Is high COVID-19 vaccination reducing natural immunity?

This is an analysis mainly focusing on countries those experienced unprecedented Deaths in the recent period and the period covered is till 21st March 2022. The peak of Deaths in later months reached an all-time high since the beginning of the pandemic. Nine countries identified in that category are Singapore, South Korea, Australia, Hong Kong, Iceland, New Zealand, Denmark, Finland and Japan. Almost all of those countries had nominal Cases and Deaths prior to September 2021 (vaccine third dose was initiated). Interestingly, all those nine countries had very high vaccination rates and were among the topmost vaccinated countries during the covered period. Israel started mass vaccination first and initiated the fourth dose at the beginning of January 2022; soon afterward, not only Cases but also Deaths reached an all-time high. Israel also introduced vaccine doses among children of various age groups first and is in fact, leading/ guiding the vaccine roll-out strategy. Gibraltar, on the other hand, implemented the most successful mass vaccination programme. Gibraltar is the country that achieved the highest target for vaccination at the earliest. It attained and maintained 100% vaccination since May 2021, though Cases of the latest peak in March 2022 reached an unprecedented high for the whole of the pandemic. Furthermore, observations indicate an unusual surge of Cases as well as Deaths in recent periods among vaccinated groups compared to the unvaccinated ones. Those observed facts, supported by well-known scientific theories, indicate high vaccination may weaken natural immune response and need urgent policy action.

Key Words: COVID-19, vaccine, mass vaccination, adverse effect, natural immunity

Introduction.

The pandemic of **CO**rona**VI**rus **D**isease 20**19** (COVID-19) killed more than 6.09 million people globally till 21st March 2022 [1] and severely impacted the economy and mental health. The responsible virus for the disease is Severe Acute Respiratory Syndrome CoronaVirus 2 (***SARS-CoV-2***) and detailed discussions on the nature of the disease and characteristics of the virus are nicely outlined in current research [2, 3].

To combat COVID-19 crisis, all vaccination groups initiated coordinated efforts. Till two years of the pandemic, vaccines were considered the only pathway to overcome the crisis [WHO] and heavily promoted. More than 65% of the world population already received at least one dose of COVID-19 vaccine [1]. Various types of vaccines are in place and the technology and compositions are discussed in detail [4, CDC[1]]. At least 4 principally different covid-19 vaccines are in place i) m-RNA Vaccines, ii) vector-borne vaccines, iii) inactivated virus from China and India, and iv) viral surface proteins. Among these vaccines, Pfizer-BioNTech is most widely used in the US and Europe followed by Moderna [Fig. S1]. Both the vaccines use m-RNA technology. Various other vaccines are also available [Fig. S1]. Vector-borne vaccines are widely administered among which are Johnson & Johnson and Astrazeneca. Sputnic V is an Adenovirus viral vector vaccine, which is mainly used in Russia. Chinese companies Sinopharm and Sinovac use inactivated virus. Indian company Bharat Biotech developed Covaxin using similar technology of Sinovac. Whereas, Novavax is a protein-based vaccine.

Approval of COVID-19 vaccine was unusually prompt though relating to COVID-19 vaccine trials concerns were initially raised that studies seem designed to answer not the most clinically relevant questions and trials were not designed to say whether these vaccines can save lives [5]. Following speedy vaccine approval, another study discussed '"Science by press release" is just one of many flaws in the way new treatments are evaluated, brought into stark relief by the pandemic' [6]. Studies further evaluated exit strategy via vaccination and discussed some striking resemblance of Flu with COVID-19 and also discussed various direct and indirect effects of mass vaccination [7]. Regarding exit pathways via vaccination, scientists followed observation and were right to mention that rapid regulatory approval and roll-out of several vaccines though have ignited much optimism but fainted by the occurrences of many new variants which are less sensitive to vaccine-induced antibodies [8].

After the initiation of mass vaccination, many adverse effects from vaccines, even Deaths were reported (CDC[2]); though medium and long-term effects are yet to be investigated properly. The percentage of reporting adverse reactions is much higher compared to other existing approved vaccines (CDC[2]). For a small country UK, more than lakhs of adverse reporting was made

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CDC[1], https://www.cdc.gov/coronavirus/2019-ncov/vaccines/stay-up-to-date.html
CDC[2], https://www.cdc.gov/coronavirus/2019-ncov/vaccines/safety/adverse-events.html.

between 09/12/20 and 06/04/22 only for mRNA Pfizer/BioNTech vaccine [UHSA[3], total reactions: 4,85,939; total reports: 1,68,927; fatal outcomes: 746). The basis of various adverse reactions of COVID-19 vaccines from biological science perspective were analysed clearly [9]. A recent review also nicely depicted the scientific basis of many adverse effects of the SARS-CoV-2 vaccines in an excellent way [10].

After the second dose, antibodies induced by the vaccines dissipate in as little as 3–10 weeks' time [11], and hence people are advised to get booster shots at regular intervals (CDC[4]). With 2 doses of Moderna or Pfizer vaccine, effectiveness was found to drop from around 65 to 70% down to around 15% by 25 weeks after the second dose as discussed in UK Health Security Agency (UHSA) government report [UHSA[5], page 4]. Whereas, two to 4 weeks after a booster dose, effectiveness ranges from around 60 to 75%, dropping to 25 to 40% after 15 weeks. Those raise questions about vaccinating the whole global population every few months interval and prompt the need of analysing thorough risk benefit analyses with a critical viewpoint. Knowing effects of vaccination fade in a few months' time and the Death rate due to COVID-19 among children is practically negligible, child vaccinations have been initiated. Apart from other usual adverse effects of COVID-19 vaccine, children disproportionately reported (based on gender, age and dose) heart-related inflammation (known as Myocarditis/ Pericarditis). Disproportionate and much higher percentages were reported for male than female and also for younger age groups below 18. Effects were noted much higher after the 2nd dose. [CDC[6]: CDC's COVID-19 Vaccine Safety Technical Work Group]

The current study mainly focused on the later months of the pandemic from the study period (till 21st March 2022). Since the initiation of the third dose many topmost vaccinated countries experienced an unusual surge in Deaths; whereas, Deaths and Cases for those countries were nominal prior to that. Countries that took the most coercive measures including vaccine mandates, stringent vaccine rules and restrictions are among the worst hit in the later period in terms of Deaths (and of course Cases too) e.g., Canada, New Zealand and Australia. New Zealand and Australia were least affected due to COVID-19 in earlier periods though transmission and Deaths became unprecedented in recent times. Such observation prompted the need to explore the situation further and examine critically the overall planned vaccine strategy. The current analyses critically evaluate those situations and have urgent policy implications.

In Israel, 80% of the eligible population got two doses of vaccine alongside the booster dose. Those include 90% of people over the age of 60 years. Israel started vaccinating 5–11-year

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UHSA[3], https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1069177/COVID-19_Pfizer-BioNTech_Vaccine_Analysis_Print_DLP_6.04.2022.pdf

CDC[4], https://www.cdc.gov/coronavirus/2019-ncov/vaccines/booster-shot.html accessed 25/4/22

UHSA[5] : https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1066759/Vaccine-surveillance-report-week-13.pdf

CDC[6],https://www.cdc.gov/vaccines/acip/meetings/downloads/slides-2021-06/03-COVID-Shimabukuro-508.pdf, accessed 15/04/21

children in November 2021 and initiated the 4th dose in January 2022 [12]. Hence Israel can be looked upon for monitoring purposes in terms of the performance of vaccines among the mass community. It can indicate an advanced overview of how mass vaccination fares and how immunity wanes over time. Those observations can play a crucial role to set and reform vaccine rollout strategies in other countries. Focus will also be on another country Gibraltar which can be set as an example of the vaccine success story. It maintained a 100 percent vaccination rate since May 2021 [1].

This analysis, using already published authentic data, will explore the existing/guided strategy of global mass vaccination programme to combat the COVID-19 crisis. The period covered is till

21st March 2022. It will examine critically some risk-benefit issues among few countries in chosen categories pointwise.

Results:

In this study, some countries were chosen based on following three categories:

i) *Countries with unusual Deaths in the later few months:* For some countries Deaths in later months reached an all-time high since the beginning of the pandemic. The latest peak of Deaths, after the start of the third dose, became the highest peak in respective countries: Nine countries were identified viz. **Singapore, South Korea, Australia, Hong Kong, Iceland, New Zealand, Denmark, Finland and Japan**. [1].

ii) *Country leading/ guiding the vaccine roll-out strategy:* The country **Israel** started the mass vaccination first and pioneering in terms of initiating new doses among the population and starting vaccination among the new age groups of children. Israel is leading the direction of vaccine roll-our strategy and is much ahead, in time than other countries [1, 12].

iii) *Highest vaccination:* **Gibraltar** is the country that achieved the highest target of vaccination first. It attained and maintained 100% vaccination since May 2021 [1].

- **Countries with unprecedented Deaths in the later period and vaccination status**

Here the main focus is on Deaths in the later period. As most countries started the third dose around September 2022, the period after 3rd dose is considered the latter period which is the focus here. I chose only those countries that experienced unprecedented Deaths in the recent period (and of course Cases too) and those countries are Singapore, South Korea, Australia, Hong Kong, Iceland, New Zealand, Denmark, Finland and Japan. All those nine countries are seen topmost vaccinated countries in that plot (Fig. 1). For easy comparison, a few other likely vulnerable countries are also included at the bottom of that plot; among those are highly populated countries e.g., India, Bangladesh alongside countries those had very high overall Death rates per million for the whole of the pandemic e.g., US, UK, Europe etc. For all those top

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Note: In the whole analysis, alternative definitions of a full vaccination, e.g. having been infected with SARS-CoV-2 and having 1 dose of a 2-dose protocol, are ignored to maximize comparability between countries. [Source: Our World in Data (1)]

nine countries, not only Cases but Deaths also reached an all-time high in the latter period (Fig. 2). Interestingly, those are the most vaccinated countries on that list. Countries at the bottom of that list though administered much less vaccination but performed relatively well in recent surges compared to those nine countries. For the US and European countries, Cases this winter peaked all-time high though Deaths were lower than the highest peak in their respective countries. Figures of Cases and Deaths for US, Europe, UK and India are shown here (Fig. S2). For India, a heavily populated country, the latest peak of Cases was even lower than the previous peak and the latest peak of Deaths was the weakest of all peaks (Fig. S2, d). Interestingly, in terms of vaccination, India is placed at the bottom of the list (Fig. 1). Another highly populated country Bangladesh also fared well like India during the latest surge [1].

Countries like Canada, New Zealand and Australia which took the most coercive measures including vaccine mandates, stringent vaccine rules and restrictions are among the worst hit in the recent period in terms of Deaths. Those countries not only administered high vaccination but with less population density, also getting favour in terms of transmission.

On the other hand, based on high population density Singapore and South Korea had disadvantages. Surprisingly, Deaths and Cases were nominal in those countries in the first one and half years of the pandemic. Whether it was guided by strong natural immunity due to high population density or not, needs to be investigated further. However, Deaths/Cases skyrocketed in the later months. Singapore and South Korea are not only the topmost vaccinated countries in that list (Fig. 1), but also administered one of the highest percentages of booster doses (steepest rise compared to Europe, US and India as shown in Fig. S3). Cases and Deaths in the later periods were unprecedented and all time high (Fig. 2).

Similar for Japan and Hong Kong - apart from high population density and very high vaccination rates, both had high booster intakes (Fig. S3). Moreover, Hong Kong and Japan suddenly increased all vaccine doses at a very steep rate since the beginning of January 2022; while, interestingly during the same time most other countries decreased vaccine doses (Fig. S4). Among all those nine countries, Hong Kong performed the worst, as daily Deaths (7-day average) even exceeded 30 per million (Fig 2, shown by the Y axis). For Hong Kong, the latest rise in vaccine doses was not only at the steepest rate since the start of mass vaccination, but the peak of doses also exceeded an all-time high (Fig. S4). It is noteworthy to mention that after the initiation of the initial mass vaccine programme, or a sudden rise in doses, almost all countries experienced a rapid surge and most countries had to impose strict lockdown measures [BMJ[7], 7].

Such observation with all those 9 countries that experienced unusual surges in Deaths (though most had nominal Cases and Deaths in the earlier period) raises an obvious question of whether more vaccination is causing to lose of natural immunity or not.

BMJ[7] , https://www.bmj.com/content/371/bmj.m4037/rr-20 dt 22/03/21

Additional Comments:

a) Reverse may not be true for all very highly vaccinated countries: There are of course various other factors involved too e.g., increase/decrease rate of vaccination (hence I am focusing only upto 21st March), number of third doses, environmental factors, dominated by people of old age etc. Thus, the reverse may not be always true for all topmost vaccinated countries.

b) *Observation can be altered if the end date of this analysis is extended:* There are also possibilities that the observation noted here may be altered by changing vaccine doses in some countries after 21st March. After that particular date if vaccine doses in some particular countries suddenly are varied or new vaccine doses are initiated or new age groups of children are included, all those can heavily impact observed/ discussed results too.

However, the main point here is inspite of all those influences and cofounding factors, observation presented here considering the period up to 21st March **can not be disregarded or overlooked by any means.** It has important policy implications.

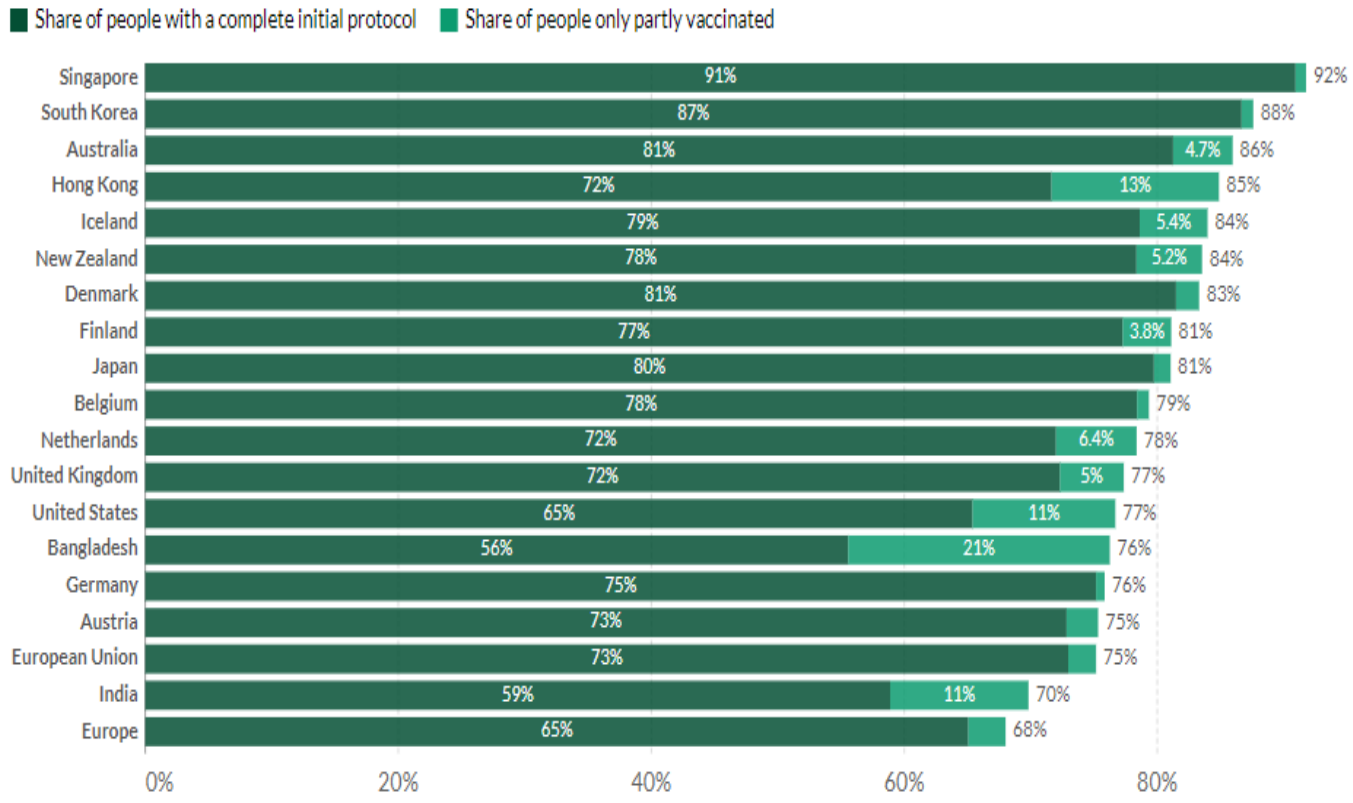
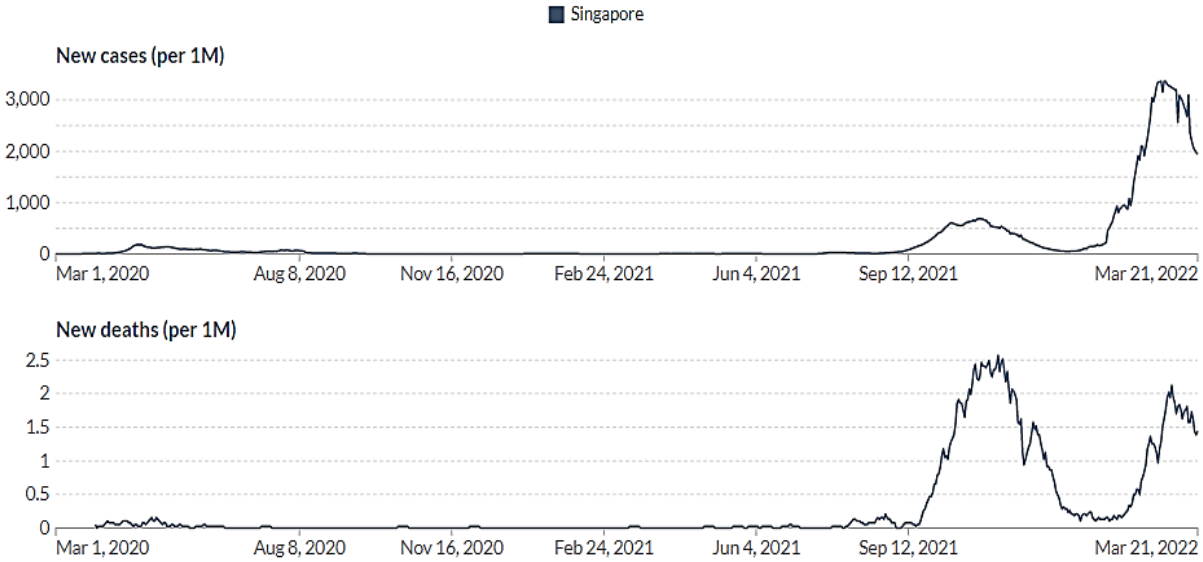
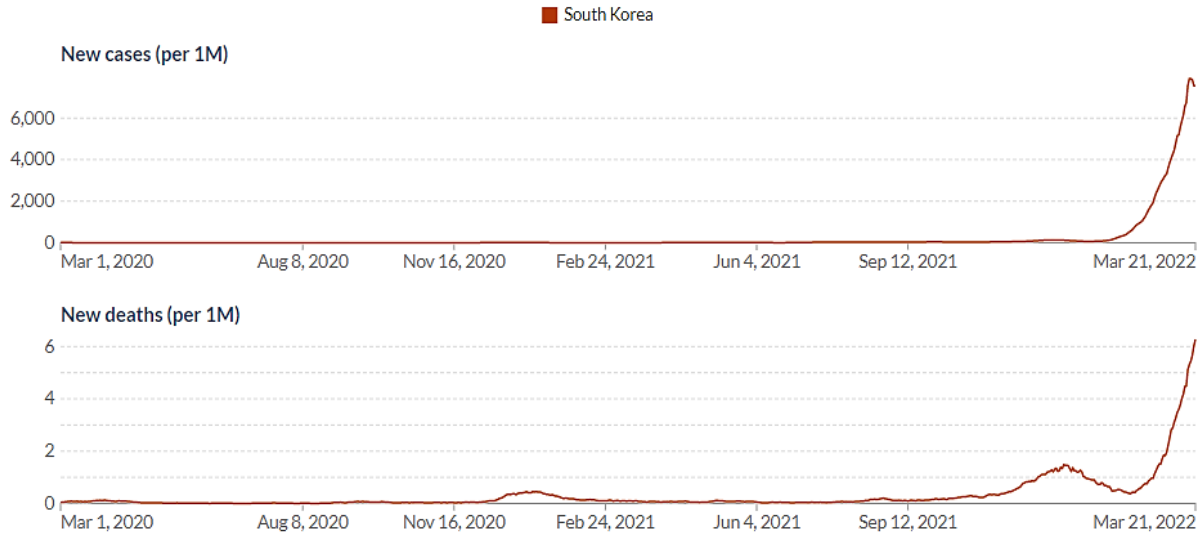


Fig. 1: Shares of people vaccinated against COVID-19 are shown for a few countries (till 21st March 2022). The vaccination status of nine countries that experienced unprecedented Deaths in the later period is placed at the top. Countries in that category are: a) Singapore, b) South Korea, c) Australia, d) Hong Kong, e) Iceland, f) New Zealand, g) Denmark, h) Finland and i) Japan.
[Source: Our World in Data (1)]

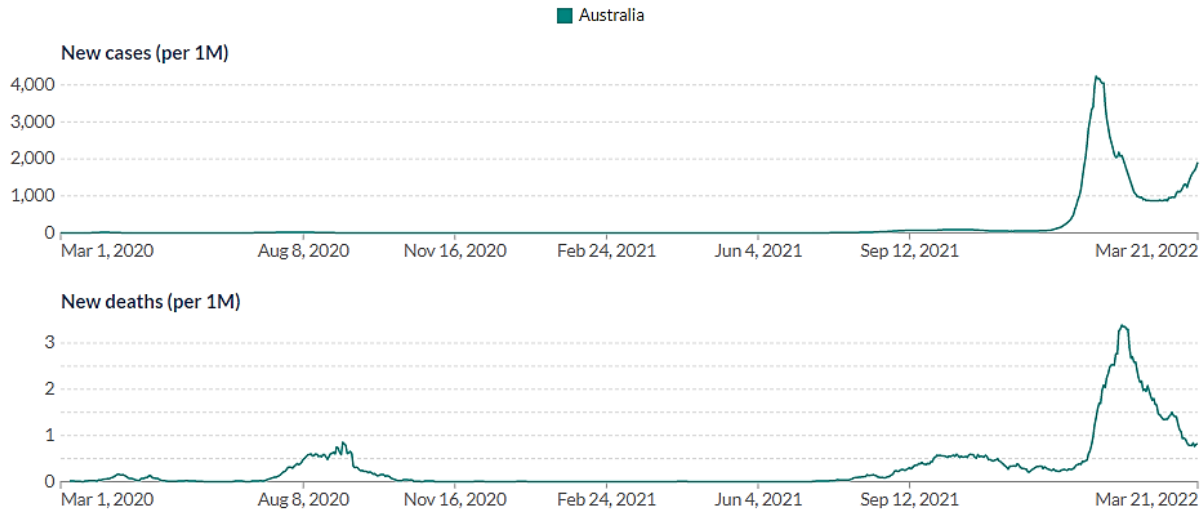
a)


Singapore
New cases (per 1M)
3,000
2,000
1,000
0
Mar 1, 2020
Aug 8, 2020
Nov 16, 2020
Feb 24, 2021
Jun 4, 2021
Sep 12, 2021
Mar 21, 2022
New deaths (per 1M)
2.5
2
1.5
1
0.5
0
Mar 1, 2020
Aug 8, 2020
Nov 16, 2020
Feb 24, 2021
Jun 4, 2021
Sep 12, 2021
Mar 21, 2022

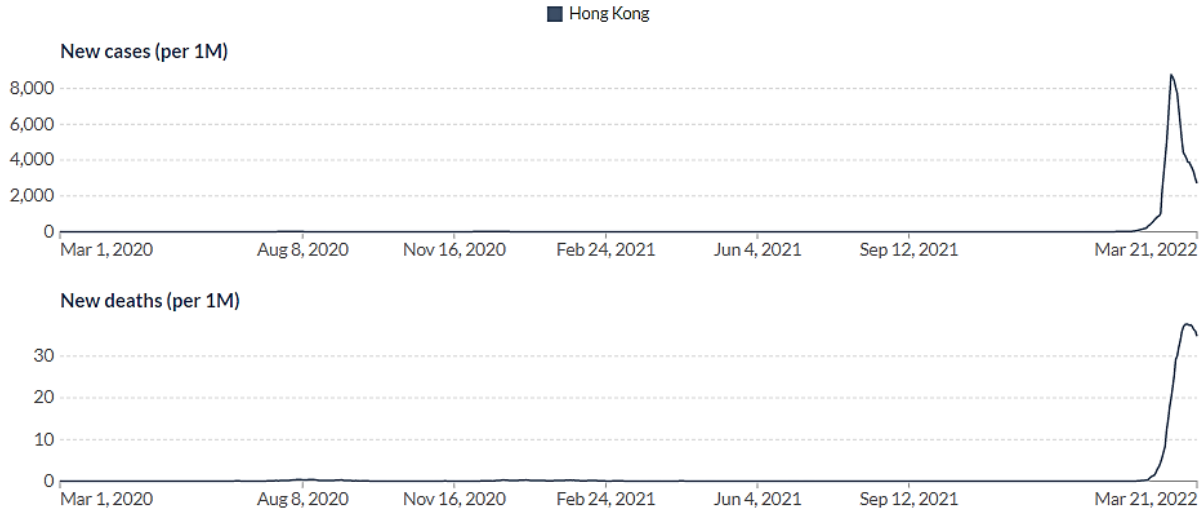
b)


South Korea
New cases (per 1M)
6,000
4,000
2,000
0
Mar 1, 2020
Aug 8, 2020
Nov 16, 2020
Feb 24, 2021
Jun 4, 2021
Sep 12, 2021
Mar 21, 2022
New deaths (per 1M)
6
4
2
0
Mar 1, 2020
Aug 8, 2020
Nov 16, 2020
Feb 24, 2021
Jun 4, 2021
Sep 12, 2021
Mar 21, 2022

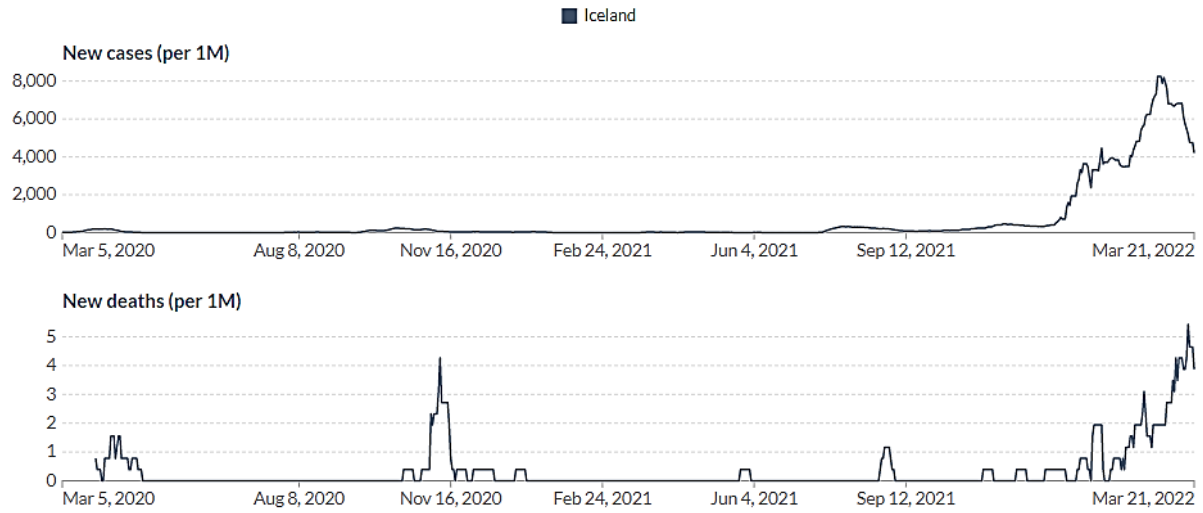
c)


Australia
New cases (per 1M)
4,000
3,000
2,000
1,000
0
Mar 1, 2020
Aug 8, 2020
Nov 16, 2020
Feb 24, 2021
Jun 4, 2021
Sep 12, 2021
Mar 21, 2022
New deaths (per 1M)
3
2
1
0
Mar 1, 2020
Aug 8, 2020
Nov 16, 2020
Feb 24, 2021
Jun 4, 2021
Sep 12, 2021
Mar 21, 2022

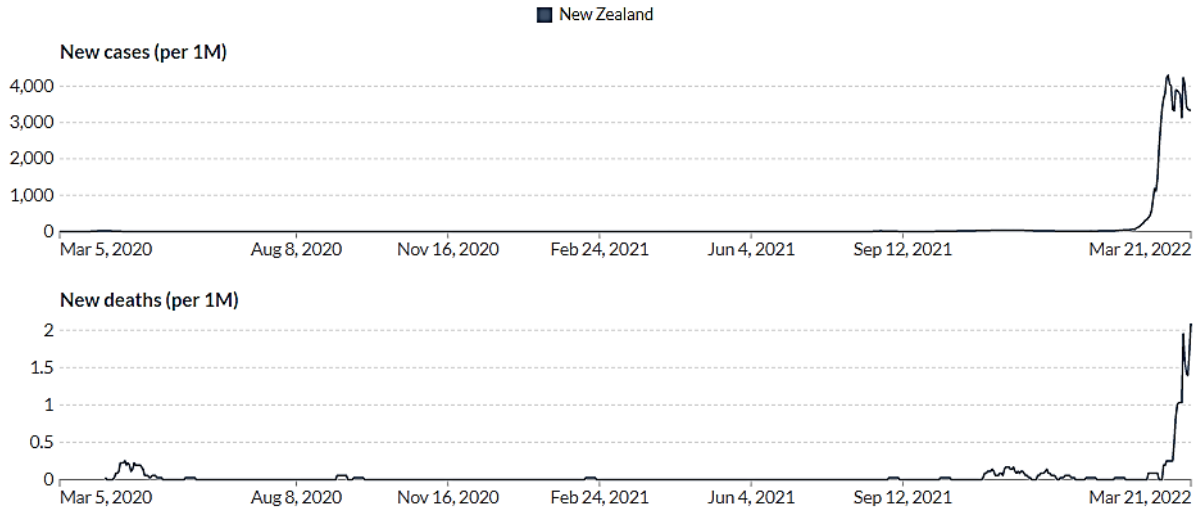
d)


Hong Kong
New cases (per 1M)
8,000
6,000
4,000
2,000
0
Mar 1, 2020
Aug 8, 2020
Nov 16, 2020
Feb 24, 2021
Jun 4, 2021
Sep 12, 2021
Mar 21, 2022
New deaths (per 1M)
30
20
10
0
Mar 1, 2020
Aug 8, 2020
Nov 16, 2020
Feb 24, 2021
Jun 4, 2021
Sep 12, 2021
Mar 21, 2022

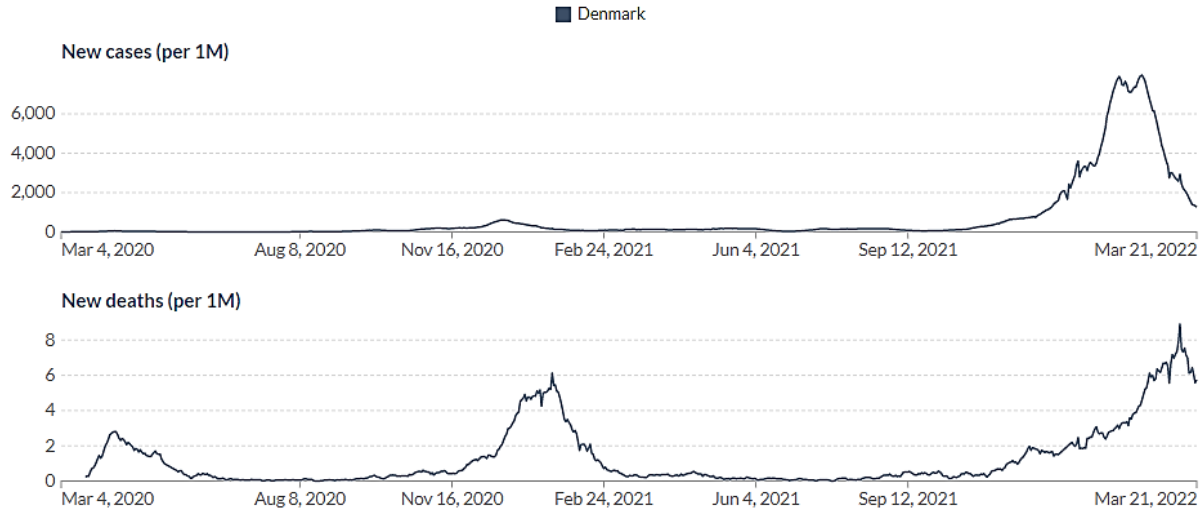
e)


Iceland
New cases (per 1M)
8,000
6,000
4,000
2,000
0
Mar 5, 2020
Aug 8, 2020
Nov 16, 2020
Feb 24, 2021
Jun 4, 2021
Sep 12, 2021
Mar 21, 2022
New deaths (per 1M)
5
4
3
2
1
0
Mar 5, 2020
Aug 8, 2020
Nov 16, 2020
Feb 24, 2021
Jun 4, 2021
Sep 12, 2021
Mar 21, 2022

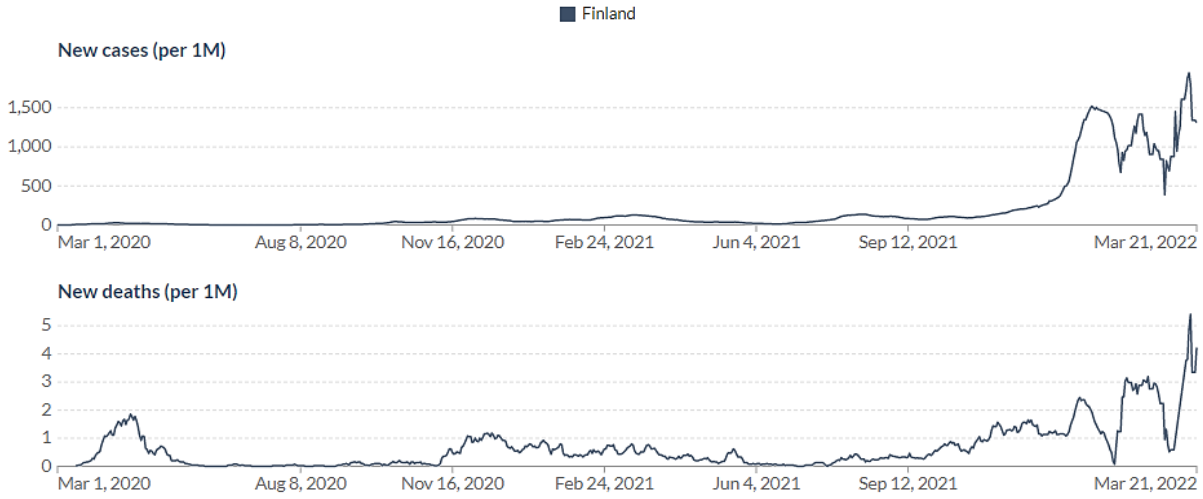
f)


New Zealand
New cases (per 1M)
4,000
3,000
2,000
1,000
0
Mar 5, 2020
Aug 8, 2020
Nov 16, 2020
Feb 24, 2021
Jun 4, 2021
Sep 12, 2021
Mar 21, 2022
New deaths (per 1M)
2
1.5
1
0.5
0
Mar 5, 2020
Aug 8, 2020
Nov 16, 2020
Feb 24, 2021
Jun 4, 2021
Sep 12, 2021
Mar 21, 2022

g)



h)



i)

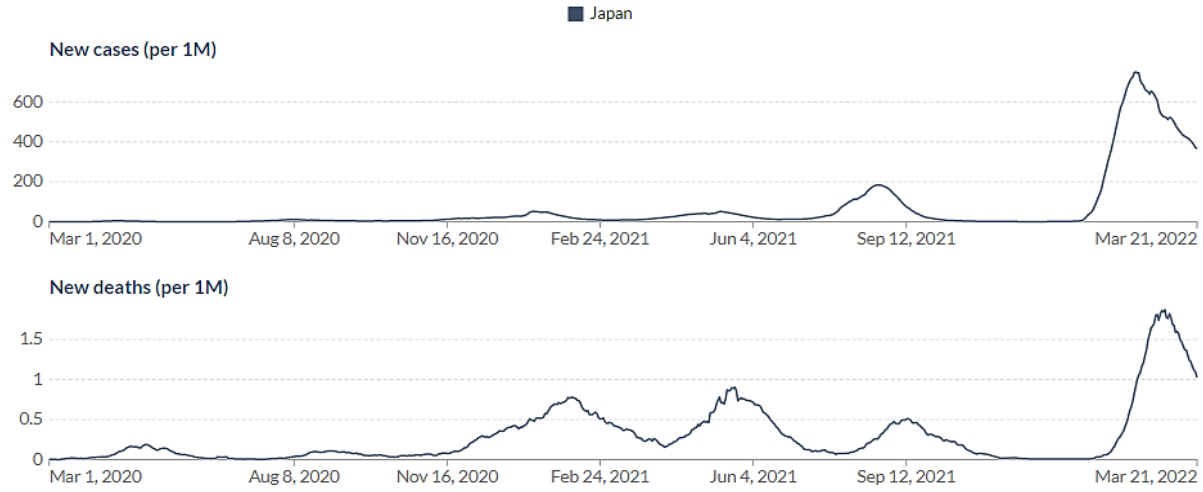


Fig. 2: Daily new confirmed COVID-19 Cases and Deaths per million people, 7-day rolling average, for countries those experienced unprecedented Deaths in the later period. Countries in that

category are: a) Singapore, b) South Korea, c) Australia, d) Hong Kong, e) Iceland, f) New Zealand, g) Denmark, h) Finland and i) Japan. The period of analysis is till 21st March 2022 and countries of vaccine status are also shown in Fig 1. [Source: Our World in Data (1)]

- **Latest performance of the country that leads/ guides vaccine roll-out strategy: Israel**

In Israel, 90% of people over the age of 60 years got two doses of vaccine alongside the booster dose. Israel is the country that first started vaccinating 5–11 years age group children and also first initiated the 4th dose in January 2022 [12]. Israel can be looked upon for monitoring purposes by other countries, in terms of the performance of vaccines among the mass community.

Israel also started 3rd dose earlier (in July) than other countries (most countries started from September 2021) and from 1st August Israel suddenly increased the third dose [1]. A new peak in Cases, as well as Deaths, appeared [Fig. 3a]. Israel is the first country that started the fourth dose at the beginning of January [12] and it coincided with the start of the highest peak of waves in Cases and Deaths. Both the latest peak in Cases and Deaths appeared to be all-time highs over the whole of the pandemic [Fig. 3a].

Before starting the 4th Dose in any country, careful analyses of the situation in Israel can offer a useful perspective. Observation from Israel can play a crucial role to reform and implement vaccine rollout strategies in other countries too.

- **Highest vaccinated country: Gibraltar**

Gibraltar is the country that maintained a 100 percent vaccination rate for a long time. It attained and maintained 100% vaccination since May 2021. However, Cases this winter (2021-'22) became an all-time high (Fig. 3b and c). The recent peak in Cases is not only the highest peak of all, but in terms of the width of waves too it exceeded all previous records (Fig. 3b). Gibraltar shows vaccination status even exceeding 100% (Fig. 3c) as they vaccinated all non-residents too and do not allow anyone to enter without full vaccination. Fig. S5 further shows Gibraltar is highly ranked not only in terms of cumulative vaccine doses but also in terms of cumulative Cases too.

All the observed data and analyses point towards high vaccination and losing natural immunity. That supports the latest unprecedented surges in Covid-19 Deaths in Singapore, South Korea, Australia, Hong Kong, Iceland, New Zealand, Denmark, Finland, Japan and Israel.

- **Unusual surge in Cases/Deaths among vaccinated groups compared to unvaccinated.**

The UK government weekly report [UK Health Security Agency (UHSA)] included vaccinated vs. unvaccinated statistics that indicated the absolute number of Deaths among vaccinated was increasing at a much higher rate than in the unvaccinated group. Record of Deaths within 28 days or 60 days of positive COVID-19 test by date of Death suggested approximately for every 6 Deaths from COVID-19 of above 50 years age group (period covered between week 43 and 46,

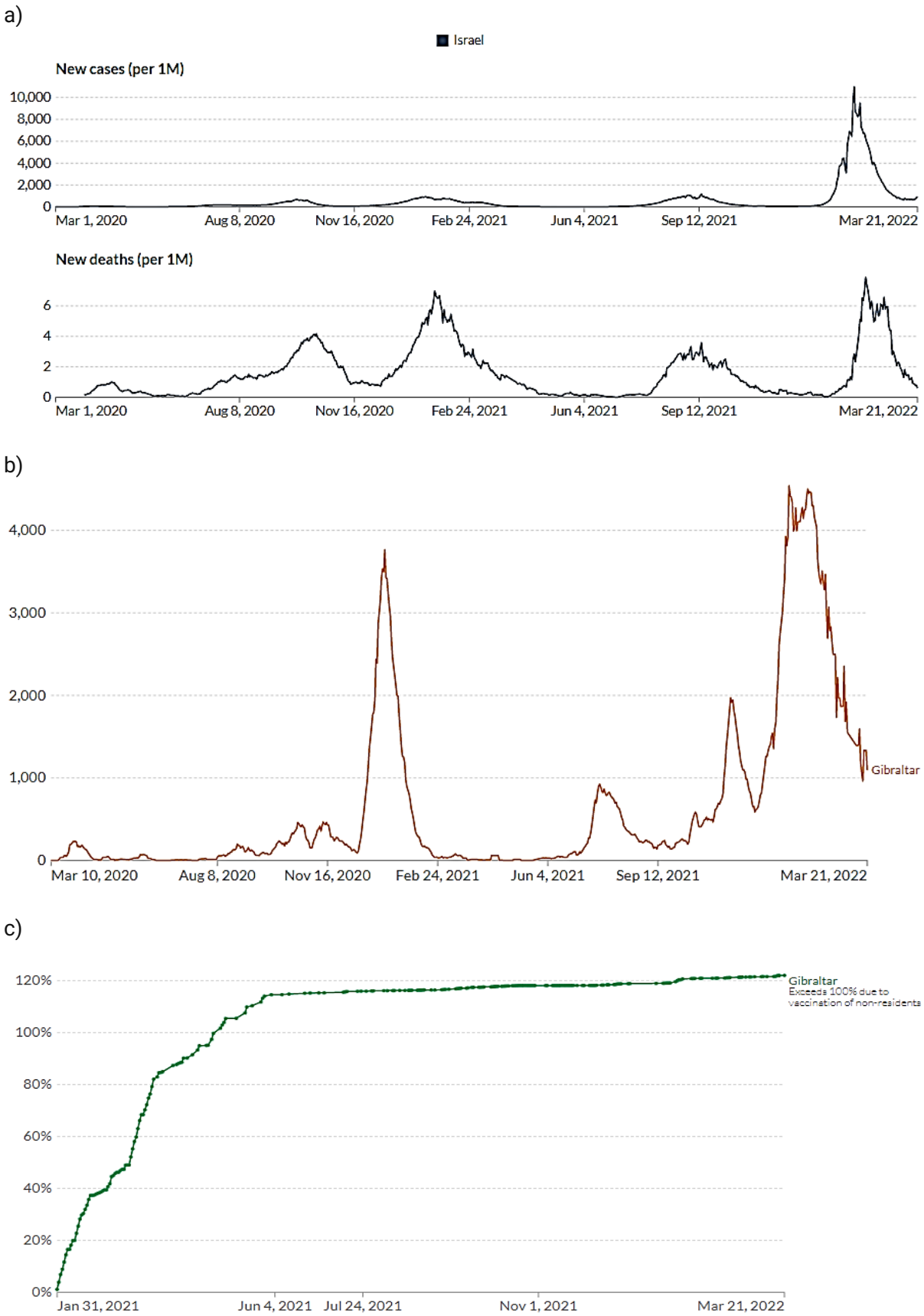


Fig. 3. Daily new confirmed COVID-19 Cases and Deaths, per million people (7-day rolling average) for **Israel** (a). The same for only Cases for **Gibraltar** (b). Share of people in **Gibraltar**

who completed all doses prescribed by the initial vaccination protocol (c). The period covered is till 21st March 2022 [Source: Our World in Data (1)]

2021, UHSA[8]), only 1 was unvaccinated and the rest other received at least one dose, Table S1). In terms of the percentage of total Deaths during those weeks, approximately 17 % were unvaccinated, while 80 % fully vaccinated [Table S1, UHSA[8]]. Whereas, in the later period, for week 9-12, 2022, Deaths within 28 days (60 days) of positive COVID-19 suggest approximately 9.5% (7.3%) were unvaccinated, and even 73.4% (76.1%) were triple jabbed (Table S1, UHSA[5]). As time passed from 28 days to 60 days, the percentage of Deaths among unvaccinated decreased (more than 2%), while Deaths among triple jabbed increased from 73.4% to 76.1% (Table S1). People aged 50 years and above are presented here, as they are the most vulnerable categories.

When the focus is on Cases, it is seen percentages of unvaccinated populations are also getting less infected compared to the fully vaccinated proportion (Table 1). The UHSA reports for week 47, 2021 (UHSA[8]) and week 13, 2022 (UHSA[5]) show Cases (in terms of percentage) among fully vaccinated people (even with third doses) are also rising at a much higher rate compared to the unvaccinated groups and is true for various age groups too (Table 1). Case numbers for individuals testing positive for the virus are seen persistently lower amongst the unvaccinated, while Case numbers among the triple-jabbed increased at a very high rate (Table 1). In later period b), all age groups show a decrease (between 2.5 times to 5 times) in Cases for the unvaccinated population to that from people of respective age groups with third doses. Whereas, in the earlier period a) the performances were mixed and not so consistent. For 30 to 79 years of age, though unvaccinated still performed better, but that did not even exceed 2.5 times.

Scotland's health authority, the Public Health Scotland (PHS) also publishes more detailed representations of weekly progression among vaccinated and unvaccinated categories. Table S2 shows the progression of Cases between 11th December '21 to 7th January '22 (PHS[9]). The report suggests that infections with COVID-19 are more common among people who have had at least one dose than the unvaccinated group (Table S2, PHS[9]). It is true for hospitalisation too. Also, mortality is considerably more probable for people with 2 doses than those who are unvaccinated (PHS[9]). As time progresses, how people with third doses will fare in Scotland compared to the unvaccinated group will be more evident, though can easily be speculated looking at data of later period from UHSA[5]. However, both the UK and Scotland governments stopped publishing the same data of vaccinated vs. unvaccinated in recent period; Scotland stopped since mid-Feb, while the UK from April 2022. Our previous discussion suggests it is very likely that UK and more specifically highly vaccinated Scotland will show a major surge in Cases and Deaths among vaccinated people with the third dose, as time progresses. Scotland the topmost vaccinated country in the UK (also one of the topmost vaccinated, globally) showed a maximum surge in Cases/Deaths in recent periods, though most stringent measures (face covering and many other restrictions) continued longer unlike most of the UK.

UHSA[8] :
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1036047/Vaccine_surveillance_report_-_week_47.pdf

PHS[9]: https://publichealthscotland.scot/media/11076/22-01-12-covid19-winter_publication_report.pdf

Table-1: Unadjusted rates of COVID-19 infection in vaccinated and unvaccinated populations in UK. Cases reported by specimen date between, a) week 43, 2021 (25th October) and week 46, 2021 (15 November) [UHSA[8] , Table 11] ; b) week 9, 2022 (w/e 6 March 2022) and week 12, 2022 (w/e 27 March 2022) [UHSA[5] , Table 14].

Age Groups	a) Week 43 to 46		b) Week 9 to 12	
	Unadjusted rates among persons vaccinated with at least ***2 doses*** (per 100,000)	Unadjusted rates among persons ***not vaccinated*** (per 100,000)	Unadjusted rates among persons vaccinated with at least ***3 doses*** (per 100,000)	Unadjusted rates among persons ***not vaccinated*** (per 100,000)
18 to 29	757.1	837.6	3,118.8	941.6
30 to 39	1,373.1	967.0	4,324.7	1,085.6
40 to 49	2,022.9	933.8	3,957.8	955.3
50 to 59	1,422.5	697.0	3,303.4	779.8
60 to 69	1,015.6	504.1	2,814.9	572.8
70 to 79	538.2	422.7	2,161.5	532.1
80 or over	320.7	410.0	2,023.7	775.6

N.B. The rates are calculated per 100,000 in people who have received either 2nd doses (a), or 3rd doses (b), of a COVID-19 vaccine or in people who have not received a COVID-19 vaccine. Calculations are updated every week as the number of unvaccinated people and individuals vaccinated with 2nd or 3rd doses in the population changes.

Such observation may explain why there was an unprecedented rise in Cases and Deaths in all those nine highly vaccinated countries after the initiation of the third dose.

- **Frequent vaccination, 'Exhaustion of T cells' and impaired immunity:**

Further explanations based on scientific perspectives can also be offered that might support unusual COVID-19 situations as discussed for those countries. A well-known effect of vaccines known as 'exhaustion of T cells' may provide an explanation [13, 14]. The destructive effects of tampering with T cells are acknowledged in many popular articles [13, 14]. The findings presented here confirm concerns as expressed by the European Union's top drug regulator. Dr Marco Cavaleri, the European Medicines Agency's head of vaccines strategy, raised that issue at a news briefing (Newspaper[10]). Dr Cavaleri was likely referencing a concern that seeing antigens (like those provided by vaccines) over and over again can lead to T cell anergy or 'exhaustion'. Prof Sarah Fortune, a professor at the Harvard TH Chan School of Public Health Department of Immunology and Infectious Diseases seconded such a possibility (Newspaper[10]). T cells play a key role in fighting COVID-19 once it is entered the body [14]. Multiple doses of vaccine can exhaust the T cells and subsequently weaken immune response.

Newspaper[10]: https://www.dw.com/en/covid-do-multiple-boosters-exhaust-our-immune-response/a-60447735 dt 18.01.22 accessed on 15/04/22.

Published research is also available that further discussed the suppression of immune response [9]. Their research suggested that in human cells, anti-COVID-19 vaccines actively suppress type I interferon (IFN) signaling. In general, type I and II interferons are accountable for activating and regulating the immune response [15]. Suppression of type I IFN responses results in impaired innate immunity. Subversion of innate immunity, primarily via suppression of interferon type I and its associated signaling cascade can have various wider consequences. It might cause reactivation of latent viral infections and can reduce the capability to fight effectively future infections [9]. Those may provide explanations for why there is an unusual surge of COVID-19 Cases as well as Deaths in recent periods among vaccinated groups compared to the unvaccinated ones [Table 1, Table S1 and S2].

- **Additional Policy Recommendations:**

Few propositions are also mentioned here. People all over the world will appreciate such endeavour, regardless of who agrees or disagree with frequent vaccine doses and child vaccinations.

a) Countries should investigate adverse reactions and if responsible, vaccine companies should be made liable to compensate for harms and Deaths.

b) Out of any announced global crisis and emergency, no one should be allowed to make profits. The huge profits so far made by vaccine companies and related businesses should be taxed under a specific COVID-19 tax scheme.

These two measures (a and b) not only have enormous socio-economic impacts but will also help bring back to normalcy sooner.

Conclusions

Considering the unprecedented recent COVID-19 situations in the following groups- a) among some topmost vaccinated countries e.g., Singapore, South Korea, Australia, Hong Kong, Iceland, New Zealand, Denmark, Finland and Japan; b) country that leads the vaccine roll-out programme viz. Israel; and c) country that is fully vaccinated for the longest period viz. Gibraltar - an obvious question arises as to what purpose was being served to those countries. Knowing many adverse effects of vaccines, noting the effectiveness of vaccination wanes in only four months' time and considering the heavy economic burden of mass vaccination globally every few months, many burning questions erupt on mass vaccination strategy. If situations became worst and unprecedented in the recent period for the whole of the pandemic, what objectives those leading countries have achieved in controlling COVID transmission. These are few critical questions discussed and addressed on current COVID-19 exit strategies based on global mass vaccination.

Furthermore, observations indicate an unusual surge of Cases as well as Deaths in later periods among fully vaccinated groups compared to the unvaccinated ones. Hence one apparent issue arises whether high vaccination among the general population is causing them to lose natural immunity or not. All observed facts are supported by a well-known scientific theory relating to vaccination known as 'Exhaustions of T Cell'. It indicates high vaccination may weaken innate immune response. Other research further discussed that anti-COVID-19 vaccines actively suppress type I interferon signaling which can result in impaired innate immunity. As type I interferons are heavily responsible for activating and regulating the immune response, such a process can cause the reactivation of latent viral infections and reduce the capability to fight effectively against future infections. Those may provide explanations for an unusual surge of COVID-19 Cases and Deaths in recent periods among vaccinated groups. It is now high time to

check these observed data and take urgent policy actions worldwide. Other additional policy measures are also proposed those will have enormous socio-economic impacts and will help bring back normalcy sooner.

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References

1. Website: Ourworldindata, https://ourworldindata.org/coronavirus-data-explorer accessed 16/04/2022.

2. Gorbalenya AE, Baker SC, Baric RS et al. (2020) The species Severe acute respiratory syndrome-related coronavirus: classifying 2019-nCoV and naming it SARS-CoV-2. Natural Microbiology;5:536–544. https://doi.org/10.1038/s41564-020-0695-z

3. Chen Yu and Lanjuan Li, (2020), SARS-CoV-2: virus dynamics and host response, The Lancet, 20, 5, P515-516, MAY 01, 2020, DOI:https://doi.org/10.1016 /S1473-3099(20)30235-8.

4. Heinz, F.X., Stiasny, K. Distinguishing features of current COVID-19 vaccines: knowns and unknowns of antigen presentation and modes of action. *npj Vaccines* **6,** 104 (2021). https://doi.org/10.1038/s41541-021-00369-6

5. Doshi P, BMJ 2020, Will covid-19 vaccines save lives? Current trials aren't designed to tell us; 371 doi: https://doi.org/10.1136/bmj.m4037, BMJ 2020;371:m4037 https://www.bmj.com/content/371/bmj.m4037.

6. Godlee, F, 2020, 'Covid-19: We need new thinking and new leadership' BMJ, https://www.bmj.com/content/371/bmj.m4358

7. Roy, I 2021: Exit Strategy from COVID-19: Vaccination and Alternate Solution, Chapter 38. BIOMESIP 2021, LNCS 12940, pp. 1–16, DOI:10.1007/978-3-030-88163-4_38. Publisher, Springer Nature.

8. Sanders, R.W. 2021, 'Pandemic moves and countermoves: vaccines and viral variants', The Lancet, DOI: https://doi.org/10.1016/S0140-6736(21)00730-3.

9. Seneff S, Nigh G, Kyriakopoulos AM et al. 2022, Innate immune suppression by SARS-CoV-2 mRNA vaccinations: The role of G-quadruplexes, exosomes, and MicroRNAs, Food and Chemical Toxicology, Volume 164, 113008, ISSN 0278-6915, https://doi.org/10.1016/j.fct.2022.113008.

10. Seneff, S., & Nigh, G. (2021). Worse Than the Disease? Reviewing Some Possible Unintended Consequences of the mRNA Vaccines Against COVID-19. International Journal of Vaccine Theory, Practice, and Research, *2*(1), 38–79.

11. M. Shrotri, A.M. Navaratnam, V. Nguyen, T. Byrne, C. Geismar, E. Fragaszy, S. Beale, W.L.E. Fong, P. Patel, J. Kovar, et al. Spike-antibody waning after second dose of BNT162b2 or ChAdOx1, Lancet, 398 (10298) (2021), pp. 385-387

12. Burki, T. K. (2022) Fourth dose of COVID-19 vaccines in Israel, The Lancet, DOI: https://doi.org/10.1016/S2213-2600(22)00010-8

13. Blank, C.U., Haining, W.N., Held, W. *et al.* Defining 'T cell exhaustion'. *Nat Rev Immunol* **19,** 665–674 (2019). https://doi.org/10.1038/s41577-019-0221-9

14. Rha, MS., Shin, EC. Activation or exhaustion of $CD8^+$ T cells in patients with COVID-19. *Cell Mol Immunol* **18,** 2325–2333 (2021). https://doi.org/10.1038/s41423-021-00750-4

15. Parkin J, Cohen B (June 2001). "An overview of the immune system". Lancet. **357** (9270): 1777–89. doi:10.1016/S0140-6736(00)04904-7. PMID 11403834. S2CID 165986

Supplementary Section

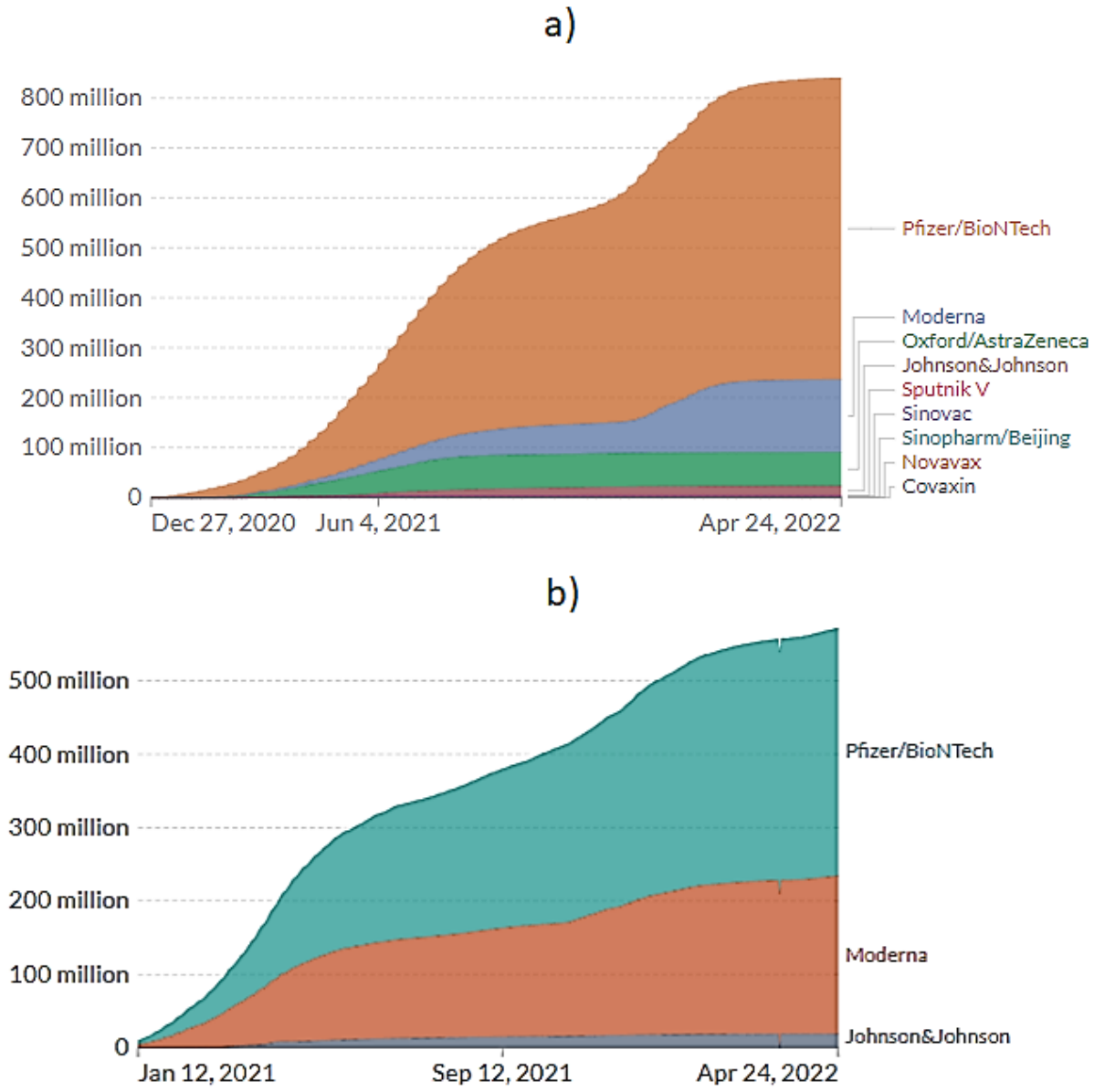
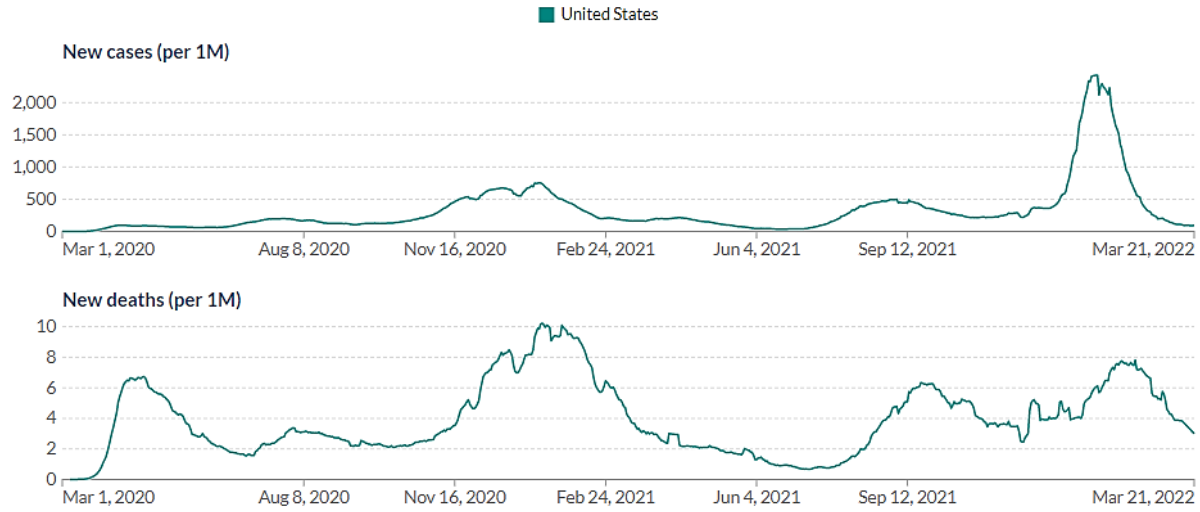


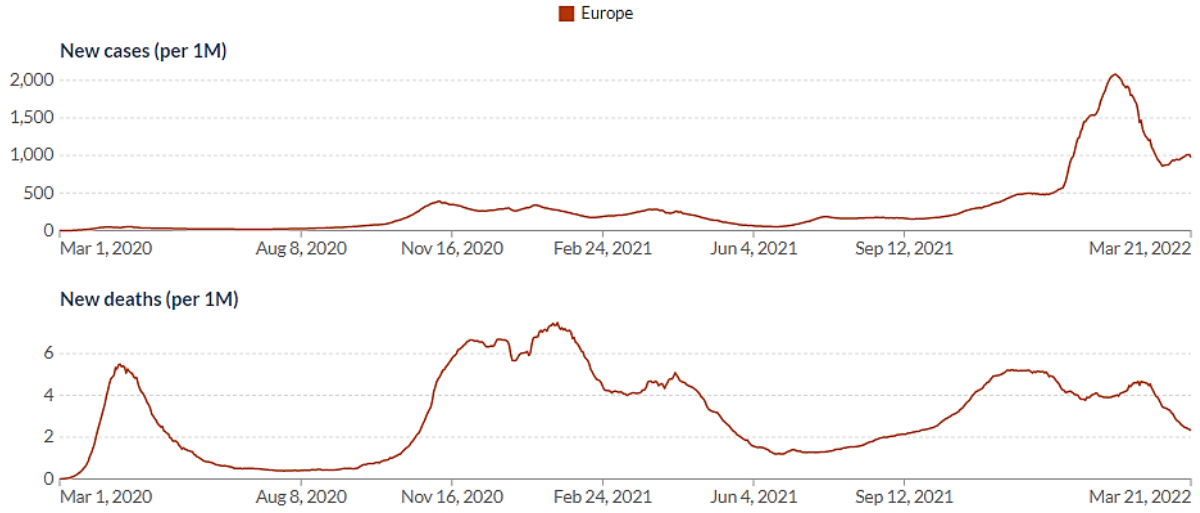
Fig. S1. COVID-19 vaccine doses administered based on manufacturer for a) European Union and b) US. All doses, including boosters, are counted individually. In both cases, majority are shown administered Pfizer-BioNTech vaccine followed by Moderna.

[Source: Our World in Data (1)]

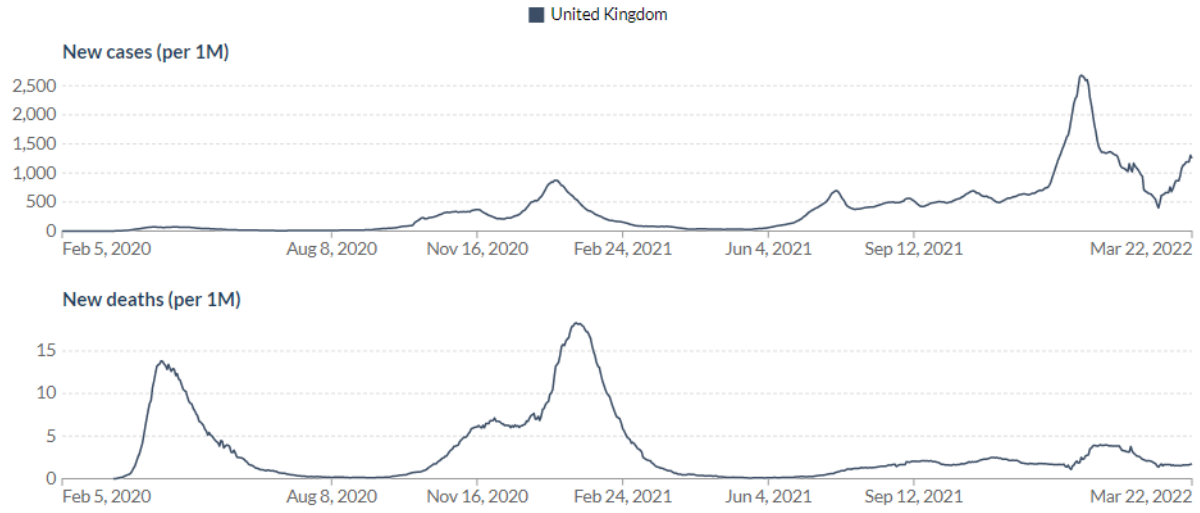
a)


United States
New cases (per 1M)
2,000
1,500
1,000
500
0
Mar 1, 2020
Aug 8, 2020
Nov 16, 2020
Feb 24, 2021
Jun 4, 2021
Sep 12, 2021
Mar 21, 2022
New deaths (per 1M)
10
8
6
4
2
0
Mar 1, 2020
Aug 8, 2020
Nov 16, 2020
Feb 24, 2021
Jun 4, 2021
Sep 12, 2021
Mar 21, 2022

b)


Europe
New cases (per 1M)
2,000
1,500
1,000
500
0
Mar 1, 2020
Aug 8, 2020
Nov 16, 2020
Feb 24, 2021
Jun 4, 2021
Sep 12, 2021
Mar 21, 2022
New deaths (per 1M)
6
4
2
0
Mar 1, 2020
Aug 8, 2020
Nov 16, 2020
Feb 24, 2021
Jun 4, 2021
Sep 12, 2021
Mar 21, 2022

c)


United Kingdom
New cases (per 1M)
2,500
2,000
1,500
1,000
500
0
Feb 5, 2020
Aug 8, 2020
Nov 16, 2020
Feb 24, 2021
Jun 4, 2021
Sep 12, 2021
Mar 22, 2022
New deaths (per 1M)
15
10
5
0
Feb 5, 2020
Aug 8, 2020
Nov 16, 2020
Feb 24, 2021
Jun 4, 2021
Sep 12, 2021
Mar 22, 2022

d)

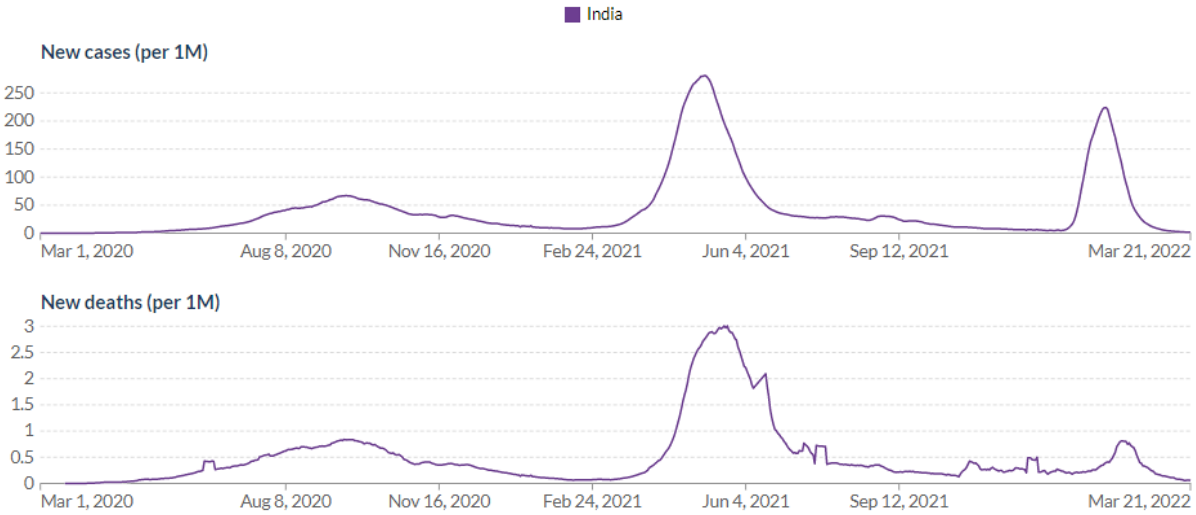


Fig. S2. Daily new confirmed COVID-19 Cases and Deaths per million people, 7-day rolling average, till 21st March 2022 for a) United States, b) Europe, c) UK and d) India

[Source: Our World in Data (1)]

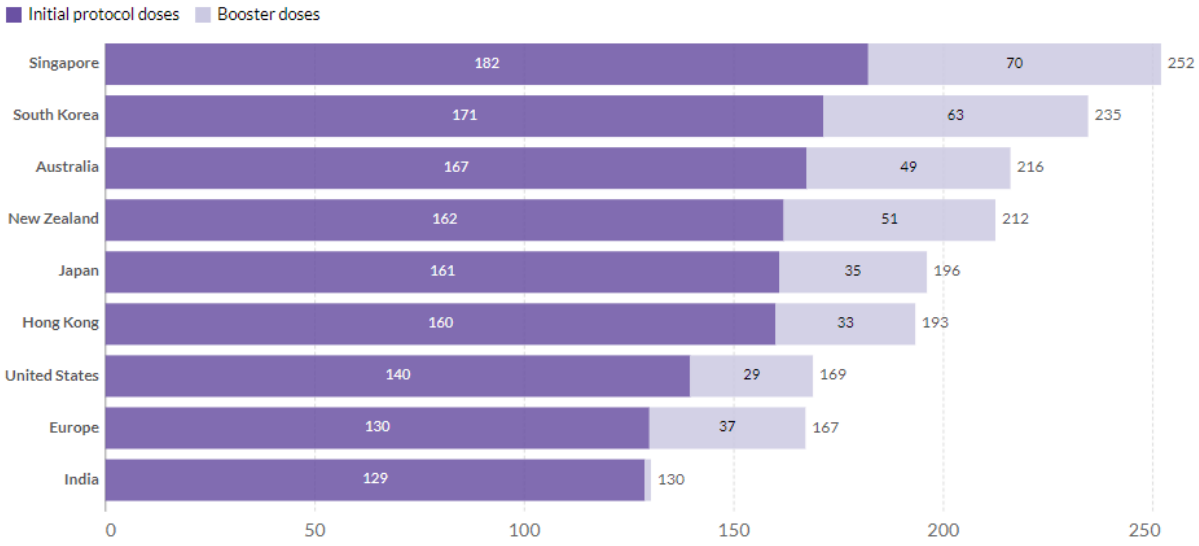
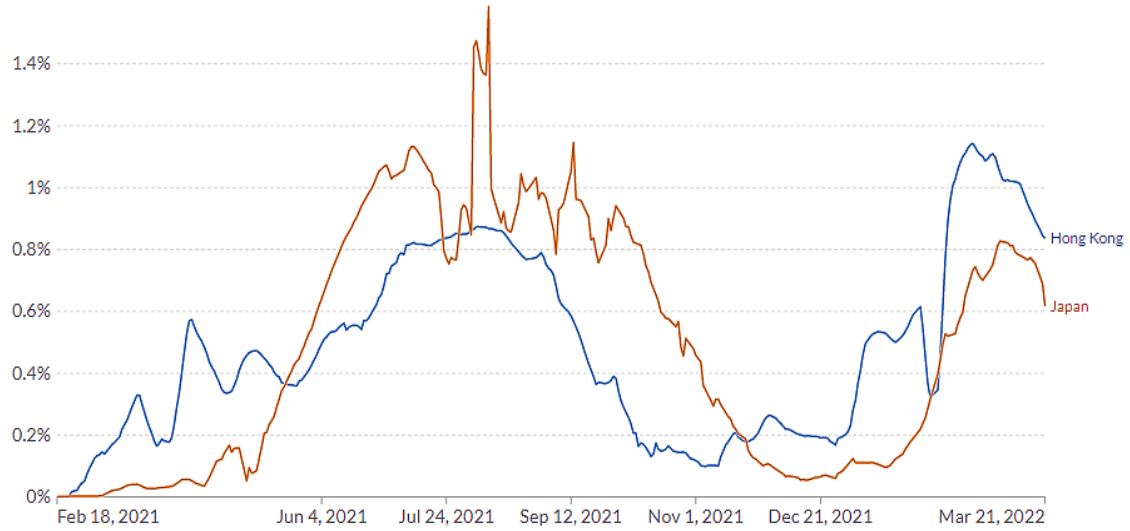


Fig. S3. COVID-19 vaccine doses, further breakdown, in terms of initial doses and boosters per 100 people upto March 21, 2022 for few countries from Fig 1. The total number of doses administered, broken down by whether they are part of the initial protocol or booster doses, divided by the total population of the country.

[Source: Our World in Data (1)].

a)



b)

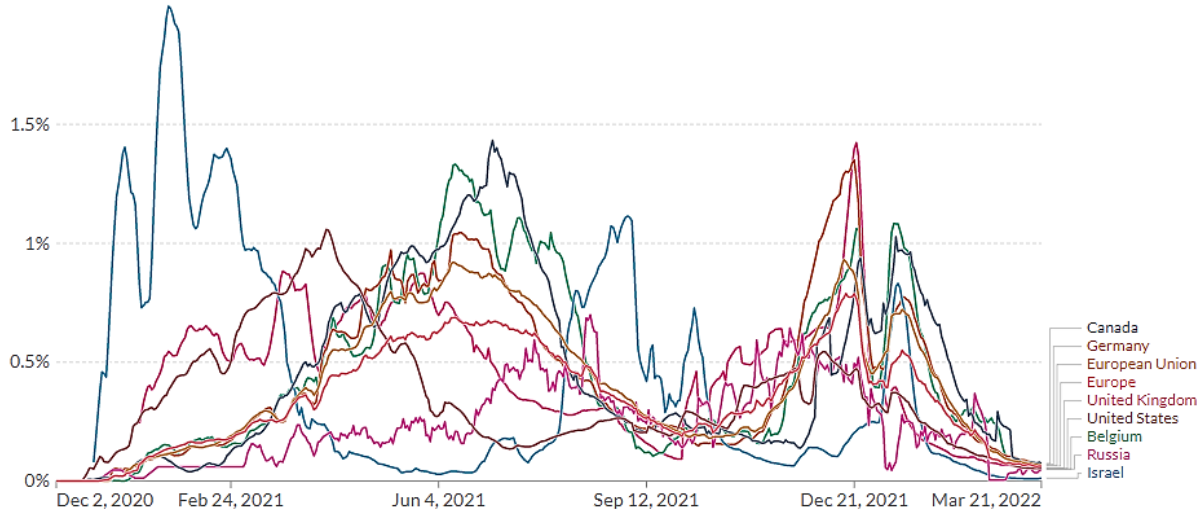


Fig. S4. Daily share of the population receiving a COVID-19 vaccine dose (7-day rolling average). All doses, including boosters, are counted individually. a) Hong Kong and Japan showed a sudden rise in vaccine dose in later period. b) Most countries decreased vaccine doses in later time. [Source: Our World in Data (1)]

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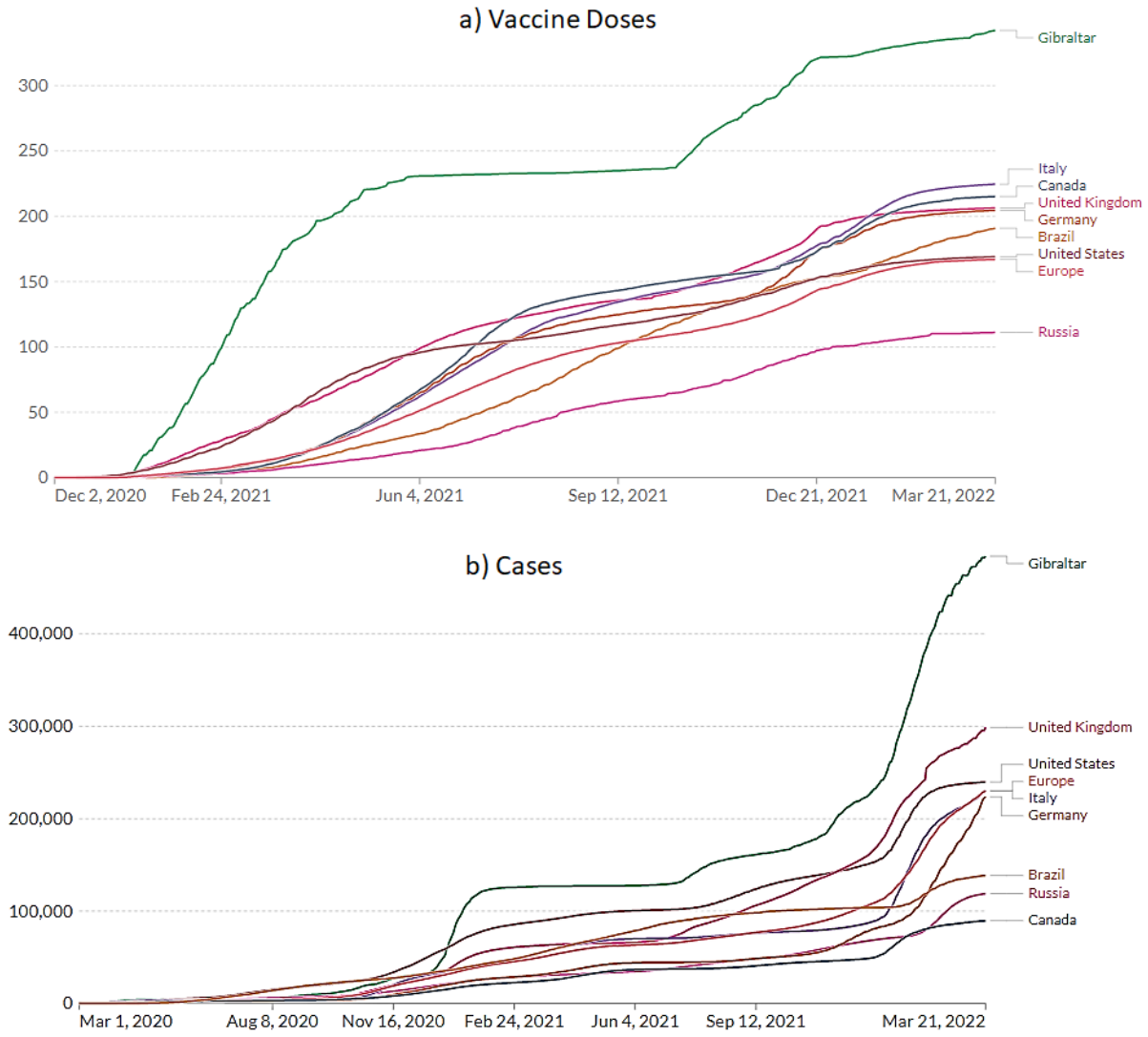

Fig. S5. The country Gibraltar is highly ranked in terms of cumulative vaccine doses as well as Cases. a) COVID-19 vaccine doses (cumulative) administered per 100 people. All doses, including boosters, are counted individually. b) Cumulative confirmed COVID-19 cases per million people. [Source: Our World in Data (1)].

Table S1. COVID-19 Deaths (≥ 50 years age groups) (I) within 28 days, (II) within 60 days of positive specimen or with COVID-19 reported on Death certificate, by vaccination status between a) week 43- 46, 2021 [UHSA[8] , Table 10 a, b]; b) week 9-12, 2022 [UHSA[5] , Table 13 a, b].

Week /Age groups (10 years band)	Total		Unlinked		Not Vaccinated		Received one dose, (1-20 days before specimen date)		Received one dose, ≥21 days before specimen date		Second dose≥14 days before specimen date		Third dose≥14 days before specimen date	
	I	II	I	II	I	II	I	II	I	II	I	II	I	II
a)Week (43-46)														
50-59	250	312	5	6	108	134	0	0	11	14	126	158	Na	
60-69	555	658	3	5	154	181	0	0	18	20	380	452		
70-79	1025	1195	6	7	163	175	1	1	9	16	846	996		
≥80	1726	2054	7	7	187	207	5	6	35	47	1492	1787		
Total	3556	4219			612	697					2844	3393		
(% of Deaths)					(17.2,	16.5)					(79.9,	80.4)		
b)Week (9-12)														
50-59	72	155	0	0	16	24	0	0	5	8	17	45	34	78
60-69	163	350	1	1	31	48	0	0	11	16	39	77	81	208
70-79	435	825	3	3	48	72	0	0	6	19	70	120	308	611
≥80	1420	2614	5	5	104	145	1	2	23	36	175	320	1112	2106
Total	2090	3944			199	289							1535	3003
(% of Deaths)					(9.5 ,	7.3)							(73.4,76.1)	

Table-S2: Age standardised Case rate per 100,000 people by vaccination status and week in Scotland between 11 December 2021 to 7th January 2022. Unvaccinated are performing the best in all weeks compared to any vaccinated groups. Double vaccinated are performing the worst in every week. [Source: PHS[9], their Table 11]

	Unvaccinated		1 Dose	
Week	No. tested positive by PCR	Age Standardised case rate per 100,000 with 95% confidence intervals	No. tested positive by PCR	Age Standardised case rate per 100,000 with 95% confidence intervals
11 December - 17 December 2021	6,545	**482.87** (464.41 - 501.34)	2,952	**574.16** (538.46 - 609.85)
18 December - 24 December 2021	9,070	**721.39** (698.44 - 744.34)	4,639	**958.62** (911.03 - 1,006.20)
25 December - 31 December 2021	14,465	**1,242.10** (1,209.27 - 1,274.94)	7,657	**1,693.71** (1,631.31 - 1,756.11)
01 January 2022 – 07 January 2022	12,485	**1,092.80** (1,063.90 - 1,121.71)	6,702	**1,527.57** (1,462.52 - 1,592.63)
	2 Doses		Booster or 3rd Dose	
Week	No. tested positive by PCR	Age Standardised case rate per 100,000 with 95% confidence intervals	No. tested positive by PCR	Age Standardised case rate per 100,000 with 95% confidence intervals
11 December - 17 December 2021	20,788	**826.49** (809.83 - 843.16)	3,926	**458.39** (400.49 - 516.29)
18 December - 24 December 2021	35,123	**1,527.87** (1,501.86 - 1,553.88)	10,193	**902.02** (841.06 - 962.98)
25 December - 31 December 2021	54,860	**2,897.58** (2,859.92 - 2,935.23)	30,327	**1,755.69** (1,701.98 - 1,809.40)
01 January 2022 – 07 January 2022	35,119	**2,499.52** (2,462.50 - 2,536.53)	33,415	**1,466.76** (1,418.18 - 1,515.33)