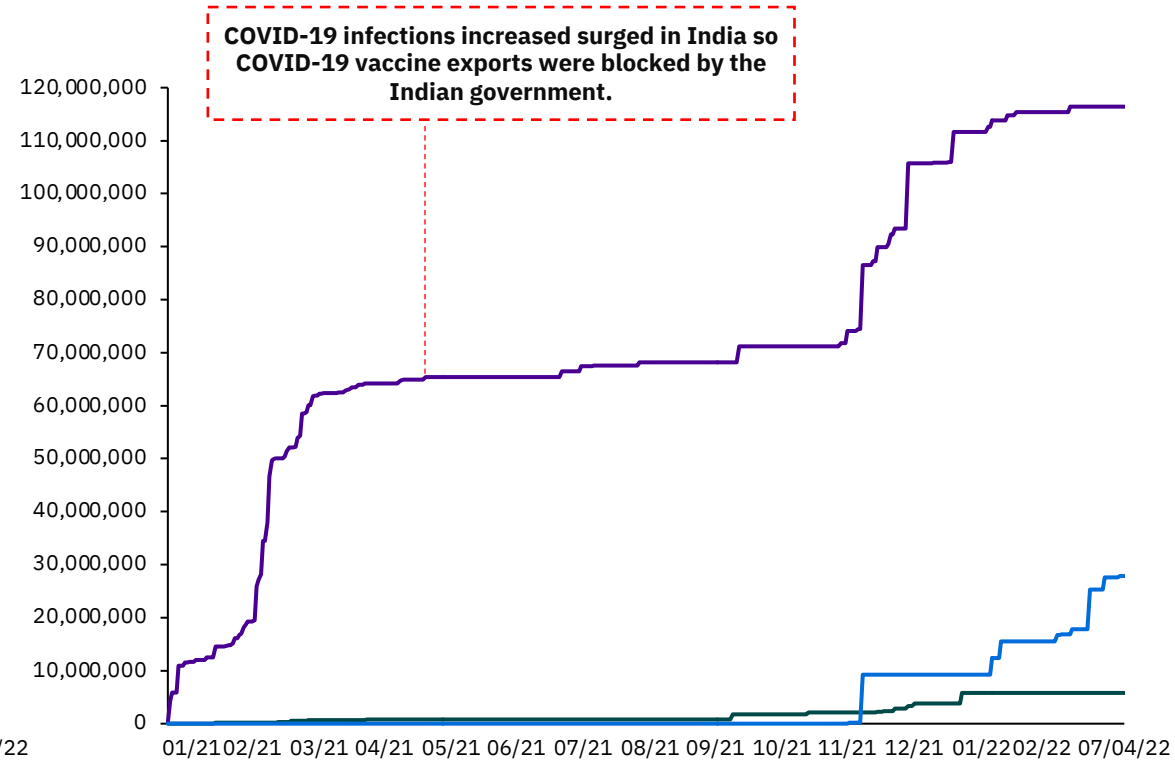
Production of vaccines in India scaled up quickly but has since slowed significantly. India has also been a large exported of doses, particularly the AstraZeneca vaccine, however exports have too begun to slow as demand lessens.

Limitations:
→ Based on publicly announced deliveries of COVID-19 vaccines.

Vaccine production output in India



Vaccine exports from India



Data updated: 07/04/2022

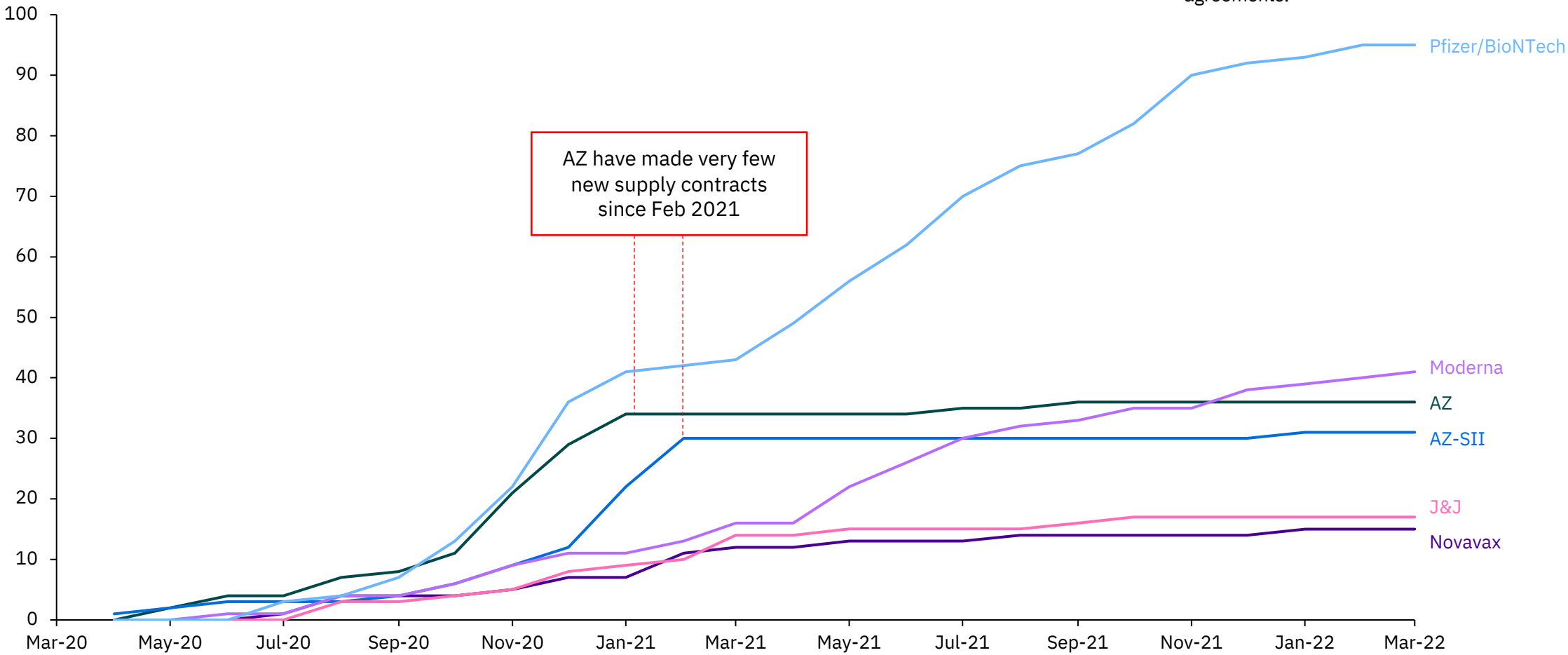
Data: Airfinity
Visualisations: Airfinity

Contracts with SII for the AstraZeneca COVID-19 vaccine have seen little increase since February 2021

COVID-19 vaccine supply agreements signed overtime

Vaccine sales have stalled for many vaccines, including AstraZeneca, with very few contracts with SII for the AZ vaccine since February 2021. The mRNA vaccines are the only ones to consistently continue to make new supply contracts with countries.

Limitations:
→ Based on publicly announced supply agreements.



Data updated: 06/04/2022

Data: Airfinity
Visualisations: Airfinity

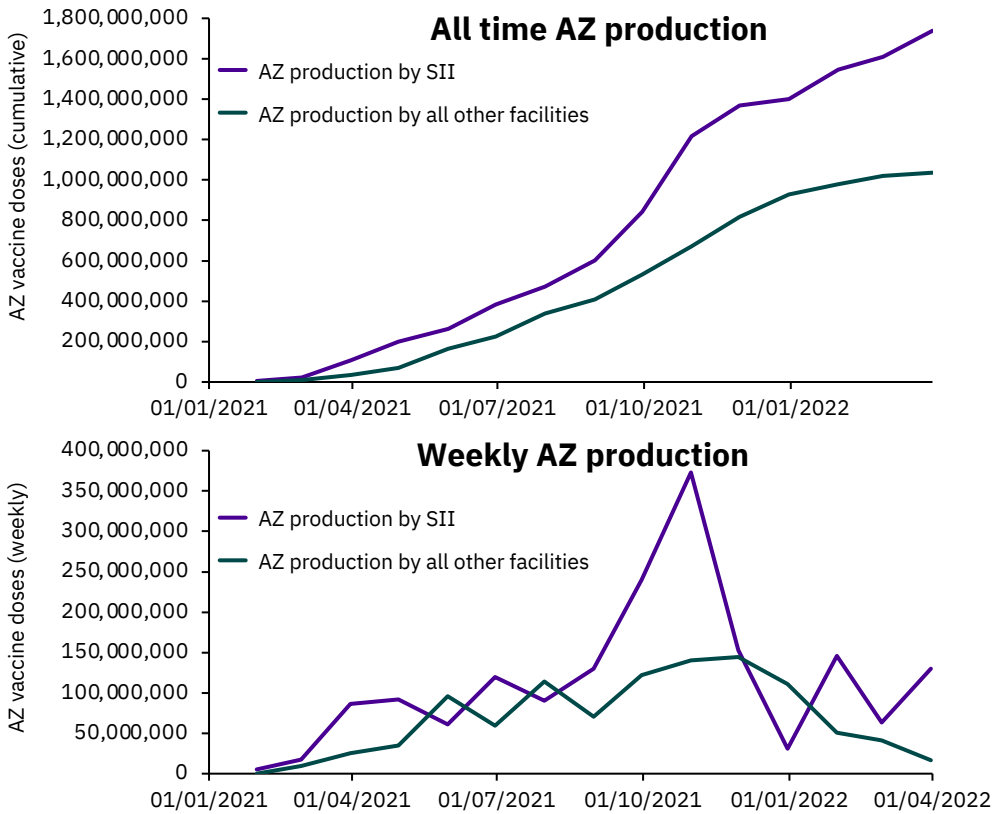
To date the SII has produced ~63% (1.7 billion) of all AZ vaccines with over 98% supplied to LMICs

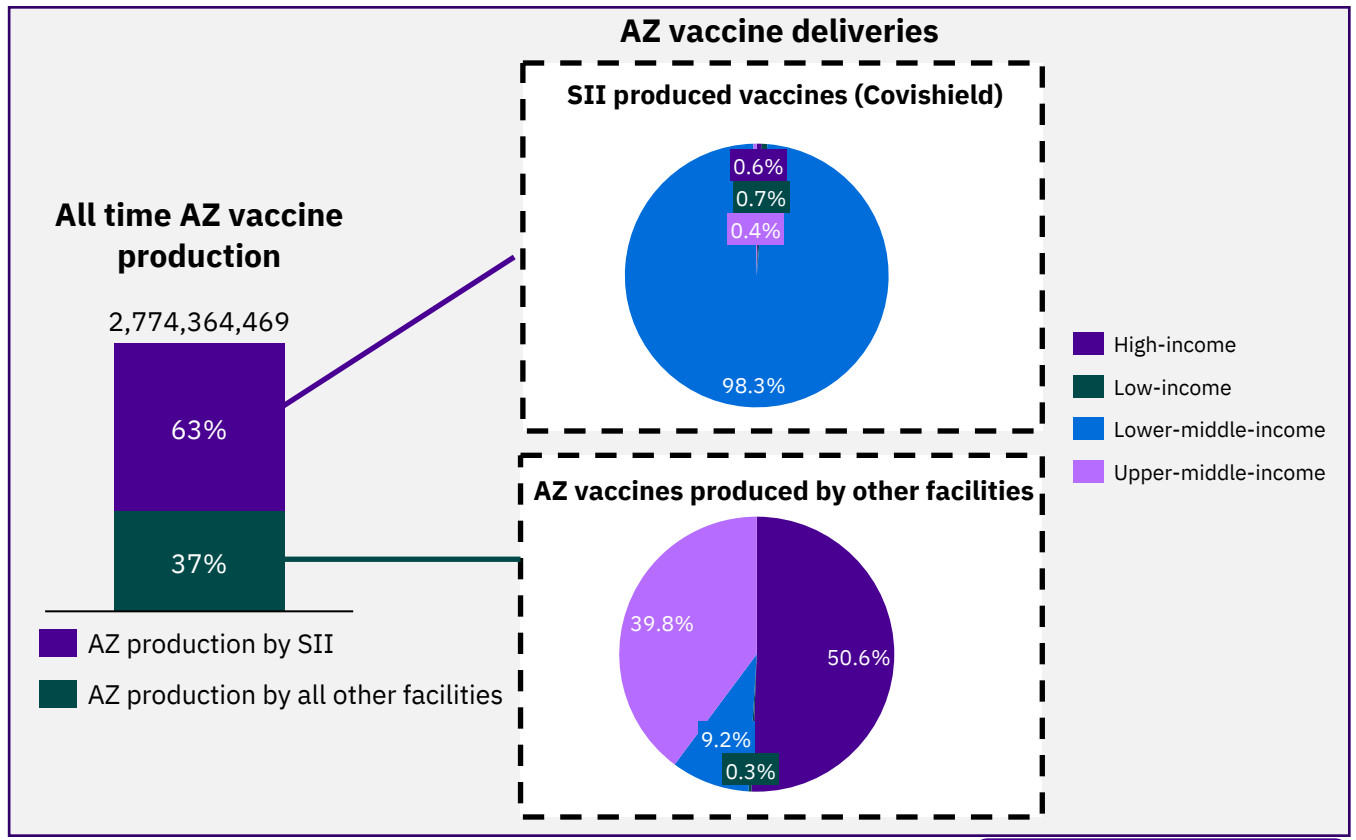
Comparative analysis of AstraZeneca vaccine production by SII and all other facilities

The Serum institute of India (SII) has recently announced that following supply deals with the government of India ending (March 31st) and no new orders being received, they will be halting production of Covishield (AZD1222). Since the start of the COVID-19 pandemic over 1.7 billion doses of Covishield have been produced, representing 63% of all AZ vaccines to have been produced. Over 98% of manufactured Covishield doses have been supplied to LMICs. Conversely, only 9% of AZ vaccine production by all other manufacturers has been supplied to LMICs, with the majority being supplied to HICs (~51%) and UMICs (40%), suggesting LMICs may be disproportionately effected by this production decrease.

Limitations:

→ Vaccine production data determined from recorded deliveries and so may lag behind true production numbers.





Data: COVID dashboard, Article
Visualisation: Airfinity

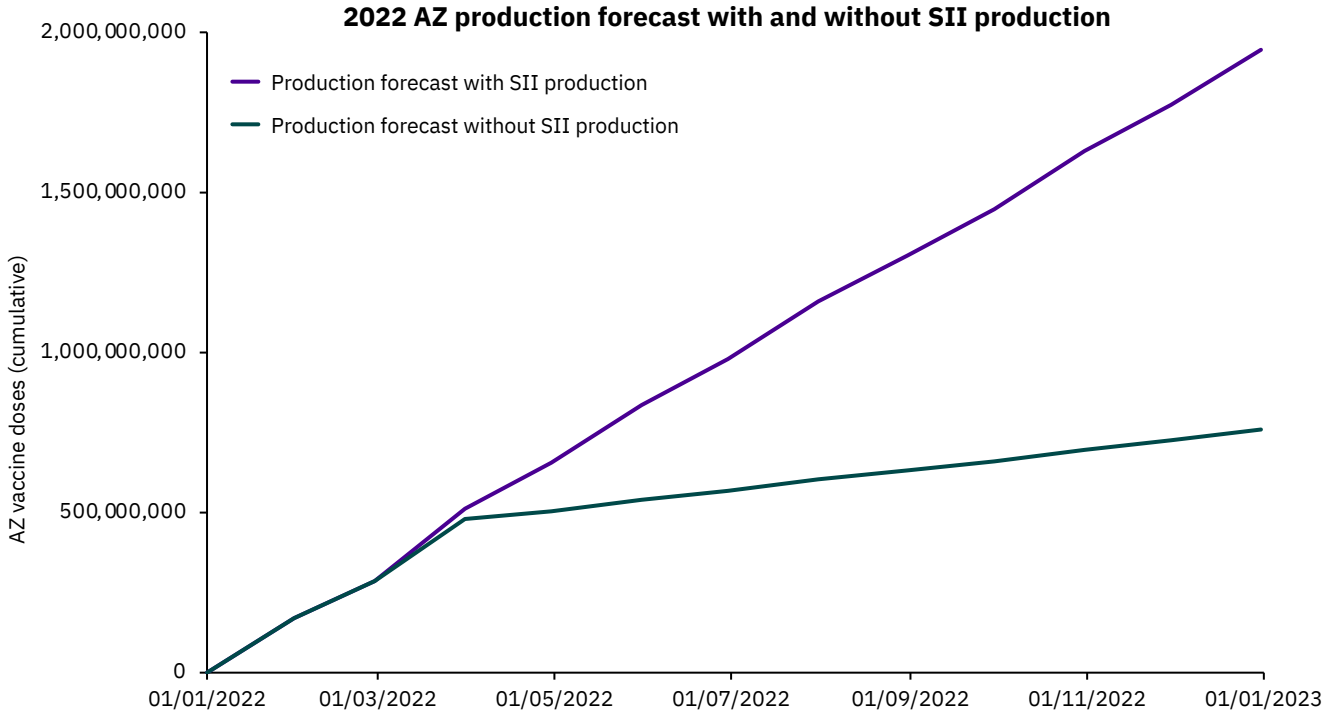
Halting production of Covishield by SII could cut expected AZ 2022 production share by over 55%

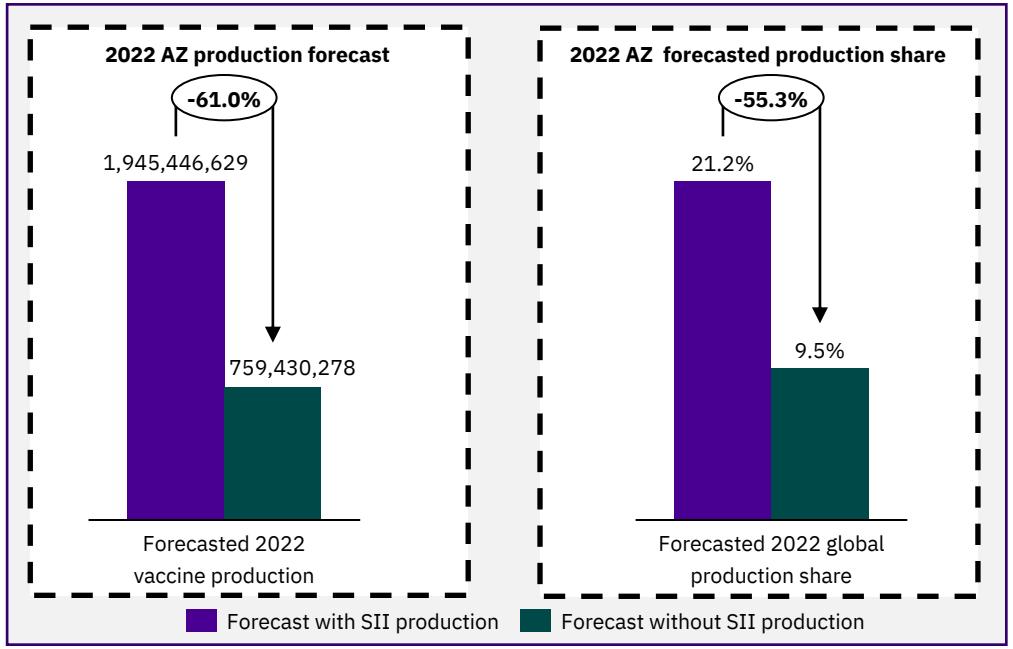
Comparative analysis of AstraZeneca 2022 production forecast with and without the production halt by SII

Since the start of the COVID-19 pandemic the Serum Institute of India (SII) has produced 1.7 billion doses of Covishield, representing 63% of all AZ vaccines to have been produced. With production halting from the largest producer of AZ vaccines, production forecasts for 2022 have decreased. Current 2022 production forecasts, based on production from all facilities except SII, expect ~759 million AZ doses to be produced, which is a 61% reduction compared to forecasts where SII production continues. Moreover, this reduced production forecast also translates into a reduced global production share of ~9.5%, down from ~21% in previous forecasts where SII production continues.

Limitations:

- → Global weekly production has been forecasted linearly to trend to 165M. This weekly rate is then used as the continuing weekly rate.
- → The 4-week average vaccine production rate as a share of the global weekly rate is used to determine the production share of vaccines, thus forecasts may change as observed weekly production rates change.





Data: COVID dashboard,
Visualisations: Airfinity

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More info.

→ Caroline Casey
Lead analyst
caroline@airfinity.com