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Commentary

The challenges of distributing COVID-19 vaccinations

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On November 9, 2020, Pfizer/BioNTech reported the preliminary efficacy results for their COVID-19 vaccine, confirming levels of 95% on November 18. On November 16, Moderna announced 95% efficacy and 2 days later, the Oxford and AstraZeneca group reported safety and immunogenicity across a wider range of groups [1]. As attention turns to deployment, we need transparency about vaccine distribution and implementation. Success will hinge on collaboration of complex networks of government, companies, health workers and the public.

Vaccinations could start by the end of 2020 and three things need to be in place: vaccine supplies (cold storage, distribution, syringes, needles), people to implement them (vaccinators, staff to document) and people to be vaccinated. If there is mismatch, failure is inevitable. The pace of the COVID-19 campaign will be driven by vaccine supplies, so implementation needs to be matched.

Phased deployment of priority groups in many countries will take place by age, comorbidity, Health Care Workers (HCWs) and care home and prison residents and workers [2]. But core questions remain. How will we identify risk groups? If they turn up at a mass centre how will we know if they are in a priority group? How will we document and trace people, particularly for a second dose? How many people can local authorities really vaccinate in care homes or HCWs per week?

Since the division of responsibility and details of deployment have not yet been described in the UK and beyond, there is time to shape implementation. Three options have been proposed by the UK government and other nations: general practitioners (GPs, i.e., doctors) and primary care networks, mass vaccination clinics and mobile health care sites. It is unclear how resources will be split between groups or who will go to GPs versus mass clinics. The Health Secretary in the UK recently discussed having one million doses a week, but that won't go far: it is only the same amount that GPs provide each week for their seasonal flu programmes. Last year, GPs in England vaccinated 7.6 million people 65 years and over, and 3.1 million less than 65 with risk factors. The first 20 million doses would suffice

for these individuals but one million doses per week will only cover the first doses per person over ten weeks. The next ten weeks would be taken up vaccinating the same people. Clearly, the pace and extent of the programme will be driven by the availability of the vaccines from whoever is under contract.

In the UK, GPs' nurses are estimated to administer around 200–500 immunisations/day in 1260 primary care networks [3]. At least one site would be open for long hours, every days. If we take the average (350/day), it would be just over 3 million a week. Mass sites plan to undertake 5000 immunisations per centre/day (35,000/week) [3]; 30 mass clinics would use up all of one million doses per week until supplies increase considerably.

Mobile teams will be used for care homes and prisons. The population of care homes across the UK has been difficult to estimate since they are privatised, but 15,000 are regulated by the Care Quality Commission (CQC) in England [4]. Recent statistics estimate that in England and Wales alone there are 73,405 individuals in care homes under the age of 65 and 369,483 65 and older [5]. There are 117 prisons in the UK with a population of 78,977 [6]. Leaving logistics of reaching over 15,000 locations aside, the care home and prison population would also need one million doses.

HCWs are also on the priority list, estimated at 3,276,595 in the UK [7]. Non-HCW key workers (e.g., education, childcare, food, transport, public safety) total 10,612,097, although not priority, compared to male doctors with 30 deaths per 100,000, male security guards (74 deaths) and bus drivers (44 deaths) experienced higher mortality [8]. HCWs also need to be vaccinated, which for seasonal influenza was low in some NHS trusts, even at 37% uptake [9]. Just as COVID-19 has contributed to excess deaths and waiting lists, similar concerns arise if staff are diverted to the vaccine drive.

A recent study estimated that 5% of the UK population is very high risk for COVID-19 and 29% high risk (i.e., at least one underlying condition) [10]. Given a population of 66.65 million, 3.3–19.3 million individuals would need 40 million doses. At one million per week, it would take 44 weeks to give this group two doses.

The campaign will be enormously influenced by the presence of more than one supplier. As more vaccines, presently under contract to the Government, come on stream, the pace must accelerate. However, this will require flexibility that will be logistically very difficult, especially if different cold chains are needed (only one requires ultra-low storage and distribution) and each person needs two doses of the same vaccine.

There is a short window available and without laying out these details, the vaccination campaign could incur shortages or enormous

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waste. Now is the opportunity to expose the plans for vaccine distribution and implementation to scrutiny. It should not be shrouded in secrecy and designed by those who have never done it before as too much depends on getting this right.

Declaration of Competing Interest

DS has provided consultancies to Pfizer, but not on COVID-19 vaccines. He is on the Scientific Advisory Board of Clover Pharmaceuticals that is developing a COVID-19 vaccine. MCM declares no conflict.

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Author contributions

The authors contributed equally and both verified the underlying data.

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