



Friday Report: Issue 39

By Matt Fletcher, John Roberts, Dan Ryan and Adele Groyer

COVID-19 Actuaries Response Group – Learn. Share. Educate. Influence.

COVID-19 is still one of the hottest topics for scientific papers and articles. The COVID-19 Actuaries Response Group provides a regular Friday update with a summary of key papers and articles.

Vaccines

Novavax trials confirm effectiveness against “Kent” and “South African” variants [\(link\)](#)

Trial results published this week suggest an efficacy rate of 86% (CI 71-94%) in respect of the now endemic B.1.1.7 variant in the UK, lower than the 96% seen for protection against the main 2020 variant that has now been largely ‘superseded’.

In South Africa, the vaccine appears to only be around 50% effective against the B.1.351 strain (varying by the participant’s HIV status). However, more encouragingly, none of the 5 serious cases reported were in the vaccinated group, suggesting that protection against serious illness and death is higher than the base level of efficacy.

	FINAL ANALYSIS	
	Vaccine n=7,020	Placebo n=7,020
Total	10	96
Mild	1	28
Moderate	9	63
Severe	0	5
Vaccine Efficacy Original COVID-19	96.4% 95% CI: 73.8, 99.5	
Vaccine Efficacy B.1.1.7 variant	86.3% 95% CI: 71.3, 93.5	

Table 1. Final analysis of United Kingdom Phase 3 Trial.

	COMPLETE ANALYSIS	
	Vaccine n=1,408	Placebo n=1,362
Total	51	96
Severe	0	5
Vaccine Efficacy Overall	48.6% 95% CI: 28.4, 63.1	
Vaccine Efficacy HIV-negative	55.4% 95% CI: 35.9, 68.9	

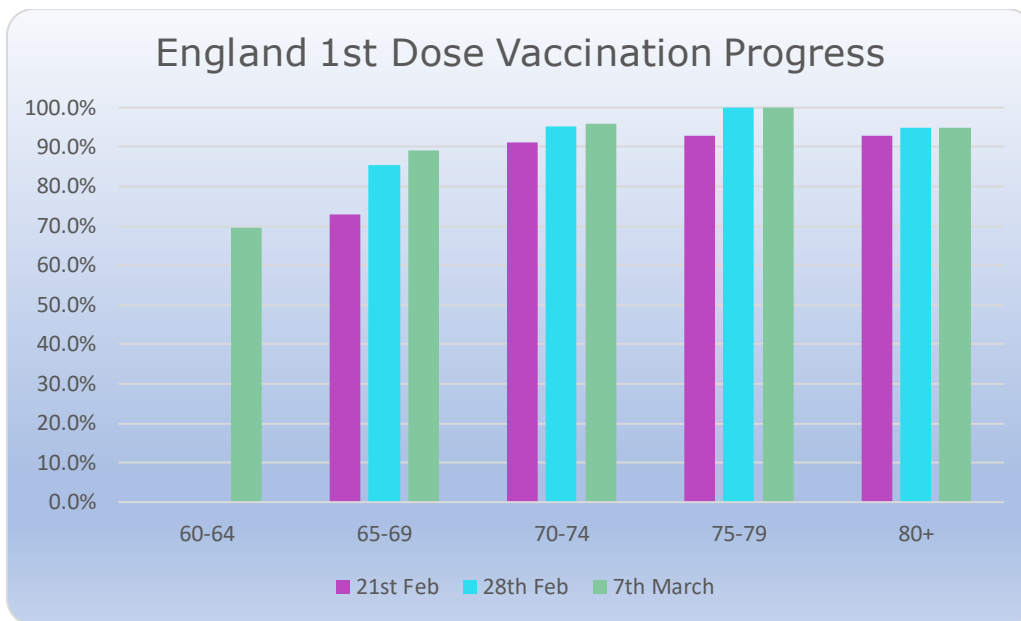
Table 2. Complete analysis of South Africa Phase 2B Trial.

Take-up Rate Update

With the programme in the UK pushing on down the age bands, with those in their upper fifties now being called, we’re starting to see a pattern regarding take-up rates. Using data for England, the vaccination rate for 75-79 was close to 100%, allowing for the approximation in the population estimate, but for 70-74 the rate is around 96%, and for 65-69 appears to be settling at around 90%.

With the latest ONS survey [\(link\)](#) suggesting that hesitancy across the age range is only 6%, and confirming the by now familiar age gradient of hesitancy, it’s possibly surprising that the 65-69 group has not reached a higher level. It’s not clear either why the 80+ group is lower than the group below, although at 95% it still remains a very respectable result.

The following graph shows this progress.



Clinical and medical news

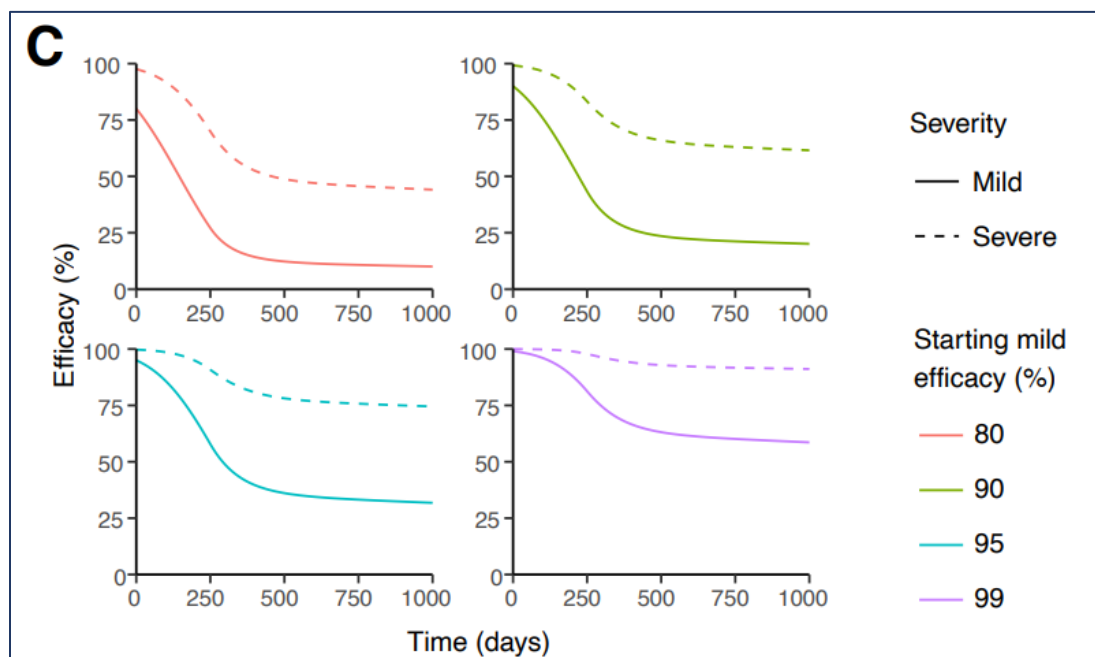
Time structure of antibody responses

Last week we reported that the [fifth round](#) of the REACT-2 study had identified high levels of IgG antibodies in all age groups for those that had received a single dose of the Pfizer/BioNTech vaccine and a prior suspected COVID-19 infection. A [pre-print study](#) released yesterday highlighted the immune benefits of prior infections in US healthcare workers.

The median concentration of specific antibodies after vaccination (two doses) was 1,974 U/ml. However, the median concentration of specific antibodies after a single vaccination and asymptomatic prior infection was 19,368 U/ml, and still higher at 30,527 U/ml after a single vaccination and symptomatic prior infection. The study recommended that two dose vaccinations were not necessary after prior infection, and vaccination campaigns could be accelerated accordingly based on knowledge of prior tests held on electronic health records.

A further [pre-print study](#) from Australia has attempted to model the likely decline in antibodies following infection/vaccination to understand what level of neutralising antibody protects against COVID-19. The model estimated that the 50% protective neutralisation level against any infection was 20% of the typical level of antibodies seen after use of convalescent plasma therapy, but that the level required for 50% neutralisation of severe infections was only 3% of that after convalescent plasma therapy. This aligns with expectations that existing vaccines would continue to prevent severe hospitalisation with more virulent variants, even though such vaccines may be less effective at preventing transmission.

Figure 1 – Time course of antibody decline and protection against different severities of infection



Hospital waiting lists at record high

NHS England [announced](#) that 4.7 million people awaited hospital treatment at the end of January, a record high (and with 304,000 of them waiting more than a year). That said, this is much lower than earlier predictions that had suggested waiting lists of up to 10 million by the end of 2020.

Further significant increases to waiting times are still expected given more severe limits to capacity in January (down by 50%) compared with the two previous months (down by 25%) because of the numbers of COVID-19 patients requiring treatment then.

However, it is helpful to put these figures in context and recognise the achievement of the NHS over the last 12 months. Numbers waiting to start treatment at end January 2020 were at a comparable level of 4.4 million; waiting times are on average just under 4 weeks longer.

Figure 2 – Patients waiting to start treatment at end January 2021

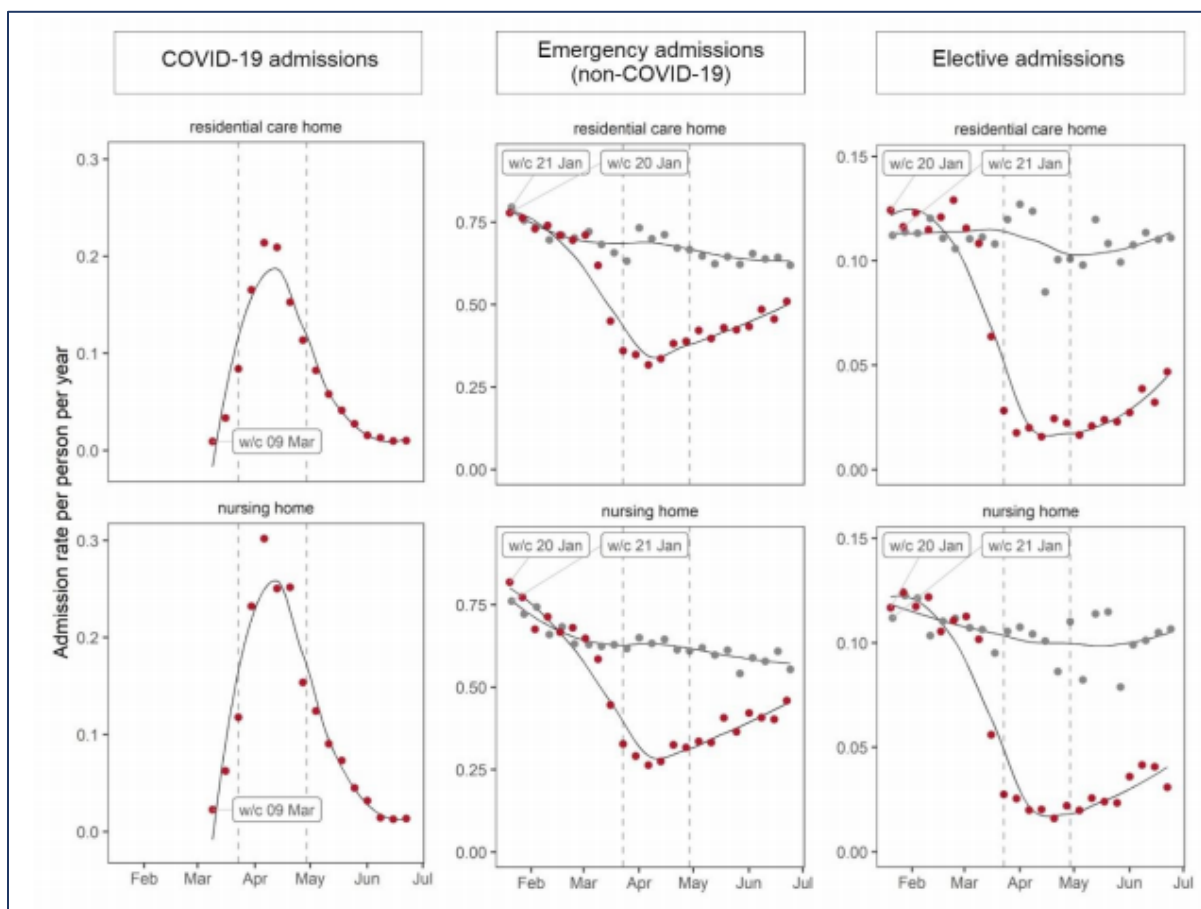
National Level Data						
Treatment Function Code	Treatment Function	Total number of incomplete pathways	Total within 18 weeks	% within 18 weeks	Average (median) waiting time (in weeks)	92nd percentile waiting time (in weeks)
C_100	General Surgery	385,165	242,178	62.9%	13.2	52+
C_101	Urology	263,695	169,458	64.3%	12.7	51.1
C_110	Trauma & Orthopaedics	588,658	323,754	55.0%	16.1	52+
C_120	Ear, Nose & Throat (ENT)	361,494	197,559	54.7%	16.1	52+
C_130	Ophthalmology	488,224	309,929	63.5%	13.2	50.6
C_140	Oral Surgery	166,099	93,937	56.6%	15.2	52+
C_150	Neurosurgery	40,727	25,646	63.0%	13.4	51.8
C_160	Plastic Surgery	63,504	35,357	55.7%	15.6	52+
C_170	Cardiothoracic Surgery	9,095	6,287	69.1%	11.1	45.3
C_300	General Medicine	47,739	35,973	75.4%	9.7	39.4
C_301	Gastroenterology	261,992	189,805	72.4%	10.7	36.5
C_320	Cardiology	190,971	147,665	77.3%	9.8	32.2
C_330	Dermatology	189,918	139,062	73.2%	10.5	35.1
C_340	Thoracic Medicine	91,597	73,097	79.8%	9.1	29.8
C_400	Neurology	113,144	85,950	76.0%	10.1	31.0
C_410	Rheumatology	77,583	60,903	78.5%	9.3	28.3
C_430	Geriatric Medicine	15,184	13,021	85.8%	7.8	23.2
C_502	Gynaecology	341,335	233,477	68.4%	11.7	48.1
X01	Other	896,551	655,312	73.1%	9.8	47.6
C_999	Total	4,592,675	3,038,370	66.2%	12.1	50.1

Hospital admissions from care homes

A [pre-print study](#) from the Health Foundation provides comparative analysis of hospital use by care home residents during the first wave compared with the prior year. This claims to provide the first-ever comprehensive examination across 250,000 care home residents in England up to the end of June 2020. Routine elective admissions fell by 63% between March and May, whereas emergency admissions for non-COVID fell by 36%. These reductions are greater than those seen in the general population, reflecting the particular needs of care home residents.

The study provided further analysis by condition and type of care home, with emergency admissions for acute coronary syndrome reducing by 42% and 28% respectively for residential and nursing home residents, and by 16% and 24% respectively for stroke across the same categories of resident.

Figure 3 – Comparison of hospital admissions for care home residents between 2020 and 2019



Higher risk of mortality from variant B.1.1.7

Variant B.1.1.7 has been the dominant strain in the UK this year, and we know that this variant is more transmissible than the main prior variant (D614G). We now have a 55,000 matched pair [study](#) showing much higher mortality. The study identified those testing positive between 1 Oct 2020 and 29 January 2021, and followed them until 12 Feb 2021 to identify deaths within 28 days of a first positive test. Matching was by age, sex, ethnicity, deprivation category and location.

The study concluded that the risk of mortality with the variant B.1.1.7 was 1.64 (CI 1.3 – 2.0) compared with the prior variant.

Modelling

Epidemiological and evolutionary consideration of vaccine dosing regimes [\(link\)](#)

This paper looks at the appropriateness of various vaccine deployment strategies, given global shortages and logistical challenges in vaccinating populations. In particular, the UK's strategy (along with Canada's) of delaying the second dose beyond the schedule used in the trials is noted. The study focuses on the spread of the virus and how variants may evolve under selection pressure to escape either natural or vaccine immunity.

The paper concludes that a wide range of outcomes is possible, depending on the approach taken to vaccination and the strength of immunity (particularly after a single dose). Spreading single doses across a population when infections are rising reduces prevalence, but if one-dose immunity is weak, the infection burden could be higher longer-term and allow more scope for virus evolution.

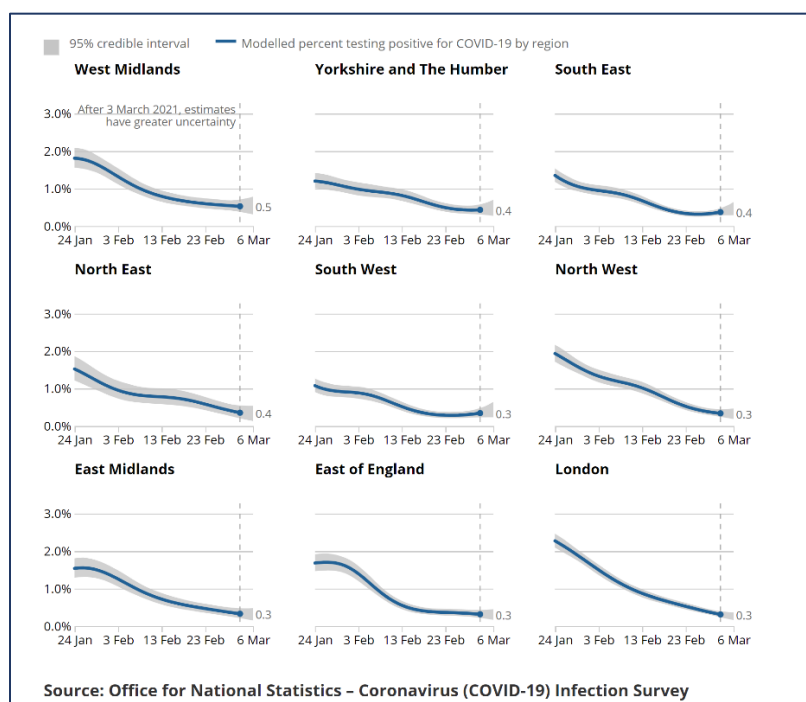
The authors stress the global impact of low vaccination rates, both in terms of spread and evolution, and the consequent need for equity in distribution and deployment of vaccines. They also note the importance of determining the strength and duration of protection (particularly from a single dose), for example via randomised controlled trials of dose intervals and regular testing in vaccinated individuals as well as those who have recovered from natural infections.

Data

ONS Infectivity Survey [\(link\)](#)

The usual weekly report from the ONS shows that infection levels in England (0.37%) and Wales (0.27%) are continuing to fall, by around 20% to 30% in the latest week. However, in contrast Northern Ireland (0.32%) and Scotland (0.31%) have now levelled off.

The regional picture in England shows some variation too. The ONS notes that there are initial signs of an increase in the South West and South East, with some uncertainty as to direction to in the Yorkshire and West Midlands region. Elsewhere, however, rates continue to fall.

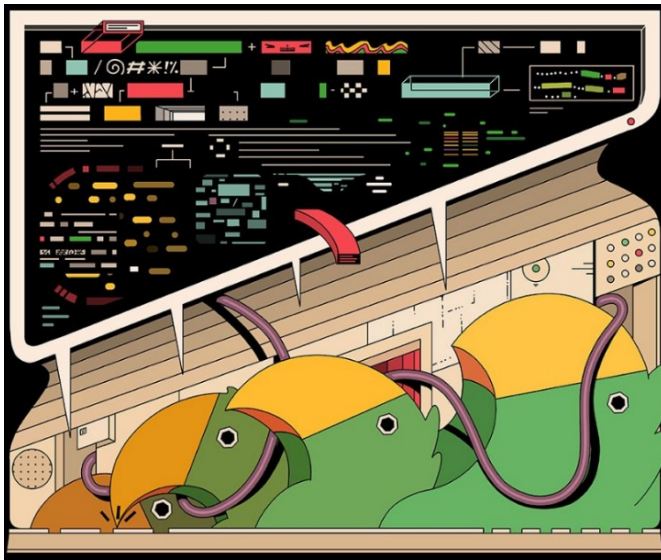


“R” Estimate

The latest government estimate of R, both for the UK and England has fallen from (0.7-0.9) to (0.6-0.8). In contrast to the ONS analysis above which suggests that some regions may be showing signs of increasing, the R rates for the South East (0.6-0.8) and the South West (0.5-0.8) are unequivocal in that they are clearly well below 1.

We have now discontinued our admissions-based estimate of R, in line with our expectation that the estimate would dip disproportionately compared with overall community infection levels, due to the reduction in older ages being admitted.

And finally ... Stochastic parrots



The curious phrase ‘stochastic parrots’ has been trending recently. An article with this [title](#) notes how one application of AI to improve the interpretation of [chest X-rays of COVID-19 patients](#) failed because the (apparently very successful) algorithm was found to be identifying technical image differences (such as labelling), rather than thoracic subtleties.

The phrase was also used in [this article](#) in Nature, discussing the ability of the AI program GPT-3 to write decent English (among other things).

The program was ‘so good that people found it hard to distinguish its news stories from prose written by humans. It could also answer trivia questions, correct grammar, solve mathematics problems ...’

The program really struck us with its ability to generate satire (not seen since the unintentional self-satire of Microsoft’s eager-to-help paperclip). The program was fed with various examples of satirical dictionary entries, and came up with its own definitions of the following words:

- *The Literature: A name given to other people’s published papers, referred to by scientists without actually reading them.*
- *Scientific method: A set of steps which a scientist (or “researcher”) would probably not follow in practice ... Additional steps include writing a paper, a process that usually involves the most violations of the scientific method.*
- *Speculation: One of Newton’s Laws of Science, also known as “Newton’s Law of Speculation”, which states that “Speculation breeds Confusion”, an effect well illustrated by how theoretical particle and string theorists debate scientific issues with each other. Confused? You should be. After all, you’re dealing with a bunch of theoretical physicists.*

13 March 2021