COVID-19 vaccine expiry forecast for 2021 and 2022
Airfinity analysis and forecasts on expiry of doses
September 20th
Analysis from 6th September report

Available supply per month, split into booster allocation for eligible and willing adults & teens and remaining supply of *SRA authorised vaccines only

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>United Kingdom</td>
<td>175,513,352</td>
<td>175,513,352</td>
<td>175,513,352</td>
<td>175,513,352</td>
<td>175,513,352</td>
<td>175,513,352</td>
<td>175,513,352</td>
<td>175,513,352</td>
<td>175,513,352</td>
<td>175,513,352</td>
<td>175,513,352</td>
<td>175,513,352</td>
</tr>
<tr>
<td>Japan</td>
<td>185,796,943</td>
<td>185,796,943</td>
<td>185,796,943</td>
<td>185,796,943</td>
<td>185,796,943</td>
<td>185,796,943</td>
<td>185,796,943</td>
<td>185,796,943</td>
<td>185,796,943</td>
<td>185,796,943</td>
<td>185,796,943</td>
<td>185,796,943</td>
</tr>
<tr>
<td>European Union</td>
<td>88,824,486</td>
<td>88,824,486</td>
<td>88,824,486</td>
<td>88,824,486</td>
<td>88,824,486</td>
<td>88,824,486</td>
<td>88,824,486</td>
<td>88,824,486</td>
<td>88,824,486</td>
<td>88,824,486</td>
<td>88,824,486</td>
<td>88,824,486</td>
</tr>
</tbody>
</table>

Cumulative available doses (rolled over from earlier supply)

<table>
<thead>
<tr>
<th>Cumulative stock</th>
<th>Already-donated</th>
<th>Stack totals include already-donated doses</th>
</tr>
</thead>
<tbody>
<tr>
<td>175,513,352</td>
<td>175,513,352</td>
<td>Total supply for the month. Above shows leftover supply; below what is used for boosters</td>
</tr>
<tr>
<td>185,796,943</td>
<td>185,796,943</td>
<td></td>
</tr>
<tr>
<td>88,824,486</td>
<td>88,824,486</td>
<td></td>
</tr>
</tbody>
</table>

Boosters campaign (for everyone over 12 years, with real-world uptake)

<table>
<thead>
<tr>
<th>Boosters campaign</th>
<th>USA</th>
<th>EU</th>
<th>UK</th>
<th>Canada</th>
<th>Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over 1.2 billion doses have been pledged to be donated by the G7 &amp; EU by mid-2022, of which less than 12% has been delivered. Analysis shows that over 1.2 billion doses could be available for donation by the G7 in 2021 alone, while still maintaining domestic booster campaigns for all adults.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Vaccine stock (per month, from supply excluding booster rollout, which is depicted below)

Pledged donations and deliveries to date

<table>
<thead>
<tr>
<th>Pledged donations and deliveries to date</th>
<th>USA</th>
<th>EU</th>
<th>UK</th>
<th>Canada</th>
<th>Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td>580,000,000</td>
<td>450,000,000</td>
<td>100,000,000</td>
<td>100,000,000</td>
<td>30,000,000</td>
<td></td>
</tr>
</tbody>
</table>

*Vaccine availability analysis is not exclusive of already-pledged doses; this is shown in cumulative stock graph, and is broken down per country in appendix

*SRA authorised vaccines only: only vaccines approved by a Stringent Regulatory Authority are included (+ Novavax)
G7 countries can achieve higher impact and easier distribution by initiating redistribution gradually

The data shows how many doses could be distributed per month including currently pledged donations and additional available stock. Additional stock is in a greater proportion in the earlier months, suggesting countries can and should begin donating doses sooner, rather than waiting. The data includes all supply, including supply purchased solely for donation (in the case of the USA).

Bars show cumulative amounts

Values indicate what can be redistributed per month

Breakdown for each country can be found in the supporting analysis
G7 could waste 241M doses by end of 2021 without immediate redistribution

Number of doses that will expire from G7 & EU supply after boosters and pledge donations are fulfilled

Expired doses each month

- Two months prior to expiry
- Expired doses

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Shelf life/time to expiry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pfizer/BioNTech</td>
<td>6 months</td>
</tr>
<tr>
<td>Moderna</td>
<td>7 months</td>
</tr>
<tr>
<td>AstraZeneca</td>
<td>6 months</td>
</tr>
<tr>
<td>Novavax</td>
<td>6 months</td>
</tr>
<tr>
<td>J&amp;J</td>
<td>6 months</td>
</tr>
</tbody>
</table>

Vanity Fair estimate 34M doses have already expired in the US

Cumulative expired doses:

- Two months prior to expiry
- Expired doses

241,471,166

Available stock from G7 could allow LIC/LMIC to have supply for 70 pct by May 2022

With currently agreed supply from COVAX & G7 pledged donations and bilateral deals LIC/LMICs collectively will not have enough doses to fully vaccinate 70% of their population. However, if additional supply – that would otherwise expire – from the G7 were donated to LIC/LMICs they could have sufficient doses for 70% of their populations by May 2022. This may then take some time to rollout, and vaccinating 70% may occur some time after this.

*Forecasted donations to COVAX from G7 countries based on announcements to deliver 1 billion doses by mid-2022

Updated 14/09/2021
Countries with low vaccination rates have an urgent need for doses, which may otherwise expire.

Vaccine coverage vs case fatality rates:

Africa has the lowest vaccine coverage while recording some of the highest case fatality rates - the continent has less than 4% of the population fully vaccinated, with many nations within Africa being even lower.

In low-income countries alone the proportion of people fully vaccinated is less than 1%.
Agenda

Supporting analysis

Redistribution potential per G7 country
Mortality forecasts and donations impact
Infection trajectories
The data shows how many doses could be distributed per month including currently pledged donations and additional available stock. Additional stock is in a greater proportion in the earlier months, suggesting countries can and should begin donating doses sooner, rather than waiting. The data includes all supply, including supply purchased solely for donation.
The data shows how many doses could be distributed per month including currently pledged donations and additional available stock. Additional stock is in a greater proportion in the earlier months, suggesting countries can and should begin donating doses sooner, rather than waiting. The data includes all supply, including supply purchased solely for donation.

Bars show cumulative amounts

Values indicate what can be redistributed per month

**United Kingdom**

Monthly redistribution potential from the United Kingdom, with current planned donations and additional available stock.
European Union

Monthly redistribution potential from the European Union, with current planned donations and additional available stock

The data shows how many doses could be distributed per month including currently pledged donations and additional available stock. Additional stock is in a greater proportion in the earlier months, suggesting countries can and should begin donating doses sooner, rather than waiting. The data includes all supply, including supply purchased solely for donation.

Bars show cumulative amounts

Values indicate what can be redistributed per month
The data shows how many doses could be distributed per month including currently pledged donations and additional available stock. Additional stock is in a greater proportion in the earlier months, suggesting countries can and should begin donating doses sooner, rather than waiting. The data includes all supply, including supply purchased solely for donation.
A large number of deaths will be averted by faster vaccine re-distribution, exact number uncertain

Estimates on deaths averted as of today and forecasted to mid-2022

Timeline estimates how many deaths could have already been avoided, had available unused doses already been donated and rolled out in July and August in low-income countries; it is estimated that 6,000 deaths may have been averted from available vaccines. Further analysis estimates the number of deaths that could potentially be averted by mid-2022 if available doses begin distribution as of today, and are rolled out in LICs & LMICs. This number will only increase as vaccines offer long-term protection.

Deaths that could have been averted

If available currently unused vaccines from G7 countries had already been donated to LICs & LMICs, it is estimated that 6,000 deaths could have been avoided by today (16/09/21).

Potential future deaths that can be prevented

If vaccine stock that is available now and that is forecasted to be available, begins being donated now and continues to be donated, and rolls out, then it is estimated that nearly 1 million deaths could be averted by mid-2022. This figure will continue to increase into the future as future deaths are then also averted.

Today estimate assumes two dose vaccine schedule in Jul 21 and Aug 21, 15% shrinkage. Being vaccinated reduces susceptible population leading to a lower infection rate, which is multiplied by IFR to estimate deaths averted

Deaths are rising and are forecasted to continue, growth rate could slow if more vaccines are administered

Global officially recorded cumulative COVID deaths and forecasts

The number of total COVID deaths has continued to increase throughout the pandemic, with global rates increasing in 2021 as more transmissible variants have spread. Deaths are forecasted to continue rising, however, the rate of growth depends on infections rates, but largely on how quickly vaccines are rolled out globally. If effective vaccines are rolled out quickly then the deaths rate could drop significantly in coming months.

It is estimated that the official death count massively underestimates actual deaths caused by COVID-19, particularly in lower income countries, where reporting systems are worse. It is estimated that actual deaths could be 3x higher.

Source: Our World in Data
Actual COVID deaths could be 3x higher than the official count

Analysis of actual COVID deaths estimated from excess deaths vs official count of COVID deaths

Global estimated daily deaths* vs confirmed COVID-19 deaths: (1000’s)

*Deaths relative to expected deaths in a normal year

Source: The Economist, Sondre Ulvund Solstad
Cases likely to exceed 400M by mid-2022

An analysis of the worldwide recorded and potential cases

So far, nearly 225M cases have been officially recorded globally. If total cases continue rise at the current rate, we could record 400M a total of cases by mid-2022. The rate of infections, however, appears to have increased with more transmissible variants spreading globally; fitting a polynomial forecast to cases shows that there could be over 500M recorded cases by mid-2022. The rollout of vaccines widely will help slow the spread of infections.

Source: Our World in Data
**Storage temperatures, shelf lives, and efficacies of vaccines to determine suitability for different countries**

With current efficacy numbers, a separate analysis by Airfinity shows between 100,000 and 225,000 lives could be saved per 100 million doses donated*

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Storage temperature</th>
<th>Shelf life</th>
<th>Non-cold storage shelf life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pfizer/BioNTech</td>
<td>-80°C</td>
<td>6 months</td>
<td>Up to 1 month at refrigerator temperatures: 2°C-8°C (36°F-46°F)</td>
</tr>
<tr>
<td>Moderna</td>
<td>-20°C</td>
<td>7 months</td>
<td>Up to 1 month at refrigerator temperatures: 2°C-8°C (36°F-46°F)</td>
</tr>
<tr>
<td>AstraZeneca</td>
<td>Refrigerator temperatures: 2°C-8°C</td>
<td>6 months</td>
<td>Up to 6 hours at room temperature 9°C-25°C (47°F-77°F) (once removed from 2-8°C storage)</td>
</tr>
<tr>
<td>Novavax</td>
<td>Refrigerator temperatures: 2°C-8°C</td>
<td>6 months</td>
<td>Unknown</td>
</tr>
<tr>
<td>J&amp;J</td>
<td>Refrigerator temperatures: 2°C-8°C</td>
<td>6 months</td>
<td>Up to 2 hours at room temperature 9°C-25°C (47°F-77°F)</td>
</tr>
</tbody>
</table>

*There are high levels of uncertainty to the numbers of lives saved, with main driver also being infection rates that are difficult to accurately predict. A deep dive can be provided on request.
MORE INFORMATION

Dr Matt Linley
Lead Analyst
matt@airfinity.com

Press:
Sarah Harper
Media and Communications Manager
M: +44 (0) 777 365 9099
Sarah@airfinity.com
Disclaimer and Copyright Notice

Copyright notice
All intellectual property rights in this publication and the information published herein are the exclusive property of Airfinity and may only be used under licence from Airfinity. Without limiting the foregoing, by accessing this publication you agree that you will not copy, reproduce, recirculate, distribute or use any part of its contents in any form or for any purpose whatsoever except under valid licence from Airfinity or with explicit consent by Airfinity. Unauthorised distribution is strictly prohibited.

Disclaimer
The data and other information published herein are provided on an "as is basis". Airfinity makes no warranties, express or implied, as to the accuracy, adequacy, timeliness, or completeness of the data or fitness for any particular purpose. Airfinity shall not be liable for any loss, claims or damage arising from any party’s reliance on the data and disclaim any and all liability relating to or arising out of use of the data to the full extent permissible by law.
THE WORLD’S TRUSTED COVID-19 PLATFORM

Airfinity is a predictive life science analytics company. Working with some of the world’s largest pharma companies, government agencies, corporates and investors, it has established itself as an authoritative provider of new predictive insights and accurate independent information.

Airfinity has built the world’s leading COVID-19 science and market intelligence platform.
The company is headquartered in London and partners with organisations worldwide.

Airfinity’s COVID-19 data was seen by more than 2 billion people in 2020.

“Airfinity has been instrumental in our country’s COVID response”

Head of Government Vaccine Task Force