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CORONAVIRUS (COVID-19) VACCINATION: SCIENTIFIC FACTS. THE GREEK REPORT

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Abstract:
Since its emergence in Wuhan, China, in late 2019, COVID-19 has rapidly become a pandemic spreading to all countries worldwide and demanding urgent healthcare response. The social and economic impact of the COVID-19 pandemic has taken variable shapes and forms regarding its effect on communities and decision-making, while the major risks probably arise not from the virus itself but from the indirect effects of the control measures and the societal activities. Owing to experiences from previous pandemics generating global health crises such as the HIV5 pandemic (1980), the Spanish flu (1918) and the 2009 flu the healthcare community had now more scientific facts to handle the COVID-19 pandemic as shown by the faster time it took for the development and licensing of the vaccines from the time the first case was identified. Although the control and vaccination strategies against the COVID-19 virus are still controversial issues as they have the potential to multiply the impact of the pandemic, this report aims to provide a timely review on the facts regarding the measures and the policy-making in Greece and how they affected the citizens in a socioeconomic and psychological context.

Keywords: Coronavirus (COVID-19), vaccination, Greek, scientific facts

1. Introduction

The global outbreak of the coronavirus infectious disease constitutes the latest pandemic severely threatening the world health. The word pandemic derives from the words pan (whole) and demos (population) and is defined as an epidemic of infectious diseases that spreads rapidly in a large area, i.e. continent, or on a global scale and threatens almost

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the entire population. On the contrary, an epidemic disease whose number of new cases remains constant over time (constant incidence) is not considered a pandemic, while influenza pandemics should not be confused with re-emerging seasonal influenza (Alcoforado, 2020). In early 2020, the novel coronavirus emerged and spread rapidly around the world, dramatically challenging healthcare resources, public health policies, and ultimately the resilience of humanity from a physical, economic, cultural, and psychological perspective. Millions of people died from the infection of COVID-19 and most countries implemented strict restrictions to prevent the spread of the virus and protect public health (Karaivazoglou *et al*., 2021).

From time to time, various new strains of influenza have appeared causing pandemics, diseases, death, and general disruption to humanity. During the last century, globalization processes and advances in medicine and epidemiology have changed the way people experience each of these epidemics (Allen, 2021). While advances in the prevention, control and treatment of infectious diseases have improved our ability to respond to such outbreaks, globalization processes related to human behavior, demographics and population movements have increased the threat of pandemic outbreaks which contribute to the spread of disease (Bowen, 2020). Throughout history, several pandemics have been observed, such as smallpox (1896), tuberculosis (1850) and plague (1817), while in the last century, humans have experienced four flu pandemics. Relatively recent pandemics are the HIV5 pandemic (1980), the Spanish flu (1918), the 2009 flu and the coronavirus (COVID-19) pandemic (Alcoforado, 2020).

2. The HIV pandemic 5

The HIV (Human Immunodeficiency Virus) virus is the virus that causes the Acquired Immune Deficiency Syndrome (AIDS). It destroys the cells of the immune system, the CD4+ T lymphocytes, which play an important role in protecting the body from infections and other diseases. It can be transmitted through unprotected sexual intercourse (anal, vaginal, oral) or through sharing of sharp objects (razors, needles, syringes) with an HIV-positive person. It can also be transmitted from an HIV-positive mother to her newborn during pregnancy, childbirth, and breastfeeding. The virus is not spread through everyday social contact (handshake, hug, kiss on the cheek), mosquitoes or other insects, saliva, tears, sweat, air, water or through sharing household utensils. The term AIDS refers to the last stage of HIV infection, in which the immune system has weakened to such an extent that the HIV-positive person is susceptible to various diseases and certain types of cancer (Waymack, *et al*., 2023).

The time between getting infected with the virus and the manifestation of AIDS varies from person to person, while the timely administration of a combination of highly active antiretroviral drugs (Highly Active Antiretroviral Therapy – HAART), significantly slows down the progression of the disease and greatly reduces mortality. Today, HIV infection is considered a chronic disease, provided that the patients receive their treatment regularly. So far, no effective prophylactic vaccine against HIV has been found. However, because HAART reduces the concentration of the virus in infectious

body fluids, thus reducing the possibility of its transmission, the role of antiretroviral therapy in prevention is now given great importance (Kaplan *et al*., 2009).

In 2010 approximately 34 million people suffered from HIV infection worldwide. Of these approximately 16.8 million were women, while 3.4 million were under 15 years of age. In 2010 about 1.8 million people died of AIDS, which shows a reduction compared to the 3.1 million recorded deaths in 2001. Overall, from 1981, when AIDS was first identified, to 2009, nearly 30 million deaths were caused by AIDS (UNAIDS, 2011). The total number of AIDS cases diagnosed in Greece until December 31, 2020, amounts to 4,418, of which 3,688 (83.5%) were men and 730 (16.5%) were women. The large reduction in the incidence of AIDS observed from 1997 to 2001 is attributed to the introduction and widespread administration of highly active antiretroviral therapy (HAART). The number of new AIDS cases remains low, but after 2006 there appears to be a small increase, especially among men. It is worth noting that after 1997, the longitudinal course of AIDS cases does not reflect the incidence of HIV infection (Kaplan *et al*., 2009).

3. The Spanish flu

The Spanish flu was an influenza pandemic that occurred in 1918, killing 17 to 50 million people. The virus first spread from birds to humans and later spread among humans. As a result of the First World War, most European countries implemented censorship, thus covering up the outbreak of the pandemic. However, as Spain remained neutral, the media portrayed the pandemic more truthfully giving the impression internationally that the country was hit the hardest. For this reason, the disease is called the Spanish flu (Bootsma *et al*., 2007).

Researchers who studied virus samples, which were preserved in the lab or found in corpses buried in the frozen ground of Alaska, found that a small mutation in the virus allows its surface protein (used by the virus to attach to cells) to recognize its counterpart human receptor. The cause of death was acute inflammatory pulmonary edema, hemorrhagic pneumonia, or pneumonia with acute hemorrhagic edema. Skin cyanosis was observed especially around the face, mouth, neck, and fingers. In the autopsy, the lung bases were more affected, and the chest cavities contained light brown or yellow to dark red fluid. The first cases of the flu occurred in France, in April 1918 among the British regiments stationed at Rouen and Vimeret. As the troops moved so did the disease. Hence, in May the flu spread throughout France, Italy, Great Britain, and the United States and it then entered Germany through the captured prisoners. In June the pandemic reached India, in July New Zealand and in August South Africa. Until January 1919 Australia managed to remain unaffected due to a strict quarantine (Bootsma et.al., 2007). On July 10, 1918, 160,000 cases were reported in Berlin. In Great Britain the flu caused the death of 220,000 people, in the United States there were more than 550,000 deaths, while in Japan and India, there were about 250,000 and five million victims respectively (Chaussois, 1969).

In Greece, the first case was detected in Patras. Among the Greek regions most affected was Skyros, where over 1000 inhabitants, one third of the population, died. In

Athens, the flu caused the death of 1,668 people, in Thessaloniki of 5,284 people, while in Patras the deaths exceeded 800. Western Macedonia recorded 4,336 deaths (Chaussois, 1969).

4. The Swine flu

The 2009 influenza pandemic was an H1N1 influenza pandemic (in its early stages it was called an epidemic), i.e., it was caused by the H1N1 virus, and it spread from person to person. The flu was a mutation with genetic material from four pre-existing forms of the virus: two from swine flu (one from North America and one from Eurasia), one from bird flu, and one from human common flu. It is a virus for which, unfortunately, there is no immunity in most of the population in the reproductive age, and for this reason, it also caused a flu pandemic. Some older people who were exposed to type A (H1N1) viruses circulating before 1957 may be immune. The symptoms of H1N1 flu include sudden onset of high fever, cough, muscle and joint pain. A runny nose, sore throat, headache, chills, feeling tired, diarrhea and vomiting may also occur. The H1N1 influenza virus is transmitted in the same way all viruses are transmitted, from person to person, through droplets emitted into the environment by the patient who coughs or sneezes (Butler, 2009). The virus can also be transmitted indirectly through the contact of the hands with the inanimate environment, i.e., surfaces, knobs, computer keyboards, telephones, switches, etc., where droplets with the flu virus have been deposited. The virus can survive on surfaces for 2-8 hours. It can also be transmitted through the contact of our hands with the nose, mouth, or eyes. The Influenza virus is detected directly and reliably by rapid tests and molecular biology methods (real-time PCR) in nasal or pharyngeal swabs. On a negative rapid test with, however, a strong clinical suspicion, a nasal or pharyngeal swab should be sent to be tested by PCR. The smear is collected with a special tube and the results come out in one day. There are certain categories of people called "high-risk groups", who are more likely to suffer from serious problems and complications, such as pneumonia, even by a common flu. These categories include children under the age of 2 and people over the age of 65, pregnant women, people with cardiovascular diseases, chronic respiratory diseases, asthma, chronic metabolic diseases such as diabetes mellitus, chronic diseases of the liver and kidneys, with diseases affecting the immune function (chronic use of cortisone and neoplasms), neurological and neuromuscular diseases, morbid obesity, sickle cell and microsickle cell anemia and children who take chronic aspirin. The basic prevention measures against the influenza virus, especially for high-risk groups and workers in Healthcare Services, are four:

- Compliance with the rules of Hand Hygiene, i.e. frequent hand washing with soap and water and rubbing with alcohol antiseptics;
- Following the basic hygiene principles, coughing and sneezing into our sleeve or handkerchief;
- Vaccination against seasonal flu;
- Timely reception of appropriate prophylactic treatment with Oseltamivir (Tamiflu).

It mainly concerns people who belong to high-risk groups, who have not been vaccinated and have been in contact with people who are sick with influenza. [Infectious Diseases Committee Health]

5. The COVID-19 pandemic

In December 2019, the first cases of a new threatening disease were detected in the Chinese city of Wuhan, which is the capital of Hubei province and the most populous city in Central China. This disease was the coronavirus COVID-19 disease which is caused by the SARS-CoV-2 coronavirus (Severe Acute Respiratory Syndrome Coronavirus-2). After recording 7,834 confirmed cases and 170 deaths due to the virus worldwide, the World Health Organization (WHO) declared the outbreak of COVID-19 a public health emergency of international concern on January 30, 2020. With clinical features similar to SARS (Severe Acute Respiratory Syndrome) and MERS (Middle East Syndrome) which broke out in 2003 and 2012 respectively, symptoms of COVID-19 include cough, fever, shortness of breath and difficulty in breathing. In more severe cases symptoms include pneumonia, acute respiratory infection and death. The high transmissibility of the virus, the large mortality rates in subgroups of the population, and the lack of any countermeasure led to the adoption of social distancing measures and isolation practices to reduce the possibility of transmission of the disease from symptomatic or asymptomatic individuals to the healthy population. Research shows that the probability of survival after SARS CoV-2 infection is high in people younger than 60 years, whereas it is observed that 81% of deaths from the virus concerned people aged >60 years. This is because at these ages people are more likely to suffer from an underlying disease. Therefore, patients with cardiovascular co-morbidity, as well as with respiratory system problems, diabetes and lymphocytopenia have a slower recovery and/or a worse prognosis. It is, however, important to understand that the Case Fatality Rate (CFR) is an indicator that by nature fails to estimate the true risk of mortality: confirmation of total cases is not possible either because there are asymptomatic patients or because not all of the symptomatic patients perform the diagnostic tests and also because the total deaths do not include the patients who have fallen ill, are in critical condition and will die. Besides, during epidemics a delay between the actual time of death and its registration has also been observed in the past, hence there are still cases of patients who will inevitably die or have already died without being declared as victims of the coronavirus (Butler, 2009).

6. Symptoms of COVID-19

The clinical consequences of the new virus SARS-CoV-2 (COVID-19) range from asymptomatic phenotypes to acute respiratory distress syndrome, metabolic acidosis, liver, kidney and heart failure, while the virus also has implications on the mental health of the patients (Alexopoulos *et al*., 2022). COVID-19 affects different people in different ways. Most people who are positive for the virus have mild to moderate symptoms and

recover without needing to be hospitalized. Most common symptoms: fever, cough, fatigue, loss of taste or smell. Rarer symptoms: sore throat, headache, aches, diarrhoea, skin rash or discoloration on fingers or toes, red or irritated eyes, Severe symptoms: difficulty breathing or shortness of breath, loss of speech or movement, confusion, chest pain. On average, it takes 5-6 days from the time someone is infected with the virus to develop symptoms, but it may take up to 14 days. The implemented measures of social distancing, school closure and general lockdown have caused a great strain on the financial and social life, and individuals' psychological well-being worldwide (Karaivazoglou *et al*., 2021).

7. The Coronavirus (COVID-19) in Greece

In Greece, the first case of SARS-CoV-2 occurred on February 26, 2020, and subsequent confirmed cases reached 89 by March 10. The first death was recorded on March 12 and was of a 66-year-old man. From March 10 to May 4, a series of measures to prevent and limit the spread of the virus were put into effect by the state resulting to Greece having the lowest death rates among the European countries. Initially, the Official Gazette defined as mandatory the clinical and laboratory assessment of people who showed symptoms and their restriction in case of clinical verification of an infection. Thereafter, in order to protect citizens from the SARS-CoV-2 virus, avoid and prevent the spread of the COVID-19 disease, the Greek government decided to suspend the operation of educational institutions, art and culture venues, sports venues and shopping centers throughout the country, while businesses providing food and beverages could only operate with takeout orders (Bowen, 2020). This was followed by the ministerial decision to ban the performance of religious services and pilgrimage in places of worship. Subsequently, in the Official Gazette 986/B/22-3-2020, a joint ministerial decision was published declaring the restriction of movement for all citizens, with specific exceptions related to vital, personal, and professional needs which could not be satisfied in any other way.

The abovementioned measures were reinforced by revoking all leave permits of the staff in all health organizations in Greece and their strengthening with auxiliary staff, restricting vehicle traffic in the center of Athens and the routes of public transport during the day and prohibiting public gatherings and rallies in the country. Also, there was a mandatory use of protective masks in all public closed spaces, while there was a maximum number of customers inside the supermarkets, i.e. one customer per 10 sq.m., entry cards to avoid overcrowding and recommendations to follow the hygiene rules.

Other measures were the operation of an emergency communications service, government forms for the commuting of citizens, the banning of entry into Greek territory for citizens from countries outside the European Union and the suspension of flights to and from specific European countries (Triantafyllidou, 2020). Moreover, people entering Greek territory were obligated to be tested for COVID-19 infection and be quarantined for 14 days, areas with a high epidemiological indication were off limits to the citizens, recreational areas and marinas were closed and fines were given to those

who violated the measures. As a result, the measures managed to limit the losses in morbidity and mortality. As of May 5 2020, the Greek government decided to gradually lift the measures restricting the movement of citizens in order for life to return to social and economic normality.

Specifically, from May 11, the operation of several commercial stores was restarted, and their re-opening was accompanied by the obligation of employees and customers to follow personal protection measures, restrictions regarding the maximum number of customers inside the stores and mandatory use of masks and gloves. On the same day, all Lyceums and tutoring schools in the country reopened, only for the students of the final year of Lyceum with the obligations to follow the hygiene and distance rules, prevent gatherings and congregating. On May 18, all classes in secondary education resumed, Technological Education Schools (IEK) and all secondary education and foreign language tutoring schools reopened. Primary schools and kindergartens also reopened on June 1. As of May 18, all traffic restrictions were lifted and citizens were able to travel outside their Prefecture. Businesses providing food and beverages opened to the public on May 25 with table seating only in outdoor areas and a specified distance between them. In June leisure parks, theme parks and outdoor playgrounds reopened, as well as indoor catering businesses, holiday lodgings and sports facilities. (IMF, 2022) On July 1, the tourist period resumed with specific control procedures and instructions.

The increase in cases in various regions of the country led the prime minister to announce new measures on November 7, 2020, namely a new general restriction of movement for citizens throughout the country. Schools were closed again until January 11, 2021, when Elementary and Kindergarten classes restarted. Gymnasiums opened on Monday, February 1, 2021, while high schools in the areas with increased cases continued remote education. Somewhere between the end of the second wave of the pandemic and the beginning of the third, the citizens were informed about the first vaccines against the pandemic through a rapid announcement. The function of the new vaccines was based on the proper preparation of the individual's immune system (the body's natural defenses) to recognize a specific disease and protect against it. At the end of December 2020, the European Medicines Agency (EMA) recommended that the European Commission grant the conditional marketing authorization of the vaccine, followed by its emergency approval by the EU. Thus began the process of vaccinating the citizens of the European Union. In June 2021, Greece was officially in the third wave of the pandemic, with the Delta mutation causing particular concern, as it was considered the most aggressive. It was first identified in India in late 2020 and carried mutations in the gene encoding the SARS-CoV-2 spike protein thus making it more contagious. As of July 20, 2021, the mutation had spread in 124 countries. The World Health Organization named the new strain B.1.1.529 "Omicron" and labeled it a "strain of concern". This mutation was characterized as highly contagious but milder than Delta. For this reason, in Greece in mid-February there was an 8% decrease in diagnoses and a 5% decrease in intubated patients. However, from Monday, November 22, 2021, until Monday, December 6, 2021, measures were put into effect, which limited the mobility of citizens in order to protect the public from the Omicron mutation.

8. The three stages of the new measures

The first stage concerns the essential establishments such as pharmacies, food supply areas, supermarkets, butchers, fish markets, bakeries, patisseries, petrol stations, etc. which are accessible to all - unvaccinated and vaccinated - with no further measures other than the use of a mask. The second stage concerns the access to establishments for those who have been vaccinated, those who have been ill in the last 6 months and those who have not been vaccinated and can use the establishments with presenting a diagnostic test. It applies to retail businesses, open dining areas, hair salons, private and public workplaces, education, beauty services and places of worship. Citizens enter by showing a vaccination certificate, or a disease certificate, or a negative diagnostic test for the COVID-19 coronavirus (PCR or rapid test, 72 or 48 hours before their presence in the store respectively). The third stage concerns access only for those who have been vaccinated or sick with coronavirus in the last six months. It applies to entertainment centers including closed reception areas, music stages, boutiques, catering, (restaurants, cafes, internet cafes), museums, venues for artistic exhibitions, film screenings, theaters, conferences, gyms, stadiums, indoor playgrounds. The use of a high protection (FFP2/KN95) or double mask is obligatory in supermarkets, public transport and overcrowded areas, as well as by catering workers. Visiting in elderly care units and hospitals can only take place with a 48-hour PCR test, while medical visitors were prohibited from entering nursing institutions. On Saturday, February 19, 2022 the measures recommended by the committee of experts slowly began to be lifted again. More specifically, school trips were resumed, the occupancy of stadiums was increased to 50% and teleworking in the private and public sectors was reduced to 20%. On May 1, 2022, as announced by the Minister of Health, citizens would not have to present the vaccination and disease certificate for access to all closed and open spaces as of August 31, 2022. In addition, the regular self-tests in schools were abolished after the return from the Easter holidays. Furthermore, from May 1st, 2022 the vaccinated population would only be required to take one rapid test per week in order to access their workplaces, while from May 1st to August 31st, the operation of all establishments was restored to 100% and all restrictions were lifted. Finally, on June 1, 2022, the obligation to use a mask indoors was lifted but with some exceptions.

9. Scientific facts about vaccination

The term vaccination refers to the introduction of a vaccine into an organism with the aim of immunizing it against a certain disease or improving the power of its immune system. The vaccine, depending on the biotechnology with which it was developed, contains microorganisms or viruses in a weakened, live, or dead state, proteins or toxins or other substances from the microorganism that causes the disease. The purpose of vaccines is to induce a strong and long-lasting response in the immune system, which mimics the body's response to a natural infection. The mechanism by which vaccines activate immunity is divided into four basic categories, depending on the type of antigen

used by each company. These mechanisms are (European Immunization Information Portal, 2021b):

The 1st category includes vaccines that contain live but weakened strains of the virus, i.e., microorganisms that are pathogenic and cause the corresponding disease for which the induction of immunity is desired but have lost their potency.

The 2nd category includes vaccines that contain dead (or otherwise, inactivated) pathogenic microorganisms. Their role of is to activate mechanisms that lead to the creation of antibodies by the body.

The 3rd category includes vaccines that contain non-toxic products of the pathogenic microorganism. In this way, immunity is achieved, which, however, to remain in the body for a long period of time, requires the so-called "booster doses", at regular intervals.

Finally, the 4th category includes the vaccines which contain either some part of the pathogenic agent or some "synthetic polysaccharide-polypeptide", which also leads to immunity. The European Commission has granted - under conditions - 4 marketing authorizations, for the vaccines developed by the companies BioNTech/Pfizer (collaboration), Moderna, AstraZeneca and Janssen Pharmaceutical NV, following the positive evaluations of the European Medicines Agency (European Medical Agency) regarding the safety and effectiveness of these formulations. (European Commission, 2021a).

9.1 BioNTech/Pfizer

This is the vaccine with the code name “BNT162b2” and it belongs to the category of mRNA vaccines. It is the result of the collaboration between the German company BioNTech (design) and the American pharmaceutical group Pfizer (development). It is distributed worldwide, except China. The vaccine is administered intramuscularly, by injection, and contains a modified nucleoside mRNA (modified RNA) that encodes the protein spike of the SARS-CoV2 virus, making the person's immune system able to recognize the virus and fight it (Polack *et al*., 2020).

9.2 Moderna (Spikevax1)

This vaccine contains a molecule called "messenger RNA" (another name for modified mRNA nucleoside), with the help of which instructions are transferred to the human body so that it can produce protein from the SARS-CoV2 virus and effectively fight the COVID-19 disease. The vaccine does not contain the virus itself, so it is unable to cause the disease. It is administered intramuscularly, in 2 doses, with a time difference of 28 days from one to the other. For people with a severely weakened immune system, an additional dose may be given, at least 28 days after the second (European Medical Agency, 2021a).

9.3 AstraZeneca

The AstraZeneca vaccine against COVID-19 does not contain live SARS-CoV2 and is also unable to cause COVID-19 in humans. In fact, it contains the genetic code of an important

part of the SARS-CoV2 virus, which is called the "protein spike". The spike protein has been inserted into a harmless virus, the carrier of the common cold (adenovirus), which transfers the spike protein to human cells so they can "read" it and make copies of it. The immune system of people vaccinated with the formulation will thus learn to recognize and deal with the virus. The adenovirus itself has been modified so that it is unable to reproduce when inside cells. This means that it is not able to spread to other cells and thereby cause infection (Australian Government, 2021).

9.4 Janssen Pharmaceutica NV

This is a vaccine that was originally administered in a single dose, intramuscularly. However, a booster dose (2nd) is now recommended, while for the abovementioned vaccines, the booster dose is the 3rd (between December 2021-January 2022). It also contains an adenovirus (type 26) which has the potential to encode the spike protein of SARS-CoV2. It uses the technology of recombinant DNA (recombinant DNA, rDNA), i.e., DNA molecules that contain a starting point of replication, and they can duplicate in the host cell (European Medical Agency, 2021b).

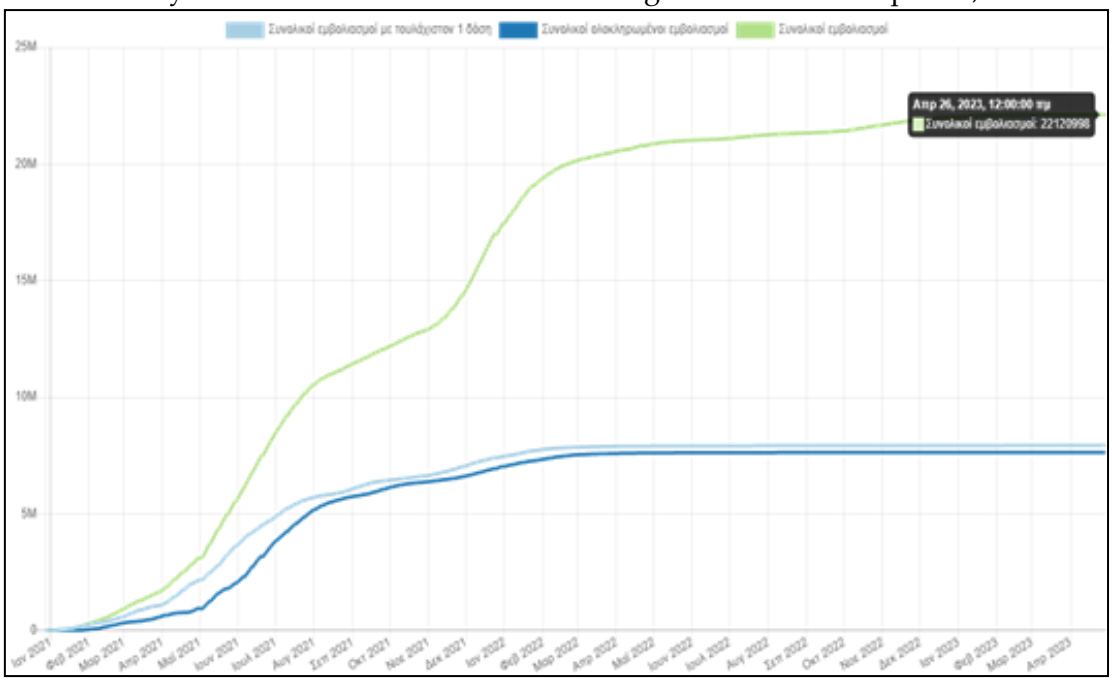
10. Vaccination in Europe

In Greece today, 22.1 million of the general population have been vaccinated (Figure 1), while in January 2023 Portugal had the highest vaccination rate in Europe with 272.78 doses per 100 people followed by Malta and Belgium with 258.49 and 253.89 doses by 100 people respectively. Italy, Sweden, Finland, Germany and France followed in the vaccination rates positions occupying the fourth to eighth place respectively. The difference in vaccination rates in Germany and France was small with the numbers being 228.68 and 226.95 doses per 100 people respectively. At the same time the UK, which was first to approve the Pfizer/BionNTech vaccine, was in tenth place with a vaccination rate of 224.04 doses per 100 people, followed by Denmark, Norway Ireland and Spain with 223.76, 223.5, 220.99 and 219.87 doses per 100 people respectively (Number of COVID-19 vaccine doses administered in Europe as of January 18, 2023, by country (per 100 population), 2023).

Russia, which was the first country in the world to authorize a vaccine (Sputnik V) against COVID-19 (August, 2020) is found among the lowest places (29th) with 127.3 doses per 100 people, while Bulgaria comes in last with 67.91 doses per 100 people. Just before Bulgaria, Romania has administered 85.60 doses per 100 people, whereas Slovakia right above Romania in the thirty-first place has 101.96 doses per 100 people showing a considerable difference. Greece is in sixteenth place with 212.54 doses per 100 people and Cyprus is in the nineteenth place with 200.62 doses per 100 people followed by Switzerland with 193.34 doses. Czechia in the twenty-first place right after Switzerland, has 177.31 doses per 100 people while the next country is Hungary with 167.56 doses. There is a small difference in the number of doses per 100 people between Estonia and Latvia which are in the twenty-fourth and twenty-fifth place respectively, while the difference between Estonia and Lithuania which is one place above is bigger with 158.74

and 165.16 doses per 100 people respectively (Number of COVID-19 vaccine doses administered in Europe as of January 18, 2023, by country (per 100 population), 2023).

Figure 1: The course of vaccinations against the COVID-19 pandemic in Greece, with fully vaccinated Greek citizens exceeding 22.1 million on April 29, 2023.



Source: https://www.data.gov.gr/datasets/mdg_emvolio/

11. Conclusion

This report constitutes a timely review on the facts and the course of the measures taken to minimize the impact of the pandemic in Greece. It is indicated by the present report that the mortality rates in Greece show that the control strategies followed by the Greek government managed to limit the losses in morbidity and mortality. At the same time, the rates demonstrate the adherence of the Greek citizens to the measures and the general societal response and behavior of the Greeks in a joint effort to control the damage from the COVID-19 pandemic. The previous pandemics of HIV5 (1980), the Spanish flu (1918) and the 2009 flu better equipped the healthcare community to handle the COVID-19 pandemic and they improved the understanding of the epidemiology and effective treatment of the coronavirus. This is evident from the fact that the time it took from the identification of the first case in Wuhan, China, in late 2019, to the identification of its genome sequencing, the clinical trials for the vaccine and other therapeutic interventions were initiated within a month followed by the development and licensing of vaccines in a much faster time compared to other previous pandemics. As a result, the attention shifted towards the identification of the long-term effects of the control measures and their impact on their high-risk populations, societal behavior and economic consequences.

Prevention and control strategies by the policymakers in each country varied according to the different socioeconomic, cultural status, government and public health

resources, while the control plans and decision-making also depended on the effective leadership and risk assessments of policymakers. In the case of Greece during the first pandemic wave (March-June 2020) the country had a population of 11,184,000 with an average life expectancy of 79 years for males and 84 years females and a median age of 44.9 years. At the time, 21.3% of Greeks were over the age of 65 years making Greece the second country after Italy (22%) with the oldest population among European Union countries. (WHO, 2023). This fact adding to the weak financial capacity and readiness of the healthcare system in Greece made the country more susceptible to high morbidity and mortality rates and also shaped the Greek approach and control strategies. To that end, containment measures were implemented in Greece as soon as the first case was confirmed, since according to the leadership and the decision-makers in Greece the results of the pandemic could potentially be devastating if effective physical, public health and social distancing measures were not implemented early enough. A national lockdown was declared in Greece with a number of 695 patients in the country, while among the early control measures were the cancelation of public festivities, closure of schools and universities (March 10th, 2020), two days later the closing malls, cafeterias and restaurants and finally, on March 23rd a nationwide travelling restriction. This containment strategy of acting rapidly and taking measures before the death rates rise was a great success for Greece, compared to other EU countries, with Greece having the third lowest case fatality rate (5%) among similar population European countries and the lowest number of deaths during the first wave (Delinasios *et al*., 2021).

Conflict of interest statement.
The authors declare no conflicts of interest.

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