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Vaccination Management in the Republic of Poland and in Selected Countries

Abstract

Objectives: The aim is to look at the vaccination management process, which may lead to its improvement. The article focuses on the analysis of management activities in healthcare, the vaccination process, and its impact on the development of the pandemic. It will show not only information about the pandemic, but, most of all, the impact of actions on the spread of the disease compared to other countries at different times.

Research Design & Methods: The main research method includes a critical analysis of secondary data. The study covers the period from January to April, 2021.

Findings: Operating in a situation where raw materials (vaccines) are of a limited availability and the social and economic situation is difficult (pandemic) poses challenges. This situation is completely new to the whole world and as such requires a new perspective on the problem. The thesis that good management contributes to the improvement of a given process is confirmed.

Implications/Recommendations: Secondary research, illustrating the course of the vaccination process in various countries, has shown that it is possible to create an optimal vaccine management method only by taking into account the elements that make up the socio-cultural and political factors.

Contribution/Value Added: The hypothesis in this article was based on the statement that there is an optimal crisis management based on the experiences of different countries and the meeting of their different methods of organising vaccination against SARS-CoV-2. From the point of view of economic sciences, it is a novel topic, because, for the first time. it is possible to examine the relationship between health policy and the state of a global epidemic in the era of general access to information, fast data transfer, high mobility, and globalisation.

Keywords: pandemic; vaccination process; management; COVID-19

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Introduction

The COVID-19 epidemic began in China, Hubei Province, Wuhan City on November 17, 2019, and spread worldwide (WHO, 2020a). On March 11, 2020, it was declared a pandemic by the World Health Organization (WHO, 2020b). Infections with the SARS-CoV-2 virus were recorded in Poland since March 4, 2020 (Ministry of Health, 2020). On March 13, the WHO announced that Europe was considered the epicentre of the coronavirus pandemic (Puls Medycyny, 2020). Patients were registered on all continents except Antarctica.

In the period from March 14 to 20, 2020, an epidemic threat was in force in Poland, and from March 15, a sanitary cordon was introduced on the Polish borders, significantly limiting border traffic. According to the regulation of the Minister of Health, an epidemic was in force in Poland since March 20. It is connected with a number of restrictions both for citizens and entrepreneurs, cultural institutions, sports, science, and higher education. These restrictions are introduced or repealed depending on the epidemic situation in a country. The pandemic hit all areas of human activity. Countries and the WHO both indicate mass vaccination as the only effective fight against the virus (May 2021). The following SARS-CoV-2 vaccines are currently available worldwide.

In December 2020 and January 2021, BioNTech, Pfizer (December 21), Moderna (January 6), and AstraZeneca (January 29) were granted a conditional marketing authorisation based on a positive safety, quality, and efficacy assessment by the European Medicines Agency (EMA) (European Commission, n.d.).

Vaccines by both Pfizer and Moderna are genetic and based on mRNA material. "In genetic vaccines, one or more genes of the virus are used to trigger an immune response in the body. This means that there is genetic information in the preparation, in this case, in the structure of a protein on the spines of the virus, which causes the cells to start producing this protein. It is recognised by the body as 'foreign', which results in the production of the appropriate antibodies" (Ważna & Mikołajska, 2021).

The Astra-Zeneca (new name: Vaxzevria) and Johnson & Johnson are vector vaccines that rely on the use of fragments of other viruses to elicit an immune response against a specific virus. Like genetic vaccines, vector vaccines are a relatively new technology. They have already been extensively studied in research on HIV and other diseases, such as the Ebola virus (Ważna & Mikołajska, 2021).

On March 11, 2021, the European Medicines Agency (EMA) issued a positive opinion on the vaccine from Janssen Pharmaceutica, which is part of Johnson & Johnson. The preparation has been approved for use in the European Union countries. It is a single-dose vector vaccine and its delivery in Poland was expected in the second half of April, 2021. There are also vaccines not approved for vaccination in Poland and the EU. These are: the Sputnik V vector vaccine; recombinant protein vaccines, which contain the purified SARS-CoV-2 S (spike) protein or a protein fragment (Ministry of Health, 2021). Advanced research is also carried out with regard to: the Novavax recombinant adjuvanted vaccine and the Sanofi-GSK recombinant adjuvanted vaccine.

The European Medicines Agency is conducting a rolling review of three COVID-19 vaccines: the Novavax recombinant protein vaccine (NVX-CoV2373) (staged procedure from February 3, 2021); the CurVac AG (CVnCoV) mRNA vaccine (staged procedure from February 12, 2021); and the Sputnik V vector vaccine (Gam-COVID-Vac) (staged procedure from March 04, 2021) (Ministry of Health, 2021).

Managing decisions related to the SARS-CoV-2 pandemic

The introduction of the vaccination process in the countries of the European Union and globally is subject to a management process. The management principles enable the optimisation of the taken actions and the control over the entire process. Process management is an activity that consists of optimising the structure of organisational elements due to their impact on creating the value of the final effect of the separated processes. It is an attempt to maximise positive value elements in the structure, i.e. process components, and at the same time to minimise ineffective operations (Grajewski, 2007). More broadly, the entire vaccination process can be considered as a management process, of which the state is the lead organisation in this case. According to the definition, management is a set of activities (including planning and making decisions, organising, leading, i.e. managing people, and controlling) directed at the resources of the organisation (human, financial, material, and information) and carried out with the intention of achieving the organisation's goals in an efficient and effective way (Griffin, 2005). In this case, the organisation is the state and the resources to be protected are the citizens who ultimately contribute to the smooth functioning of that state (Regulation of the Prime Minister of April 11, 2011 on the organisation and operation of the Government Center for Security; Journal of Laws of 2015, item 508).

Other definitions of management emphasise the action of disposing resources, because people constitute the most important resource, and money is a resource, and, thus, people are affected. Management is associated with leadership, and the phrases 'organisation and management' as well as 'leadership and management' are very often used together (Pszczołowski, 1978). It is an activity aimed at causing the functioning of entities, organisations, or subordinates, in accordance with the goals of the manager (Gliński, 1974).

Management consists of providing (consciously creating) conditions for the organisation to operate in line with its assumptions, i.e. to carry out its mission, achieve goals consistent with it, and maintain the necessary level of consistency enabling survival (i.e. isolation from the environment) and development (i.e. implementation of the mission and goals in the future) (Koźmiński & Jamielniak, 2011). The basic management functions include: planning; organising; motivating; control (Stoner, 1992; Mintzberg, 1973; Lamond, 2004).

For pandemic vaccine management, we may consider crisis management. Studies on Poland in this regard can be found, among others, in:

- The Act of April 26, 2007 on crisis management (Journal of Laws of 2017, item 209);
- The Act of April 18, 2002 on the state of natural disaster (Journal of Laws of 2017, item 1897);
- Regulation of the Prime Minister of April 11, 2011, on the organisation and operation of the Government Centre for Security (Journal of Laws of 2015, item 508);
- Regulation No. 67 of the Prime Minister of October 15, 2014, on the organisation and operation of the Government Crisis Management Team (MP of 2014, item 926);
- The Act of March 8, 1990, on neighbourhood self-government (Journal of Laws of 2017, item 1875);
- The Act of June 5, 1998, on district self-government (Journal of Laws of 2016, item 814 as amended);
- The Act of June 5, 1998, on provincial self-government (Journal of Laws of 2016, item 814 as amended);

– The Act of September 8, 2006, on the State Medical Rescue (Journal of Laws of 2016, item 1868);
– The Act of January 23, 2009, on the voivode and government administration in the province (Journal of Laws of 2015, item 525);
– The Act of November 22, 2013, on the emergency notification system (Journal of Laws of 2013, item 1635 as amended).

Crisis management concerns both controlling and overcoming a crisis situation, as well as preparing for its possible occurrence. Crisis management is discussed, among others, by K. Holla, J. Ristvej, M. Titko, (2018), S. Kovoor-Misra S. (2019), J. Ziarko (2010). Considering potential emergencies usually prevents them, or at least reduces their adverse effects (Hayes, 2021). The actions to be taken in a crisis situation partly overlap with the actions customarily taken in management. The actions to be taken include:
– the appointment of an anti-crisis team;
– the establishment of communication and information methods;
– range limitation;
– the elimination of the threat;
– the restoration of normal functioning;
– the long-term liquidation of the effects of the crisis;
– lessons for the future.

Materials and methods

This study uses a comparative analysis based on secondary data with the aim of confronting the actions that individual countries are taking to ensure epidemic safety for their citizens by providing them with the possibility of vaccination against SARS-CoV-2.

The hypothesis assumes that the better the rules governing the vaccination process are, the more efficient the process is. Among the studied countries, particular emphasis was placed on anti-crisis measures in Poland against the background of other EU states such as Spain and Germany, and non-EU countries such as the United Kingdom, Israel, and the United States of America. All these of them belong to highly-developed countries that do not have major economic problems with financing the purchase of vaccines. Also, all of them have a well-developed healthcare system. Seven countries were selected for this study, representing different approaches to vaccine management in the pandemic era. These are: Poland, Germany, Spain, the United Kingdom, the USA, Israel, and Brazil. The first three, despite their presence in the structure of the European Union, take various steps to increase security. Poland is a country where crisis and vaccination are managed in an inconsistent and uncoordinated manner. Germany is the opposite, because the vaccination process there is progressing in a coordinated manner despite relatively strong anti-vaccination movements. Spain is the country where resistance to vaccination is the lowest, but human relations are strong. The UK is a liberal country in which it is very difficult to ensure compliance with restrictions. Also, social resistance to vaccination is the strongest there. The same is true in the case of the USA, which only changed its vaccine management policy after Biden had become the president. Israel is the country that quickly lifted the restrictions due to an efficient mass vaccination management system and very small anti-vaccination movements. Brazil, which ends the ranking, is an example of a less-developed country in which the failure of the vaccination process is additionally determined by the country's rulers who are sceptical about richer countries.

This comparison provides a picture of the difficulties involved in managing the vaccination process in a pandemic era. This picture shows different paths and makes it possible not only to compare them, but also choose the optimal way out of the pandemic crisis for different countries.

Results

It must be said that the distribution of vaccines is not proportional and depends on the wealth of the affected country. For this reason, the COVAX programme (COVID-19 Vaccines Global Access) was implemented. However, more affluent nations have entered into national bilateral agreements with vaccine manufacturers. Last year, 56 such contracts were concluded (Puls Medycyny, 2021), which hinders the implementation of the COVAX programme, which aims to ensure fair distribution of the vaccine around the world. This programme was launched in February 2021; 190 countries have joined the WHO's initiative, the GAVI Global Vaccine Alliance, and the Coalition for Epidemic Preparedness Innovation (CEPI), half of which are paying countries. The programme is expected to enable the purchase of 2 billion doses of COVID-19 vaccines by the end of 2021. These vaccines are to be distributed to 92 poorer countries around the world (Polityka Zdrowotna, 2021a). Only the European Union allocated 500 million EUR to COVAX, and some EU countries also paid additional money. The graphs below include data on people who have received at least one dose of the COVID-19 vaccine in a given country, i.e. the adopted vaccination policy in the world (Our World in Data, 2021).

When analysing Figure 1 and 2, the following aspects can be noted. The analysed data shows that the USA was the first to start vaccinating. On 11 December, 2020, the Agency for the Food and Drug Administration (FDA) approved the COVID-19 vaccine developed by Pfizer and BioNTech for emergency use. On December 14, the vaccination process began in the USA (Mikołajska, 2020).

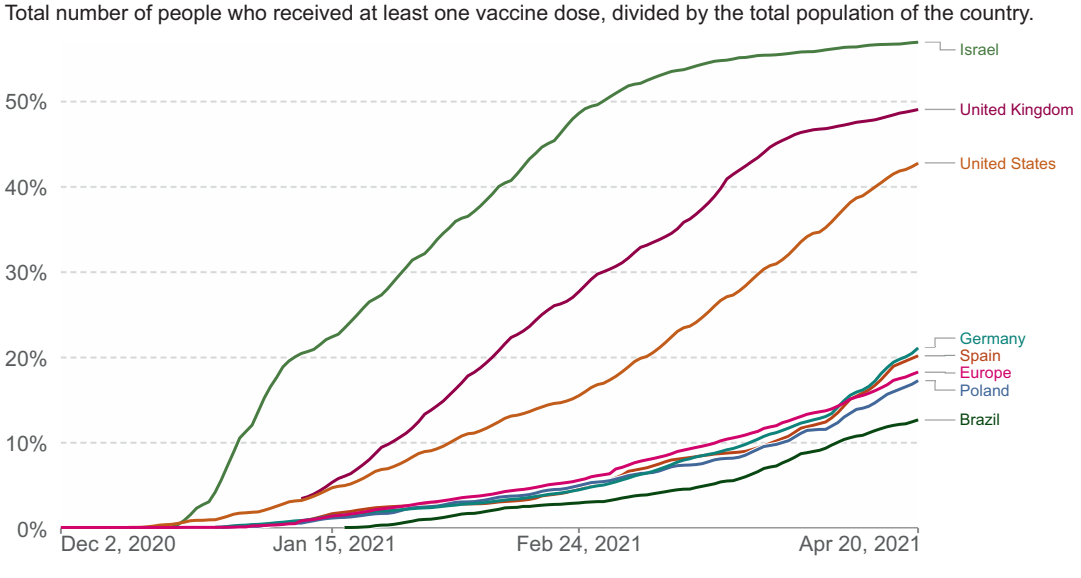

Figure 1. Share of people who received at least one dose of COVID-19 vaccine

Source: Our World in Data (2021).

Policies for vaccine delivery. Vulnerable groups include key workers, the clinically vulnerable, and the elderly. "Others" include select broad groups, such as by age.

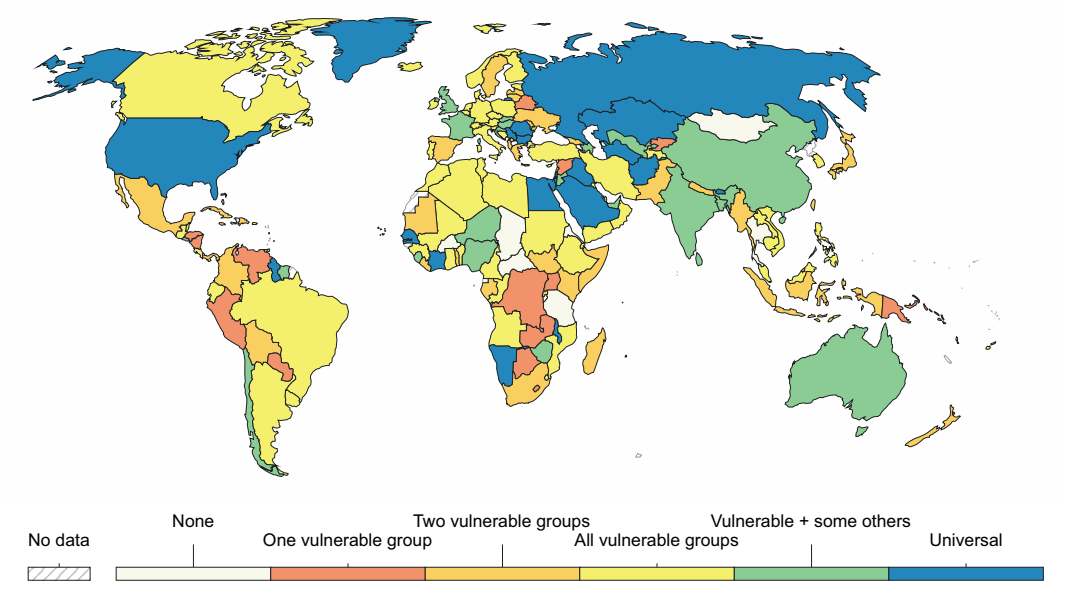

Figure 2. COVID-10 Vaccination Policy

Source: Our World in Data (2021).

Both federal and state governments are responsible for the distribution of vaccines in the USA. The government administration decides how many vaccines each state will get, then ships them to distribution centres. The preparation of vaccination plans and the order of administration of the preparation is the responsibility of state institutions. They are based on guidelines prepared by the Donald Trump administration. These provisions ambiguously define the priority of receiving the vaccine. Health institutions are not able to handle large numbers of patients. The very process of registering for vaccinations is slow due to overloaded websites and constantly busy telephone lines through which appointments are made. Organisational errors, combined with unclear guidelines, are causing too many vaccines to be delivered to some parts of the country, while other states are experiencing shortages of supplies.

This situation gave rise to 'vaccine tourism' in the USA. Visitors to the New York City as well as Florida vacation home owners go to these states not as tourists, but in order to get the vaccine in advance. Another problem is the reluctance to vaccinate. Statistics from New York show that while white residents in the city have taken nearly half of the vaccines available, the numbers among black and Latin Americans are 11% and 15%, respectively. This is due to the lack of Spanish-speaking volunteers who would assist Hispanic seniors with vaccination registration (Naftulin & Attkar, 2021). The situation changed completely after Joe Biden had started the presidency, as he considers vaccination to be a priority action.

The situation is different in Israel, a country that is a leader in terms of the number of vaccinations, which began on December 19, 2020 (Forsal, 2021). Israel has a system to fully monitor the vaccination process through a customised digital citizen vaccination record and one unique identifier used in all healthcare facilities to keep data on doses and the number of vaccinations on

a day-to-day basis. The registry also enables the monitoring and evaluation of post-vaccination side effects and provides real data on vaccine efficacy. Israel has a large body of well-trained nurses who are authorised to administer vaccinations without the presence of doctors. Israel also acted swiftly to change the laws governing paramedics' practice so that they, too, could administer vaccines (MEDEXPRESS, 2021).

In July 2021, a special law came into force, allowing services to track citizens' mobile phones. The act did not came across very well. People were so scared of the virus that they thought it was better for the services to know where they were. A similar attitude concerned the government application, which also tracked the whereabouts and sent notifications in a situation where contact with an infected person could have occurred. The app was not mandatory, but Israelis were eager to install it anyway. Moreover, owing to trust in the State of Israel, the country is the world leader in terms of vaccination rate. More than 55% of the public have already received one dose of the vaccine, and more than 50% have received both doses.

The problem in this country only appeared in the group of ultra-orthodox religious followers, but even here the rabbis allowed them to vaccinate (Krämer, 2021). Health experts cite the relatively small size of the country, with a population of only about 9 million, as the reason for rapid nationwide immunisation in Israel. Every Israeli citizen must be a member of one of the four health insurance companies that run their own clinics. The vaccination campaign is conducted by these units as well as by hospitals and specially-created vaccination centres, seven days a week. Here, too, people over 60, medical staff, and careers, as well as people at risk, were vaccinated first.

The situation is different in the Gaza Strip and the West Bank, which is administered by the Palestinian Authority, and where infection rates have increased. There is no vaccination schedule there. The Palestinian Authority focuses primarily on participation in a special programme of the World Health Organization and the Gavi Vaccine Alliance. Owing to the COVAX programme, vaccines can be delivered there by mid-2021 (Deutsche Welle, 2020). In the countries of the European Union, the vaccination process started officially on December 27, 2020 (Krzysztofek, 2020b).

In Germany, vaccinations started earlier than planned, all owing to the decision of the management of the nursing home in Halberstadt in Saxony-Anhalt, where 101-year-old Edith Kwoizalla and approximately 40 other residents and 10 nurses were vaccinated. In Berlin, the national vaccination programme began on December 28 in one of the nursing homes. However, starting vaccination too early in one of the centres turned out to be a problem in the first days of vaccinations. Due to the breakdown in several Bavarian counties, the initiation of the vaccination had to be postponed, as there were inconsistencies in the cold chain, which are to be cleared with the manufacturer of the preparation. Similar problems arose in Upper Saxony. GPs in Germany have been dealing with coronavirus vaccinations since April 2021. Family doctors' clinics were to be supplied with vaccines through pharmaceutical wholesalers and pharmacies. At the same time, the large vaccination centres that were set up at the end of the year 2020 were still operational. According to the data of the Federal Association of Health Insurance Physicians, vaccination could be carried out in 75,000 medical clinics in Germany. If 50,000 clinics admitted 20 people every day, up to five million people could be vaccinated per week.

The Association's simulation shows that, if there are enough vaccines in Germany, all volunteers will be vaccinated by August 2021 at the latest. The head of the European Commission, Ursula von der Leyen, announced that, from April, European Union countries will receive 100 million doses of vaccines per month (Deutsche Welle, 2021a).

Germany published recommendations on vaccination sequences on December 8, 2020, through the German Standing Committee on Vaccination operating at the Robert Koch Institute. The recommendation concerned the priority of people over the age of 80, carers of the elderly and the sick, as well as employees of hospital emergency departments and COVID-19 departments. As explained by the commission, these people are at the highest risk of severe disease and even death, or, because of their work, they are at the highest risk of infection, or are in constant contact with people at risk. Nursing homes, as well as medical staff in transplantology or oncology departments, are also mentioned. In total, over 8 million people will be vaccinated in the first phase. Vaccines were also first given to people suffering from other diseases and representatives of systemically important professions, such as teachers, policemen, and firefighters (Deutsche Welle, 2021b).

In Spain, vaccinations began on December 28, 2020, in Guadalajara, where the Pfizer's logistics centre is located. On Sunday morning, a 40-year-old female worker and her 96-year-old protégé were vaccinated in a local nursing home. Other residents of the centre and staff also received the vaccine. In Spain, healthcare workers, especially hospital infectious wards, paramedics, and staff in intensive care units, were the first to be vaccinated. The next vaccinated group consisted of nursing home residents and the staff of these institutions. For over 30 years, Spain has had a law that makes it compulsory for citizens to vaccinate against COVID-19 (Mandatory Vaccination Provision). However, Pedro Sánchez's government did not take such radical steps; only a register of people who refused to participate in voluntary vaccination was introduced. The Spanish government had planned to vaccinate about 70% of the population against coronavirus by September 2021. Achieving this goal was probably difficult due to the relatively low interest in vaccination against COVID-19 in the country. According to the results of public opinion polls, about 28% of citizens do not want to be vaccinated.

In such a situation, the condition for enabling compulsory vaccinations must be the existence of a threat to public health, while the decision to introduce compulsory vaccinations is to be confirmed by the court. The Spanish government is trying unconventional methods compared to other countries to encourage citizens to get vaccinated. A special register has been set up for all those refusing to participate in vaccination. The register will include people who have been included in the vaccination programme but have not participated in it. Moreover, the data from the database will be made available to other European countries. Vaccinations in Spain are carried out by 13,000 public health facilities. There is a national immunisation programme there. First of all, it was available to healthcare workers, and then, *inter alia*, to the residents of nursing homes. Approximately 2.5 million people were expected to receive the vaccine during the first phase of vaccinations. People who have recovered from COVID-19 are to be vaccinated last (Krzysztofek, 2020).

Vaccination in Poland began on December 28, 2020. It is up to national governments to develop vaccination plans, but there is a general tendency to vaccinate healthcare professionals and the elderly at the outset, i.e. groups at the highest risk of severe cases of COVID-19. In Poland, as well as in other EU countries, the vaccine is free and voluntary. Vaccinations are first targeted at those most vulnerable to infection. The division took place into groups (I, II), and now there is a tendency to release vaccination dates. Earlier restrictions were due to problems with the availability of vaccines (Krzysztofek, 2020).

The average rate of vaccination per day is at the level of 200,000, but about 1.5% of scheduled patients fail to attend the scheduled date (Ministry of Health, 2021). On April 19, 2021, the first universal vaccination point against COVID-19 was launched in Poland, and with it, 16 similar

points as part of the pilot programme. The government assumed that if mass vaccinations were launched in May, all Poles who wanted to be vaccinated would receive the first dose by the end of August (Interia, 2021; Bieńczak & Markiewicz, 2021). Poland reported long delays in the supply of individual vaccines, causing delays related to the vaccines themselves. There is also a phenomenon of blocking vaccination sites by the so-called 'anti-vaxxers', who do not show up for vaccinations (Polityka Zdrowotna, 2021b).

In the UK, vaccinations have been available from 8 December, 2020. The British are not obliged by EU decisions, because they are no longer a member state. The British organised the mass vaccination programme in an almost exemplary fashion and kept strict restrictions for a long time. They also approached the dosage quickly and, initially, differently than others, and delayed the administration of the second dose of the COVID-19 vaccine so as to give the first dose as soon as possible to the largest group of people at the highest risk of severe disease and death. The UK ordered over 400 million doses of seven of the most promising vaccines. In the UK, three brands are used: AstraZeneca, Pfizer, and Moderna. AstraZeneca is produced in several factories in the United Kingdom, hence a certain independence from vaccine supplies. The next doses were to come from the Serum Institute of India and the Halix plant in the Dutch city of Leiden. The Pfizer's vaccine is imported to the UK from a factory in Puurs, Belgium, and Moderna doses come from factories in Switzerland and Spain, and are also shipped from Belgium (Bellon, 2021).

According to the plans, by April 15, 2021, all nine priority groups, i.e. 32 million people, were to be vaccinated. According to the statistics from Our World in Data, which tracks vaccination progress, the number of doses administered in the UK per 100 people was, at the time of writing this article, 39.04. In the USA, it was 33.11, and in the European Union, it was 11.81 (Gazeta Prawna, 2021).

From September 2020, the most vulnerable and oldest British citizens were to receive a third dose of the COVID-19 vaccine, which was expected to offer better protection against new variants of the coronavirus. The next boosting dose was to be given first to people over the age of 70, healthcare workers, and social workers, as Zahawi told the newspaper in an interview published on Saturday. People up to 30 years of age could decide whether they preferred the Pfizer or Moderna vaccine (Onet, 2021).

For comparison, the vaccination process in Brazil is presented. Brazil is a less-developed country and there are insufficient resources to look after the entire society. It is one of the most affected countries in the world. In terms of mortality, it is the second country in the world after the USA (at the moment, i.e. April 4, 2021, the worst situation is India). To date, more than 12.3 million cases of infection have been confirmed, and 303,000 Brazilians have died. Thursday (04.04.2021) was record-breaking in terms of infections, which were recorded at the level of over 100.1 thousand (Medonet, 2021).

Vaccination with the Chinese Sinovac Biotech vaccine and the AstraZeneca vaccine started in Brazil. On January 29, 2021, they were approved for use by the Anvisa Brazilian drug control agency (Stasiński, 2021). In Brazil, the country's first COVID-19 vaccine, ButanVac, was produced at the Butantan Institute in Sao Paulo. The new formula was supposed to enter into use in the first half of 2021. It will initially be produced only in Brazil, where vaccination against SARS-CoV-2 is carried out by several foreign products, mainly from China. So far, more than 30 million doses of coronavirus vaccines have been delivered to Brazilian states. Among the 15 million already vaccinated citizens, more than 11 million are those who took the first dose. Brazil's problem involves the lack of a consistent government policy, and the Brazilian President Jair Bolsonaro

said that the rush to vaccinate against COVID-19 is unjustified. He also criticised pharmaceutical companies and announced that he would not undergo vaccination.

Bolsonaro is one of those who question the severity of the pandemic and criticise any restrictions on social contact to limit it. Still, the president signed an executive decree that allows the government to incur a debt of 20 billion *reais* (about 4 billion USD) to purchase vaccines against COVID-19. The Ministry of Health also announced the main assumptions of the vaccination campaign. It assumes, *inter alia*, immunising everyone, i.e. 210 million inhabitants of the largest country in Latin America, within 16 months (Gazeta Prawna, 2021).

Brazil had one of the largest coronavirus outbreaks in the world: it had the second highest number of daily deaths (964) and the third highest number of new daily infections (54,000). More than 200,000 Brazilians have already died from the coronavirus, and more than 8.5 million have become ill. The governor of Sao Paulo was the first to bring the (Chinese) vaccine to Brazil. It is also his personal triumph, as the vaccine is now also produced by the Brazilian company Butanan. As of April 2021, the company had 6 million doses of the vaccine ready in Sao Paulo, but could not distribute them around the country due to the lack of government approval. Paradoxically, President Bolsonaro tried to block the production and legalisation of the vaccine. The president himself announced that he would not get vaccinated, and he advised his compatriots to use an anti-malaria drug, chloroquine, which is not recommended by Brazilian medics and scientists, or by the World Health Organization. First, doctors and healthcare professionals were vaccinated, then the transport of vaccines to the most affected areas of the country began. The Butanan company announced that it would be able to produce 46 million doses of Coronovac by April, 2021. The federal government was unable to deal with the distribution of vaccines (Stasiński, 2021).

Table 1 shows that the most important factors lie in two areas: socio-cultural and political. In details, it can be assumed that the socio-cultural area focuses on elements such as: social discipline, the strength of anti-vaccine movements, trust in the State, confidence in promotional campaigns and the State's communication policy. In the political area, the most important elements are as follows:

– the organisation of vaccinations from the practical side (the availability of vaccines, deliveries, the organisation of a network of points);
– affiliation with international organisations;
– authorities' attitude to science and to the pandemic;
– organisations and recommendations of age, and social groups for vaccination;
– campaigns promoting vaccination at the central level;
– the centralisation or decentralisation of vaccination activities.

All these elements and factors influence the speed of controlling the epidemic situation and the advancement of the vaccination process until collective immunity is achieved, and, as a result, overcoming the epidemic and normalising the social and economic life.

Table 1. Management of the vaccination process in selected countries

Factor	Poland	Germany	Spain	UK	US	Israel	Brazil
Start of vaccination	28/12/20	26/12/20	28/12/20	8/12/2020	14/12/20	19.12.20	29.01.21
Supervision	State	State/ Landes	State	State	Individual states/ country	State/ accurate record system	Local Government
Is there a programme recommending people to get vaccinated?	Yes	Yes	Yes	Yes	Yes	Yes	No clear guidelines
Epidemic situation	Controlled	Controlled	Controlled	Controlled	Controlled	Very good	Very bad
Access to vaccines – production/ distribution	Import	Own	Import	Own	Own	Import	Own
Power of anti-vaccine movements	Mean	Mean	Small	Mean	High	Very small	High
Population vaccinated with 2 doses	10,1%	10%	13.9%	27,7%	35.8%	56.2%	7,5%
Falling ill with COVID-19	4159 (12/5/21)	7321 (10/5/21	6428 (12/5/21)	2357 (10/5/21)	33789 (8/5/21)	(5/5/21) 68	76,692 (10/5/21)
Total population	37,660,000 (2021)	82,186,000 (2021)	46,468,000 (2021)	67,082,000 (2021)	335,190,000 (2021)	9216,000 (2021)	215,278,000 (2021)

Source: Own study based on Mathieu, Ritchie, Ortiz-Ospina *et al.* (2021).

Conclusions

Based on secondary research, the most important factors influencing the course and management of the vaccination process can be determined. The hypothesis in this article was based on the statement that there is an optimal crisis management based on the experiences of different countries and the meeting of their different methods of organising vaccination against SARS-CoV-2. From the point of view of economic sciences, it is a novel topic, because, for the first time. it is possible to examine the relationship between health policy and the state of a global epidemic in the era of general access to information, fast data transfer, high mobility, and globalisation. The hypothesis relies on the statement that there is an optimal crisis management based on the experiences of different countries and the meeting of their different methods of organising vaccination against SARS-CoV-2.

Secondary research, illustrating the course of the vaccination process in various countries, has shown that it is possible to create an optimal vaccine management method only by taking into account the elements that make up the socio-cultural and political factors. A detailed analysis has shown that the effectiveness of the vaccination process during a pandemic does not directly depend on the availability of vaccines. The example of vaccination in Israel shows that it does not matter whether the vaccine is imported or produced in a given country. As long as it facilitates

distribution and makes it independent, with the proper organisation of deliveries, the influence of this factor can be minimised.

Among the socio-cultural elements influencing the course of the vaccination process, social discipline and the power of anti-vaccination movements come first. In Israel, the impact of anti-vaccination movements has been minimised to almost zero, but in the USA and developed countries, through the Internet, the strength of anti-vaccination movements is strong. This creates a situation where many people have not come for vaccinations. This, in turn, disrupts the vaccination process and causes the still-relatively-low vaccination rates against the virus. Another element is the lack of trust in the State, manifested in the dissemination of – and belief in – conspiracy theories about the impact of politicians and the richest people on the pandemic, the belief that the epidemic is false, and that the purpose of vaccination is surveillance or even extermination. As in the previous example, where the State applied strict rules, the vaccination process was more efficient and the society recovered faster from pandemic restrictions.

The lack of trust in the State is also associated with the lack of trust in promotional campaigns. This has its roots in a general reluctance to advertising and marketing. The more the vaccination process is promoted, the greater the fears that the goal of this promotion is not to overcome the pandemic itself. All of the above should be reflected in the communication policy which would be strictly adapted to the target audience. In this aspect, it is worth considering a less formal way of persuading people to vaccinate.

Political factors include, primarily, the country's membership in international organisations. Research shows that this affiliation does not guarantee an efficient vaccination process; it only facilitates control over the process and protects political interests. An extremely important element that influences the vaccination process is attitude to science. The attitude of the President of Brazil has had a negative impact not only on the vaccination process, but, above all, on the uncontrolled development of the pandemic in this country. The lack of guidelines related to the process of restrictions (and then vaccinations) caused the virus to mutate and become more and more dangerous.

Age recommendations in the vaccination process were the first step in recommending patients and victims of the pandemic. The organisation of this process in the countries of the European Union was similar. While the majority of countries countries introduced formal recommendations, in practice, the age recommendation did not exist in the USA and Israel. In Israel, the emphasis was on mass vaccination, and in the USA, the recommendation system was ambiguous. On the other hand, in Poland, the dates of recommendations were variable, which gave the impression of chaos in the vaccination process.

Vaccination promotional campaigns appeared along with the emergence of vaccines. Their main goal was to achieve collective immunity in specific age groups. In this case, age recommendations were a problem, which in many countries made it impossible to vaccinate against one's own will. Promotional campaigns include not only commercials on TV or lotteries for the vaccinated, but also promises of freedom of movement, free holidays, or minimising restrictions. Even so, the persuasion towards vaccines in many countries has not worked entirely. As a result of the research, it can be said that the optimal vaccination process should involve the following:

– communication policy adjusted in terms of information and organisation to target recipients;
– limiting the impact of anti-vaccination movements through constant education adapted to the age of the recipients;

– strengthening confidence in the State through honest information and relative stability of rules in the face of a pandemic and the attitude of politicians;
– the constancy of the rules of the vaccination process and appropriate information policy at the individual level;
– ensuring the stability and quantity of vaccine supplies according to the size of the centres;
– introducing age recommendations, but also making it possible to vaccinate other groups at the same time while maintaining priority or separation at the point of vaccination;
– facilitating the vaccinated persons and a coherent information policy in this regard;
– emphasising the role of science in fighting the pandemic and the role of vaccination in this process;
– emphasising the role of vaccination in achieving normality;
– communicating problems related to vaccines in a neutral manner which does not arouse concern in the recipients.

All these elements avoid creating unnecessary divisions in society and the state in the face of the fight against the pandemic. Overcoming a pandemic is essential on the way to normality and economic development.

This study may contribute to the presentation of the problem of operating in a situation of the limited availability of raw materials (vaccines) and a difficult social and economic situation (pandemic). This situation is completely new to the whole world and requires a new perspective on the problem. The thesis that good management contributes to the improvement of a given process is confirmed once again. However, cooperation is required in every stage of the activity. This article describes only a small selection of activities related to the SARS-CoV-2 vaccination process. The study covers the period from January to April, 2021. It is based on secondary data that can be extended with primary data that significantly enrich the subject matter. Secondary data largely includes Polish-language articles available on websites. The inability to conduct direct research is related to, among others, the epidemic situation in Poland and the related restrictions, especially in the healthcare sector. Another danger and weakness of this study is that it describes a process that is still ongoing and cannot be judged from perspective. The final result of the actions is unknown. As previously mentioned, all these considerations and activities can be based on the theory of crisis management, which is widely discussed in the literature on the subject.

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