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Coronavirus Vaccine Distribution 2020-2021

By Annika Vuppala

The distribution of a vaccine to the 328 million people living in the United States is no easy feat. It requires a lot of planning, coordination, time, and money. Yet, it must be done if we are ever to get out of this persistent global pandemic. The federal government has its own strategy to get the vaccine from the factory to states, but from there it's all up to the state governments to decide how to get the vaccine to priority groups. This article will first cover the general strategy of the federal government, and then the strategy of the State of Washington.

There are two different coronavirus vaccines that are available right now- the Pfizer/BioNTech vaccine and the Moderna vaccine. One big challenge of distributing these vaccines is that they have to be stored at incredibly low temperatures. The Pfizer vaccine has to be stored at -112°F, which means that special packaging (using dry ice) had to be invented to transport it at such a low temperature. The Moderna vaccine is a little bit more accessible as it is able to be stored at only -4°F, which is the temperature of an average freezer found in a hospital. It is also much easier to transport. Because of these reasons the two vaccines are split up and targeted at different groups depending on their accessibility. The Pfizer/BioNTech vaccine is targeted at large hospitals in metropolitan areas because of the temperature it has to be stored at. It will also be produced in larger numbers and batches because those large hospitals care for so many people, the smallest batch amount Pfizer is producing is 975 doses. Whereas the Moderna vaccine is targeted at smaller hospitals in more rural areas because it is easier to transport and store. It is produced in smaller numbers as those hospitals have a smaller number of patients and also a smaller capacity to store doses. The minimum number of doses Moderna produces is 100 in a batch.

The process of making and distributing vaccine doses is long and expensive. Pfizer plans to make raw materials, the mRNA active, and finished doses for BNT162b2 (the vaccine) at its own plants in Andover, Massachusetts; Kalamazoo, Michigan; and St. Louis, Missouri. It will also use its site in Belgium for the European market. In contrast, Moderna has contracted with Lonza, one of the world's largest pharmaceutical services firms, to produce much of the mRNA active for its vaccine, mRNA-1273. Lonza will make the active at its complex in Portsmouth, New Hampshire, and at its main site in Visp, Switzerland. While the vaccine production is the most important part of this process, there are other materials that are essential to vaccination, like glass vials and syringes. The vials used to store the vaccines are made of borosilicate glass, and multiple companies are trying to produce at least enough for 2 billion doses each. The American company Corning is testing out new technology called Valor Glass, which is to be stronger than borosilicate glass and cheaper. Corning got funding from the United States Government to make more for the vaccination effort. SiO₂ Materials Science is also working on making medical-grade vials out of plastic with a thin coating of pure silica, to provide the strength of plastic with the same effectiveness of glass. In terms of syringes and needles, the DOD has spent

\$100 million to get more syringes and safety needles to provide over 500 million safety syringes within a year to the Strategic National Stockpile. The American company ApiJect is producing pre-filled syringes which serve as an alternative to traditional syringes and also reduce time in preparing the vaccine. This has yet to be approved by the FDA for the coronavirus, but has been used for other vaccines. The company aims to supply the government with 286 million syringes by early spring. The American distribution company McKesson will be taking the vaccine, vials, syringes, gloves, etc. from their separate suppliers and putting them into kits so it streamlines the process and all supplies needed are in one place. One specific material needed by the Pfizer vaccine is tens of thousands of pounds of dry ice, which local suppliers have identified as feasible but also a daunting task. From then on, the vaccines will have to be distributed to the states.

Pfizer plans to distribute at least some of its vaccine independently, while Moderna is teaming up with McKesson and the US Government to distribute its vaccine. In terms of the methods of transportation, Pfizer has a special thermal shipper to keep the vaccine at such a low temperature, with dry ice. The only problem is that the ice has to be renewed every five days. This means that the cold chain has to move quickly to get the vaccine to the people before the doses spoil. The packaging for Moderna's vaccine will suffice with just normal freezer storage. As the pandemic has put an abrupt stop to air travel, many planes are available to transport the vaccine. Some airlines are even turning to grounded passenger planes as many are not in use. Other shippers like UPS and FedEx are also bracing for transport of the vaccine, especially in the holiday season with many people opting to online shop opposed to in-person. The National Guard is also preparing to help distribute. One concern is that there won't be enough storage capacity at the vaccination points to be able to vaccinate at the desired rate, so freezer companies are also working on increasing their production.

Once the vaccine has reached its destination, it still has to be injected, and there are many things that could go wrong. First, among primary workers, confidence in the vaccine is lacking. Only a third say they are willing to take the vaccine, and a third more say they would like more information on the efficacy on them according to an internal survey done of 1000 workers. Also, rural hospitals might have to drive somewhere to pick up their allotted doses, but workers are already stretched thin caring for patients. Not to mention that rural areas might just receive the vaccine later than urban areas because there are minimum order numbers and no one wants to waste anything. Yet as hospitals fill up, people are getting creative and opening up testing and vaccination sites in places like car washes and fire stations. As cases are rising, the CDC is discussing giving people aged 18-55 only one dose of the two doses, in order to double the number of people vaccinated. This was suggested as a potential alternative to spacing out time between doses, as the United Kingdom is doing.

Moving on to the state level of distribution, in this article I will talk about Washington State's approach, but to find information on how your state will distribute the vaccine you could go to their website or local news sources that might cover it. Washington has an internal COVID-19 Vaccine Planning and Coordination Team led by the State Health Officer, Secretary

of Health, and Deputy Secretary for the COVID-19 response. They are also trying to have a consistent approach with the neighboring states like Oregon and Idaho. The Office of Immunization and Child Profile has ongoing provider enrollment in vaccine distribution programs in efforts to expand enrollment and therefore, the outreach of the vaccine. Right now, providers that can support lots of doses per day and have access to the targeted priority groups are being prioritized to receive the vaccine first. These targeted people are anyone at a higher risk for illness, for example older adults, people with comorbidities, people with disabilities, and pregnant women. People at a higher risk for exposure are also targeted, for example, high risk workers in health care facilities, essential workers, educators, and long term care facility members.

Because there are 7 million people living in Washington State, the vaccination is split up into four phases. Phase 1 is where there would potentially be limited doses available, so the vaccine would be targeted at those priority groups mentioned earlier. As there are still so many people that would qualify for Phase 1, it was split up into two subgroups: Phase 1a and Phase 1b. Phase 1a would cover high risk health workers (approx. 500,000) and high risk first responders (approx. 53,200). Phase 1b would cover people of all ages with comorbidities that put them at a high risk and older adults (55+ yrs) living in congregated or overcrowded settings (approx. 33,000). Phase 2 is when there should be a large number of doses available, and the supply is likely to meet the demand. Phase 2 includes educators, essential workers, people with comorbidities that would put them at moderate risk, people in homeless shelters or group homes and the staff that work there, people who are in detention centers/jails and the staff that work there and lastly, all older adults not included in Phase 1. Phase 3 is when there should likely be a sufficient supply of the vaccine and there isn't as much demand. The people getting the vaccine now will be young people (18-30 yrs), children (under 18), and any people working in jobs which put them at a risk for getting the coronavirus that weren't included in previous phases. The last Phase, Phase 4, is when there should be a sufficient supply and it would be treated like the flu shot. Anyone who wasn't eligible to receive the vaccine in previous phases would get it now.

There are also many tools that the state government is using to aid them in this process and help them identify the correct people to get the vaccine. One tool that is used is the [CDC PanVax tool](#) which provides the estimated vaccination capacity of your state, the number of vaccination sites needed, and the vaccinators needed in order to vaccinate varying percentages of the population. The Washington Immunization Information System (IIS) keeps lifetime immunization records for people of all ages, and can be used to keep track of who got both doses of the vaccine and who only got one. For evident reasons, this database isn't available to the public. The [Washington Tracking Network](#) and the [CDC Social Vulnerability Index](#) identify people that have higher health inequities and map other social determinants of health. For example, overcrowded housing, poverty, disabilities, health insurance coverage, etc.

This pandemic has taken a toll on everybody, but has disproportionately affected health care workers, people with comorbidities, and others who are at disadvantage compared to everyone else. That is why the country has prioritized getting the vaccine to them first. While

there have definitely been bumps along the road, I am confident that we will achieve herd immunity and get rid of COVID-19 for good.

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