



Distribution of COVID-19 vaccines

23 February 2021

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7 billion vaccines are expected to be distributed by air

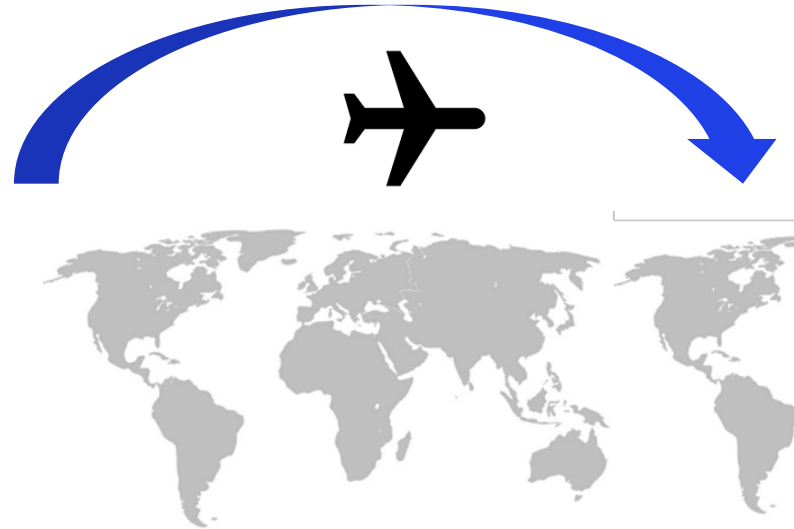
There will also be air cargo demand for ancillary goods (e.g. PPE, needles) and medicines (e.g. adjuvans)

16Bn
vaccine doses needed worldwide



7Bn
Air distribution

60k
Tonnes of air freight



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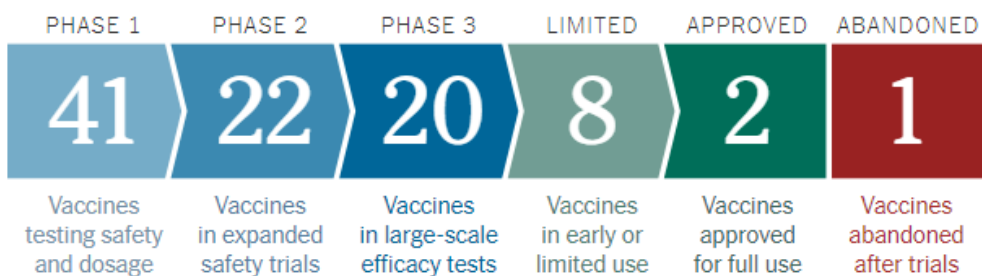
9Bn
Local/regional distribution

60k tonnes equals:

- 0.3% of 2018 air trade
- 12% of 2019 pharma air trade
- ≈ 5x 2019 vaccine air trade

68 vaccines are in clinical trials on humans

20 have reached the final stages of testing*; Pfizer and Moderna most widely approved.



PRECLINICAL TESTING : Scientists test a new vaccine on cells and then give it to **animals** such as mice or monkeys to see if it produces an immune response.

PHASE 1 SAFETY TRIALS : Scientists give the vaccine to a **small number of people** to test safety and dosage, as well as to confirm that it stimulates the immune system.

PHASE 2 EXPANDED TRIALS : Scientists give the vaccine to **hundreds of people** split into groups, such as children and the elderly, to see if the vaccine acts differently in them. These trials further test the vaccine's safety.

PHASE 3 EFFICACY TRIALS : Scientists give the vaccine to **thousands of people** and wait to see how many become infected, compared with volunteers who received a placebo. These trials can determine if the vaccine protects against the coronavirus, measuring what's known as the efficacy rate. Phase 3 trials are also large enough to reveal evidence of relatively rare side effects.

EARLY OR LIMITED APPROVAL : Britain and other countries have begun giving emergency authorization to vaccines based on preliminary evidence that they are safe and effective. [China](#) and [Russia](#), on the other hand, have authorized vaccines without waiting for the results of Phase 3 trials, which experts say has serious risks.

APPROVAL : Regulators review the complete trial results and plans for a vaccine's manufacturing, and decide whether to give it full approval.

COMBINED PHASES : One way to accelerate vaccine development is to combine phases. Some vaccines are now in Phase 1/2 trials, for example, which this tracker would count as both Phase 1 and Phase 2.

PAUSED or **ABANDONED** : If investigators observe worrying symptoms in volunteers, they can pause the trial. After an investigation, the trial may resume or be abandoned.

Leading vaccines

Developer	How It Works	Phase	Status
Pfizer-BioNTech	mRNA	2 3	Approved in Saudi Arabia and other countries. Emergency use in U.S., E.U., other countries.
Moderna	mRNA	3	Emergency use in U.S., E.U., other countries.
Gamaleya	Ad26, Ad5	3	Early use in Russia. Emergency use in Belarus, other countries.
Oxford-AstraZeneca	ChAdOx1	2 3	Emergency use in Britain, India, other countries.
CanSino	Ad5	3	Limited use in China.
Johnson & Johnson	Ad26	3	
Vector Institute	Protein	3	Early use in Russia.
Novavax	Protein	3	
Sinopharm	Inactivated	3	Approved in China, U.A.E., Bahrain. Emergency use in Egypt.
Sinovac	Inactivated	3	Limited use in China, Indonesia.
Sinopharm-Wuhan	Inactivated	3	Limited use in China, U.A.E.
Bharat Biotech	Inactivated	3	Emergency use in India.

Source: New York Times Corona Virus Tracker (14 January)

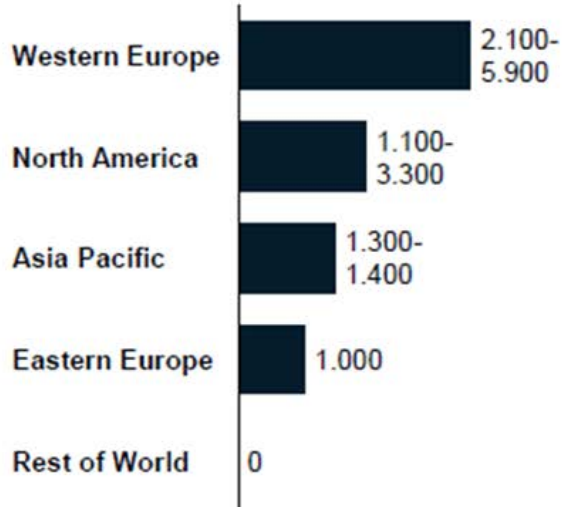
Large part of the vaccines will be produced in Western Europe

India and China are the main manufacturing countries in Asia

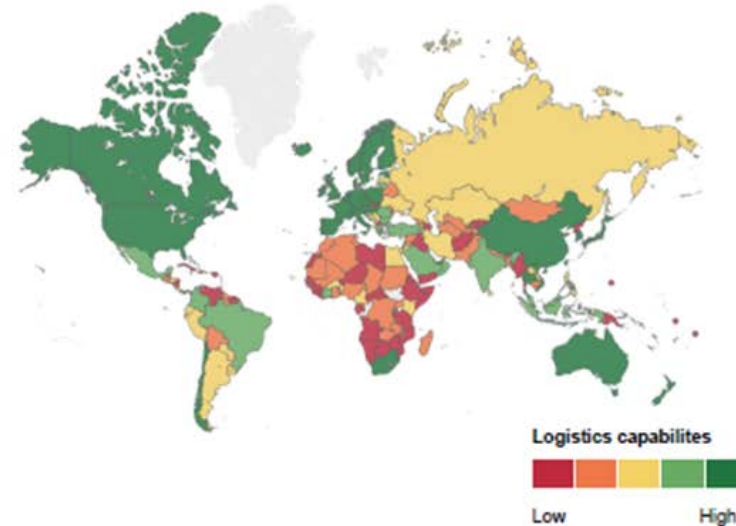
Required storage temp. depends on maturity of vaccine

Vaccine maturity	Early stage	Mature stage
Temperature requirements	~-80°C until fill/finish ~-20°C for primary distribution	~-20°C during production 2~8°C for distribution

Covid-19 vaccine production sites
In million doses



Global capacity to manage refrigerated vaccine distribution (2 – ~8°C)



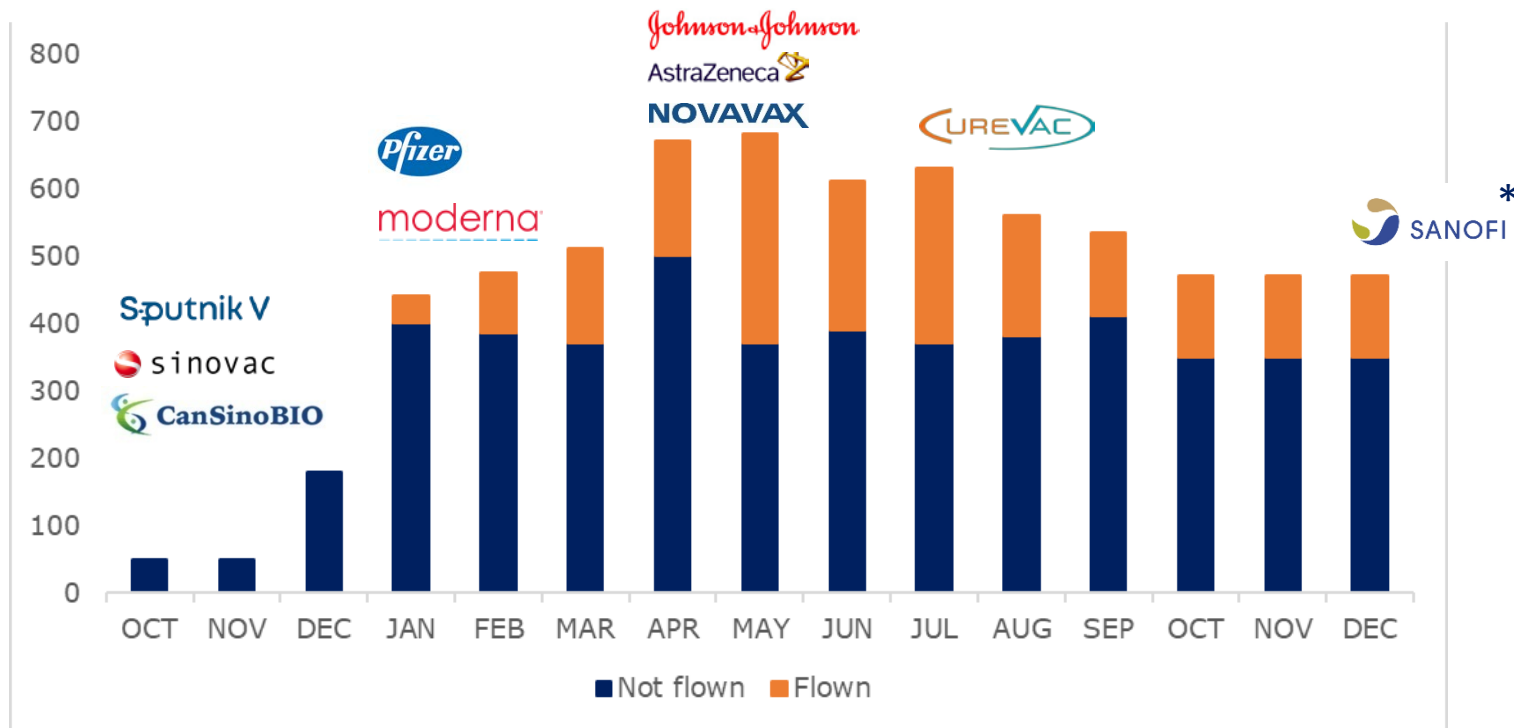
- Pfizer is the only vaccine that has to be transported at -80 °C.
- Moderna and Curevac vaccines are based on the same technology, but can be distributed at -20 °C.
- These vaccines will hardly be used for the developing countries.
- As more stability data on these vaccines becomes available they may be transported at regular temperatures (2-8 °C).

Air cargo distribution will build up in the first half of the year

It will take 2-3 years to vaccinate most of the worlds population

Monthly vaccine production outlook

Million doses, per transport requirement



- Vaccines will initially be consumed predominantly in the country of origin.
- As more vaccines are approved in more countries the volumes will increase.
- Q2/Q3 expected to be the peak for air cargo volumes but highly dependent on approval of vaccines.

* Outlook of Seabury assumed introduction of Sanofi vaccine in July but it will be no earlier than end of 2021

Difficulties in vaccine transport

What makes COVID19 vaccines different than normal pharma or vaccines

Last minute information availability

- Volumes and timing very uncertain
- Daily changes in information
- No/limited link to pharmaceutical companies

High quantity of Dry-Ice

- Considered dangerous good
- Maximum amounts allowed on aircraft
- Dry-ice stock
- Re-icing
- High volumes only on Cargo aircraft only



High volumes in short times

- Everybody wants to have the vaccine fast
- Volume on top off regular flows
- Low availability of air cargo capacity
- Capacity to receive goods at destination



Temperature compliance

- Very vulnerable to temperature deviations
- No stability data

Security risks

- Vulnerable to theft and/or tampering
- High interest by foreign nations
- Cyber threats



How did we prepare

What we did to be as ready as we could be

Try to be as close to the source of information as possible

- A lot of interaction with all relevant parties in the supply chain.
- Studies by various parties used in our predictions

Pro-actively push our 'Corona package'

- Years of experience in pharma transport
- Customers were not sure what they needed yet, by pro-actively promoting what we could do we are in control

COVID19 taskforces with specialists and with mandate

- Started at the beginning of summer 2020
- Commercial and operational taskforces
- Mandate to change processes, do investments and use resources

Some luck

- AFKL has had the cool chain program since 3 years in which we have been improving the way we handle temperature sensitive freight.
- Pharma recognized as focus growth product
- Investments to allow for product volume growth for coming years
- Opening of new cool and climate rooms
- New capacity can be used for Vaccine flows that are 'on top off'



Positive exposure for KLM

A lot of news outlets have visited SPL handling
High(er) risk of negative PR if things go wrong!

[RTL](#)

[Al Jazeera](#)

Reuters

Nieuwsuur

[Intern on a Mission](#)

[AD](#)

Etc



Zo gaat KLM de coronavaccins vervoeren

RTL Nieuws



Kaag wil onderzoek naar #MeToo-beschuldiging tegen D66-prominent
Frans van Dommelen zou vrouwen binnen de partij hebben geïnlimideerd en hebben lastiggevallen. Hij herkent zich niet in de beschuldigingen.



8793 nieuwe besmettingen, 2210 meer dan gisteren • ING leent miljard aan mkb
Volg hier het coronanieuws uit binnen- en buitenland van donderdag 10 oktober 2020.



VVD-leden hebben meer invloed op verkiezingen door corona
Zaterdag is er een VVD-congres. Gedreven leden hebben meer te zeggen doordat de voorbereidingen online gaan.



LAATSTE NIEUWS SPORT
10/10/2020 10:00:00

