



Mandatory vaccinations, the segregation of citizens, and the promotion of inequality in the modern democracy of Greece and other democratic countries in the era of COVID-19

Charalampos Mavridis¹ · Georgios Aidonidis² · Marianna Evangelou³ · Athanasios Kalogeridis⁴

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Abstract During the COVID-19 pandemic, the Greek authorities enforced a vaccination mandate for healthcare workers (HCWs). At the same time, multiple concerns were raised about the epidemiological profile of Greece in addition to the ethical status of the harsh measures and their impact on employees, organizations, society, and public health. According to the World Health Organization (WHO), considerations regarding the evidence of vaccine safety and effectiveness, necessity, and proportionality should be clearly evaluated by before imposing mandatory vaccination policies. We discuss the issues regarding the mechanics of the transmission and contraction of SARS-CoV-2, the toxicity of COVID-19 vaccines, and the impact of the suspension of HCWs who did not vaccinate versus the potential expected benefits in addition to whether the vaccine mandates were justified considering the overall epidemiological context.

✉ Charalampos Mavridis
ch.mavridis@uoc.gr

Georgios Aidonidis
georgaidonis@yahoo.gr

Marianna Evangelou
anmarevan@gmail.com

Athanasios Kalogeridis
akaloger@ippokratio.gr

¹ Medical School, University of Crete, Voutes Campus, 710 03 Heraklion, Greece

² Interbalkan Medical Center, Thessaloniki, Greece

³ Independent Researcher, Larissa, Greece

⁴ 2nd Department of Internal Medicine, Aristotle University of Thessaloniki, Hippokratation General Hospital, Thessaloniki, Greece

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1 Introduction

COVID-19 is undoubtedly one of the most important human health issues, with more than 6,000,000 deaths worldwide to date (Dong et al., 2020). Each country's government was tasked with taking several measures to protect public health without causing additional direct or indirect harm, either in the short or the long term, to its citizens. Vaccinations for infectious diseases are undeniably the most effective preventive measure, as we have historically seen with diseases such as smallpox, which have essentially disappeared (Belongia & Naleway, 2003). However, in every medical practice, the costs must be weighed against the benefits, and science has the responsibility of providing guidance, without any bias or partiality, to ensure the maintenance of public health at the lowest possible cost. As of July 2022, searches of the Medline database reveal over 165,000 articles on COVID-19 and about 2,100 related meta-analyses. As we are still in a period of learning, during which a massive amount of medical data are constantly added on a daily basis, implementing guidelines is a great challenge.

The pandemic came to Greece at the end of February 2020 with the official announcement of the first case of COVID-19 (Reuters, 2020). The first death was recorded on 12.3.2020 (ANA-MPA, 2020), while the number of cases up to the first official report of the EODY (ΕΟΔΥ—Hellenic National Public Health Organization) on 20.3.2020 was 495 (Eody, 2020). By July 2022, 31,337 deaths attributed to COVID-19 had been counted (Hannah Ritchie et al., 2020). Greece is a country of about 10.5 million people, but in total, receives more than 30 million tourists annually (Reuters, 2020), leading to the logical consequence of increasing the required reserves of the health system, especially in situations of healthcare crises, such as the one brought on by COVID-19. This means that healthcare workers (HCWs) face various challenges; apart from the obvious potential of SARS-CoV-2 infection, higher workloads, social exclusion, stigmatization, and mental disorders (Gupta et al., 2021; Razu et al., 2021) are likely to increase at times (e.g., coinciding with increased tourist arrivals). Consequently, in order to cope with the challenges facing the health system, specific strategies need to be implemented in order to increase staffing, equipment and the adequacy of pharmaceutical agents, as well as provide the possibility of home care (primary health care) for patients such that hospitals are not overburdened (Levin et al., 2007). The role of general practitioners and nurses is of paramount importance in the overall management of the pandemic (Sarango et al., 2021; Van Poel et al., 2022). Unfortunately, according to Organisation for Economic Co-operation and Development OECD data, Greece entered the pandemic (2019) with the lowest ratio of nurses and general practitioners per 1,000 inhabitants among all European countries. Specifically, there are only 3.4 nurses and 0.44 general practitioners per 1,000 inhabitants, while in Germany, the corresponding ratios are 11.79 and one, respectively (Fig. 1) (OECD.). Moreover, it is

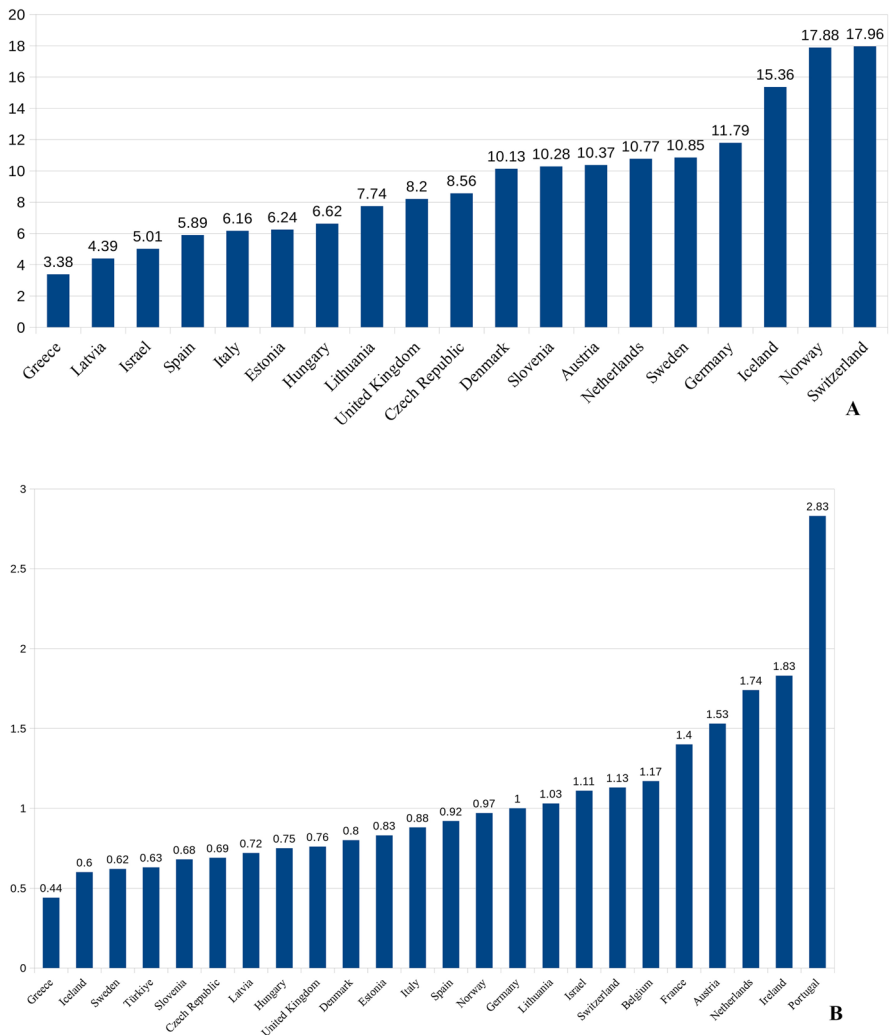


Fig. 1 Comparative bar charts of European countries with OECD data: **A** practicing nurses per 1,000 population (head counts); **B** generalist medical practitioners per 1,000 population (head counts) (OECD. Stat, 2019a, 2019b)

essentially impossible to hope for home care for COVID-19 patients in a country with a seriously undermanned and fragmented primary healthcare system that has not yet been properly established (Kondilis et al., 2012). Thus, COVID-19 patients have followed instructions over the telephone given by doctors with whom they were personally acquainted, if available, or visited hospitals.

During the pandemic, Greek HCWs have served with admirable self-sacrifice to uphold public health. The “heroes”, as they were called, have been working under conditions of incredible pressure in a healthcare system experiencing staff and

equipment shortages, and some of them unfortunately lost their lives in the battle with COVID-19 (Tovima.gr, 2020). Since 1.9.2021, the Greek government has enforced a COVID-19 vaccination mandate for HCWs and medical nursing students, which has placed the unvaccinated and non-recently convalescent HCWs in unpaid suspension. In addition, Greek lawmakers imposed severe restrictions on all unvaccinated citizens, who were essentially subject to ongoing “social exclusion” for six months (4.11.2021–2.5.2022), prohibited from remaining indoors in restaurants or bars, participating in-person at scientific conferences, attending cinemas, entering stadiums, or visiting museums, even with a negative PCR or rapid test, despite the relaxation of preventive measures in many European countries, including the United Kingdom and those of Scandinavia, which had started much earlier than February 2022 (Gijs & Duxbury, 2022; Schengenvisa.info, 2022; Stokel-Walker, 2022; Thelocal.no, 2022). In addition, the duration of the temporary “Green Pass” (i.e., the immunity certificate), issued to recently convalescent individuals, was reduced to three months only, though it was recently re-instated to six months (4.4.2022). Lastly, unvaccinated citizens over 60 years old had to pay a fine of EUR 100 every month, starting on 15.1.2022, a measure that seems to have been temporarily paused since April 2022. According to the World Health Organization (WHO), considerations regarding necessity and proportionality; sufficient evidence of vaccine safety, efficacy, and effectiveness; public trust; and ethical frameworks should be explicitly assessed by authorities before imposing mandatory vaccination either on the general population or on certain groups, such as HCWs (O’Sullivan, 2022).

Our purpose was to analyze whether the imposing of vaccine mandates on Greek HCWs can be justified according to the WHO considerations as well as under the context of the specific conditions present in Greece. We also aim to raise concerns about the current COVID-19 vaccinations as well as the social repercussions of the medico-political decisions, providing an open invitation to a critical debate within the scientific community.

2 Discussion

The proportionality of the measures taken against the pandemic, which can include the use of masks, COVID passes, lockdowns, fines, and mandatory vaccination, varies considerably from country to country. However, global trends tend to merge in the fact that transparency in the conveying of information and the promotion of educated self-choice are linked with more rational, humane, and effective management of the pandemic (Kerr et al., 2021). In their attempt to manage the pandemic, the Greek government recruited several doctors and scientists who urged people, through persistent television broadcasts, to get vaccinated, while the media highlighted dramatic medical cases and deaths of young patients and parents from COVID-19 in order to promote vaccination (Protothema.gr, 2022; Skai.gr, 2021a, 2021b). For example, the Deputy Minister of Health (who is a pulmonologist), after the death of a 20-year-old, highlighted that “COVID-19 disease is severe, resulting in death so often” (Skai.gr, 2021b). Another example is an ICU director who emphatically declared on TV that “I was faced with a tragic dilemma,

a living nightmare, where I had a 22-year-old young patient with leukemia who needed admission in the ICU, but I had no available beds, and at the same time, an unvaccinated 62-year-old COVID-19 patient, who also needed admission in the ICU" (Ethnos.gr, 2021a). These claims were, however, later refuted by the Ministry of Health (Protothema.gr, 2021). The opinion of experts, as displayed on television and the media, carries the lowest degree of scientific credibility and recommendation according to the definition of evidence-based medicine. In science, "severe" and "often" imply numbers and data, so such phrases may create public confusion and unbalanced fear. For example, as shown in a systematic review and meta-analysis, the infection fatality rate for COVID-19 in the age group of 0–34 years old is 0.004 (0.003–0.005) (Levin et al., 2020). Confusion, fear, and distrust can also result from the inconsistencies in the claims between politicians and doctors, especially when the latter are ICU directors. Although fear of COVID-19 infection seems to be negatively correlated with vaccine hesitancy (Willis et al., 2021), the implementation of fear as a means of coercing should not be accepted from an ethical point of view, as it creates distress and anxiety (Hastings et al., 2004). On the other hand, several studies on social marketing show that the implementation of fear and guilt should be substituted with more educative/informative approaches, as the former is more likely to result in inaction rather than voluntary compliance (Brennan & Binney, 2010; Szmigin et al., 2011). Consistent with its generally strict policies, the Greek government also decided to place unvaccinated HCWs on unpaid suspension, supposedly to protect public health, and may have unwittingly created the false impression that the patients' health is primarily endangered by these HCWs, as the Prime Minister asserted that "it is unacceptable for HCWs, who are supposed to protect the most vulnerable patients from COVID-19, to be potential carriers and transmitters of the virus themselves" and "it is inconceivable for an unvaccinated nurse to provide care to an immunocompromised cancer patient" (Ethnos.gr, 2021b). In the first year of the pandemic, when there were no vaccinations, and until 31.8.2021, the same HCWs responsibly protected vulnerable patients by carrying out frequent testing and taking all preventive measures. After the advent of vaccines, the stigmatization and ostracism of the unvaccinated HCWs might have had some basis if being vaccinated against COVID-19 meant being "sterile" and being unvaccinated meant being infectious, i.e., if the vaccines provided almost 100% protection against transmission. In the following sections, we analyze our concerns about the mechanics of COVID-19 transmission and contraction, toxicity of COVID-19 vaccines, and suspension of HCWs and its impact on employees, hospitals, and society.

2.1 Considerations regarding the mechanics of COVID-19 transmission and contraction

The facts concerning the ability of vaccines to prevent the contraction and transmission of the disease should certainly have been taken into consideration when issuing vaccine mandates for HCWs or citizens. The initial data from phase III clinical trials showed that the number needed to vaccinate (NNTV) to prevent one case of COVID-19 was about 119, and to prevent severe disease, about 2,380 (Fig. 2)

	Placebo group (number of cases / number of participants)	BNT162b2 group (number of cases / number of participants)
Symptomatic COVID-19	162 / 18,325	8 / 18,198
Severe COVID-19	9 / 21,686	1 / 21,669

As presented in Table 2 of the study by Polack et al. in the placebo group, 162 out of 18,325 participants had symptomatic COVID-19. In the BNT162b2 group, 8 out of 18,198 participants had symptomatic COVID-19 at least seven days after the second dose. To estimate the number needed to vaccinate (NNTV) to prevent one case of symptomatic COVID-19, we first divide the occurrence of each group by the total participants. Hence the occurrence was for the placebo group $162/18,325 \approx 0.0088$, and for the treatment group (BNT162b2 vaccination), $8/18,198 \approx 0.0004$. The difference between groups is approximately $0.0088 - 0.0004 = 0.0084$. Then in order to calculate the NNTV for symptomatic disease occurrence, we have to divide 1 by the difference, as we are looking at how many people need to be vaccinated to prevent one case of COVID-19, or $1/0.0084 \approx 119$.

Following the same method, we used the data from Table S5 (Supplementary Materials), which showed that 1 participant out of 21,669 had severe COVID-19 (at least seven days after dose 2) in the vaccinated group and 9 in total out of 21,686 in the placebo group. Hence with the same calculations:

A) $9/21,686 \approx 0.00046$, B) $1/21,669 \approx 0.00004$, C) $0.00046 - 0.00004 = 0.00042$ and D) $1/0.00042 \approx 2,380$.

Fig. 2 Calculation of the number needed to vaccinate (NNTV) for symptomatic and severe COVID-19 occurrence. Data used were from the phase III clinical trial of BNT16b2 (Polack et al., 2020)

(Polack et al., 2020). It is well known that SARS-CoV-2 can be transmitted from vaccinated HCWs (Hetemäki et al., 2021; Ioannou et al., 2021; Keehner et al., 2021; Pollett et al., 2022; Shitrit et al., 2021). After the fourth dose, although there is still a high efficacy of the vaccine against symptomatic COVID-19 disease, there is, unfortunately, a significantly reduced efficacy against preventing infection with SARS-CoV-2, with the virus still being well transmitted to and from vaccinated HCWs (Regev-Yochay et al., 2022).

A careful review of the weekly and very thorough COVID-19 Vaccine Surveillance Reports of the UK Health Security Agency (UKHSA), beginning from Week 37 of 2021 (UKHSA, 2021a), which is based on data from 18.8.2021 to 3.9.2021 and onwards, displays a constant and repeating pattern, which is that in the age groups from 30 to 80 years old, after the prevalence of the Delta strain, the number

of new COVID-19 cases per 100,000 of the respective population (unadjusted case rate) is invariably higher in the fully vaccinated individuals compared with the unvaccinated. The unadjusted case rate among vaccinated individuals also increased in the remaining age groups, with the exception of the <30 and >80 years old. One can verify this pattern by running through the following weekly reports: Week 37 (p.13), Week 38 (p.13), Week 39 (p.14), Week 40 (p.13), Week 41 (p.13), Week 42 (p.13), Week 43 (p.19), Week 44 (p.20), Week 45 (p.22), Week 46 (p.23), Week 47 (p.33), Week 48 (p.44), Week 49 (p.35), Week 50 (p.39), and Week 51 (p.40) (UKHSA, 2021a, 2021b, 2022). Starting in Week three of 2022 (p.38), the UKHSA started to produce these tables by counting only the people who had undergone a booster vaccination, i.e., at least three doses in total, in the vaccinated group, and the same pattern can still be observed. Unfortunately, moving forward to the most recent reports in 2022, in Week nine (p.45), Week 10 (p.45), Week 11 (p.45), and so on, the pattern seems to become worse, with the unadjusted case rate among the booster-vaccinated individuals in the aforementioned age groups climbing to three or even four times higher than among the unvaccinated (UKHSA, 2021b, 2022). The aforementioned tables correctly point out that the proportionate unadjusted rates of ER admissions and deaths are definitely lower in the vaccinated group compared to the unvaccinated, progressively increasing in proportion with age. However, this difference has been narrowed considerably and has become almost even in terms of younger age groups with the prevalence of the Omicron strain.

In accordance with this, reports from the Robert Koch Institute (RKI) in Germany demonstrated that breakthrough infections are possible also among vaccinated staff at a similar viral load (Koch-Institut, 2021). Data from previous months from RKI underline that the vaccinated constituted 66% of new cases (Koch-Institut, 2022), although vaccine effectiveness against hospitalization and ICU-treatment was preserved. In Israel, a new in-hospital outbreak recently occurred, where the source was a fully vaccinated patient with COVID-19 (Kampf, 2021a, 2021b). The US Center for Disease Control and Prevention (CDC) announced four of the top five counties with the highest percentages of fully vaccinated populations (84.3–99.9%) as "high" transmission counties (Kampf, 2021a, 2021b). Moreover, a large study by Subramanian and Kumar showed that vaccination for COVID-19 cannot control its spread regardless of the level of vaccination coverage, with data from 68 countries and 2,947 counties in the United States (Subramanian & Kumar, 2021). Consequently, by taking all these facts into consideration, vaccination against COVID-19 seems to be an individual rather than a collective one protective measure. In addition, relying solely on mass vaccination without controlling the horizontal and vertical transmission of the infectious disease potentially carries significant public health issues, negating any expected benefits (Gandon et al., 2001; Read et al., 2015).

The validity of the "Green Pass" of convalescent individuals in Greece was reduced to only three months, and only recently (April 2022) re-instated to six months, although the duration of naturally acquired immunity, especially that acquired after infections from pre-Omicron strains, has been demonstrated to last much longer than six months. An additional unequal measure was put into effect after 7.2.2022, allowing vaccinated HCWs to continue working provided they underwent regular rapid testing, with negative results, after the expiry of their

vaccination certificate, which was arbitrarily set at seven months post-vaccination. On the other hand, the convalescent unvaccinated HCWs could work only at three months post-infection.

The potency and duration of naturally acquired immunity have been demonstrated by many studies. Firstly, we will refer to a recent report from the CDC (León et al., 2022), which studied 18% of the population of the United States and showed that naturally acquired immunity was more potent by up to five times and longer-lasting compared with vaccine-acquired immunity against the Delta variant. In addition, the systematic review and meta-analysis by Chivese et al. covering a total of 18 countries and 12,011,447 patients demonstrated the strong immune memory of COVID-19 patients, lasting for at least eight months with a 0.2% probability of reinfection (Chivese et al., 2022), and there are studies showing protection against reinfection for two years as well as protection against severe infection for several years, even after asymptomatic COVID-19 infections (Le Bert et al., 2021; Wei et al., 2021). This hesitancy to acknowledge the duration and quality of naturally acquired immunity seems to be out of alignment with evidence-based studies (Kojima & Klausner, 2022). Against the Omicron variant, which probably has an increased breakthrough infection rate among the vaccinated, as mentioned, as well as a generally more benign epidemiological course (Lewnard et al., 2022), naturally acquired immunity still provides excellent protection against reinfection and serious disease (Altarawneh et al., 2022; León et al., 2022). By taking all of the above into consideration, “forcing” individuals with naturally acquired immunity to vaccinate may not be justified.

2.2 Considerations regarding the toxicity of COVID-19 vaccines

An important factor when considering mass vaccination of the population, and particularly the mandatory vaccination of a specific social or professional group, such as HCWs, without any individualization, e.g., in regard to age, comorbidities, etc., is the fact that the molecular and physiological mechanisms of action of the currently available vaccines are still under continuous investigation. Along with this, the deadlines for the completion of studies by pharmaceutical companies are 2023 and 2024 (ClinicalTrials.gov, 2022). Most vaccines are designed to target the surface spike (S) protein of SARS-CoV-2 because it binds strongly to ACE2 receptors and mediates entry into host cells (Salvatori et al., 2020). We also know that the S protein of SARS-CoV significantly induces the production of neutralizing antibodies, showing high immunogenicity (Salvatori et al., 2020). For these reasons, the S protein appears an optimal target (Salvatori et al., 2020). The translation product of the new vaccine technologies, namely the isolated S protein, appears to modify the normal function of ACE2 receptors and trigger several molecular mechanisms via signal transduction pathways. It can be briefly summarized that the S protein alone could cause either impairment of the DNA repair mechanism, inducing dysfunction of the tumor suppressor proteins p53 and BRCA1, or downregulate the ACE2 receptors and inhibit mitochondrial function, resulting in serious damage to vascular endothelial cells (Jiang & Mei, 2021; Lei et al., 2021; Singh & Bharara Singh,

2020). In addition, it appears that other pathways of cellular signaling are activated, such as MEK and ERK, which are known for their involvement in key molecular mechanisms of cell growth (Suzuki & Gychka, 2021; Zhang & Liu, 2002). The improper activation of such pathways, combined with the possible presence of established mutations or polymorphisms and/or the possible inhibition of the DNA reparative mechanisms, increases the chances of tumorigenesis given the diversity of the genetic profile in the general population. Correspondingly, mRNA vaccines could trigger a pathophysiological mechanism, resulting in the suppression of innate immunity (Seneff et al., 2022). This dysregulation is related to the interferon type I (IFN-1) pathway and could potentially lead to an increased risk of carcinogenesis (Seneff et al., 2022). The suppression of IFN-1 could also increase vulnerability to future infectious diseases (Seneff et al., 2022). We should also take into consideration some reports that have shown that the S protein could migrate and circulate via exosomes for at least four months after vaccination (Bansal et al., 2021), possibly at higher levels than in severely ill COVID-19 patients (Röltgen et al., 2022). High levels of S protein-carrying exosomes could lead to serious inflammation and the development of neurodegenerative diseases (Seneff et al., 2022). This probably explains, to a degree, the findings of a study, demonstrating that the immunological functions of vaccinated individuals eight months after the administration of two vaccine doses were lower than those of the unvaccinated (Yamamoto, 2022). The European Medical Agency proposed that the frequent booster doses for COVID-19 could negatively impact the immunological response (Yamamoto, 2022). Thus, as a security measure, it is advised that further vaccinations be abandoned, since they also seem to be an important risk factor for infection, especially in seriously ill patients (Yamamoto, 2022).

Regarding the mRNA technology itself, a recent study (Aldén et al., 2022) showed the presence of DNA sequence unique to BNT162b2 as a product of reverse transcription as well as upregulation of the endogenous reverse transcriptase long interspersed nuclear element-1 (LINE-1) protein expression, in a human hepatic cellular line as early as six hours after BNT162b2 exposure. Although the probability of this phenomenon is extremely low, it is generally known that molecules are transported to and from the nucleus via nuclear pore complexes. In particular, the transport of various proteins and RNAs can take place by binding with importin- β (Oka & Yoneda, 2018). Furthermore, since vaccine mRNA could be detected up to 60 days post-vaccination in lymph nodes (Röltgen et al., 2022), there are multiple questions that arise with regard to the accuracy, quantity, and quality of the ongoing mRNA translation. During the pandemic, the antibody-dependent enhancement (ADE) of infection is a possible critical factor, since the present strains are different from the original, with potentially unfavorable consequences (Yahi et al., 2021). Although ADE and antibody-enhanced disease (AED) are theoretically rare phenomena for genetic vaccines, they should be studied more extensively (Gartlan et al., 2022). Since vaccine-associated enhanced disease (VAED) was observed in the SARS-CoV-1 pandemic, the same trials to investigate VAED should be repeated for the current SARS-CoV-2 pandemic (Gartlan et al., 2022). Additionally, the increased hospital and ICU admission rates in fully vaccinated patients are a cause for concern, as according to Munoz F.M. et al., the criteria with a possible

diagnostic certainty for VAED are met (Munoz et al., 2021). In particular, the recent large-scale study of Lewnard J.A. et al. showed that for the Omicron variant, the risk of an unvaccinated person being put on mechanical ventilation is 76% reduced compared with the Delta variant (statistically significant), while for a vaccinated person, the risk is 50% increased (not statistically significant) (Lewnard et al., 2022).

Concomitantly, reports of myocarditis due to direct toxic effects predominantly in young males (Diaz et al., 2021), along with the detection of unusual thrombotic events such as cerebral sinus thrombosis (implicating blood–brain barrier penetration) (Wittstock et al., 2022), cardiovascular deaths, including sudden cardiac deaths attributed to the particular pathophysiology of the well-described Kounis syndrome (Kounis et al., 2021), as well as other miscellaneous adverse events with the common underlying pathophysiology of an activated inflammatory and thrombogenic process (Guardiola et al., 2022), compose a dynamic profile of a vaccine that constitutes a continuous safety alert (Edler et al., 2021). At the same time, a very recent Israeli study showed that acute cardiovascular events, including sudden cardiac deaths, among vaccinated individuals under 40 years old are significantly associated with the rates of first and second vaccine doses but not with COVID-19 infection rates. Furthermore, it mentions that “while not establishing causal relationships, the findings raise concerns regarding vaccine-induced undetected severe cardiovascular side effects and underscore the already established causal relationship between vaccines and myocarditis, a frequent cause of unexpected cardiac arrest in young individuals” (Sun et al., 2022). As for cardiovascular events, endothelial dysfunction is a possible side effect of vaccination (Lei et al., 2021) that is not benign, since it is linked with the development of atheromatosis and coronary disease (Berenji Ardestani et al., 2020; Landmesser et al., 2004). This possible pathogenetic mechanism is demonstrated in a published abstract, where the five-year predicted risk of developing an acute coronary event in a group of patients was increased from 11 to 25%, on average, for those who received two doses of an mRNA vaccine, with the changes persisting for at least 2.5 months after the second dose (Gundry, 2021). We summarize the key points of possible mid- and long-term side effects of vaccines in Table 1. The questions that arise need to be transparently clarified through properly structured randomized clinical trials and meta-analyses investigating the molecular pathways and clinical events in more samples. Moreover, knowledge about the vaccines’ mechanisms of action and their possible side effects seems to increase the intention to vaccinate (Andrade et al., 2022). We must also consider that we may need to research additional pharmacological and non-pharmacological preventive alternatives to establish health and social equilibrium in order to avoid the “nightmare” in which the public’s confidence in medicine declines (Hellerstein, 2020).

2.3 Considerations regarding the suspension of HCWs due to vaccine mandates

The vaccination of HCWs theoretically provides multiple benefits, as it safeguards their health, protects the health of vulnerable patients, and may stand as an “advertising campaign” to encourage the vaccination of citizens, creating a climate of trust.

Table 1 Synopsis of publications related to possible mid- and long-term vaccine side effects included in the present study

Reference(s)	Possible mechanism—causes	Side effect	Term of effect
Gundry (2021)	Endothelial inflammation—Dysfunction	CVD	Mid/Long
Lei et al. (2021)			
Seneff et al. (2022)	Reduced INF-1 response	Tumorigenesis	Long
Singh and Bharara Singh (2020)	Dysfunction of p53 and BRCA1		
Jiang and Mei (2021)	Impairment of DNA repair		
Suzuki and Gychka (2021)	Improper activation of MEK and ERK pathways		
Yamamoto (2022)	ADE, OAS, SP, LNPs	Decrease in immunity	Mid
Seneff et al. (2022)	Reduced INF-1 response, SP		
Seneff et al. (2022)	Exosomes with SP	Demyelinating injury (e.g., Guillain-Barre)	Mid
Bansal et al. (2021)	Reduced BRCA1 expression	Neurodegenerative disease (e.g., Alzheimer's)	Mid/Long
Seneff et al. (2022)			

ADE antibody-dependent enhancement, BRCA1 breast cancer gene 1, CVD cardiovascular disease, DNA deoxyribonucleic acid, ERK extracellular signal-regulated kinase, INF-1 interferon type 1, LNPs lipid nanoparticles, MEK mitogen-activated protein kinase, OAS original antigenic stimulant, SP spike protein

However, as previously stated, the intention to impose mandatory vaccination on a specific population group must be thoroughly weighed against necessity, proportionality, evidence of vaccine safety/efficacy, and ethics (O'Sullivan, 2022). Out of the 27 countries of the European Union, only six (Greece, Germany, France, Italy, Latvia, and Hungary) have decided on a strict framework of compulsory vaccination for HCWs (Diaz Crego et al., 2022). In Estonia and, until 6.3.2022, also in Hungary, employers were authorized to impose such requirements on their employees (Diaz Crego et al., 2022). Austria initially voted for compulsory vaccination of all adults under the threat of very severe penalties, which was never implemented, formally declaring that it was “no longer needed” (Reuters, 2022). Germany, although having recently (15.3.2022) voted for vaccine mandates, does not seem to have implemented corresponding laws, since out of approximately 190,000 unvaccinated HCWs, only 70 entry bans have been recorded up to July 2022 (Welt, 2022). Italy seems to have allowed unvaccinated HCWs to be transferred to other duties (Paterlini, 2021). In the remaining countries, HCWs are allowed to continue working on the provision of carrying out timely diagnostic tests with appropriate results (Table 2) (Diaz Crego et al., 2022). The United Kingdom considered vaccine mandates for HCWs but postponed the measure until 1.4.2022, when the hard winter would be over, in order to not lose a single HCW. Later, a House of Lords committee refused to acknowledge the need for a mandate, declaring it not economically, scientifically, nor morally supported (Kmietowicz, 2021). This has led to a total revoke of the measures for mandatory HCW vaccination and the vaccination-as-condition-of-deployment (VCOD) in the United Kingdom, as officially stated in the Government resolution of 1.3.2022 (DHSC, 2022).

Theoretically, one reason for introducing compulsory vaccination in Greece would be a low vaccination coverage among HCWs. Another reason would be to coerce citizens to get vaccinated through the indirect threat of future fines or other restrictions in cases of non-compliance, especially in a period of high number of cases. In addition, citizens' confidence in COVID-19 vaccines could theoretically increase if their family doctors were 100% vaccinated. However, in reality, according to the POEDIN (ΠΟΕΔΗΝ, the official national association of hospital healthcare workers) data, 94.7% of doctors and more than 80% of nurses were already vaccinated before the mandatory vaccinations were imposed (Naftemporiki.gr, 2021). In the United Kingdom, for example, and specifically in London, only 79% of HCWs were vaccinated before the introduction of compulsory vaccination in Greece (BBC, 2021), and even in January 2022, 5.4% of all NHS HCWs remained unvaccinated (Iacobucci, 2022). In Sweden, the percentage of vaccinated doctors was reported as 96% (Ljung et al., 2022), and in the Czech Republic, and 69.8% overall vaccination coverage of HCWs was reported in some tertiary hospitals (Štěpánek et al., 2021). Regarding the overall vaccination coverage of citizens, by 12.7.2021 (when the impending law about mandatory vaccinations was announced), Greece ranked 11th among 28 countries in the European Union and including the United Kingdom (Fig. 3) (Hannah Ritchie et al., 2020). Moreover, Greece and Finland had the fewest confirmed COVID-19 cases relative to their population compared with the other countries (Fig. 4) (Hannah Ritchie et al., 2020). Consequently, there seems to be no

Table 2 Mandatory vaccinations for healthcare workers (HCWs) in EU countries and the United Kingdom (DHSC, 2022; Diaz Crego et al., 2022; Paterlini, 2021)

Country	Mandatory Vaccination to HCWs
Austria	No
Belgium	No
Bulgaria	No
Croatia	No
Cyprus	No
Czechia	No
Denmark	No
Estonia	No (decided by employers)
Finland	No (contact with at-risk patients—tested on site)
France	Yes (from 5.8.2021)
Germany	Yes (from 15.3.2022, no known suspensions to date)
Greece	Yes (from 1.9.2021)
Hungary	Yes (from 15.9.2021)
Ireland	No
Italy	Yes (from 1.5.2021, optionally transferring to other duties)
Latvia	Yes (from 1.11.2021)
Lithuania	No
Luxembourg	No
Malta	No
Netherlands	No
Poland	No
Portugal	No
Romania	No
Slovakia	No
Slovenia	No
Spain	No
Sweden	No
United Kingdom	No (from 1.4.2022, rolled back)

significant evidence for the Greek government to decide to issue vaccine mandates at that point.

The vaccine mandate for HCWs, as an ultimate and extreme measure in a panicked attempt to manage the pandemic, and with the resulting suspension of unvaccinated HCWs, could not be implemented without serious complications. It has had an impact on the HCWs themselves, hospitals and medical departments (e.g., ICUs), public health, and society. For more than 11 months, unvaccinated HCWs have been confined to unpaid suspension and, moreover, are prohibited from seeking employment anywhere, not only in the healthcare sector but in any other job, as they are bound by the legal terms that govern their status as public servants. The potential harm caused to unvaccinated HCWs is multifactorial. The most likely damage they

Share of people who completed the initial COVID-19 vaccination protocol, Jul 12, 2021



Total number of people who received all doses prescribed by the initial vaccination protocol, divided by the total population of the country.

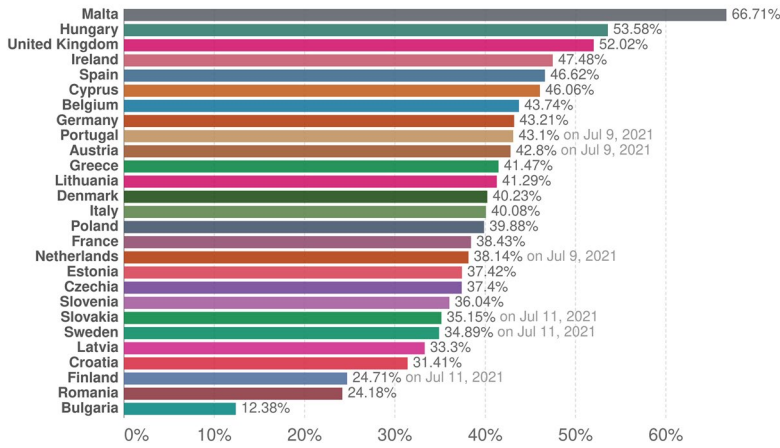


Fig. 3 Vaccination coverage among 27 EU countries and the United Kingdom (12.7.2021) (Hannah Ritchie et al., 2020)

Cumulative confirmed COVID-19 cases per million people, Jul 12, 2021



Due to limited testing, the number of confirmed cases is lower than the true number of infections.

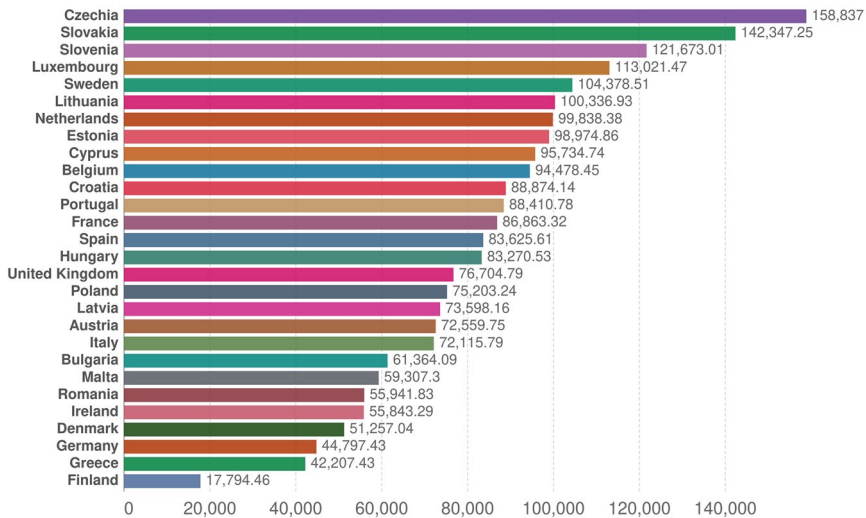


Fig. 4 Confirmed cumulative cases per million people among 27 EU countries and the United Kingdom (12.7.2021) (Hannah Ritchie et al., 2020)

are subject to is financial. An unpaid, suspended HCW will enter into an impoverished state, which will affect the members of their household (children, spouse, and dependent members). Unfortunately, some HCWs have faced serious issues with

survival, resorting to fundraisers, selling lottery tickets, or borrowing money, and some HCWs have also been on a hunger strike. Another possible harm concerns their scientific development and education since, for the previous 11 months, they have not had the right to attend various scientific conferences, meetings, or seminars in person, even with a negative PCR test. They could also be harmed by their long-term absence from the scientific community. In some cases, the harm may involve their professional expertise, since, for example, a surgeon needs to perform a minimum number of annual procedures to maintain their learning curve (depending on the procedure). There are also concerns about stigmatization. The prestige of an unvaccinated HCW may be harmed in their workplace due to the stigmatization of a long absence as well as the negative propaganda against them and their peers. Moreover, the long absence could create false impressions for a physician's patients, whose confidence in the physician may be shaken. The physician could be falsely stigmatized as "inefficient", "antisocial", and "non-scientific", facts that may cause irreparable damage to their scientific entity and represent the most dramatic volte face to the admiration they received during the previous 18 months of the pandemic for their valiant and self-sacrificial efforts. In addition, the medical confidentiality regarding the person has been violated (Law 3418/2005), as everyone knows their vaccination status through the imposed penalty of suspension. The "side effects" of compulsory vaccinations do not only affect the unvaccinated HCWs; the remaining HCWs are being led to physical and emotional exhaustion in compensating for their absence. There were mass resignations of doctors due in part to the suspensions of HCWs since September 2021 (Efsyn.gr, 2021). They were forced to do 20 resident on-calls in a month. The same situation exists today, where waves of resignations are occasionally observed (Efsyn.gr, 2022).

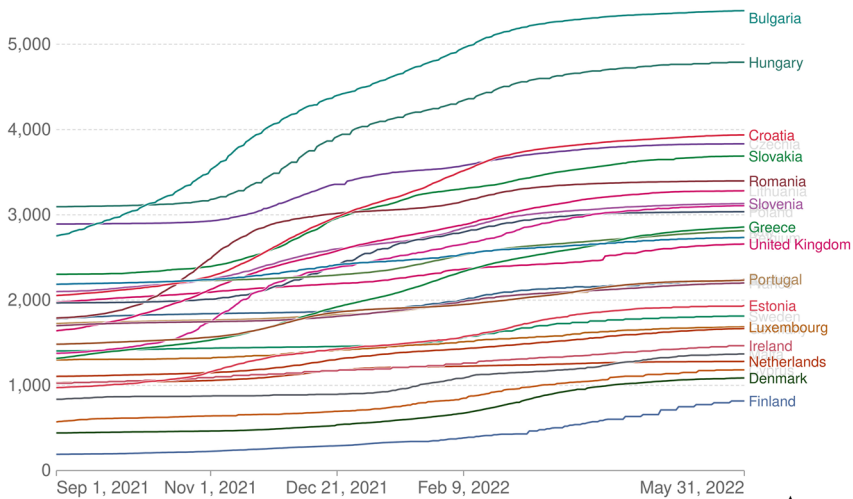
A major issue arising from the reduction in the available number of HCWs in countries where mandatory vaccinations are implemented is the quantitative and qualitative understaffing of health-care units. The availability, level of training, and specialization of health personnel are definitive factors in increasing mortality (Aiken et al., 2002; Tourangeau et al., 2006). Department understaffing could result in an increase in the mortality of each inpatient by 3% daily (Griffiths et al., 2019). On the contrary, countries that have invested in the steady improvement of medical services have achieved a reduction in ICU mortality over time (Karagiannidis et al., 2021). The number of substantive medical staff shortages in Greek hospitals was estimated to be 5,000 doctors, without including the suspended staff, but the actual urgent demands are quantified as being higher (Panagiota Karlaira, 2022). The respective shortages in other healthcare professions (nursing, etc.) are estimated to be even worse, reaching about 30,000 (In.gr, 2020). In addition, as departmental understaffing worsens, with hundreds of quarantined HCWs due to breakthrough COVID-19 infections (Iatronet.gr, 2022), we have unfortunately seen some ICUs or whole departments temporarily closed (In.gr, 2021). Recently, on 30.6.2022, a young patient lost a liver transplant due to a shortage of anesthesiologists (News4health.gr, 2022).

Regarding in public health, the general picture that Greece has presented since the introduction of compulsory vaccinations is, unfortunately, not the most promising, especially in comparison to other EU countries and the United Kingdom. Out of

Cumulative confirmed COVID-19 deaths per million people

Due to varying protocols and challenges in the attribution of the cause of death, the number of confirmed deaths may not accurately represent the true number of deaths caused by COVID-19.

Our World
in Data

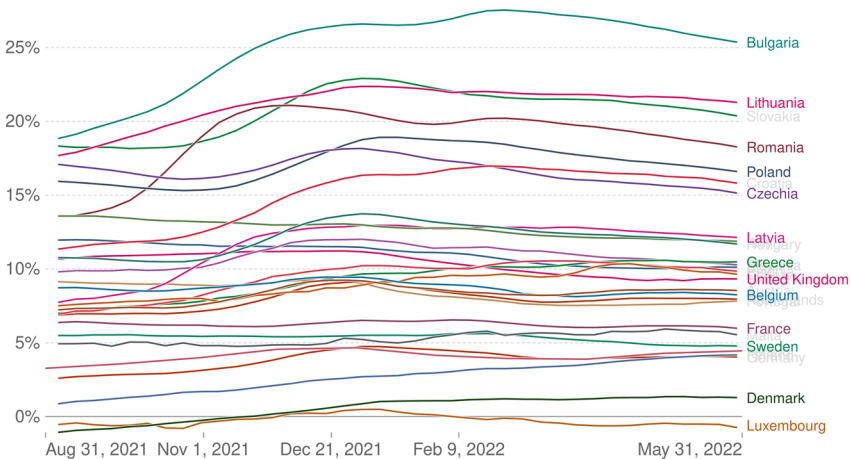


A

Excess mortality: Cumulative deaths from all causes compared to projection based on previous years

The percentage difference between the cumulative number of deaths since 1 January 2020 and the cumulative projected deaths for the same period based on previous years. The reported number might not count all deaths that occurred due to incomplete coverage and delays in reporting.

Our World
in Data



B

Fig. 5 Comparative charts of 27 EU countries and the United Kingdom (1.9.2021 to 31.5.2022) showing **A** cumulative COVID-19 deaths per million people; **B** percent excess mortality (Hannah Ritchie et al., 2020)

28 countries, it ranks as low as 17th in confirmed deaths from COVID-19 per million people as well as in excess mortality in general (Fig. 5) (Hannah Ritchie et al.,

2020). These facts do not necessarily mean that the suspensions of HCWs are solely responsible for the overall crisis in Greece, but they probably played a detrimental rather than a beneficial role, as we explained in the previous sections.

2.4 Other considerations regarding politics and policies

During the pandemic, the government discussed decisions with a multidisciplinary committee of experts, who have developed the guidelines. By definition, medical guidelines apply recommendations regardless of the level of evidence. Two major limitations in the development of guidelines are the consideration of patient co-morbidities and potential conflicts of interest for the members of the panel of experts. The inability to provide individualized guidance is probably associated with serious drug-related adversity in a patient with multiple co-morbidities (Franco et al., 2020). In addition, it has been estimated that in the panel of experts, approximately half of the members may have had conflicts of interest (Franco et al., 2020). The expert committee's role should be to express recommendations, and to provide a background of concepts that constitute the framework under which specific policy decisions will be discussed and implemented (Barros, 2017). Ideally, misguided political decisions could be avoided through properly structured and continuous discussions with the expert group (Barros, 2017). The experts should always be on alert to adapt their guidance in accordance with fluctuations in the pandemic's course as well as the consequences of imposed measures. Authorities should be flexible in renewing guidelines and adapting to new concepts regarding COVID-19 (Ioannidis, 2021). Moreover, they should be open to complementary advice or criticism from external experts, even from the international community. In this way, proper political choices could be adopted to improve citizens' lives (Barros, 2017). Politics, as a science, carries the role of society's doctor (Lepawsky, 1967). As the doctor investigates the symptoms and the ailment of a patient, searching for the proper cure, politics should also investigate and formulate treatments for the ailments of society. These two different sciences can be distinguished, though with difficulty, in modern societies (Krakauer, 1992). Although their effective cooperation can be socially beneficial, it is crucial that there exists a clear distinction between them in order for medicine to function independently, without being politically manipulated (Krakauer, 1992; Merskey, 1978). The doctor probably needs to maintain a degree of distance from politics, always following the Hippocratic principles of "First, do no harm" ("primum non nocere"), or more correctly "Help, or do not harm" (ὤφελειν, ἢ μὴ βλάπτειν), as was originally stated (Krakauer, 1992).

In regard to the legal status of applying compulsory vaccinations to HCWs, in addition to statements by the House of Lords committees, we will mention the decisions of the courts in the United States and India. Foremost amongst them is the decision of the US District Courts for the Western District of Louisiana and the Eastern District of Missouri, both of which found the mandatory vaccination of HCWs in the United States to be defective and entered preliminary injunctions against its enforcement (Louisiana v. Becerra, 2021 WL 5,609,846 (30.11.2021); Missouri v. Biden, 2021 WL 5,564,501 (29.11.2021)). In each case, the Government moved for

a stay of the injunction from the relevant Court of Appeals, which was dismissed by the Supreme Court of the United States on 13.1.2022 (Nos. 21A240 and 21A241, cited as 595 US (2022)). Similarly, the Supreme Court of India recently underlined that bodily autonomy and integrity are protected under Article 21 of the Constitution, issued such that no person can be forced to get vaccinated against COVID-19, and directed the central government to make the adverse effects of vaccination public (Vani Mehrotra, 2022). On the contrary, Germany's top court approved the vaccine mandates for HCWs (Euronews, 2022), but as we reported, the measure has not been implemented in practice.

Therefore, it can be deduced that the imposition of draconian measures, cultivation of an irrational fear of an infectious agent, and segregation of citizens carry the risk of stigmatizing persons or groups. Stigmatization and segregation are unacceptable in civilized societies, as they can lead to further major public health and social issues (Yuan et al., 2021). An increase in domestic violence and suicide attempts among young people has already been demonstrated (Kourti et al., 2021; Yard et al., 2021). There have also been reports of appalling events worldwide, including a student's suicide due to bullying about his vaccination status in the United States (Joshua Rhett Miller, 2022). Consequently, a published correspondence noted that "stigmatizing unvaccinated people is unjustified" according to the cumulative data of the pandemic (Günter Kampf, 2021a, 2021b), and from an ethical point of view, the justification and imposition of mandatory vaccinations requires robust scientific evidence that the policy will achieve the intended goal in addressing a health emergency of dramatic proportions (e.g., extreme death rate) (An Roinn Sláinte Department of Health, 2021). By definition, a government should be intolerant to situations that involve the creation of excluded, marginalized, or segregated citizens and constantly strive to address concomitant social inequalities and the related issues that arise (O'Donnell et al., 2021). According to the World Health Organization (WHO) Director for Europe, Dr. Harry Klug, vaccine mandates could be a risky approach, increasing social inequalities (Ashleigh Furlong, 2021). In addition, according to WHO, even in hypothetical situations where they can be justified, the re-deployment of HCWs who refuse to vaccinate is definitely a better, more humane, and, colloquially, a "win-win" situation compared to the profoundly harsh punishment of unpaid suspension (O'Sullivan, 2022). Thus, it is utterly dismaying when the political authorities could promote inequalities and social exclusion. As clearly pointed out by Viladrich A, "Without drastically enforcing antidiscrimination laws for all federal employees—including top-ranked politicians—inclusive language and educational booklets against stigmatization will merely remain 'lip service'". This essentially means that if the political authority is not somehow subjected to control, the democratic principles that form the basis of Western civilization are placed at risk (Viladrich, 2021). Segregation and inequality create a strong oxymoron in Greece, the country that gave birth to democracy 2,500 years ago.

3 Conclusions

In summary, mandatory vaccinations for COVID-19 can raise medical, social, and ethical concerns. Politics and medicine are completely disparate, but through their transparent cooperation, they can be life-saving in times of a health crisis, contributing to multidimensional healthcare. Mandatory vaccination of HCWs in Greece does not seem to have improved the pandemic's outcomes and, in addition, has produced a quantitative and qualitative shortage of staff that may have contributed to increased inpatient mortality. In addition, vaccinated individuals can contract and transmit SARS-CoV-2, so the mandatory requirement does not seem to be in a potent factor in pandemic management. Furthermore, it is necessary to design and complete randomized controlled trials to address the critical issues discussed in this paper, especially regarding the mid- and long-term adverse events of current vaccines. We sincerely hope that the scientific community will re-evaluate bioethics principles and the medical data toward maintaining the fundamental Hippocratic principles. Our duties as scientists are to ensure that our actions promote well-being and avoid harm to the public and individuals, and this includes avoiding silently backing a potentially flawed political model of pandemic management in such a complicated and unclear medical and scientific challenge.

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Declarations

Competing interest The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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