



EUROPHIA



## COVID-19 VACCINE Distribution Status March 2021

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## Introduction

The availability of Covid-19 vaccines has become a top priority on the agenda of Health Authorities, governments, politicians and to all of us 8 Billion people around the world.

In late 2020, the main challenge was about getting the first vaccines approved by regulatory bodies and to start the vaccination programs. The world was trying to understand the meaning of vaccine efficacy. Production capacities were still being built and scaled up. There were big question marks about the available airfreight capacity and dry ice constraints on flights related to the Pfizer and Moderna vaccine deep frozen storage and transportation requirements. Governments were trying to figure out how to rapidly establish nationwide vaccination centers whilst battling with the economic and medical effects of the pandemic itself.

Now 3 months later we see that the world has started to slowly come to grips with all these points but the differences in approach between countries and regions are still large and new challenges have appeared that need to be addressed quickly.

From the onset, authorities around the world agreed that global immunisation would need to happen as soon as possible. Viruses do not have borders and they like to mutate thus international collaboration would be vital to ensure COVID-19 was tackled quickly and effectively. However, in the first 3 months we are already witnessing clear signs of disparity in access to vaccines between countries. For sure equitable access will be a geo-political topic in the months to come.

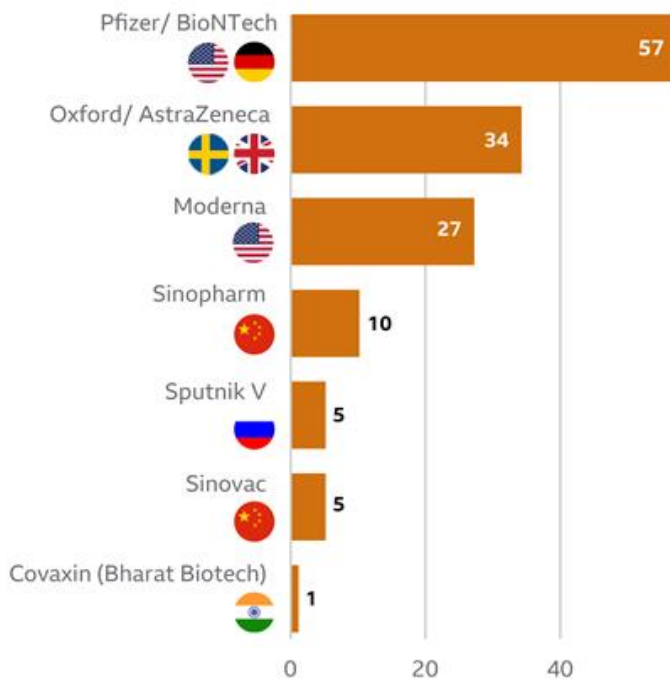
Vaccines are also big money and political instruments of power. Already we see that some countries have made commercial contracts with manufacturers which reduce short term access to others.

The good news is that there are now a handful of vaccines available and some new ones such as Janssen J&J on their way soon to help tackle the enormous scale of this global operation. However, the ramp up of production is happening slower than expected and this is still holding back the distribution process globally.

The below diagram illustrates the “reach” of some of the vaccines on the market currently. However, it does not show the volumes behind the reach. And it is also a moving playing field as production capacities are still being ramped up and new vaccines are still in the pipeline waiting to be released.

### Which vaccine has greatest global reach?

Number of locations currently administering each vaccine



Note: Only includes locations where data on doses administered is available

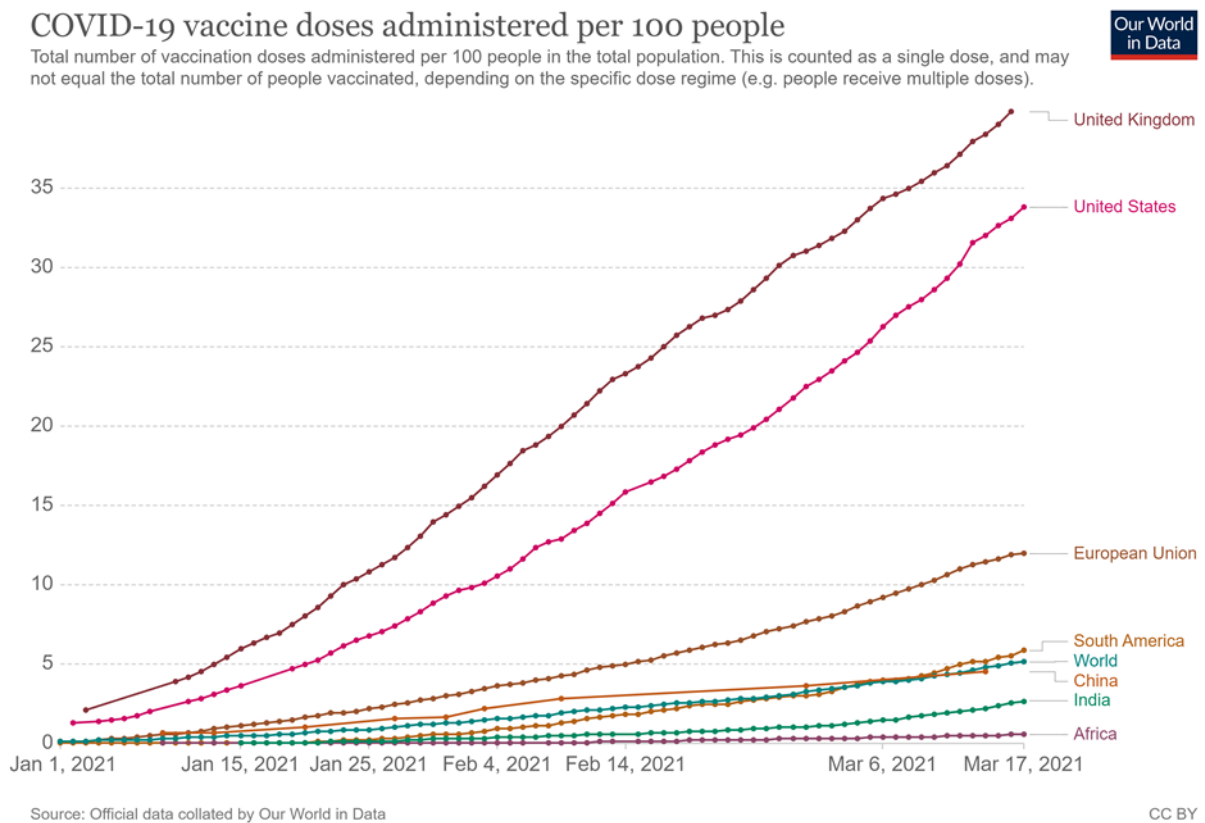
Source: Our World In Data, 1130 GMT on 11 Feb



This report will look at some of the key issues related to distribution based on where we stand today in March 2021. It will examine several bottlenecks in which distribution and logistics processes play a key role and provide potential thinking material for solutions.

## Global Vaccination Status

Since the first roll out of COVID-19 vaccines in December 2020 there has been a gradual increase in distribution. Israel and the UAE have led the vaccination race. Israel has now almost completed its immunization program with over 90% of its population now vaccinated. The UAE is currently at around 70%.



The diagram above shows the number of vaccine doses administered in a number of countries and regions. However, as the current vaccines all require 2 shots the vaccination percentages shown need to be reduced at least 35% to equate to the actual number of people fully vaccinated. This is due to the time-lag between the first and second doses and because some countries have a strategy of deploying single shots on some vaccines to speed up the number of people with at least some level of protection - although this last point does not follow manufacturer medical guidelines.

As the diagram above shows, when we look at this from a global perspective, we see a wide range of results. The UK, largely due to its production agreement with Oxford AstraZeneca is now at 40% vaccination. The US in the past 2 months has ramped up its vaccination campaign and now sits at around 35%. These are the success stories.

However, the rest of the world is trailing way behind and in many cases still struggling big time. Governments in many countries still operate some type of emergency lock down and many economies remain fragile.

The EU as a total is still at less than 10% vaccination and the differences between individual EU countries are large. Hungary is currently the best performing EU state at a 12% vaccination ratio. Hungary's vaccine strategy also makes use of the Russian Sputnik and the Chinese Sinopharm both of which have not been approved by the EMA, Europe's pharmaceutical regulator.

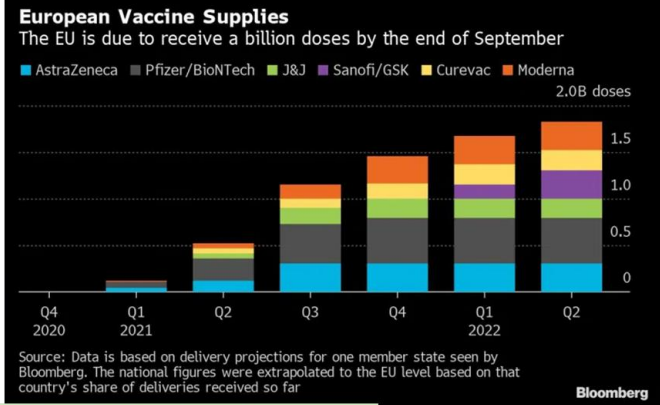
Sadly, the rest of the world still sits at less than 5% vaccination.

**Retesting 1.7m vaccines and Indian delay blamed for UK shortage**  
Shipments of AstraZeneca doses from Serum Institute emerge as pinch point in supply to the NHS  
Financial Times 18 March 2021

**BREAKING NEWS** PFIZER INFORMS CANADIAN GOVERNMENT THERE WILL BE A DELAY IN VACCINE PRODUCTION



**J&J manufacturing delays hit US vaccine rollout**  
Pharmaforum March 10, 2021

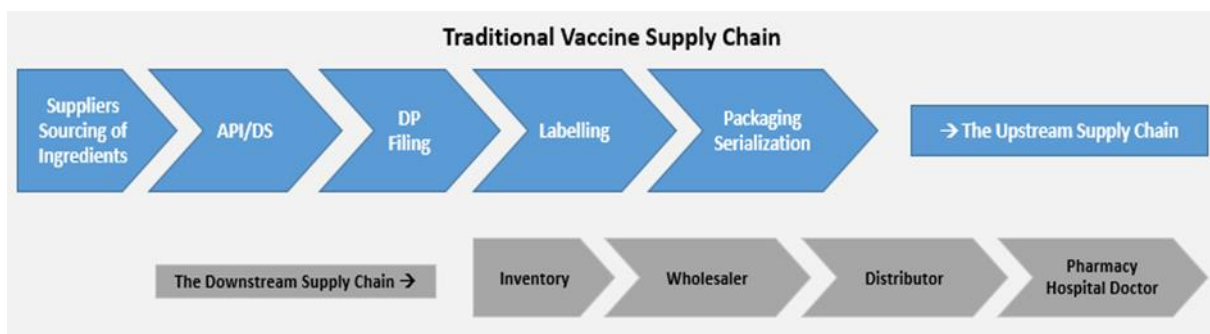


A vaccine supplied by Moderna would be available “in the coming weeks”, Hancock confirmed, but refused to say exactly when.  
Financial Times 18 March 2021

## Production Lag

There are currently a handful of COVID-19 vaccines being produced for global consumption and several under way. However, until now, we have seen a lag in production ramp-up against the earlier forecasts from late 2020. This is cause of concern as many countries around the world are dependent with their domestic immunisation programs on the supply of vaccines which are still coming in at much lower rates than initially planned and agreed.

The production of pharmaceutical vaccines is a complicated and delicate process as we have all witnessed over the past 12 months. Setting up production capacity for COVID-19 at a scale never seen before is a mammoth undertaking. Many of the vaccine manufacturers have had to build new factories and/or outsource production to commercial partners.



There are a number of production steps in making the final finished vaccine. There are raw materials, there is the active API ingredient, there is bulk production of the vaccine and finally the filling process into vials and packaging. These manufacturing steps in the upstream pharmaceutical supply chain are often spread across multiple partners and countries. These manufacturing steps require time to set up also because they need to be quality validated at each step of the process which takes additional time but is required to ensure critical product safety standards are met.

However, as time and scalability are of critical essence here, each of these companies needs to create manufacturing capacity quickly to cater for the whole world. Therefore, these companies are creating manufacturing partnerships across their upstream supply chain to ensure this happens. Encouraging pharmaceutical companies to work together commercially to create more factory output across multiple production lines and locations is probably the best way forward.



## Equitable Access - The Battle

“Getting the world vaccinated against Covid-19 is a matter of life and death, involving complicated scientific processes, multinational corporations, government promises and backroom deals. So figuring out when and how everyone in the world will get the vaccine is not easy”.

Source BBC World, 12 Feb 2021.

The stakes are high. The race is not just to provide the world with a COVID-19 vaccine. At stake is politics, money and potentially big profits.

Many of the findings seem to fall along predictable lines of rich versus poor. This brings us to the topic of equitable access and distribution. The first months show that the countries which are getting vaccinated the quickest are the richer countries, typically the Western World. China, Russia and India who have successfully developed their own COVID-19 vaccines also fall in this category.

National interests and geo-politics is already playing a role in who gets access first. In January the Indian government for a period of time put an export ban on vaccines. The US government has used the Defense Production Act from 1950 to pressurize Pfizer and Moderna to speed up supply to the US government. The EU and the UK are at loggerheads over the AstraZeneca vaccine in which the EU has also threatened to put export bans on vaccines produced in the EU.

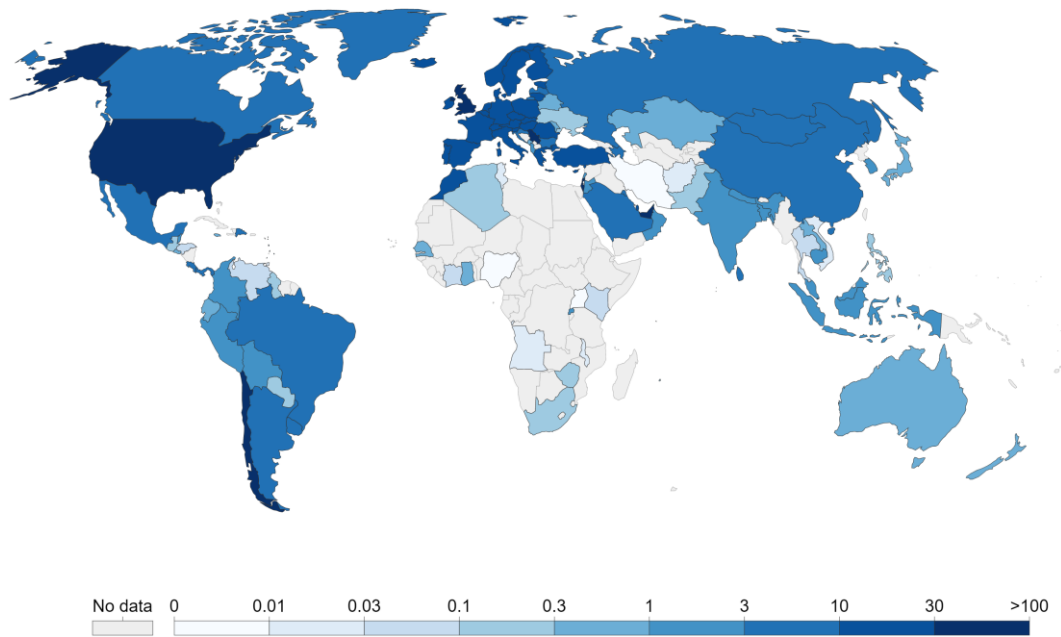
Where at first countries most seemed reluctant to use the Chinese and Russian vaccines, there is a now a growing interest in getting access to these vaccines to offset some of the supply issues from some of the Western manufacturers.



The below chart clearly shows the differences in vaccine doses used globally for vaccination. The dark blue areas show the highest level of vaccination, the white geographical areas the lowest. But even the dark blue areas only show 30-40% vaccination levels which indicated there is still a long way ahead.

### COVID-19 vaccine doses administered per 100 people, Mar 17, 2021

Total number of vaccination doses administered per 100 people in the total population. This is counted as a single dose, and may not equal the total number of people vaccinated, depending on the specific dose regime (e.g. people receive multiple doses).



Source: Official data collated by Our World in Data

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It will probably not come as a surprise that Africa and other poorer regions around the world hardly show any level of meaningful vaccination levels. The World Health Organisation, Covax and GAVI have been working hard for months on behalf of these poorer regions to make commercial contracts. They are continuing to seek funding from some of the richer nations and other donators from around the world to procure sufficient vaccines to cater for the vaccine needs of at least 4 Billion people.

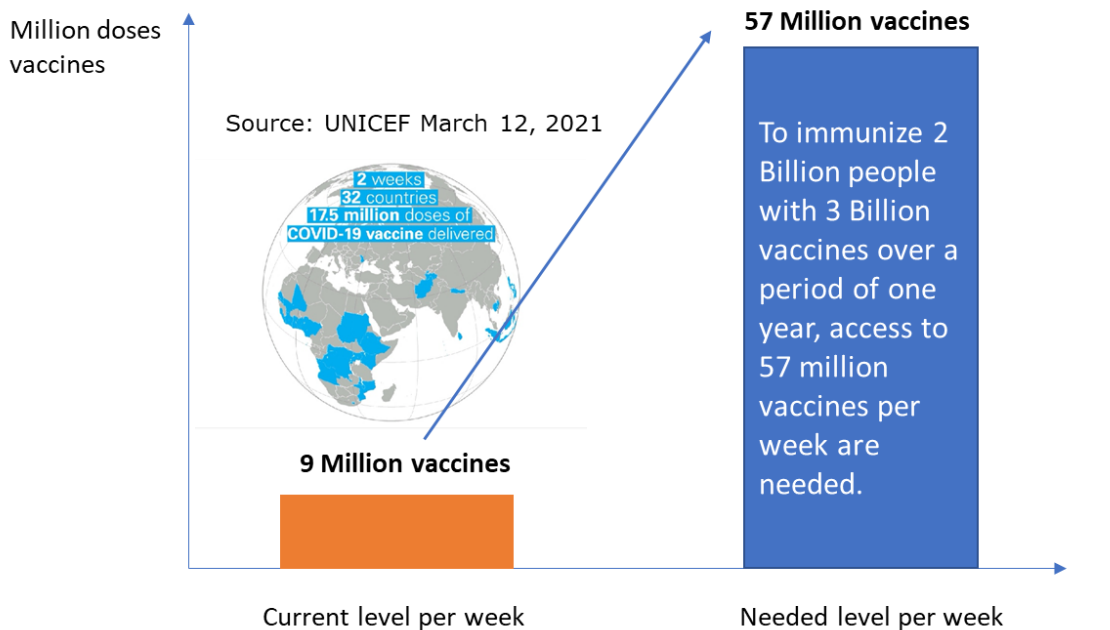
The good news is that UNICEF, as distribution partner to WHO, started at the end of February to distribute vaccines to more than 32 poorer

countries. Despite the enthusiastic reception in many of these countries there is still a long way to go.

By conservative estimates, poorer nations needing WHO support make up at least 2 Billion people. Two shots of vaccines are typically needed which in the mix will change somewhat when the single shot Janssen vaccines arrives. Therefore, if we argue that 3 Billion vaccine doses will be needed to immunize 2 Billion people then that's a mammoth distribution undertaking.

To vaccinate 2 Billion people over the next 12 months, UNICEF will need to distribute 57 Million vaccine doses each week to reach that target of 3 Billion vaccines. Last week, UNICEF reported that in their first 2 weeks of work, they distributed 18 Million vaccines or 9 Million per week.

### Developing Nations\* - Vaccine Distribution in Millions per week



\* Conservative est that 2 Billion people around the world require WHO support.

The biggest challenge to UNICEF is in getting access to vaccines which are still not being produced in sufficient quantities. However, the second challenge will be to get all these vaccines distributed quickly and safely across wide parts of the world not just into countries but also within countries domestically to points of use, the vaccination centers.



## Final Mile Distribution

Governments traditionally do not have the expertise or the people in place to organize the supply chain for pharmaceutical products. The past three months have shown that even the wealthier, arguably the more organized nations, have struggled to get their domestic vaccination programs off the ground. In many cases, the logistics piece was the weak spot.

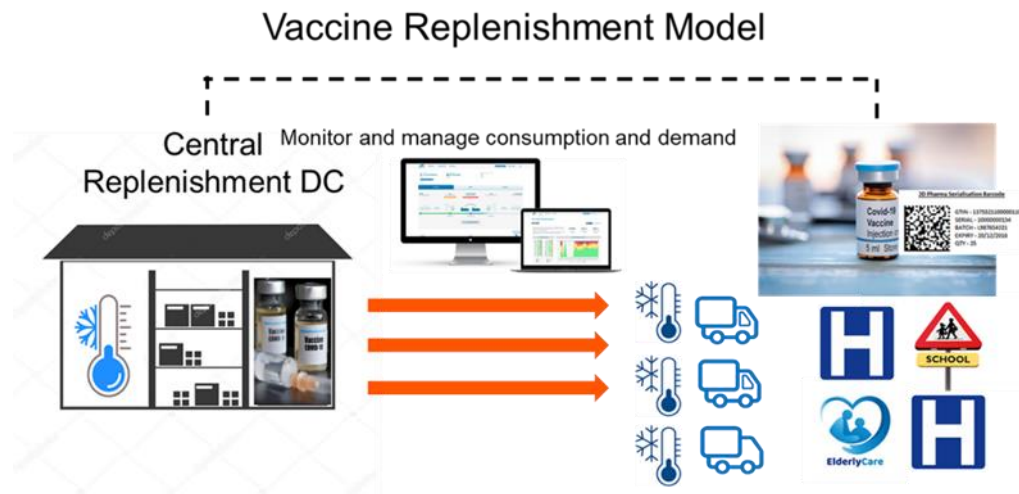
Given the enormous scale of this pandemic, most governments simply do not have the required expertise to manage the logistics. It is therefore imperative for manufacturers to step up and provide more support in the domestic distribution and perhaps take the lead when it comes to the final mile logistics rather than leaving this to governments to manage. Pharmaceutical companies have their own established supply chains already servicing countries. They have their supply chain departments, logistics processes, planning tools and importantly their established logistics partners.

In turn, the medical teams within governments can then focus more effort on all the other areas related to the immunisation programs themselves. Some of these other critical areas include establishing and organizing

points of use, the planning of vaccination resources, vaccination appointments, medical administration processes, public awareness etc.

Current final mile bottlenecks need to be fixed quickly and professional supply chain support can be an enabler in this process to streamline processes quickly.

The “final mile” distribution from a central DC to vaccination centers is still a largely manually driven process. Making better use of consumption data, using item level barcoding to scan and track inventory can help in improving current replenishment processes. Currently, many vaccines are not barcoded at item level which means inventory and consumption use is a largely manual process.



Source: Vaccine Replenishment model - Europhia Consulting 2021

From a product safety and integrity perspective it is also imperative that pharmaceutical GDP standards are maintained throughout the entire replenishment process. Vaccine manufacturers as well as logistics companies partnering with governments can play an important role here to help ensure such standards are in place and maintained.



Good Distribution Practices (**GDP**) is a quality system for warehouse and distribution centers dedicated for medicines. This also includes the transportation of pharmaceuticals. Internationally accepted **pharmaceutical GDP regulations** stipulate that manufacturers, brand owners, logistics providers and distributors of **pharmaceutical** products must align their operations with these **standards**.



## Immunisation Centers and Replenishment

The efficient organization of vaccination points remains a big challenge for governments around the world. This is mainly due to the enormous scale of operations. Governments would do well to start looking at “best practice” methods which are starting to emerge around the world.

For instance, The UAE and Israel have proven to be able to vaccinate at much higher levels per day than some other countries. The UK early in the process quickly identified the need to radically scale up with the number of vaccination points across the country.

Having many vaccine points close to communities is one critical success factor. Another one is how these vaccine points are organized. In the UAE, medical authorities have tried to keep the “patient” administration process as simple and short as possible. There is also a “back office” in place to prepare syringes centrally for use leaving the front line to focus on vaccinating people only. This helps speed up vaccinations per day.

In the Netherlands, a recent study by logistics experts under the leadership of Professor Jan Fransoo showed a huge productivity gain if the administration process is separated as much as possible from the physical vaccination process at vaccination centers. Jan Fransoo is Professor of Operations and Logistics Management at Tilburg University.

## Barcode Technology

The use of big data, technologies such as GS1's datamatrix GTIN barcoding and automation can all play an important role in making further improvements in terms of product safety, process control and productivity improvements.



As the manufacturing and distribution ramp up continues across the world, criminal elements will also start seeing opportunities to make money off COVID-19 vaccines. Interpol came out with a warning on the 19<sup>th</sup> of March 2021 on this very subject. They warn for a potential pandemic in crime related to counterfeiting and vaccine theft around the world.

GS1 data-matrix has already been adopted by many countries and manufacturers within the pharmaceutical industry to reduce the risk of counterfeiting by creating traceability through barcode technology. GTIN barcodes are already legislated in many countries and mandatory. However, GTIN barcodes are not yet being applied to COVID-19 vaccines which create an additional risk criminal groups could take advantage of.

GTIN barcodes in vaccine vials can also play a useful role in keeping track of inventory as discussed earlier as part of the replenishment model. Logistics companies are already used to working with these barcodes.

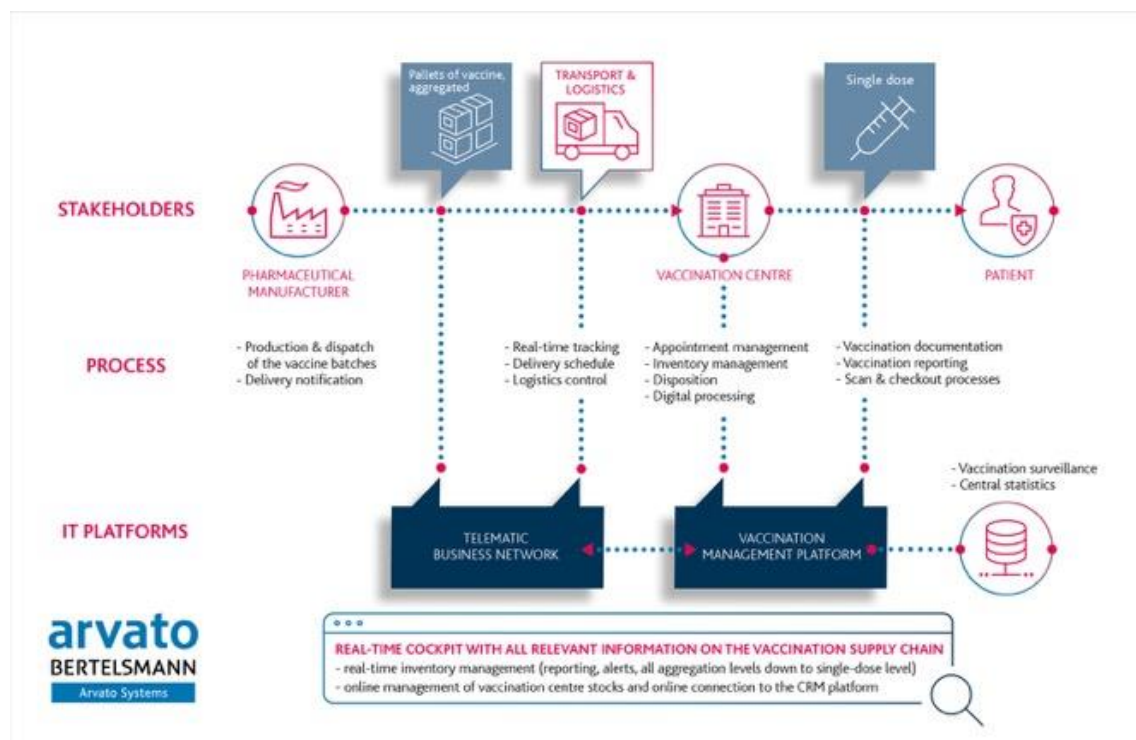


## Bridging the Gap

The best logistics solution would be one where the vaccination data based on appointments and throughput would be coupled to the logistics replenishment model mentioned earlier in this report. This would create one integrated solution in managing the demand and supply of vaccines throughout the final mile supply chain.

As an example, in Germany, Arvato Systems has developed such an IT platform to help the German government manage the vaccination planning of the whole immunization program. This IT platform ensures vaccination appointments are made and the administration registered to facilitate planning and reduce the administration burden on the vaccination centers and medical authorities. This ensures the smooth handling of the entire vaccination process as well as a high level of information transparency.

What is different about this IT platform is that it integrates both appointment scheduling and the logistics handling and replenishment in a single integrated solution as the diagram below illustrates.



The Arvato Systems vaccination platform has already been used successfully in one large federal state and will now expand its offering.

#### COVID-19 Vaccine Distribution - Critical Success Factors



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## Summary

Over the past three months we have seen the start of the global COVID-19 vaccination program. Vaccines have started to be distributed to countries around the world. However, there is still a scaling up of global production capacity happening which appears to be behind earlier production output forecasts.

Vaccines are being used to serve a national political agenda for various reasons. This has created some geo-political tensions even between friendly nations such as members of the EU and the UK.

There is a lot of discussion about the need for equitable access to vaccines. The reality is quite different. There is clearly a select group of richer nations who committed early on and entered into commercial contracts with manufacturers. They are currently the main beneficiaries of COVID-1 vaccines.

Unfortunately, “equitable access” is therefore already a mere buzz word. Most countries, especially the poorest will probably only start being able to access large quantities of vaccines late into 2021. Global vaccination efforts will run well into 2022 and possibly longer before we see everyone around the world having been vaccinated.

From a logistics and distribution perspective, most of the first wave countries have struggled to roll out vaccination centers and establish end to end GDP compliant distribution models.

For most governments, the key learning curve related to the supply chain is to involve logistics expertise much earlier in the design of the distribution model. Embedding logistics as integral part of any government COVID-19 taskforce is instrumental.





Governments should ask themselves whether they themselves are the best positioned to organize their national final mile logistics program or whether this is best outsourced and organized with more support from vaccine manufacturers who have established distribution models and logistics partners.

Setting up and running vaccination centers has also been a challenge for most governments. There are some exceptions such as the UAE, Israel and the UK which are worthwhile examining in terms of best practice.

Early research suggests that establishing many vaccination centers as close as possible to communities and target groups instead of having fewer large facilities is the best way forward. Taking away as many administrative tasks from the physical front line of vaccination can help to increase productivity.

Currently, the replenishment and the tracking of vaccine inventory is very manual. Linking demand and supply of vaccines through an automated management tool would be a sure way forward. Using barcoding within the supply chain would help towards this concept.

Integrated IT solutions such as Arvato's vaccination IT platform could help governments ramp up quickly in buying ready-made proven

technologies to bridge vaccination planning to the logistics replenishment model. These solutions could be outsourced.

GTIN data-matrix barcoding is already used extensively within the pharmaceutical industry and should be deployed as soon as possible to the distribution of COVID-19 vaccines. As well as being an effective instrument against counterfeiting risks it could be a useful tool in better managing vaccine consumption, inventory levels and the replenishment model.

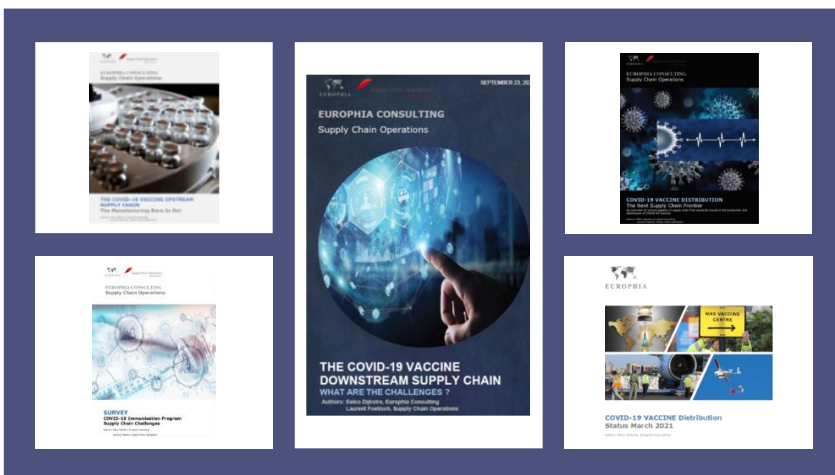
Fighting the COVID-19 pandemic is a matter of life and death. Effective policy and deployment of intelligent logistics and distribution solutions are of critical importance in this fight. The past three months have already provided valuable lessons in how the distribution model can be improved. Important is to continue to learn from the lessons of first wave countries. Sharing of information and collaboration between players in the supply chain is the fastest way to overcoming this global crisis and moving back to a sense of normality.

The COVID-19 pandemic has taught us that supply chains are trivial to everything we do. Supply chains have evolved over the years from having a purely physical distribution dimension into the digital era where big data, analytics and automation play an increasingly important role in how end to end supply chains function and add value.

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This report is part of a series of articles on the COVID-19 vaccine supply chain. For a free download see also: <https://europia.com/covid-19-supply-chain>





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**Europhia Consulting** is an international management consulting company specialized in the logistics and supply chain industry in the life sciences sector. We operate global assignments for our clients. The opinions are based on the author's own experience and understanding of the dynamics within the sector.

**Eelco Dijkstra** of Europhia Consulting has worked in supply chain and consultancy for over 25 years and in recent years has focused his expertise on the global pharmaceutical sector on establishing and optimizing supply chains. He has worked a number of years in leadership positions for TNT Express and Kuehne & Nagel and over the past 10 years managed his own management consultancy practice.

Over the past 12 months, his company has advised a number of organizations on COVID-19 distribution topics related to PPE equipment and COVID-19 vaccines. Eelco has written a number of whitepapers and articles on the topic of COVID-19 vaccine distribution and has organized several COVID-19 vaccine distribution conferences for the global logistics industry including one on March 23<sup>rd</sup>, 2021.

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