COVID-19 Immunisation Strategy: Priority Populations

The Multidisciplinary Collaborative Group for the Scientific Monitoring of COVID-19 (GCMSC) Review

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Opinions and recommendations represent those of the GCMSC members and do not necessarily represent those of their institutions. All work done was voluntary.

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Resum executiu

S'espera que hi hagi un **subministrament inicial limitat** de dosis quan les primeres vacunes COVID-19 estiguin disponibles, amb un retard esperat per a la vacunació universal d'aquells elegibles per rebre-la. Sota aquest escenari, és rellevant **analitzar quina és la millor manera de prioritzar les primeres dosis disponibles** per aconseguir el major impacte, tant en termes de protecció de les persones com de minimització de la transmissió comunitària. Les qüestions ètiques són fonamentals per orientar una distribució justa. Es resumeixen diferents escenaris sobre la implementació de la vacuna. Després d'una revisió crítica dels documents i considerant que aquests criteris s'apliquen als ciutadans espanyols, els membres de l'GCMSC proposen **el següent ordre de priorització de persones susceptibles**:

1. **Treballadors de la salut en contacte amb pacients, inclosos llars d'avis i personal de primers auxilis**

2. **Persones de 80 anys o més i ancians institucionalitzats**

3. **Adults de 65 a 79 anys**

4. **Comorbiditats:**

    a) **Diabetis mellitus tipus 2**
    b) **Malaltia cardíaca crònica incloent malaltia coronària**
    c) **Malaltia pulmonar obstructiva crònica**
    d) **Malaltia renal crònica eGFR (< 30 mL/min/1.73 m)**
    e) **Obesitat classe III (BMI >40 Kg/m2)**
    f) **Pacients amb càncer sotmesos a quimioteràpia**
    g) **Condició d'immunosupressió**
    h) **Condició crònica que pugui afectar la resposta al SARS-CoV-2**

5. **Persones institucionalitzades i en risc d'exclusió social (presons, centres de refugiats, migrants, etc.)**

6. **Treballadors essencials (transport, educació, alimentació, etc.)**

7. **Majors de 55 anys**

8. **Vacunes per a tots**

Les persones amb evidència d'infecció prèvia per SARS-CoV-2 (PCR, test d'antígens, o serologia) no han de ser considerats com prioritaris a la hora de l'accés a les vacunes.

Infografia que mostra els grups prioritaris de vacunació.

Els membres del GCMSC consideren que és especialment necessari preparar-se per:

- **Com identificar grups prioritaris.** En particular, com s'avaluaran les afeccions cròniques seleccionades en un enfocament que pugui manejar fàcilment?
- **Un pla de comunicació a la població en general**, assumint que hi pot haver un cert nivell de vacil·lació a la vacuna. El públic en general ha de comprendre els beneficis i riscos de la vacuna o vacunes propostes i per què hi ha criteris de priorització.
- **Un pla de vigilància** per supervisar la cobertura, acceptabilitat i efectes secundaris de les vacunes amb un procés ràpid per poder donar una resposta immediata si es detecta algun esdeveniment advers rellevant. S'ha d'establir un pla per a les interrupcions i com respondre abans d'iniciar el procés de vacunació.
- **Una promoció contínua de mesures addicionals de prevenció** (mascaretes, rentat de mans, ventilació i distanciament físic) fins que la transmissió s'hagi reduït significativament fins al punt de fer-les redundants.
- **L'existència de diferents vacunes disponibles** pot requerir una administració de les vacunes segons la seva eficàcia basada en grups de risc específics.

Totes les declaracions anteriors segueixen sent provisionals en vista de la propera informació. Els membres del GCMSC segueixen atentament les publicacions sobre el tema.

Resumen ejecutivo

Se espera que haya un **suministro inicial limitado** de dosis cuando las primeras vacunas COVID-19 estén disponibles, con un retraso esperado para la vacunación universal de aquellos elegibles para recibirla. Bajo este escenario, es relevante **analizar cuál es la mejor manera de priorizar las primeras dosis disponibles** para lograr el mayor impacto, tanto en términos de protección de las personas como de minimización de la transmisión comunitaria. Las cuestiones éticas son fundamentales para orientar una distribución justa. Se resumen diferentes escenarios sobre la implementación de la vacuna. Tras una revisión crítica de los documentos y considerando que estos criterios se aplican a los ciudadanos españoles, los miembros del GCMSC proponen el **siguiente orden de priorización de personas susceptibles**:

1. **Trabajadores de la salud en contacto con pacientes, incluidos hogares de ancianos y personal de primeros auxilios**
2. **Personas de 80 años o más y ancianos institucionalizados**
3. **Adultos de 65 a 79 años**
4. **Comorbilidades:**
    a. **Diabetes mellitus tipo 2**
    b. **Enfermedad cardiaca crónica incluida la cardiopatía isquémica**
    c. **Enfermedad pulmonar obstructiva crónica**
    d. **Enfermedad renal eGFR (< 30 mL/min/1.73 m)**
    e. **Obesidad clase III (BMI >40 Kg/m2)**
    f. **Pacientes con cáncer sometidos a quimioterapia**
    g. **Condición inmunodeprimida**
    h. **Condición crónica que pueda afectar la respuesta al SARS-CoV-2**
5. **Personas institucionalizadas y en régimen de exclusión social (prisiones, centros de refugiados, migrantes, etc.)**
6. **Trabajadores esenciales (transporte, educación, alimentación, etc.)**
7. **Mayores de 55 años**
8. **Vacunas para todos**

Las personas con evidencia de infección previa por SARS-Cov-2 (PCR, test de antígenos, o serología) no deben ser consideradas como prioritarias en el acceso a las vacunas.

Infografía que muestra los grupos prioritarios de vacunación.

Los miembros del GCMSC consideran que es especialmente necesario prepararse para:

- **Cómo identificar grupos prioritarios**. En particular, ¿cómo se evaluarán las afecciones crónicas seleccionadas en un enfoque que pueda manejarse fácilmente?
- **Un plan de comunicación** a la población en general, asumiendo que puede haber un cierto nivel de vacilación a la vacuna. El público en general debe comprender los beneficios y riesgos de la vacuna o vacunas propuestas y por qué existen criterios de priorización.
- **Un plan de vigilancia** para supervisar la cobertura, aceptabilidad y efectos secundarios de las vacunas con un proceso rápido para poder dar una respuesta inmediata si se detecta algún evento adverso relevante. Se debe establecer un plan para las interrupciones y cómo responder antes de iniciar el proceso de vacunación.
- **Una promoción continua de medidas adicionales de prevención** (mascarillas, lavado de manos, ventilación y distanciamiento físico) hasta que la transmisión se haya reducido significativamente hasta el punto de hacerlas redundantes.
- **La existencia de diferentes vacunas disponibles** puede requerir una administración de las vacunas según su eficacia basada en grupos de riesgo específicos.

Todas las declaraciones anteriores siguen siendo provisionales en vista de la próxima información. Los miembros del GCMSC siguen atentamente las publicaciones sobre el tema.

Executive summary

It is expected that there will be a **limited initial supply** of doses when the first COVID-19 vaccines become available, with an expected delay for the universal vaccination of those eligible to receive it. Under this scenario, **it is relevant to analyse how best to prioritise the first available doses** to achieve the greatest impact, both in terms of protecting individuals and minimising community transmission. Ethical issues are key in guiding a fair distribution. Different scenarios on vaccine implementation are summarised. After a critical review of the documents and considering that these criteria are applied to Spanish citizens, the members of the GCMSC propose **the following order for prioritisation of susceptible people**:

1. **Health workers in contact with patients including nursing homes and first responders**
2. **Age 80 years or more and institutionalised elderly**
3. **Age 65-79 years**
4. **Co-morbidities:**
    a. **Type 2 diabetes mellitus**
    b. **Chronic cardiopathy including ischemic heart disease**
    c. **Chronic obstructive pulmonary disease**
    d. **Chronic kidney disease eGFR (< 30 mL/min/1.73 m)**
    e. **Obese class III (BMI >40 kg/m^2)**
    f. **Cancer patients under chemotherapy**
    g. **Immunocompromised condition**
    h. **Any chronic disease that may affect the response to SARS-CoV-2**
5. **Institutionalised people and at risk of social exclusion (prisons, refugee centers, migrants, etc.)**
6. **Essential workers (Transportation, education, food, etc.)**
7. **Older than 55+**
8. **Vaccines for all**

People with evidence of previous SARS-CoV-2 infection (PCR, antigen testing, or serology) should not be considered a priority when accessing vaccines.

Infographic showing the priority vaccination groups.

The members of the GCMSC consider that there is a special need to prepare for:

- **How to identify priority groups.** In particular, how will the selected chronic conditions be evaluated in an approach that can be easily managed?
- **A plan for communicating** with the general population, assuming that there may be a certain level of vaccine hesitancy. The general public needs to understand the benefits and risks of the proposed vaccine or vaccines and why there are prioritisation criteria.
- **A surveillance plan** to oversee the coverage, acceptability and side effects of the vaccines with a fast process to be able to provide an immediate response if any relevant adverse events are detected. A plan for disruptions and how to respond should be in place before initiation of the vaccination process.
- **Continuous promotion of additional prevention measures** (face masks, hand washing, ventilation and physical distancing) until transmission has been significantly reduced to the point of making these measures redundant.
- **The availability of multiple vaccines** may require specific vaccine-based allocation to specific risk groups.

1. Introduction

A severe acute respiratory syndrome caused by the newly described coronavirus 2 (SARS-CoV-2) was first identified in Wuhan, China, in December 2019 (Zu et al. 2020). The World Health Organisation (WHO) declared the outbreak a Public Health Emergency of International Concern on 30 January, and a pandemic on 11 March. At the moment of writing this report, there have been over 1.2 million deaths and COVID-19, the illness caused by SARS-CoV-2, is overwhelming health care systems globally. Research to stop this pandemic has been paramount in many fields, including mechanisms and risk factors for transmission, prevention and treatment options. A major worldwide effort on vaccine development has resulted in a record time of less than 12 months to have several vaccine candidates finalising their phase 3 trials and reporting potential high efficacy and good safety profiles. The initial results of these trials are expected for at least three vaccines in December 2020.

We need safe and efficacious vaccines for all. For any given new vaccine, confirmation of acceptable levels of efficacy and a clearly established safety track record are necessary before considering the possibility of its introduction in the population.

When one or more vaccines for COVID-19 become available, limited initial supply will raise the question of **how to prioritise the available doses to target groups**. The concern applies to global distribution and also to vaccine distribution within a country or even region. As the benefits of an effective vaccine for individuals and their communities may result in high and widespread demand, it is critical that decision-making on vaccine distribution is transparent, ethical and based on scientific parameters, particularly in the initial phases when vaccine availability is likely to be limited (Cobey et al. 2020, Khamsi 2020). Once one or more vaccines are available in a country, the distribution criteria should consider the vaccine characteristics and the **best target for each vaccine**. In this report, we summarise scientific papers and agency recommendations that provide insights on vaccine prioritisation.

The aim of this report is to provide the **best knowledge that may assist in planning an early strategy for COVID-19 vaccination of the target population while vaccine availability is limited**.

2. Leading vaccine candidates

The development of SARS-CoV-2 vaccines was initiated in early January 2020 when the sequence of the virus became available and moved at record speed with

one phase I trial starting in March 2020. Currently, more than 180 vaccines are in various stages of development. Phase I/II trial data are already available for several vaccine candidates and many (at least nine, as of October 2020) have moved into phase III trials. The data available so far suggest that safe and effective vaccines might become available within months rather than years (Kramer et al. 2020). To date (November 2020), the situation can be described as cautiously optimistic, with nine vaccine candidates currently being tested in Phase III trials, encouraging protection data for many of these candidates in non-human primates, and at least 40 further candidates having reached Phase I, II or I/II trials. Phase III trial results need to show that the vaccines are safe and effective in a larger population. As of November 2020, preliminary data from one trial using a mRNA vaccine show that 94 cases of COVID-19 were detected among 43,538 trial participants, suggesting an estimated 90% efficacy (Callaway 2020), while another vaccine with an adenoviral vector reported 92% efficacy based on preliminary results from the phase III trial on 40,000 volunteers (Sputnick 2020). For a third vaccine, also RNA-based, it was announced that the trial met the statistical criteria pre-specified in the study protocol for efficacy, with a vaccine efficacy of 94.5% (COVE study 2020). Final results from phase III trials are expected by December 2020. Because of the short follow-up time, accurate and reliable duration of vaccine-induced protection, together with duration of infection-induced natural immunity and effectiveness in different population groups will not be known in 2020 (Callaway Nature 2020). It will be important to consider the different vaccine specifications when planning their delivery into the population in terms of storage conditions, since not all promising vaccines will require -70°C storage—a factor that may add difficulties in large-scale implementation.

2.1 Major issues identified with the existing vaccines

2.1.A. Almost all vaccines currently in clinical trials are delivered intramuscularly. This means that the resulting immune response is predominantly IgG, rather than IgA. Parenteral COVID-19 vaccine administration aims to induce a robust, durable response involving both neutralising antibodies and T cells, and should provide a significant level of protection. Contrarily, a respiratory mucosal vaccine strategy (nasal administration) could potentially induce these responses directly in the respiratory mucosa through IgA, which would render vaccines most effective in the early control or clearance of SARS-CoV-2, and in blocking viral transmission (Krammer 2020). Because there have been very few intranasal vaccines in human trials (one developed by Hong Kong entered phase I trials in September), most forthcoming vaccines will be aimed at preventing infections of the lower respiratory tract through IgG response.

2.1.B. At this time, due to the short follow-up accomplished so far in phase III trials, the duration of immunity conferred by these vaccines is unknown. As soon as longer follow-up information is available, more clarity will become available regarding the potential need for booster doses. Similarly, very little evidence exists regarding the duration of protection and longevity of antibody responses conferred by naturally acquired SARS-CoV-2 infections.

2.1.C. Vaccine protection in the elderly may be lower, although recent (October 2020) information on some vaccine candidates indicated good immunogenicity also in those over age 55 years.

2.1.D. Most vaccines seem to have mild to moderate side effects that could be more serious in children. So far, no serious adverse events attributable to the vaccines have been reported. Clearly, a proper surveillance post-commercialisation will be needed to guarantee a high safety profile.

2.1.E. Dosing schedules may need to be reviewed for different age groups according to efficacy and safety data.

2.1.F. The novelty and speed with which these vaccines have been developed may raise concerns in the population about their safety (Lazarus et al. 2020). It is critical that any vaccine rollout be accompanied by a major effort in communication on the vaccine profile and the balance between harms and benefits.

3. Identifying priority populations

This report does not aim to consider prioritisation across world regions. Given the pandemic situation, we consider that **every country needs to receive vaccines** to protect their own population and to help reduce transmission across borders. The WHO defines priority groups on the basis of the principle of **global equity,** aiming to inform global-level allocation decisions and alerting that countries with greater financial resources should not undermine vaccine access for low- and middle-income countries (WHO SAGE).

Therefore, international efforts like the Access to COVID-19 Tools (ACT) Accelerator that bring together governments, scientists, businesses, civil society, philanthropists and global health organisations (Bill & Melinda Gates Foundation, CEPI, FIND, Gavi, The Global Fund, Unitaid, Wellcome, WHO) will be critical in supporting the development and worldwide equitable distribution of the tests, treatments and vaccines to prevent COVID-19.

Optimal prioritisation requires an understanding of the infectious agent, its transmission dynamics in the population, and disease dynamics within different population groups. Although there are still many uncertainties regarding SARS-2 and COVID-19, identifying the most exposed and the most vulnerable will help in prioritisation if the initial aim is to reduce associated morbidity.

3.1. The most exposed

3.1.A. Health care workers (in potential contact with patients) and first-line responders

Some studies have shown **similar or even lower proportions of positive COVID-19 cases among health care workers** (HCWs) as compared to the rest of the community, suggesting the efficacy of PPE when adequately used and a relatively low occupational risk (Lai et al. 2020). However, other studies, such as one conducted at Hospital Clinic in Barcelona, reveal a higher seroprevalence among HCWs than that reported for the general Barcelona population (Garcia-Basteiro et al. 2020, Pollan et al. 2020). One study with more than 2 million community individuals and 100,000 HCWs in the United Kingdom (Nguyen et al 2020) showed that, compared with the general community, front-line HCWs were at increased risk for reporting a positive COVID-19 test (HR 11·61, and an adjusted HR of 3·40).

In Spain, there were an estimated 513,777 HCWs as of 2018. Prioritisation within this group is likely for those with potential contact with patients. **Figure 1** summarises the potential exposure to diseases by closeness and frequency in different occupational groups and ages. Nurses, probably the largest group of all, have frequent daily exposure, with clear close contact with sick people, but the share of nurses who are 55 years or older is not high. Meanwhile, care escorts tend to have similar characteristics and are more likely to be older.

In the United States, and according to recent data from the Centers for Disease Control and Prevention (CDC), among COVID-19 cases, 100,481 (18%) were identified as HCWs and 641 died (1%). Health care support workers accounted for the largest overall group of occupation types (32%) and nurses constituted the largest single occupation type (30%) affected with COVID-19 (Hughes et al. 2020).

Kambhampati et al. 2020 analysed COVID-19 hospitalisations from 13 US states and showed that over 5% of them were in HCWs, with nurses accounting for over 36% of hospitalisations among HCWs (**Figure 2**).

The DELVE report from the UK Royal Society (Delve 2020) found that early in the pandemic, at least 10% (CI 4-15%) of all COVID-19 infections in England were among HCWs, with 6% of infections among care home residents.

3.1.A. Essential workers

Essential workers make up a large part of the workforce. **In Spain, about 7 million individuals could be considered essential workers.** Transport staff, teachers and carers, grocery clerks and supermarket workers, delivery people, factory and farm workers may be at higher risk of infection due to numerous contacts with the public and often lack adequate PPE (Lancet editorial 2020). The UK Office for National Statistics has published an occupational risk graph in which nurses and carers (close contact) are among those at highest risk, followed by care workers and home carers. These workers are not only at higher risk of contracting the virus, but are also at higher risk of transmitting it. Carers and workers in long-term elder-care facilities are a priority population for this reason. Healthy people working in critical public services—such as educators, public transport workers, police, or firefighters—may are also be considered a priority group.

3.2 The most vulnerable

Several factors, including age and chronic conditions, are consistently shown in different reports to increase the risk of severe disease outcomes and mortality. About one in five individuals worldwide could be at increased risk of severe COVID-19, should they become infected. In this section, we outline the factors that could best define the most vulnerable.

3.2.A. Age

Several reports indicate that the risk of dying from COVID-19 **increases with age**. Williamson et al. (2020) evaluated mortality due to COVID-19 in a cohort of over 17 million people in the United Kingdom. People aged 80+ had 20 times higher risk of mortality than their peers aged 50-59 years. People under 50 had lower mortality. Reports from the European Centre for Disease Prevention and Control (ECDC) show a similar pattern, as shown in the **Figure 3,** where the risk of severe hospitalisations and crude case-fatality rate are shown to increase exponentially with increasing age.

In several European countries, deaths among elderly residents of long-term care facilities and nursing homes have accounted for over half of all COVID-19-related deaths.

In terms of prioritisation, the cut-off point for categorising 'elderly' is likely to be determined by the number of vaccine doses available. However, it is consistent across data sets that those older than 80 years have higher mortality that those 65-79 years old. Although there is a continuum, **prioritisation to those aged**

80+ years is likely to be the best balance of benefit and risk if followed by 65+ as vaccine doses become available.

3.2.B. Sex

Men are consistently shown to be at higher risk than women of dying from COVID-19. Williamson et al. (2020) reported an increase mortality of 59% in males compared to females (Hazard Ratio=1.59 (1.53–1.65)). **Sex is however un unlikely factor for prioritisation.**

3.2.C. People with underlying health conditions

More data on COVID-19 and prior co-morbidities is becoming available every day. A consistent pattern in the literature identifies that the underlying health conditions associated with **higher risk of severe COVID-19 and death include diabetes, cardiovascular disease, chronic respiratory disease, immunocompromised status, cancer and obesity** (ECDC summary here). The latest report from ECDC on the association between severe and fatal outcomes of COVID-19 by pre-conditions is summarised in Table 1 for the most serious conditions.

The American CDC recommends that individuals with any underlying condition should consult with their health care providers about personal risk factors and circumstances to determine whether extra precautions are warranted. Their list of conditions likely, a priori, to increase the risk of severe illness from the virus that causes COVID-19 include the following: **cancer, chronic kidney disease, chronic obstructive pulmonary disease (COPD), heart conditions (such as heart failure, coronary artery disease or cardiomyopathies), immunocompromised status (weakened immune system) from solid organ transplant, obesity (body mass index [BMI] of 30 kg/m² or higher but < 40 kg/m²), severe obesity (BMI ≥ 40 kg/m²), pregnancy, sickle cell disease, smoking and type 2 diabetes mellitus.**

Further, factors that may add risk for **severe illness** from the virus that causes COVID-19: **asthma (moderate-to-severe), cerebrovascular disease (affects blood vessels and blood supply to the brain), cystic fibrosis, hypertension or high blood pressure, immunocompromised status (weakened immune system) from blood or bone marrow transplant, immune deficiencies, HIV, use of corticosteroids, use of other immune-weakening medicines, neurologic conditions such as dementia, liver disease, overweight (BMI > 25 kg/m², but < 30 kg/m²), pulmonary fibrosis (damaged or scarred lung tissues), thalassemia (a type of blood disorder) and type 1 diabetes mellitus**.

An important study based on the OPENSafely cohort was recently published in the United Kingdom (Williamson et al. 2020). This study reports on the evaluation of primary care records of 17,278,392 adults linked to 10,926 COVID-19-related deaths. The study found in a multivariate analysis that in addition to age and sex, patients with type 2 diabetes mellitus were at increased risk of death, patients with HbA1c < 58 mmol mol– had a hazard risk of mortality of 1.31 (95% CI = 1.24–1.37), those with HbA1c ≥ 58 mmol mol– had a hazard ratio of 1.95 (95% CI = 1.83–2.08) and those with no recent HbA1c measure had a hazard ratio of 1.90 (95% CI = 1.72–2.09). Further, a similar increase in mortality was observed among obese people. Among those not obese, a BMI between 30-34.9 kg/m² increased mortality risk 5%, BMI between 35-39.9 kg/m² by 40% and a BMI of 40 kg/m² or more increased mortality by 92%. Chronic kidney disease eGFR < 30 mL/min/1.73 m was significantly associated with increased mortality (hazard ratio = 2.52 (95% CI = 2.33–2.72). Chronic heart disease, including chronic heart failure, ischaemic heart disease and severe valve or congenital heart disease likely to require lifelong follow-up, was associated with a hazard ratio of 1.17 (95% CI = 1.12–1.22). High blood pressure was not associated with increased mortality. Liver disease, stroke or dementia were also associated with a significant increase in mortality.

Data from Spain identified two studies on hospitalised patients and risk of mortality. Rubio-Rivas et al. (2020) studied 12,066 COVID-19 patients followed up from 1 March to 31 July 2020, from the nationwide Spanish Society of Internal Medicine (SEMI)-COVID-19 Registry. The risk of in-hospital death was significantly associated with COPD with an OR of 1.36 and Charlson's index of co-morbidities with an OR of 1.20. The fact that the analysis included the co-morbidity index may have affected the statistical significance of some factors. Berenguer et al. (2020), in a study of 4,035 patients hospitalised in 127 centres in Spain, identified 17 pre-conditions associated with increased mortality, among which the strongest risk factors were for age and liver cirrhosis. The GCMSC noted that Rubio-Rivas et al. and Berenguer et al. studied hospitalised COVID-19 patients while Williamson extracted co-morbidities within a population-based cohort; thus, the identification of factors linked to mortality is less likely to have a selection bias in the latter study.

Immunodeficiency due to organ transplant had a very high increase in mortality risk in Williamson et al. (2020) with a hazard ratio of 3.53 (95% CI = 2.77–4.49). Chronic respiratory disease, asthma and cancer cases with recent diagnosis were also at an increased mortality risk. High blood pressure was not identified as a risk factor, while ischemic heart disease increased mortality by 17%.

3.2.D. Certain ethnic groups and disadvantaged populations

The death rate observed among males of Black ethnicity is higher than for their white male counterparts. In the United States, a study found that for every 10% increase in a county's Black population, its COVID-19 death rate roughly doubled. Authors adjusted for age, sex, comorbidities and income but none of these variables seemed to explain the higher death rate. In the United Kingdom, the rate of deaths involving COVID-19 for Black males was 3.3 times greater than for White males of the same age, while the rate for Black females was 2.4 times greater than for White females.

The Latino populations in the United States have also been disproportionately affected due to higher exposure and less social protection. **We could not identify information on the impact of COVID-19 among ethnic minority groups in Spain.**

However, institutionalized persons with limited capacity of isolation (f.ex. prisons, refugee centres) as well as people at risk of social exclusion (migrants, homeless) should be considered vulnerable populations.

3.2.E. Size of potential vulnerable populations in Spain and Catalonia

With a population of 47.3 million, Spain had about 513,777 health workers in 2018. According the Ministry of Health, there are about 149,342 doctors, 18,600 nurses and 331 other professionals working in health. It is unknown to the GCMSC how many of them are in close contact with patients, but about 19,000 are working in an emergency activity. About 5 million (around 12% of the population) are estimated to have type 2 diabetes mellitus and prevalence increases sharply with increasing age (Ruiz-Garcia et al. 2020). About 10 million people are estimated to have a BMI over 30. The incarcerated population is estimated to be around 59,589. It is unknown to the GCMSC how many people are institutionalised in the country in psychiatric centres, nursing homes or other types of facilities.

3.3 Those who transmit the most?

From a population perspective, **focussing on transmission may lead to a greater impact on reducing mortality due to disease**. Several models have suggested that vaccinating high-transmission groups first would result in fewer overall deaths.

A modelling study estimated that **adults aged 30-50 are responsible for a majority of transmission**, so they could also be a population worth vaccinating to decrease viral spread. In this sense, a mathematical model estimated that herd immunity can be achieved at a population-wide infection rate of ~40% (instead of 60-70%), since transmission and immunity are concentrated among the most active members of a population. Children, on the other hand, are less vulnerable to developing severe disease and, even if recent studies indicate that they may have viral loads similar to or higher than symptomatic adults, they are not frequently at the origin of case clusters. Their transmission potential seems also to be lower than that of adults. In fact, interventions aimed at children might have a relatively small impact on reducing SARS-CoV-2 transmission, according to another model-based study. In this sense, two recent studies show that SARS-CoV-2 infections and outbreaks were uncommon in summer schools in Barcelona and the United Kingdom. In a pre-print study by Forbes et al. of 10 million adults in the United Kingdom, living with children aged 0-11 years was not associated with increased risk of SARS-CoV-2 infection, suggesting that children are not transmitting the virus as frequently as observed among the adult population.

4. Prioritisation summaries

When confronted with prioritisation, two approaches have been observed:

1) A model-based one where infection dynamics are prioritised to achieve maximum impact.

2) A benefit/risk model based on ethical considerations. **The second one is the preferred approach by institutions such as the WHO and the Academy of Medicine**.

Models can add relevant information to predict what actions might lead to what outcomes, but they may not include societal issues that are key in prioritisation (Kim Tingley, NYT, 5 November 2020).

4.1 Modelling approach

Bubar et al. (2020) proposed two main approaches to vaccine prioritisation: (1) directly vaccinate those at highest risk and (2) protect them indirectly by vaccinating those who do the most transmitting. However, choice of 1 or 2 will depend on **vaccine performance** and the **total quantity of vaccines available** and doses required in those chosen to be vaccinated. Cobey et al. modelled the best performing scenario of target vaccination to best impact on mortality. Assuming that vaccine efficacy is not strongly dependent on age, their model suggests that **vaccination of adults aged 60+ years is the best strategy**. In contrast, if vaccine efficacy decreases with age, priority may be given to the adult population 10-59 years old. An additional although challenging strategy would be to prioritise vaccination of those who are seronegative. This would require the availability of fast testing and a good correlation between antibody levels and protection.

Matrajt et al. (2020) evaluated the best scenarios to reach the fewest deaths, the fewest symptomatic infections and, at their peaks, the fewest non-ICU hospitalisations and the fewest ICU visits. Taking into account vaccine efficacy and the number of doses available, they found that vaccinating older people first resulted in the fewest deaths — unless a vaccine is at least 60% effective and there are enough doses to cover roughly half the population. At that point, **vaccinating high-transmission groups first** — in their model, children and adults between the ages of 20 and 50 years — would result in fewer overall deaths if 30% of the population could be covered and would minimise symptomatic infections and non-ICU hospitalisations, whereas giving it to older people would minimise ICU hospitalisations and deaths.

4.2 The UK Royal Society proposes the following scenarios for prioritisation

The Data Evaluation and Learning for Viral Epidemics (DELVE) initiative was convened by the Royal Society to support a data-driven approach to learning from the different approaches that countries are taking to managing the COVID-19 pandemic. In a comprehensive report analysing data and considering the limitations on knowledge of the vaccine efficacy, the Royal Society presented different scenarios for vaccine implementation. The scenario numbers do not represent a sequential approach but rather different approaches to planning an initial vaccination phase.

Scenario 1: Vaccination of groups most vulnerable to severe disease such as HCWs, seniors, people with co-morbidities and ethnic minorities, when vaccine supply is initially limited. This scenario could include those over 50 years of age and with other risk factors, such as chronic heart disease, chronic kidney disease, chronic pulmonary disease, malignancy, obesity and dementia. Priority groups would also include HCWs, pregnant women and those who are immunosuppressed. In this scenario, the virus continues to circulate and there is the potential for a large reduction in disease burden with relatively low number of doses. However, some vaccines might be of low efficacy in older people, and not all those at high risk can be identified. This scenario would require fewer doses than a strategy of widespread vaccination and is likely to be the optimal strategy when vaccine supplies are limited.

Note: It is not specified in this scenario whether first responders would be included (such as, in addition to emergency medical services (EMS) personnel, police, and firefighters, those working in transport, environmental services, and other health care facility services exposed to aerosol contamination and body fluids).

Scenario 2: Vaccination aimed at reducing incidence in those at high risk of infection

This scenario aims to protect those at the highest risk of infection to reduce the incidence of disease. Thus, the scenario would include occupations at high risk of exposure, particularly HCWs and those who share households with those in vulnerable groups. Priority might be extended to key workers, such as EMS personnel and teachers, and occupations at high risk of exposure. In this scenario, the virus continues to circulate in the wider population and pose a risk to the vulnerable.

Note: The elderly and people with co-morbidities would not be initially included in this scenario.

Scenario 3: Vaccination of wider population

In this scenario, the vaccine is offered to the whole population or large sectors of the population. A widespread vaccination programme would eventually aim to achieve herd immunity, in which a sufficient proportion of a population is immune to prevent sustained transmission of infection. This strategy would reduce the overall incidence of infection and thus in addition to reducing severe disease, it would reduce the potential long-term effects of milder SARS-CoV-2 infection. Eventually, the virus could be eliminated.

This strategy requires a vaccine to be available in a large number of doses.

Scenario 4: Vaccination in response to local outbreaks

In this scenario, members of communities are vaccinated in response to outbreaks due to the higher risk of transmission events in the wider community following a spike in cases. This scenario might be used once vaccination is more widespread in the population, if immunity wanes or if coverage is low in certain populations, allowing sustained transmission to occur. The aim is to induce immunity sufficiently rapidly to provide protection before the outbreak has spread through the community. This strategy is limited by the high number of asymptomatic carriers and the pre-symptomatic interval of SARS-CoV-2 infection. Under this strategy, vaccination of the wider local community is recommended as likely to be a more effective strategy.

4.3 The US National Academy of Medicine

The US National Academy of Medicine (NAM) based their criteria for vaccine allocation on **four risk levels** that distinguish risk of acquiring the infection, risk of severe morbidity and mortality, risk of negative societal impact and risk of transmitting the infection to others. The strategy behind this grouping involves relevant ethical considerations to maximise benefit, reduce harm and protect the most vulnerable within a population.

- **Risk of acquiring infection:** Individuals have higher priority to the extent that they have a greater probability of being in settings where SARS-CoV-2 is circulating and of being exposed to a sufficient dose of the virus.
- **Risk of severe morbidity and mortality:** Individuals have higher priority to the extent that they have a greater probability of severe disease or death if they acquire infection.
- **Risk of negative societal impact:** Individuals have higher priority to the extent that societal function and other individuals' lives and livelihood depend on them directly and would be imperiled if they fell ill.
- **Risk of transmitting infection to others:** Individuals have higher priority to the extent that there is a higher probability of their transmitting the infection to others.

Based on these criteria, the NAM proposes a phase-based introduction of the vaccines (see **Figure 4**).

Phase 1a targets high-risk health workers and first responders. This group includes health professionals who are involved in direct patient care, as well as those working in transport, environmental services or other health care facility services exposed to aerosol contamination and body fluids. First responders also include EMS personnel, police and firefighters (including volunteer firefighters).

Phase 1b targets those with serious high-risk comorbidities irrespective of age, as well as institutionalised elderly aged 65+ years.

Phase 2 includes teachers and essential workers at high risk of exposure, comorbid situations of moderate risk, homeless people and other institutionalised groups. Essential workers in this phase include individuals distributing or administering the vaccine—especially in areas of higher community transmission—such as pharmacists, plasma and blood donation workers, public health nurses, and other public health and emergency-preparedness workers. This group also includes morticians, funeral home workers, and other death care professionals involved in handling bodies.

Note: The document does not specify what comorbidities are of high or moderate risk and refers to the list provided by the CDC: cancer, chronic kidney disease, COPD, immunocompromised status from solid organ transplant, obesity (body mass index [BMI] ≥ 30), serious heart conditions (e.g., heart failure, coronary artery disease, cardiomyopathies), sickle cell disease, and type 2 diabetes mellitus). This suggests that prioritisation may need to include those with two or three conditions, since the number of affected people may be very high. The NAM recommends referring to the most recent published results for an update in view of new data.

Phase 3 includes young people and children, since they play a potential role in asymptomatic transmission, as well as other essential workers. Vaccination of younger populations will depend on phase III safety results.

Phase 4 is for all remaining individuals not yet vaccinated. If vaccines are still limited, lottery assignment can be an option.

4.4 World Health Organisation

The WHO declares an obligation 'to ensure, to the best of their ability, adequate provision of **health care for all**'. In a pandemic, prioritisation and rationing of resources are necessary. Choices in this regard may be difficult and require a clear ethical justification. In a policy brief, the WHO discusses the ethics of setting priorities for the allocation of resources during times of scarcity. The document

provides a high-level ethical framework that can be used to guide decision-making and complements the WHO's technical guidance.

The document evaluates ethical issues such as equality, utility, prioritisation of the worst off, and prioritisation of those that help others. Decisions on prioritisation should be taken under the concepts of **transparency, inclusiveness, consistency and accountability**.

Based on the aforementioned criteria, a fair allocation of scarce resources within countries during the COVID-19 outbreak could consider the **following priority groups (in order)**:

1. HCWs (caring for patients) and first responders can justifiably be prioritised when allocating some resources because of their contribution to the health and well-being of the community. Their health helps preserve the health of others.

2. Participants in research aimed at developing vaccines, therapies or other critical resources should receive some priority in receiving those resources because they have also helped save others by their participation. This is not an absolute priority—for example, it should not take precedence over giving priority to those most at risk in the case of resources such as vaccines.

3. While the principle of first come, first served is often applied when allocating resources in health care settings, it is rarely appropriate in an emergency. In practice, it is very likely to favour certain groups, such as those closest to a distribution centre, those with access to better information or those who are most well-off.

4. Younger populations appear to be at lower risk in the COVID-19 context. Consequently, the principle of youngest first should have low priority for vaccination. Younger people may perhaps have greater priority if they do become sick and need critical care resources.

5. The allocation of different resources may find ethical justification in different principles or values. For instance, if a novel vaccine is found to be safe and effective, a lottery-based allocation among those as highest risk, the old and those with co-morbidities may be justified, if such people outnumber the available vaccines.

6. Utility maximisation should be balanced with the principle of priority to the worst-off: centralising the availability of resources in larger centres may extend their benefits to more people, but may exclude isolated populations and challenge the concern for protecting those at highest risk.

4.5 US Advisory Committee on Immunisation Practices for COVID-19 Vaccination Implementation (ACIP)

In September 2020, the ACIP endorsed interim ethical principles (Bell et al. 2020). The principles are central to the development and implementation of recommendations for COVID-19 vaccine use, including in the setting of a constrained supply. The principles are maximising benefits, minimising harms, equity, justice, fairness and transparency. Transparency was considered foundational to ethical decision-making, as it is essential to fostering public trust and ensuring that allocation decisions are clear and open for review and public engagement. The suggested prioritisations of the ACIP, pending the results of the phase III clinical trials, can be summarised as follows:

Phase 1a. HCWs are considered for phase 1a, which includes the first available doses and an extremely constrained supply. HCWs are defined as all paid and unpaid persons serving in health care settings who have the potential for direct or indirect exposure to patients or infectious materials. Examples include hospital workers, long-term care and assisted living workers, home health carers and outpatient facility staff, as well as pharmacists and EMS personnel. HCWs are essential to the ongoing COVID-19 response and are at high risk for exposure to SARS-CoV-2. The GCMSC notes that no reference is made to first responders.

Phase 1b. Groups under consideration for phase 1b—when more doses and likely more than one vaccine product will be available—include essential workers, people with high-risk underlying medical conditions and elderly individuals. Essential (non-health care) workers conducting operations vital to critical infrastructure—such as food and agriculture, transportation, education, and law enforcement—are included.

Phase 2. People with high-risk medical conditions (e.g. obesity, diabetes, and cardiovascular disease). In the United States, some racial and ethnic minority groups have disproportionate prevalence of certain high-risk conditions, such as diabetes and obesity.

Phase 3. Adults aged 65 years and older**.**

The ACIP recommends monitoring implementation of the vaccination recommendations as a critical activity to identify gaps, ensure equity and determine best practices. A system for tracking the vaccinated population is therefore required.

Finally, the ACIP ensures that their recommendations on the use of licensed COVID-19 vaccines will value safety first.

4.6 European Centre for Disease Prevention and Control (ECDC)

The ECDC provides high-level recommendations on vaccine prioritisation as "conceptual approaches that could be implemented in parallel or sequentially".

Focusing on specific groups (e.g. essential service employees, risk groups, socially vulnerable groups). Vaccination could be given to specific groups in the population based on their key societal role during the COVID-19 pandemic (e.g. HCWs, first responders, social care workers), on their individual risk of developing severe COVID-19 (e.g. individuals with underlying conditions) and on belonging to specific vulnerable groups (e.g. socially vulnerable groups). Pursuing this approach would contribute to well-functioning health care and to protecting those most at risk and the most vulnerable, given adequate vaccine safety and effectiveness in all these groups.

Targeting different age groups. Based on incidence of COVID-19 across different age groups, age itself is to be considered a risk factor for severe COVID-19. The aim of pursuing a vaccination program targeting older adults is to reach the age group with the highest burden of COVID-19 and to protect the majority of the individuals most at risk in the population. However, before pursuing this approach, acceptable levels of vaccine safety and efficacy need to be demonstrated among older adults. At this stage, this information is not known. Synergies with, and impact on, other vaccinations against respiratory infections in older adults (e.g. influenza, pneumococcus) should also be considered. Targeting by age group could optimise the vaccine deployment strategy.

Aiming at efficient reduction of disease transmission at the population level. Based on modelling and data from investigations of COVID-19 outbreaks (including active case finding, seroepidemiological studies, social contact patterns data), groups that are identified as highly exposed to SARS-CoV-2 (e.g. younger adults, specific occupations) can be targeted for vaccination to protect them and efficiently minimise the viral circulation in the population. Pursuing this option could significantly and cost-effectively reduce the spread of COVID-19 in the community, enabling society to return to functioning normally. However, the identification of these groups may not be possible, while groups at risk of severe COVID-19 and death from COVID-19 may not immediately benefit from this approach, unless prioritised in parallel.

Targeting high-incidence and densely populated areas. Based on COVID-19 surveillance and geographical data, vaccination can initially target areas and subnational regions in which the highest viral activity is detected, in particular densely populated areas.

Deploying vaccines in outbreak settings. Priority can be given to vaccination activities within active clusters of COVID-19 outbreaks. Different vaccination approaches (e.g. mass vaccination, ring vaccination) can be considered in order to maximise cost-effectiveness of the intervention in the outbreak setting. The choice of this approach should be carefully weighed against or in addition to alternative options following a specific evaluation of the COVID-19 epidemiology and vaccine supply in the country.

The ECDC emphasises the need for well-defined indicators and systems to guarantee an adequate surveillance system. High-quality surveillance and adequate modelling will allow for adaptations to sudden changes in vaccine supply or in COVID-19 epidemiology. Careful plans need to be made for a universal vaccination strategy for subsequent phases following the introduction of the COVID-19 vaccines. Universal vaccination can be reached through a gradual approach following sequential prioritisation steps (e.g. by using tiers or phases) based on some of the principles outlined above.

5. Other key considerations

Those who have already had a confirmed SARS-CoV-2 infection should not be initially prioritised. With over nine months of exposure to circulating SARS-CoV-2 in our country, it is now clear that an important proportion of the population has already been infected, reaching **~15-25% of the population** in some areas. There is not yet good evidence regarding the duration, specificity and potential waning of the immune response generated by natural infection, although the scarce evidence of recurrent infections worldwide suggests that protection will be robust, at least for several months. Individuals with documented past SARS-CoV-2 infections could therefore have some degree of immunity and would therefore not require prioritisation. The logistical implications of this would entail screening with serological tests, or measuring antibody titres, should these have been confirmed to be an accurate predictor of protection. Needless to say, this would add additional complexity and steps in the process of deciding who needs to be vaccinated, but could spare many vaccine doses that could alternatively be given to those most in need.

Vaccine confidence/acceptability

A global survey conducted in June 2020 of 13,426 people in 19 countries found that, overall, **nearly 72% reported they would be very or somewhat likely to take a COVID-19 vaccine if it was proven safe and effective** (Lazarus et al. 2020); for Spain, this figure was 75% (Lazarus et al. 2020). In the United Kingdom, a YouGov poll found that nearly 1 in 6 Britons would refuse a COVID-19 vaccine, and that people who rely on traditional media rather than social media for information were more likely to say they would get a vaccine.

According to an EU survey in 2018 (*The Guardian* 2020), a high percentage of the Spanish population agrees that vaccines are safe (91.6%) and effective (94%).

Regarding communication with the public, experts in science communication note that it is important to **let people know, starting now, that side effects including** nausea, fatigue and muscle pain are to be expected given the phase I results for several of the leading candidates. Another message that needs to be transmitted, starting now, is that the first vaccines approved will necessarily be safe, but will probably not be perfect (they may protect only against severe disease, or may be less effective among certain population groups). In addition, vaccine coverage will be low at the beginning. Therefore, another key message during the first vaccination phases is that non-pharmaceutical measures (such as social distancing, face masks and hand hygiene) will still play a key role in protecting us against COVID-19.

Clear and transparent information is key to COVID-19 vaccine acceptance. People who ask when we will have a vaccine in fact are asking three questions: When will the public be able to have confidence that the available vaccines are safe and effective? When will a vaccine be available to people like them? And when will vaccine uptake be high enough to enable a return to pre-pandemic conditions?

6. GCMSC evaluation

In view of the literature review (see Table 3 for a summary), the members of the GCMSC consider that there is general agreement within the reviewed reports that **there will be a need to prioritise vaccination and that this action needs to be set up under an ethical premise**. Because of the rapidly evolving field, the GCMSC relies on fast vaccine production and logistical management taking place in 12 or more months to allow a vaccine for everybody in need. However, foreseeing the initial scarcity of the vaccines, as well as logistic issues in the production and delivery of first doses, these could be best prioritised to the most vulnerable and the most susceptible of acquiring the infection. These groups will have to be confirmed on the basis of clinical trial results for each vaccine, and on the number of doses available. As mentioned before, data on co-morbidities is being reported continuously and the list included reflects the most consistent factors identified in the literature. However, any person with an existing chronic condition should be considered individually, as rare conditions not identified in published studies may affect the course of **SARS-CoV-2** infection.

We propose the following prioritisation, until everybody can have access to the vaccine

1. **Health workers in contact with patients including nursing homes and first responders**
2. **Age 80 years or more and institutionalised elderly**
3. **Age 65-79 years**
4. **Co-morbidities:**
    a. **Type 2 diabetes mellitus**
    b. **Chronic cardiopathy including ischemic heart disease**
    c. **Chronic obstructive pulmonary disease**
    d. **Chronic kidney disease eGFR (< 30 mL/min/1.73 m)**
    e. **Obese class III (BMI >40 kg/m²)**
    f. **Cancer patients under chemotherapy**
    g. **Immunocompromised condition**
    h. **Any chronic disease that may affect the response to SARS-CoV-2**
5. **Institutionalised people and at risk of social exclusion (prisons, refugee centers, migrants, etc.)**
6. **Essential workers (Transportation, education, food, etc.)**
7. **Age 55+ years**
8. **Vaccines for all**

People with evidence of previous SARS-Cov-2 infection (by PCR, antigen testing or serology) should not be considered a priority when accessing vaccines.

The Commission considers that there is a special need to prepare for:

- **How to identify priority groups.** In particular, how will the selected chronic conditions be evaluated in an approach that can be easily managed?
- **A plan for communicating** with the general population, assuming that there may be a certain resistance and anti-vaccine movements. The general public needs to understand the benefits and risks of the proposed vaccine or vaccines and prioritisation criteria.
- **A surveillance plan** to oversee the coverage, acceptability and side effects of the vaccines with a fast process to be able to provide an immediate response if any relevant adverse effects are detected. A plan for disruptions and how to respond should be in place before initiation of the vaccination process.
- **Continuous promotion of additional prevention measures** (face masks, hand washing, ventilation and physical distancing) until transmission has been significantly reduced to the point of making these measures redundant.
- **The availability of multiple vaccines** may require specific vaccine-based allocation to specific risk groups.

All the above statements remain provisional in view of changing information. The Commission follows publications on the issue attentively.

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Useful links

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https://www.eacsociety.org/files/spain_benet-garcia_fraile-verdejo_munoz.pdf (HIV data)

https://www.ecdc.europa.eu/en/publications-data/threat-assessment-brief-reinfection-sars-cov-2

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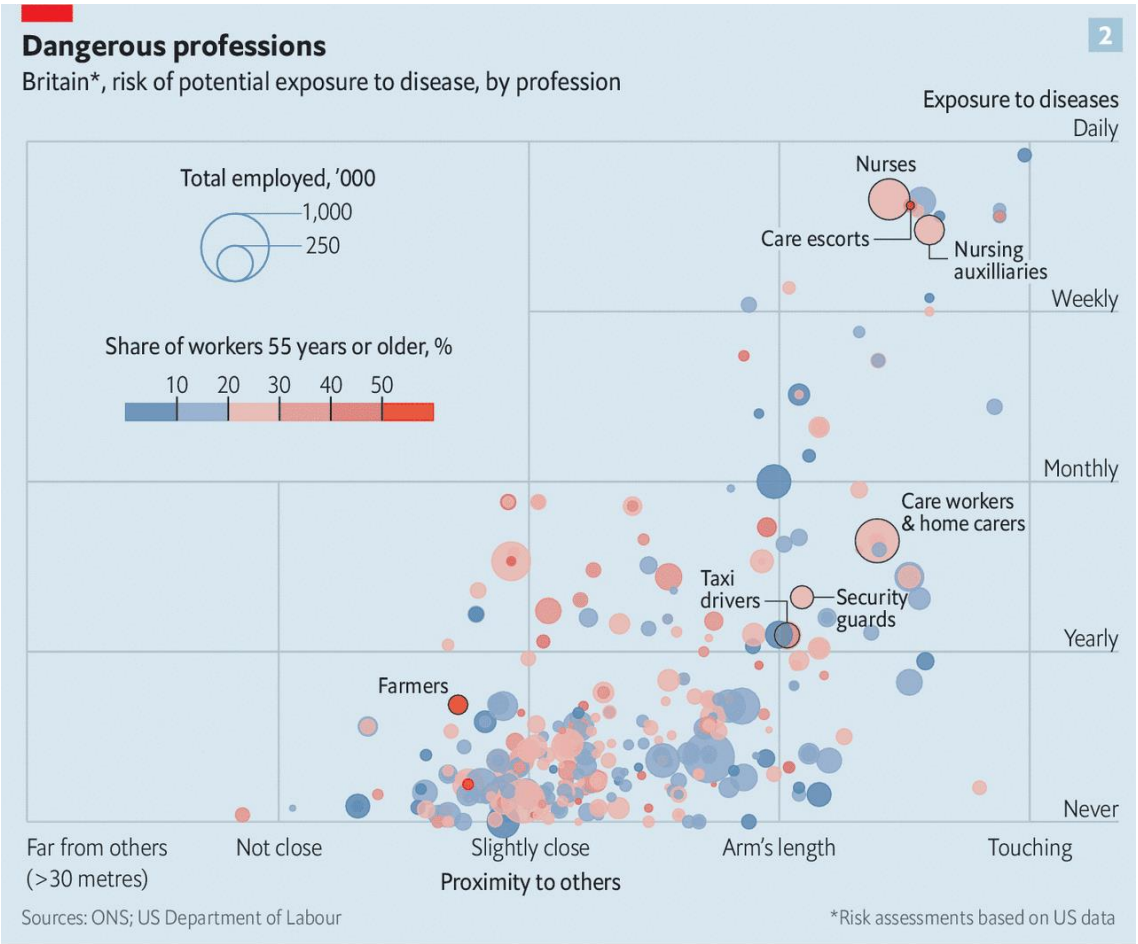
Figure 1. Selected professions by risk of potential exposure to COVID-19 in the United Kingdom.



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https://www.economist.com/science-and-technology/2020/05/21/the-risk-of-severe-covid-19-is-not-uniform

Figure 2. Weighted percentages of personnel types among reported health care personnel with COVID-19-associated hospitalisations.

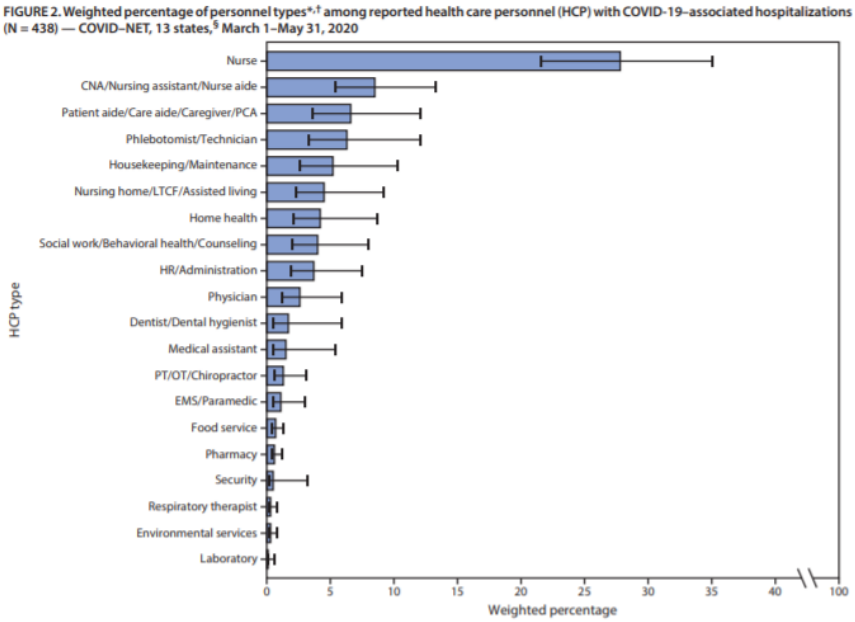


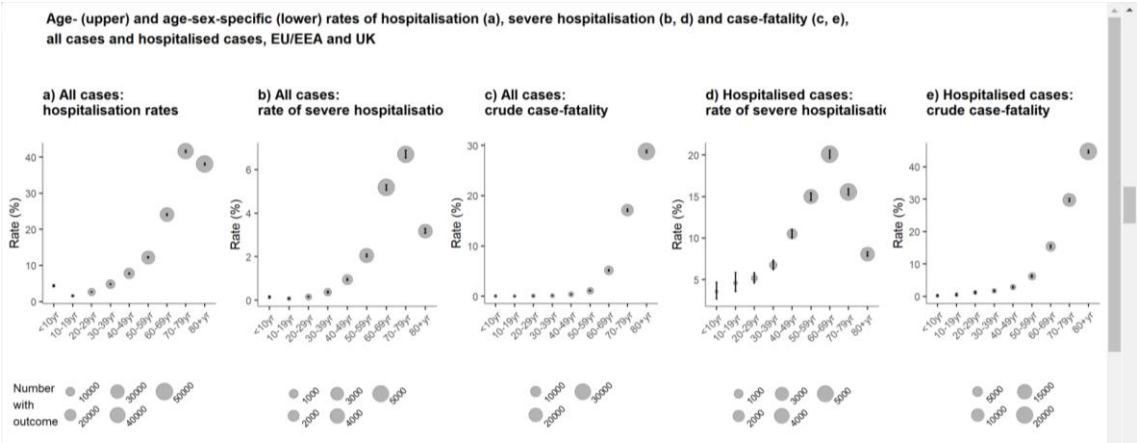
FIGURE 2. Weighted percentage of personnel types*,† among reported health care personnel (HCP) with COVID-19–associated hospitalizations (N = 438) — COVID–NET, 13 states,§ March 1–May 31, 2020

Abbreviations: CNA = certified nursing assistant; COVID-19 = coronavirus disease 2019; COVID–NET = COVID–19–Associated Hospitalization Surveillance Network; EMS = emergency medical services; HR = human resources; LTCF = long-term care facility; OT = occupational therapist; PCA = patient care assistant; PT = physical therapist.
* HCP categorized as "unspecified" or "other" have not been included in the figure but are included in the denominator.
† Error bars represent 95% confidence intervals.
§ Sites located in the following 13 states: California, Colorado, Connecticut, Georgia, Maryland, Michigan, Minnesota, New Mexico, New York, Ohio, Oregon, Tennessee, and Utah.

recommends that HCP wear eye protection for all patient care These results are consistent with previously reported data

Source: Kambhampati et al. 2020

Figure 3. Hospitalisation and fatality rates by age group in the European Union.



Source:

https://covid19-surveillance-report.ecdc.europa.eu/#5_risk_groups_most_affected

Figure 4. A phased approach to vaccine allocation for COVID-19. US National Academy of Medicine.

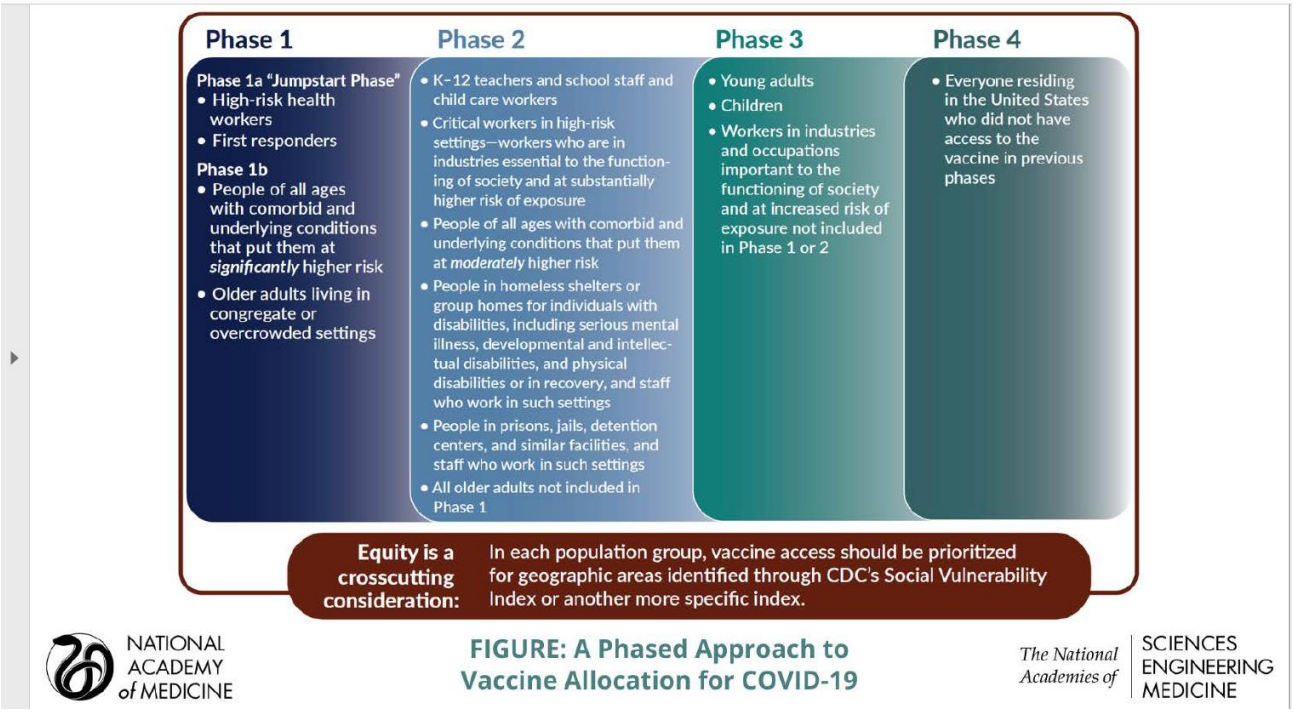


Table 1. ECDC summary report on severe and fatal evolution of COVID-19 by health pre-conditions in Europe.

Condition	Severe	%	Fatal	%
Cardiac disorder, excluding hypertension	3241	23.9	7481	28.3
Diabetes	2662	19.7	4643	17.6
Cancer, malignancy	987	7.3	2771	10.5
Hypertension	768	5.7	2450	9.3
Chronic lung disease, excluding asthma	965	7.1	1720	6.5
None	3204	23.7	3598	13.6
Total	13540	100	26452	100

Source:
https://covid19-surveillance-report.ecdc.europa.eu/#5_risk_groups_most_affected

Table 2. Estimated number of people living in Spain by specific characteristics.

Potential priority groups Phase 1-2	Spain No.	Source
Health workers (if in contact with patients)	513,777	https://www.mscbs.gob.es/ https://cadenaser.com/ser/2020/04/08/sociedad/1586325364_643641.html
Doctors **Nurses** **Other health prof.**	149,342 186,000 331,000	https://www.mscbs.gob.es/
Emergency health workers	19,000	https://www.mscbs.gob.es
First responders and essential workers	1.7/7.5 M	http://www.mites.gob.es/ficheros/ministerio/contacto_ministerio/lista_actividades_esenciales.pdf
Older than 80 years	2,851,868	https://www.ine.es/jaxiT3/Tabla.htm?t=31304
Older than 64 years (19%)	9 M	https://www.ine.es/dyngs/INEbase/es
Older than 64 years with diabetes (21%)	2 M	
Diabetes	5.3 M 12-15% 8-9%	https://www.fundaciondiabetes.org/prensa/297/la-diabetes-en-espana Ruiz/Garcia et al. 2020.
Obesity (BMI>30kg/m²)	10.8 M	https://www.fundaciondiabetes.org/prensa/297/la-diabetes-en-espana
Incarcerated	59,589	http://www.interior.gob.es/web/archivos-y-documentacion/la-poblacion-reclusa-en-espana
TOTAL POPULATION IN SPAIN	47.3 M	

Table 3. Summary of prioritisation levels by scientific societies.

	Royal Society in UK	National Academy of Medicine US	WHO	ACIP
Health workers in close contact	**P1**	**P1a**	**P1**	**P1**
First responders	**P1**	**P1a**	**P1**	**P1**
Age	**P1**	**P1b** Elderly 65+ living in congregate settings **P2** Other elderly 65+	**P1** Lottery allocation	**P1** **E**lderly **P2** >65 years old
Morbidity (Diabetes, ICD, COPD, Obesity,..) **High risk** **Moderate risk**	**P1**	**P1b** **P2**	**P1** Lottery allocation	**P2**
Specific essential occupations	**P2** Teachers and occupations at high risk of exposure	**P2** Teachers K-12 & staff, critical industry workers		**P2** Essential workers
Underprivileged groups		**P2** Homeless, institutionalized & staff		
Participants in trials			**P2 or P3**	

P1,P1a, P1b, P2,P3 refer to levels of prioritisation

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