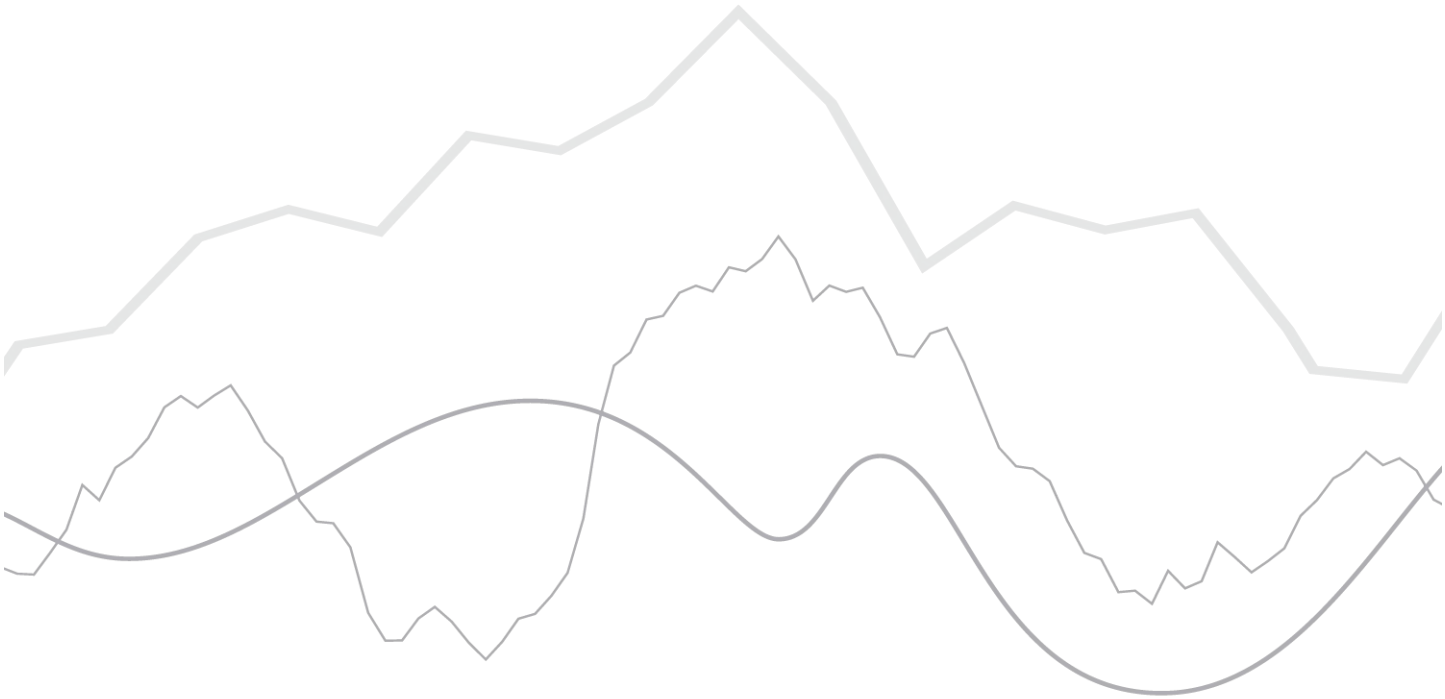
ÁLLAMI SZÁMVEVŐSZÉK

ANALYSIS

Protection of the Population against Infectious Diseases

2021



1052 Budapest, Apáczai Cs. J. u. 10. | 1364 Budapest 4. Pf. 54
TEL: +36 1 484 9100
email: szamvevoszek@asz.hu
web: www.asz.hu | www.aszhirportal.hu

ÁLLAMI SZÁMVEVŐSZÉK

ANALYSIS

Protection of the Population against Infectious Diseases

Approver:

László Domokos
President

Editor:

NORBERT TESKI auditor

Supervisor:

TÍMEA HORVÁTH project manager

The analysis is available online at www.asz.hu website .

Authors:

ISTVÁN ZOLTÁN DORMÁN auditor

JÓZSEF LÁSZLÓ JANIK auditor

GERGELY ZSOLT KORMÁNY auditor

ANDREA MENGYI MOKÁNSZKINÉ auditor

JÓZSEF SIMON auditor

NORBERT TESKI auditor

DR JÚLIA VÍZHÁNYÓ VALASTYÁNNÉ auditor

Published by the State Audit Office

EL-3079-001/2021

TABLE OF CONTENTS

INTRODUCTION

"…if many people get sick at the same time, we must attribute a common cause to it," recognised Hippocrates in the 5th century BC. This recognition suggests that infections and epidemics have been present in history since the beginning of humanity. With regard to infectious diseases, it can be stated that the development of their monitoring, documentation and protection system began at the same time as their appearance. However, for a long time humanity was helpless against the occurrence and spread of infections, which until the 20th century were considered the leading causes of death around the world.

A major advancement in medicine regarding protection against infections was the introduction of vaccines, which was based on the observation that the immune response of the human body can be triggered intentionally. The immune system is able to provide protection against re-infection even if the individual contracted the disease previously. These discoveries were already recognised in 16th century China, however, the distribution of vaccines came only in the early 1900s. In the 20th century, vaccinations against many infectious and often fatal diseases became available, thus vaccination programmes were launched to promote vaccines. With the distribution of vaccines, several diseases that previously claimed many fatalities have almost completely disappeared, vaccination has become widespread and available also to poorer countries. Nowadays there are vaccines against many infectious diseases, thanks to which millions are saved every year and hundreds of thousands of children escape permanent health impairment and serious complications. Thanks to the achievements of medicine, life expectancy at birth has roughly doubled in the last two centuries, a key reason being that vaccinations have been able to prevent childhood deaths from infectious diseases in much of the world. A fundamental factor in the radical reduction of child mortality is the use of vaccines. It is the most important factor, in addition to clean drinking water, for ensuring the sustainability of human health. Vaccines are an effective tool for combating infectious diseases not only in childhood but also in adulthood. The existence and use of vaccines, and the appropriate vaccination level of the population, give society security against infectious diseases. The lack of vaccinations may reduce the immunity of the population, as a result of which forgotten diseases may reappear in some areas.

Population immunity plays a role not only in maintaining health at the societal level, but also in economic development and the sustainability of the economy. This includes, for example, that, simultaneously with the emergence of scheduled air transport, international tourism also gained considerable ground, and that labour mobility and workforce commuting emerged with the establishment of economic communities. Nowadays, climate change and the economic exposure of some countries have brought with them further migration. This type of 'free' movement can lead to the occurrence of infectious diseases that can mean a significant cost to the economy. In addition, an important factor is that the performance of the economy is higher with healthier citizens, so disease prevention also has an indirect impact on the country's economic performance.

In the 21st century, maintaining health has become an integral part of the sustainable functioning of the environment and society. A healthy society is not only a consequence of a country's socio-economic development, but also a fundamental condition therefor. The development of health based on overall social activity, the prevention of diseases and the reduction of infectious diseases play a key role in the sustainability of the economy.

EXECUTIVE SUMMARY

In Hungary, the legal grounds for protection against infectious diseases were first defined in the 19th century. Since 2011, Hungary's Fundamental Law states that everyone has a right to physical and mental health. The state promotes the enforcement of this right, among other things, by organising the healthcare service. Closely linked to the organisation of the healthcare service are preventive services, which support the prevention of diseases and prevent, among other things, the spread of infectious diseases.

In the case of Hungary, protection against infectious diseases is regulated in detail at legislative and regulatory level. The provisions defined for the organisation of protection against infectious diseases and for the prevention of vaccine-preventable infectious diseases and epidemics are contained in Act CLIV of 1997 on Health, which determines the complex system of conditions for maintaining and improving health, and certain sections of the Decree of the Minister of Welfare 18/1998 (3 June) NM on the Epidemic Control Measures Required for the Prevention of Infectious Diseases and Epidemics. The Health Act regulates the field of epidemiology in detail, including the provisions related to infectious diseases and the prevention of the spread of infectious diseases. The Health Act states that the purpose of epidemiological activity is to prevent and contain infectious diseases and epidemics, and to increase the resilience of the human body to infectious diseases.

The primary task of prevention is to prevent or interrupt the epidemic process. The simultaneous existence of three basic factors, the source of the infection, the mode of transmission and the susceptible organism, is necessary for the occurrence of infectious diseases and epidemics. Perhaps the most effective way to protect against infectious diseases is to eliminate susceptibility, which can be achieved naturally or artificially after vaccinations. Vaccination-related prevention aims to preserve health while avoiding infection. Curing diseases is generally more difficult and risky than preventing them. Prevention can protect society from unnecessary suffering, pain and premature death.

In Hungary, vaccination is mandatory for 12 infectious diseases, depending on age. Mandatory age-specific vaccinations, with the exception of hepatitis B, should be given to those aged 0-6 years in a continuous vaccination system. Over the age of six, vaccinations are given as a campaign vaccination. In 2018 and 2019, the age group subject to vaccination received at least 99.6% of the individual age-specific mandatory vaccinations.

In addition to age-specific mandatory vaccinations, other mandatory vaccinations are defined in the Health Act, such as the mandatory vaccinations in case of disease risk, which are typically given to those living in the patient's environment when the disease is diagnosed. Job-related vaccinations must be provided by the employer if there is an increased risk of certain infectious diseases due to the occupation of the workers. In relation to travel, when an individual travels to a region where certain increasing perilous diseases occur. In addition to mandatory vaccinations, those who are at higher risk for certain diseases e.g., due to their sports activities and health, can be given active immunisation based on voluntary application. Free vaccinations are also available on a voluntary basis to reduce the risk of illness.

From an international perspective, Hungary has the highest number of age-specific vaccinations in the EU, which contributed to the achievement of outstanding vaccination results in 2018-2019. Owing to the almost 100% vaccination rate of some infectious diseases that can be prevented by

mandatory vaccination, registered infectious diseases such as whooping cough, tuberculosis or diphtheria, which previously claimed significant fatalities, were reduced to a minimum in Hungary in 2018-2019.

The practices of certain countries with regard to the use of vaccinations against infectious disease may vary. In the EU, for example, some Member States have mandatory vaccinations, while others use a recommended vaccination scheme. In the EU, each Member State has its own vaccination programme. In the vast majority, two thirds of Member States, the use of vaccinations is optional, with 10 Member States, in addition to Hungary, introducing mandatory vaccinations. In 9 of the 27 Member States of the EU, vaccinations are mandatory for measles, whooping cough, diphtheria and mumps. Malta has joined the countries supporting mandatory vaccination for one disease, diphtheria.

Despite the fact that there are a higher number of Member States where vaccinations against diseases are not mandatory, the vaccination rate for vaccine-preventable infectious diseases was, with a few exceptions, over 90% in the EU Member States. These ratios show that the usefulness of vaccinations is accepted at the societal level, regardless of whether the population is bound by law to have the vaccinations or they are only recommended. In the EU, vaccination rates for e.g. measles, whooping cough, diphtheria or mumps averaged 94-97% in 2018-2019. Some diseases, such as diphtheria, which used to have high infection rates, have now completely disappeared. In 2018-2019, a total of 70 cases of diphtheria were recorded in the EU, none of which affected Hungary. The number of people infected with measles was close to 36,000, of which 37 cases were recorded in Hungary. Mumps infected approximately 27,500 people, which in the case of Hungary meant one infection each year. The highest level of infection was measured for whooping cough, with nearly 61,000 infected people identified, of which 30 cases were recorded in Hungary. For these diseases, the number of infected did not exceed 1% of the population in any Member State.

The right to free movement and residence within the EU and between Member States is a cornerstone of EU citizenship. In relation thereto, the question may arise as to whether the free movement of the citizens of Member States affects the spread of infectious diseases. Despite the fact that people residing in or commuting to other countries can play a mediating role in the spread of infectious diseases within the Community, statistics on the number and prevalence of infectious diseases show that diseases for which vaccination is available are socially acceptable, with the vaccination level resulting from it preventing the mass spread of infectious diseases resulting from free movement.

CONCLUSIONS - OPPORTUNITIES, SUGGESTIONS

Based on the facts and comparisons revealed in the analysis, the legal frameworks recording epidemiological measures in Hungary up until 2019, the established vaccination scheme and the vaccination level achieved by vaccines together ensured the prevention of the spread of known and vaccine-preventable infectious diseases and the prevention of mass infection, thus contributing to the security of citizens. Perhaps the greatest advance in the history of medicine in the prevention of infectious diseases is that acquired immunity can be created artificially after vaccinations, thus preserving health, avoiding infections, and curbing serious epidemics. Effective management of infectious diseases with vaccines has been proven at several points in history, such as smallpox, which killed tens of millions of people at the time, but the disease has disappeared owing to vaccination. A key element of these successes is the appropriate vaccination level, because only this can provide population immunity, reduce the risk of individual infections, and ensure the prevention and elimination of mass infections in the case of an epidemic. An appropriate vaccination level with the use of vaccinations can therefore provide a way out of the current epidemiological situation caused by COVID-19 and bring ‘peace’ in the cataclysm caused by the pandemic.

In Hungary, mandatory and certain other vaccinations that can be requested on a voluntary basis for disease prevention are available to the population free of charge and with state funding. The majority of age-specific vaccines are used for preventive immunity in childhood. The high vaccination level achieved with the mandatory vaccinations demonstrates people's confidence in vaccinations. In the interests of social responsibility, it is important to maintain this confidence for non-mandatory vaccinations against new infections, which mostly affect the adult population.

The recently published analysis of the State Audit Office, ‘*Analysis of the Public Financial Impact Assessment of the COVID-19 Epidemic*’, also pointed out that the COVID-19 epidemic has caused unprecedented challenges in the global economy. The social shock and the associated uncertainties due to the spread of the epidemic hinder rapid economic recovery, therefore effective protection with the vaccine and the elimination of the epidemic also contribute to the sustainability and development of the economy.

Following the calming of the catastrophic impact of the COVID-19 pandemic, the theoretical and practical knowledge in the fields of science (biology, infectology, vaccinology) related to the new disease and the introduction and use of the vaccine for its management will undoubtedly increase. Following the example of vaccines used to manage known infectious diseases, treatment of the COVID-19 epidemic may also trigger the incorporation of the vaccine used into the vaccination scheme.

Today, the possible outcome, development and impact of the epidemic are still unknown to everyone, no one knows when we can leave the coronavirus behind. It is therefore, in the interests of the sustainability of the health system and the economy, and important for citizens to respond adequately to the challenge posed by the pandemic, because the active willingness of individuals to vaccinate can assist in achieving the vaccination level and security, with which mass infection can be avoided.

SCOPE AND METHOD OF ANALYSIS

Scope of the analysis

Preserving health and preventing epidemics is an important tool for ensuring social and individual well-being for both society and individuals. Consequently, the analysis aims to raise public awareness of the role and importance of the vaccination scheme and vaccinations against vaccine-preventable infectious diseases for the prevention of infectious diseases. Because preserving health and avoiding epidemics is in the interest of both society and individuals.

The analysis focuses on the following:

- Hungarian scheme established for the prevention of infectious diseases,
- Presentation of the Hungarian vaccination scheme and its possible changes in 2018-2019;
- Changes in the population's vaccination level,
- Changes in vaccine-preventable infectious diseases in 2018–2019
- Changes in the international outlook on vaccination levels and vaccine-preventable infectious diseases in the EU in 2018-2019

Method of the analysis

The analysis processes the relevant Hungarian legislation, as well as reviews the related EU legislation. The analysis uses available national and international specialist materials, annual reports and statements relating to infectious diseases, as well as good practices that can be identified based thereon. The analysis presents the Hungarian vaccination scheme and the changes in vaccine-preventable diseases, with an emphasis on mandatory vaccinations, and makes an international comparison between vaccination levels and the changes in disease numbers in 2018 and 2019, with regard to measles, whooping cough, diphtheria, and mumps. It uses statistics produced by the WHO in relation to EU Member States for comparison.

The results of the analysis

- point out the role and advantages of the Hungarian vaccination scheme established for the prevention of infectious diseases and epidemics;
- give a picture of the changes in the vaccination level of Hungary and the population;
- present the 2018-2019 results of the vaccinations against infectious diseases, and the changes in infectious diseases that can be prevented by them.

1. HISTORICAL INFECTIOUS DISEASES AND EPIDEMICS

1.1. Infectious diseases and epidemics

Infections and epidemics have been present in history since the beginning of humanity and were one of the leading causes of death up until the 20th century. Urbanisation, the settlement of humanity into larger communities, has facilitated and made the spread of infections more frequent. The close cohabitation has contributed to the spread of certain pathogens from animals to humans, from human to human, making humans themselves carriers and even transmitting members of emerging, increasingly populous communities. Previously isolated communities came into contact with each other through trade and the spread of various epidemics started to accelerate, and with their expanding geographical scope, and the development of international trade, pandemics also appeared (Morens et al, 2020).

The first recorded wave of infection, which can be referred to as a pandemic, broke out in Athens in 430 BC, which spread across the world then known to the Greeks. Although the specific cause of the epidemic is unknown, it is significant because it was the first to be investigated and described using clinical and epidemiological approaches.

Throughout history, the development of shipping and international trade, as well as wars and population explosions caused by economic growth, have also played a major role in the emergence of the subsequent pandemics following that of Athens. In the Middle Ages, the greatest epidemics were caused by the plague, a disease that spread throughout the world in two different periods. First in 541, when it claimed the lives of half of the population of the then known world, then in the 14th century, when it claimed a quarter of the world's population. Records of the very first influenza disease have been available since 1510, but it did not become widespread until the 18th century. The first demographic significance of the disease was caused by an influenza pandemic known as the 'Spanish flu' that began in 1918 and swept almost throughout the world, which claimed more casualties than World War I in its first year, killing nearly 50 million people. (Johnson-Mueller, 2002) Further identified, documented epidemics are indicated in Table 1. The indicated diseases have appeared on several occasions and have claimed many lives in many countries.

1. Table 1:

Epidemics and pandemics in history

Period	Epidemic	Number of victims (persons)	Remarks
430 BC	Athens epidemic	~100,000	First detected cross-border epidemic
541	Justinianic Plague	30–50 million	Pandemic; destroyed half the world's population
1340s	'Black Death'	~50 million	Pandemic; destroyed at least a quarter of the world's population
1494	Syphilis	~50,000	It was introduced to Europe from America
approx. 1500	Tuberculosis	many millions	Ancient disease; it became a pandemic already in the Middle Ages
1520	Smallpox	3.5 million	The epidemic was introduced to the 'new world' by Europeans
1793–1798	Yellow fever	~25,000	Yellow fever that terrorised the colonies of America
1832	Cholera epidemic	18,402	It spread from India to Europe

1918	Spanish flu	~50 million	It led to further epidemics in 1957, 1968 and 2009
1976–2020	Ebola	15,258	First recognised in 1976; to date, 29 regional epidemics have been identified
1981	Acute hemorrhagic conjunctivitis	a small number	First recognised in 1969
1981	HIV/AIDS	~32 million	First recognised in 1981; ongoing epidemic
2002	SARS	813	Close to a pandemic in magnitude
2009	H1N1 swine flu	284	Flu pandemic of the 5th century
2014	Chikungunya fever	a small number	Pandemic, spread by mosquitoes
2015	Zika	~1,000	Pandemic, spread by mosquitoes

Source: SAO editing based on Morens et al, 2020

1.1.1 Emergence of infectious diseases and pandemics in Hungary

The most significant world trade routes did not pass through Hungary in the Middle Ages or in the Modern Age, but from the 13th century onwards, the country became a permanent battlefield in Europe, which played a decisive role in the development of domestic epidemics. The first high mortality count of the population can be attributed to the years following the Tartar invasion, however, in the absence of symptom records, it cannot be identified that an infectious disease caused the population decline. (Tardy-Schultheisz, 1964)

The first epidemic with a large demographic impact, which can be described by somewhat more accurate data, was the plague, causing devastation between 1347 and 1351. Thereafter, chronicles and certificates continuously mentioned the destruction of the plague at intervals of approximately 10 years, the frequency of which began to decline from the mid-18th century. Among other major pandemics, smallpox, cholera, tuberculosis and the Spanish flu have appeared in Hungary. Smallpox did not occur until the Middle Ages, but by the early 18th century, it had spread throughout the country. Cholera, which caused a total of seven major pandemics, significantly impacted the Carpathian Basin three times during the 19th century. Tuberculosis was responsible for 25–30 per cent of deaths at the end of the 19th century, and accurate death statistics at the beginning of the 20th century showed an average of between 65 and 70,000 tuberculosis deaths per year in historical Hungary. The Spanish flu caused the deaths of nearly 54,000 Hungarians in 1918. (Faragó, 2011)

1.2. History of protection against infectious diseases

Already at the onset of the first infections, in the absence of microbiological knowledge, people of the time suspected that the diseases were caused by phenomena invisible to the naked eye, and also recognised that the infections spread through human contact. For these reasons, the first method of protection against infectious diseases was to separate patients from healthy ones. There was no other effective method of protection until the first plague, when they introduced completely sealed, waxed clothing for doctors. The clothing of the doctors also included a beak-like mask stuffed with herbs. At the time, herbs were thought to protect doctors from infection, however, we now know that the gas mask-like headgear and the hermetically sealed clothing were the first protective clothing articles to protect against major infections.

A major medical advance in the protection against infectious diseases was the discovery of vaccines, made possible by the observation that the immune response can be triggered deliberately. The immune system is able to provide protection against re-infection even if the individual contracted

the disease previously. This ability can be artificially triggered and maintained by the use of vaccines. The first effective vaccination, which established the vaccination principle and practice of the modern age, was used to prevent smallpox. Smallpox was one of the most dreaded infectious diseases of mankind, it also appeared in ancient Egypt, but in 16th century China it was recognised that when powder from smallpox blister scabs was smeared on the skin of a healthy person, they survive the disease with milder symptoms. The first success story is associated with the name of Edward Jenner, who in 1796 injected a healthy 8-year old boy with secretions from a cowpox blister, later infecting him with smallpox, and the boy did not become ill. The effectiveness of the vaccine is supported by the fact that less than 200 years after Jenner's discovery, smallpox has completely disappeared from among the infectious diseases. Although the method became known, its wider application came at a later stage. By the 1900s, a vaccine had been developed for 2 viruses and 3 bacterial infections. (Fazekas, 2010)

In addition to vaccinations, another method against infectious diseases, disinfection, still plays a prominent role in prevention, which is attributed to the Hungarian physician Ignác Fülöp Semmelweis (1818-1865). Being ahead of his time, he applied chlorinated water hand washing from as early as 1847, recognising the significance of the antisepsis. In 2013, the UNESCO International Advisory Committee declared Ignác Semmelweis's findings on puerperal fever and their documents part of the Memory of the World Programme. (BOTE, 2019)

The importance of protection against infectious diseases, which has been proven empirically and scientifically throughout history, lies in the fact that all methods are still in use in a modernised form. The infected people are separated on separate wards in the hospitals, and in the case of certain diseases, home quarantine can also be imposed on the infected individuals. With regard to protective equipment, in addition to the most modern research and medical clothing, face masks and rubber gloves that can also be worn during simpler everyday life have appeared. Vaccinations are already available against many infectious diseases, and disinfection procedures are part of all medical and hospital treatment, according to strict rules. In addition to protective equipment, some types of disinfectants have already become available to the general public.

2. HUNGARIAN SCHEME ESTABLISHED FOR THE PREVENTION OF INFECTIOUS DISEASES

2.1 Organising protection against infectious diseases

In Hungary, the legal grounds for protection against infectious diseases (epidemics) were first established in 1876. Act XIV of 1876 provided detailed guidance on the regulation of public health with respect to the prevention and spread of epidemics. (Kiss, 2015) Nowadays, protection against infectious diseases is regulated in detail at legislative and regulatory level. The provisions defined for the organisation of protection against infectious diseases and for the prevention of vaccine-preventable infectious diseases and epidemics are contained in Sections 56-74 of Act CLIV of 1997 on Health (hereinafter: 'Health Act'), entering into force on 1 July 1998 and amended on multiple occasions since, which determines the complex system of conditions for maintaining and improving health, and certain sections of the Decree of the Minister of Welfare 18/1998 (3 June) NM on the Epidemic Control Measures Required for the Prevention of Infectious Diseases and Epidemics (hereinafter: 'Decree of the Minister of Welfare').

The Health Act regulates the field of epidemiology in detail, including the provisions related to infectious diseases and the prevention of the spread of infectious diseases. Since the entry into force of the Health Act, no significant changes have been made to the epidemiological provisions, mainly the detailed rules have been elaborated and clarified. Section 56 (1) states that the purpose of epidemiological activity is to prevent and contain infectious diseases and epidemics, and to increase the resilience of the human body to infectious diseases.

The primary task of prevention is to prevent or interrupt the epidemic process. The simultaneous existence of three basic factors, *the source of the infection, the mode of transmission and the susceptible organism*, is necessary for the occurrence of infectious diseases and epidemics, which are considered the primary driving forces of the epidemic process. The *source of the infection* is the living organism that carries the pathogen, and if the pathogen enters a susceptible organism in the outside world, it causes disease. The *mode of transmission* can be direct or indirect. A direct pathogen causes the disease by entering the susceptible organism directly from the source of infection, without a transmitting medium. It is indirect, if the pathogen reaches the susceptible individual through a living or inanimate (e.g.: drinking water, wastewater, food, object, aerosols, dust particles, etc.) transmitter. The *susceptible organism* does not have effective protection against the pathogen. By eliminating any of the primary factors, the epidemic process becomes interruptible. (Ádány, 2011)

Infectious patients and persons suspected of having an infectious disease must be reported to the micro-regional public health institute responsible according to the place of infection. The obligations related to the reporting of infectious diseases are defined in the Decree of the Minister of Human Capacities 1/2014 (16 January) EMMI on the Rules of Reporting Communicable Diseases. Certain diseases that are particularly dangerous from an epidemiological point of view (e.g.: cholera, the plague, etc.) must be reported urgently to the competent county public health administration and to the NPHC. The public health body can take the necessary epidemiological measures based on the notification.

Restricting the movement and isolation of the infected individual prevents the spread of the infectious pathogen. One form of segregation is placement in the infectious ward of an inpatient facility. If segregation and therapy can be achieved at the patient's home, hospitalisation is not required

for certain diseases, depending on the extent of the symptoms (Section 63-64 of the Health Act, epidemiological segregation, from June 2020, in the case of severe cases, Section 67/A official home quarantine). In the case of persons who come into direct contact with an infectious patient, the task of epidemiological observation is to eliminate the primary factors. Its duration is the maximum incubation period for the given infectious disease. During epidemiological observation, the person should be prohibited from engaging in occupations in which they may be a high-risk source of infection and from visiting places where they may cause mass infection. A stricter form of epidemiological observation is epidemiological lockdown (Sections 65-67 of the Health Act, epidemiological observation, epidemiological lockdown). In the case of an epidemic threat or an epidemic, the restriction of the operation or closure of certain institutions (kindergartens, schools, health care institutions, etc.) may be ordered pursuant to Section 74 (2) a) of the Health Act.

3. THE VACCINATIONS SCHEME AND ITS ROLE IN PROTECTION AGAINST INFECTIOUS DISEASES

3.1 Vaccinations scheme

With regard to the elimination of primary factors, the most effective way to prevent infectious diseases is to eliminate susceptibility. Immunity against a particular disease can be congenital and acquired. Acquired immunity can be developed naturally by surviving the infection or artificially after vaccinations (Ádány, 2011). Vaccination-related prevention aims to preserve health while avoiding infection. Curing diseases is generally more difficult and risky than preventing them. Prevention can protect society from unnecessary suffering, pain, and premature death (Kaló et al, 2010). Thanks to modern medicine and innovative medicinal products, over the past nearly half a century, many serious, previously often fatal diseases, such as smallpox or the plague, which previously reduced the population dramatically, have become curable or effectively treatable (Fazekas, 2010). A key element of these successes is the achievement of full vaccination, which ensures that outbreaks of epidemics are impossible (Kaló et al, 2010).

Within the European Union, each Member State has the right to formulate and implement its own healthcare policy. With regard to vaccinations, a common point is that each Member State has its own vaccination scheme, which sets out which vaccinations are mandatory or recommended, when and to whom. Hungary's vaccination programme was published in 2018 by the Ministry of Human Capacities[1] and in 2019 by the NPHC[2] in a methodological letter.

An important difference is that the EU Member States are not uniform with regard to the use of vaccines. A smaller number of Member States have defined mandatory vaccinations (Table 2), with the majority of them using a recommended vaccination scheme, letting their citizens choose whether to receive the vaccinations. In the latter case, the intention is to increase the vaccination rate by requiring the given recommended vaccination in order to participate in certain communities/activities (e.g.: participation in kindergarten and school education).

Table 2

Member States introducing mandatory vaccinations and the number of mandatory vaccinations

Member State	Number of mandatory vaccinations	Member State	Number of mandatory vaccinations
Hungary	12	Italy	10
Czech Republic	12	Slovakia	10
Bulgaria	11	Slovenia	10
France	11	Malta	3
Poland	11	Belgium	1
Croatia	10		

SAO editing based on Source: https://vaccine-schedule.ecdc.europa.eu/

[1] Methodological letter of the Ministry of Human Capacities on vaccinations in 2018 https://www.antsz.hu/data/cms84807/EMMI_VML2018_kozlony.pdf (downloading date: 14 January 2021)

[2] Methodological letter of the National Public Health Centre on vaccinations in 2019 https://www.antsz.hu/data/cms92651/VML2019_NNK_2019_05_08.pdf (downloading date: 14 January 2021)

Pursuant to Section 57 (1) of the Health Act, the purpose of vaccination in Hungary is to establish active and passive immunity against infectious diseases. For active immunity, antigens are delivered into the body that result in a specific resistance. When passive immunity is established, ready antibodies against a given infection enter the body of the vaccinated individual.

Mandatory and voluntary vaccinations for the prevention and containment of infectious diseases are defined in the Decree of the Minister of Welfare. Mandatory vaccinations include age-specific vaccinations and, where there is a risk of infection, vaccinations for work-related illnesses and the mandatory vaccinations required when travelling abroad. In the case of these vaccines, a recommendation or instruction is not sufficient, it is necessary to enforce their administration in a legal sense, as the protection of society is a public interest that allows for a lawful and justified restriction of civil liberties. The enforcement of the administration of mandatory vaccinations is based on Section 56 (1)-(2) of the Health Act, which states that the rights of individuals may be restricted in order to increase the resistance of the human body to infectious diseases, and that mandatory epidemiological measures do not require the consent of patients, but patients still have the right to information.

Mandatory age-specific vaccinations, with the exception of hepatitis B, should be given to those aged 0-6 years in a continuous vaccination system. Over the age of six, vaccinations are given as a campaign vaccination. It meant a change in the administration of mandatory vaccinations that, for those born after 31 July 2018, vaccination against chickenpox was no longer recommended but mandatory.

Opposition to or rejection of vaccinations may also occur with age-specific vaccinations. Mandatory vaccinations can, on occasion, fall victim to their own success in terms of individual perception, as many dreaded diseases have disappeared from public consciousness as a result of population immunity. Without knowing the properties and consequences of the diseases, in some people the fear of the supposed side effects of the vaccinations may intensify, and they may refuse to get vaccinated, but the mandatory vaccinations are necessary to prevent the spread of infectious diseases. With regard to the effective administration of mandatory vaccinations, the regional nurses keep records of those who are vaccinated, which are sent to the competent district offices on a monthly basis. In the event of a missed vaccination, the nurses first notify the legal representative of the person to be vaccinated and, after the third unsuccessful written request relating to the same person to be vaccinated, notify the competent district office of the failure to vaccinate. If the age-specific mandatory vaccinations, or any of them, are not administered, and if the repeated nurse instructions are unsuccessful, an official procedure is launched. Unjustified failure to receive the age-specific mandatory vaccinations results in guardianship proceedings, in which the vaccination is administered in all cases. Section 58 (3) of the Health Act provides, in particularly justified cases, the possibility for the treating physician, the patient or the patient's legal representative to request the exemption of the patient from the vaccination obligation from the health administration agency competent according to the patient's place of residence. Only those who have received the age-specific vaccinations prescribed may be admitted to a children’s community, primary and secondary education institution. The mandatory vaccinations are listed in Table 3.

Table 3

Mandatory vaccinations in Hungary

Mandatory vaccinations	Infectious disease	Date of administration
BCG	Tuberculosis/Pulmonary tuberculosis	0-4 weeks
DTPa*	Diphtheria (putrid throat)	at 2 months old
PCV*	Pneumococcus	at 2 months old
TT	Lockjaw (tetanus)	at 2 months old
DTAP/acP	Whooping cough (pertussis)	at 2 months old
IPV*	Infantile paralysis (polio)	at 2 months old
HIB*	Haemophilus influenza bacteria type B	at 2 months old
VAR*	Chicken pox	At 13 months of age
MMR	Measles	at 15 months old
MMR	Mumps	at 15 months old
MMR	Rubella	at 15 months old
HPV	Human papillomavirus HPV B	At the age of 12

For DTPa, PCV, IPV, HIB, VAR vaccinations, a booster injection is required to achieve immunisation, the table shows the date of the first administration.

Source: SAO editing based on the Decree of the Minister of Welfare

Mandatory vaccinations in case of disease risk are typically given to those living in the patient's environment when the disease is diagnosed. ***Job-related vaccinations*** must be provided by the employer if there is an increased risk of certain infectious diseases due to the occupation of the workers. ***In relation to travel***, when an individual travels to a region where certain increasing perilous diseases occur, the host country may require certain vaccinations to be administered in advance, in accordance with international conventions. Vaccinations for persons travelling abroad are administered by vaccination clinics operated by government offices and other international vaccination clinics licensed to perform vaccinations in connection with international travel.

In addition to these mandatory vaccinations, active immunisation can be provided free of charge on a ***voluntary*** basis to those who are at higher risk for certain diseases due to their sports activities and health status. Free vaccinations under the Decree of the Minister of Welfare (e.g.: tetanus, hepatitis B, influenza, etc.) are also available on a voluntary basis to reduce the risk of infection.

The consequences of possible damage to health caused by vaccinations are regulated by Section 58 (10) of the Health Act. If the person obligated to be vaccinated suffers a serious health impairment, becomes disabled or dies due to the administration of the vaccination, they or their dependent relative are compensated by the state.

3.2 Changes in the vaccination level of the Hungarian population in 2018-2019

According to statistics published by the NPHC, in 2018 and 2019, the age groups required to be vaccinated received at least 99.6% of each age-specific mandatory vaccination. The proportion of those vaccinated reached 99.8-99.9% in more than half of the vaccinations. (Table 4) No significant differences were observed between the different vaccine types and counties.

Table 4

Completion of age-specific mandatory vaccinations in Hungary in 2018-2019

Vaccines	2018		2019	
	Vaccinated		Vaccinated	
	people	%	people	%
BCG	89,599	99.8	88,080	99.8
DTPa+HIB+IPV (2 months)	89,761	99.9	88,250	99.9
PCV (2 months)	89,668	99.9	88,181	99.9
DTPa+HIB+IPV (3 months)	89,736	99.9	88,232	99.9
DTPa+HIB+IPV (4 months)	89,675	99.9	88,183	99.9
PCV (4 months)	89,618	99.8	88,133	99.8
PCV (12 months)	91,213	99.9	90,091	99.8
MMR	91,244	99.9	90,125	99.9
DTPa+HIB+IPV (18 months)	91,022	99.6	89,908	99.6
DTPa+IPV (6 years)	80,129	99.6	82,796	99.6
MMR booster injection	100,264	99.7	95,361	99.8
dTAP	100,590	99.8	95,442	99.7
Hepatitis B vaccination I.	92,753	99.8	98,972	99.8
Hepatitis B vaccination II.	90,750	99.7	92,120	99.8

Source: SAO editing based on NPHC reports

In Hungary, in addition to the mandatory vaccinations, the recommended vaccinations against other diseases are: influenza, severe pneumococcal infection, hepatitis, tick-borne encephalities, infectious meningitis, and human papilloma viruses. Of the non-mandatory vaccinations, 17,791 vaccinations were required in 2018-2019 due to the risk of disease. In 2018-2019, approximately the same number of people, 718,396 and 719,898, were vaccinated against influenza.

3.3 Changes in vaccine-preventable infectious diseases in 2018–2019

With regard to vaccine-preventable infectious diseases, the EU Health Information Gateway identifies measles, whooping cough, mumps, diphtheria and influenza as relevant.[3] The term ‘relevant’ for the diseases indicated means that, comparing the vaccine-preventable infectious diseases, measles, whooping cough, diphtheria and mumps have the highest rates of re-infection:

- a person infected with measles can infect 12 to 18 people;
- a person infected with whooping cough can infect 12 to 17 people;
- a person infected with diphtheria can infect 6-7 people;
- a person infected with mumps can infect 4-7 people;

The NPHC keeps annual statistics on the changes in vaccine-preventable infectious diseases. In the case of vaccine-preventable mandatory diseases, the number of infected persons was negligible in 2018-2019 owing to the Hungarian vaccination scheme. Of the infectious diseases identified as

[3] https://vaccination-info.eu/en/vaccination (Downloading date: 17 December 2020)

relevant, for example, no diphtheria patients have been identified in Hungary in the last two years. The changes in certain vaccine-preventable infectious diseases in 2018-2019 are shown in Table 5.

Table 5

Changes in certain vaccine-preventable infectious diseases in 2018-2019

Infectious disease	Number of infected in 2018	Number of infected in 2019
Tuberculosis	-	-
Diphtheria	-	-
Whooping cough	23	7
Measles	14	23
Mumps	1	1
Rubella	-	-
HPV B	35	17
Chicken pox*	24,176	30,412

*Vaccination against chickenpox is mandatory for those born after 31 July 2018

Source: SAO editing based on NPHC reports

Table 5 shows that the number of vaccine-preventable diseases in 2018-2019 were small compared to the population (2018-2019: 9.7 million people). The number of cases of chickenpox is high compared to other diseases that can be prevented by mandatory vaccination, but in this case the number of compulsory vaccinations has not yet reached a level that will greatly reduce the number of infections. However, the high number of vaccinations contributed to the fact that, from the diseases listed in Table 5, only 1 person died from measles, 2 from HPV-B and 3 people respectively from rubella and chicken pox in 2018-2019.

4. INTERNATIONAL SCHEMES FOR THE PREVENTION OF INFECTIOUS DISEASES

4.1 WHO International Organisation

In accordance with its constitution, the WHO, the world's largest health organisation with 194 member states, acts as the global international public health coordinating body for immunisation. In an increasingly interdependent global environment, the WHO's mission is to support all countries in providing quality immunisation services as part of an integrated, people-centred platform for disease prevention.[4] The WHO has been working for more than 50 years on the development of biological reference materials for the standardisation of biological materials, and its norms and standards contribute to ensuring the quality and safety of biological medicinal products. The Organisation, in close cooperation with the international scientific and professional communities, consults on important technical issues and employs expert working groups to provide up-to-date information on complex issues such as the biocondition of potential epidemic risks, and to perform clinical and non-clinical trials of vaccines.[5]

For infectious diseases, the WHO requests information from its member states on their preparedness and vaccinations in accordance with the International Health Regulations issued in 2005. It prepares and publishes annual reports on the status of vaccines and the vaccination levels in its member states. The data supply obligation of Hungary is fulfilled by the NPHC on an annual basis. The data supply covers age-specific mandatory vaccinations, mandatory vaccinations in case of a risk of disease and voluntary vaccinations to prevent the risk of disease.

4.2 The European Union's scheme against infectious diseases

In the European Union, the European Parliament and the European Council decide on serious cross-border health threats.[6] According to the background of the Decision, the rate of infectious diseases in the EU has decreased or remained stable in the years preceding the entry into force of the Decision, but new infections can occur at any time, such as HIV in the 1980s and Creutzfeldt-Jakob disease variations in the 1990s, or the various viral infections of influenza in the 2000s (e.g.: SARS, H1N1).

The Decision lays down rules for the epidemiological supervision, monitoring, early warning and containment of serious cross-border threats to health, including the rules relating to the preparedness and response planning for these activities, in order to coordinate and supplement the relevant national policies. It aims to promote cooperation and coordination between Member States in this field, thus making it more effective in preventing and curbing the cross-border spread of serious human diseases and, on the other hand, to combat other serious cross-border health threats and thus contribute to a high level of protection of public health in the Union. Under this Decision, the Commission, in co-

[4] https://www.who.int/about/who-we-are/our-values (Downloading date: 6 January 2021)

[5] https://www.who.int/csr/alertresponse/en/ (Downloading date: 17 December 2020)

[6] Decision No 1082/2013/EU of the European Parliament and of the Council on Serious Cross-Border Threats to Health and Repealing Decision No 2119/98/EC

operation with the Member States, shall ensure, inter alia, coordination and the exchange of information on infectious diseases. The Member States may maintain or establish additional provisions, procedures and measures in the areas covered by the Decision in respect of their national scheme, provided that such additional provisions, procedures and measures do not adversely affect the application of the Decision.

According to the Decision, the European Centre for Disease Prevention and Control (hereinafter: 'ECDC'), established in 2005 following the SARS outbreak of 2002-2003, has a key role to play in identifying, assessing and providing information on current and future infectious diseases that threaten human health. Among other things, the ECDC provides early identification and analysis of emerging threats to the European Union, provides scientific advice to the EU institutions and Member State governments, and supports EU Member State governments in preparing for epidemics. (Commission, 2015)

Hungary, as an EU Member State, reports to the ECDC in compliance with Article 6 of the Decision, the data supply obligation is fulfilled by the NPHC. The data supply to the ECDC is performed in an aggregated or ad hoc form through an online reporting system. The scope of the data to be reported is clearly defined by the ECDC, they are data on the relevant characteristics for each infectious disease, which do not contain personal data. Based on these, the epidemiological reports published on the ECDC website also contain the current Hungarian data. ECDC forwards the reported data to the WHO.

4.2.1 Changes in the vaccination level of the EU in 2018-2019

In the EU, each Member State has its own vaccination programme. In the vast majority, two thirds of Member States, the use of vaccinations is not mandatory, only recommended. In 9 of the 27 Member States of the EU, vaccinations are mandatory for measles, whooping cough, diphtheria and mumps. Malta has joined the countries supporting mandatory vaccination for one disease, diphtheria. (The changes in mandatory and recommended vaccinations are shown in Annex 2.) Despite the fact that there are a higher number of Member States where vaccinations against diseases are not mandatory, vaccination rates for measles, whooping cough, diphtheria and mumps ranged on average from 94-97% in 2018-2019, with only a few Member States not reaching 90%. (Table 6)

Table 6

Changes in EU vaccination levels in 2018-2019, achieved through vaccinations for the diseases identified as relevant (values in %*)

Countries	Measles		Whooping cough		Mumps		Diphtheria	
	2018	2019	2018	2019	2018	2019	2018	2019
Estonia	87	88	93	92	87	88	93	92
Austria	94	94	90	90	94	94	90	90
Romania	90	90	94	94	90	90	94	94
Cyprus	90	86	99	98	90	86	99	98
Bulgaria	93	93	94	94	93	93	94	94
Lithuania	92	93	95	96	92	93	95	96
Italy	93	94	95	95	93	94	95	95
France	90	90	99	99	90	90	99	99
Ireland	92	91	98	98	92	91	98	98
Croatia	93	93	98	98	93	93	98	98
Netherlands	93	94	97	98	93	94	97	98
Poland	93	93	98	98	93	93	98	98
Slovenia	93	94	97	98	93	94	97	98
Denmark	95	96	97	97	95	96	97	97
Czech Republic	96	92	99	99	96	92	99	99
Belgium	96	96	98	98	96	96	99	99
Finland	96	96	99	98	96	96	99	98
Malta	96	96	99	98	96	96	99	98
Germany	97	97	98	98	97	97	98	98
Slovakia	96	96	99	99	96	96	99	99
Spain	97	98	97	98	97	98	97	98
Sweden	97	97	99	98	97	97	99	98
Greece	97	97	99	99	97	97	99	99
Latvia	98	99	97	99	98	99	97	99
Portugal	99	99	99	99	99	99	99	99
Luxembourg	99	99	99	99	99	99	100	100
Hungary	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Average	**95**	**94**	**97**	**97**	**95**	**94**	**97**	**97**

* Statements prepared by the WHO do not include statements with a one decimal point accuracy

Source: SAO editing based on the WHO control system for vaccine-preventable diseases

The data in Table 6 show that for many Member States there is no significant correlation between the mandatory nature of vaccinations and vaccination levels. Based on the results, at societal level, the EU population accepts the usefulness of vaccinations, regardless of whether their own government obliges them to have the vaccination or only recommends it. Hungary has an outstanding vaccination rate in comparison to the Member States, reaching a vaccination rate of 99.9% for all infectious disease identified as relevant.

4.2.2 Changes in vaccine-preventable infectious diseases in the EU in 2018-2019

The infection rates relating to vaccine-preventable diseases identified as relevant was low in the EU, in line with the vaccination level of the population. Some diseases, such as diphtheria, which used to have high infection rates, have now completely disappeared. In 2018-2019, a total of 70 cases of diphtheria were recorded in the EU, none of which affected Hungary. The number of people infected with measles was close to 36,000, of which 37 cases were recorded in Hungary. Mumps infected approximately 27,500 people, which in the case of Hungary meant one infection each year. The highest level of infection was measured for whooping cough, with nearly 61,000 infected people identified, of which 30 cases were recorded in Hungary. However, in terms of population, the number of people infected did exceed 1% of the population in any country. (The changes in vaccine-preventable diseases identified as relevant in 2018-2019 are presented in Annex 3.)

4.3 The impact of free movement on the spread of infectious diseases in the EU

The right of citizens of the Member States to move freely and reside within the EU is a cornerstone of EU citizenship, which was established by the Maastricht Treaty in 1992. Free movement is guaranteed to more than 400 million citizens. This right of free movement for persons and workers may be restricted for reasons of public policy, public security or public health. In accordance with the Directive of the European Parliament and of the Council on the right of citizens of the Union and their family members to move and reside freely within the territory of the Member States, the restriction must be necessary and proportionate, objective and non-discriminatory. In the context of public health, the Directive states that: measures restricting freedom of movement are justified only by potentially epidemic diseases, as defined by the relevant WHO instruments, and by other infectious diseases or contagious parasitic diseases, provided that they are subject to the protection provisions applicable to the nationals of the host Member State.[7]

The EU's continued enlargement policy helps to increase the intensity of labour market-type migration between old and new Member States due to the differences in living standards and the economy, with the new Member States typically playing the role of issuer and the old Member States the host. (KSH (Central Statistical Office), 2015) Despite the growing importance of migration between Member States for both issuing and host countries, based on statistics on infectious diseases affecting individual Member States, free movement within the EU did not significantly affect the spread of infectious diseases in 2018-2019.

For example, in 2018, according to social security data, almost two million people worked on assignments in another EU Member State, and approximately three million people worked in two or more EU Member States at the same time. Despite the fact that long-term residents or commuters, regardless of their residence status, can contribute to the Community transmission of infectious diseases, in the case of the EU, free movement between Member States, labour mobility and workforce commuting did not have a significant impact on vaccine-preventable infectious diseases in 2018-2019. The high level of vaccination in the EU has contributed to the negligible number of cases of

[7] Directive 2004/38/EC of the European Parliament and of the Council (29 April 2004) on the Right of Citizens of the Union and their Family Members to Move and Reside Freely within the Territory of the Member States Amending Regulation (EEC) No 1612/68 and repealing Directives 64/221/EEC, 68/360/EEC, 72/194/EEC, 73/148/EEC, 75/34/EEC, 75/35/EEC, 90/364/EEC, 90/365/EEC and 93/96/EEC Downloading date: 18 December 2020

each vaccine-preventable infectious disease in the individual Member States. The vaccination schemes of the EU Member States and the social acceptance of vaccines prevent the spread of vaccine-preventable infectious diseases resulting from free movement.

ANNEX 1

Significance of vaccines with regard to physiological, social and economic aspects

Physiological significance

Decrease in the number of deaths

In previous years, the importance of vaccines in the curbing of high mortality rates has been the most noticeable. Nowadays, vaccinations play a significant role in reducing the number of deaths, especially in the case of rapidly progressing, fatal diseases. Today, only a few people die from slowly progressing vaccine-preventable infectious diseases (such as diphtheria (putrid throat)).

The risk of complications is reduced

In the case of some diseases, such as chickenpox, measles, we can talk about progression without complications, however, in the case of all diseases, the occurrence of later or severe side effects must be expected. The importance of vaccinations is to prevent the expected complications and thus preserve health by preventing the disease. Although vaccines can have side effects, they are still much safer than the immunity obtained by overcoming the disease.

Prevention of suffering and pain, alleviation of the progression of the disease

Vaccinations help prevent the suffering and pain associated with diseases, and also alleviate the progression of the diseases.

Prevention of chronic diseases and cancers

Vaccines are experiencing a renaissance. With its new generations, it will not only be possible to prevent classic infectious diseases; in addition to the currently available cervical cancer vaccine, it will be possible to prevent and even cure other types of tumours. At a presentation at the June congress of the American Society of Clinical Oncologists, it was stated that the survival rate of a melanoma patient was successfully increased with a vaccine. The developments will fundamentally change the possibilities of combating diseases.

Social significance

Establishment of flock immunity to protect non-vaccinable individuals

An important factor in demonstrating the importance of vaccinations is to explain that the protection of non-vaccinable individuals is most easily achieved through the ‘establishment of flock immunity’, which limits the spread of infection by surrounding the non-vaccinated individual with vaccinated individuals. Population immunity has a sufficient protective effect only when the vaccination of the population reaches a certain level. If there is a decrease in the proportion of vaccinated individuals, the diseases may reappear. Thus, it is of paramount importance that healthcare personnel have adequate information about the vaccinations and lead the way in prevention. Population immunity improves the cost-effectiveness of vaccinations, which is an economic interest, and has a demographic significance in ageing societies.

Demographic significance

Through prevention, vaccinations can also play a role in halting the decline of the national population and in resolving the current demographic crisis. If the health of society improves, the number of years spent working may also increase, decreasing the number of people on disability pensions. The number and efficiency of active employees increases.

Economic significance

National economic significance

Infectious diseases and epidemics have many direct and indirect costs for the economy. In addition to the costs of laboratory testing, tests, medical services and medicinal products, the burden on workers who lose their jobs is also significant. The performance of the economy is higher with healthier citizens. The basic elements of social progress, economic prosperity and sustainable development are healthy people, with healthy bodies and souls. Suitable human resources are decisive in terms of the opportunities for economic development. Disease prevention is therefore an investment in the health of the future, which also has an indirect impact on the country's economic performance.

Relieving the healthcare system

The occurrence of an epidemic or infectious disease strains the healthcare system. This fact also highlights the importance of prevention, which is always more effective than management itself. In addition to GPs, laboratory testing and related administrative burdens appear, which can be indirectly prevented by vaccinations. In relation to the management of COVID-19, the relief of the healthcare system is of paramount importance.

Other significance:

Avoidance of multiplicative effects

It is not possible to list the effects and significance of vaccines in full, but it is important to note that in addition to most of the direct effects listed above, indirect effects also play a significant role. In the event of infection, the costs include, for example, the extra workload of staff involved in replacing lost workers, the occurrence of more errors, and the fact that staff are more likely to become ill.

ANNEX 2

Presentation of the mandatory or recommended status of vaccines against infectious diseases identified as relevant in the EU Member States

	Vaccinations			
Countries	**Measles**	**Whooping cough**	**Mumps**	**Diphtheria**
Austria	R	R	R	R
Belgium	R	R	R	R
Bulgaria	M	M	M	M
Cyprus	R	R	R	R
Czech Republic	M	M	M	M
Denmark	R	R	R	R
Estonia	R	R	R	R
Finland	R	R	R	R
France	M	M	M	M
Croatia	M	M	M	M
Germany	R	R	R	R
Greece	R	R	R	R
Hungary	**M**	**M**	**M**	**M**
Ireland	R	R	R	R
Italy	M	M	M	M
Latvia	R	R	R	R
Lithuania	R	R	R	R
Luxembourg	R	R	R	R
Malta	R	R	R	M
Netherlands	R	R	R	R
Poland	M	M	M	M
Portugal	R	R	R	R
Romania	R	R	R	R
Slovakia	M	M	M	M
Slovenia	M	M	M	M
Spain	R	R	R	R
Sweden	R	R	R	R

Source: SAO editing based on the WHO control system for vaccine-preventable diseases

ANNEX 3

Changes in vaccine-preventable infectious diseases identified as relevant in the EU in 2018-2019

Measles

	2018		2019	
Countries	Number of cases	Ratio to population (%)	Number of cases	Ratio to population (%)
Austria	77	0.0087	n.a.	-
Belgium	117	0.0102	480	0.0416
Bulgaria	13	0.0018	1,231	0.1759
Croatia	23	0.0055	52	0.0126
Cyprus	15	0.0126	6	0.0050
Czech Republic	207	0.0194	590	0.0552
Denmark	8	0.0014	15	0.0026
Estonia	10	0.0076	27	0.0204
Finland	15	0.0027	12	0.0022
France	2921	0.0449	2637	0.0405
Germany	543	0.0065	514	0.0062
Greece	2291	0.2177	12	0.0011
Hungary	**14**	**0.0014**	**23**	**0.0024**
Ireland	0	0.0000	9	0.0265
Italy	7,682	0.1267	1,623	0.0268
Latvia	25	0.0130	3	0.0016
Lithuania	30	0.0107	834	0.3022
Luxembourg	4	0.0066	24	0.0390
Malta	6	0.0137	30	0.0682
Netherlands	24	0.0014	84	0.0049
Poland	359	0.0095	1,367	0.0361
Portugal	162	0.0158	10	0.0010
Romania	6,407	0.3285	3,900	0.2014
Slovakia	565	0.1036	318	0.0583
Slovenia	9	0.0043	51	0.0245
Spain	225	0.0048	288	0.0062
Sweden	43	0.0043	20	0.0020

Source: SAO editing based on the WHO control system for vaccine-preventable diseases

Whooping cough

	2018		2019	
Countries	Number of cases	Ratio to population (%)	Number of cases	Ratio to population (%)
Austria	2,197	0.2471	n.a.	-
Belgium	1,354	0.1179	1,098	0.0952
Bulgaria	114	0.0162	70	0.0100
Croatia	128	0.0308	56	0.0136
Cyprus	0	0.0000	2	0.0017
Czech Republic	752	0.0705	1,446	0.1353
Denmark	1,028	0.1787	3,697	0.6405
Estonia	69	0.0522	135	0.1018
Finland	447	0.0809	557	0.1007
France	n.a.	-	n.a.	-
Germany	12,907	0.1553	10,302	0.1234
Greece	19	0.0018	20	0.0019
Hungary	**23**	**0.0024**	**7**	**0.0007**
Ireland	117	0.0243	165	0.0338
Italy	162	0.0027	725	0.0120
Latvia	159	0.0825	720	0.3776
Lithuania	27	0.0096	26	0.0094
Luxembourg	9	0.0149	n.a.	-
Malta	5	0.0114	15	0.0341
Netherlands	4,710	0.2761	6,079	0.3556
Poland	1,552	0.0409	n.a.	-
Portugal	60	0.0059	84	0.0082
Romania	93	0.0048	110	0.0057
Slovakia	376	0.0690	702	0.1286
Slovenia	213	0.1025	129	0.0620
Spain	3,665	0.0785	3,075	0.0658
Sweden	739	0.0741	782	0.0779

Source: SAO editing based on the WHO control system for vaccine-preventable diseases

Diphtheria

	2018		2019	
Countries	Number of cases	Ratio to population (%)	Number of cases	Ratio to population (%)
Austria	0	0.0000	n.a.	-
Belgium	2	0.0002	6	0.0005
Bulgaria	0	0.0000	0	0.0000
Croatia	0	0.0000	0	0.0000
Cyprus	0	0.0000	0	0.0000
Czech Republic	0	0.0000	0	0.0000
Denmark	0	0.0000	0	0.0000
Estonia	0	0.0000	0	0.0000
Finland	0	0.0000	0	0.0000
France	n.a.	-	n.a.	-
Germany	26	0.0003	15	0.0002
Greece	0	0.0000	1	0.0001
Hungary	**0**	**0.0000**	**0**	**0.0000**
Ireland	0	0.0000	0	0.0000
Italy	1	0.0000	0	0.0000
Latvia	3	0.0016	2	0.0010
Lithuania	0	0.0000	0	0.0000
Luxembourg	0	0.0000	n.a.	-
Malta	0	0.0000	0	0.0000
Netherlands	4	0.0002	0	0.0000
Poland	0	0.0000	n.a.	-
Portugal	0	0.0000	0	0.0000
Romania	0	0.0000	0	0.0000
Slovakia	1	0.0002	2	0.0004
Slovenia	0	0.0000	0	0.0000
Spain	1	0.0000	2	0.0000
Sweden	0	0.0000	4	0.0004

Source: SAO editing based on the WHO control system for vaccine-preventable diseases

Mumps

	2018		2019	
Countries	Number of cases	Ratio to population (%)	Number of cases	Ratio to population (%)
Austria	n.a.	-	n.a.	-
Belgium	230	0.0200	234	0.0203
Bulgaria	27	0.0038	50	0.0071
Croatia	24	0.0058	15	0.0036
Cyprus	3	0.0025	0	0.0000
Czech Republic	516	0.0484	191	0.0179
Denmark	17	0.0030	16	0.0028
Estonia	6	0.0045	4	0.0030
Finland	4	0.0007	4	0.0007
France	n.a.	-	n.a.	-
Germany	534	0.0064	594	0.0071
Greece	1	0.0001	2	0.0002
Hungary	**1**	**0.0001**	**1**	**0.0001**
Ireland	575	0.1193	2,761	0.5655
Italy	47	0.0008	587	0.0097
Latvia	2	0.0010	6	0.0031
Lithuania	19	0.0068	32	0.0116
Luxembourg	0	0.0000	n.a.	-
Malta	0	0.0000	7	0.0159
Netherlands	73	0.0043	132	0.0077
Poland	1,585	0.0418	n.a.	-
Portugal	106	0.0103	153	0.0150
Romania	119	0.0061	110	0.0057
Slovakia	13	0.0024	16	0.0029
Slovenia	0	0.0000	0	0.0000
Spain	9,129	0.1955	9,459	0.2024
Sweden	21	0.0021	33	0.0033

Source: SAO editing based on the WHO control system for vaccine-preventable diseases

LITERATURE

Róza Ádány (ed.) (2011): Preventive Medicine and Public Health Medicina Könyvkiadó Zrt. Chapter 6: Epidemiology of infectious diseases

Budapest Medical Students' Association (2019): The life and work of Ignác Semmelweis

David M. Morens, Peter Daszak, Howard Markel, Jeffery K. Taubenberger (2020): Pandemic COVID-19 Joins History's Pandemic Legion DOI: 10.1128/mBio.00812-20

Dr Z. Kaló, Dr A. Kovács, Dr B. Margitai, Dr Z. Mészner, & Dr Z. Vokó, (2010): "Value of vaccine". IME VOLUME IX ISSUE 1, 39-44

European Commission (2015): Report on the Implementation of Decision No 1082/2013/EU of the European Parliament and of the Council of 22 October 2013 on Serious Cross-Border Threats to Health and Repealing Decision No 2119/98/EC

Tamás Faragó (2011.): Introduction to Historical Demography, Humanitarian Disasters Chapter, Budapest Corvinus University

Erzsébet Fazekas (2010): June 21 is the Day of Vaccinations IME VOLUME IX. ISSUE 5 JUNE 2010, CLINIC, 30-33

László Kiss (2015): The progression of Hungarian public healthcare from the development of public health thinking to the establishment of the state public health system ELTE Doctoral School of Sociology pp. 36

Judit Lakatos (2015): Hungarians working abroad, foreigners working in Hungary Statistical Survey Volume 93 Issue 2 pp. 94

National Public Health Centre (2018): Data on infectious diseases reported in 2018

National Public Health Centre (2019): Data on infectious diseases reported in 2019

National Public Health Centre (2018): Data on vaccinations performed in 2018

National Public Health Centre (2019): Data on vaccinations performed in 2019

Niall P. A. S. Jonhnson, Juergen Mueller (2002): Updating the Accounts: Global Mortality of the 1918–1920 'Spanish' Influenza Pandemic 105 Bull. Hist. Med., 2002, 76: 105–115

Lajos Tardy, Emil Schultheisz (1964): A separate imprint from the History of the epidemics in Hungary, from Issue 3 of 1964 'History'

T. Jacob John & Reuben Samuel (2000): Herd immunity and herd effect: new insights and definitions European Journal of Epidemiology 16: 601-606, 2000

Referenced Legislation

Decision No 1082/2013/EU of the European Parliament and of the Council on Serious Cross-Border Threats to Health and Repealing Decision No 2119/98/EC

Directive 2004/38/EC of the European Parliament and of the Council on the Right of Citizens of the Union and their Family Members to Move and Reside Freely within the Territory of the Member States Amending Regulation (EEC) No 1612/68 and repealing Directives 64/221/EEC, 68/360/EEC, 72/194/EEC, 73/148/EEC, 75/34/EEC, 75/35/EEC, 90/364/EEC, 90/365/EEC and 93/96/EEC

Fundamental Law of Hungary (25 April 2011)

Act CLIV of 1997 on Health

Act CXXIII of 2015 on Primary Health Care

Act CXXXII of 2006 on the Development of the Healthcare System

Government Decree 43/1999 (3 March) on the Detailed Rules of Financing Healthcare Services from the Health Insurance Fund

Decree of the Minister of Welfare 18/1998 (3 June) NM on the Epidemic Control Measures Required for the Prevention of Infectious Diseases and Epidemics

Decree of the Minister of Human Capacities 1/2014 (16 January) EMMI on the Rules of Reporting Communicable Diseases

LIST OF ABBREVIATIONS

SAO	State Audit Office
Commission	European Commission
ECDC	European Centre for Disease Prevention and Control
EMMI	Ministry of Human Capacities
EU	European Union
Health Act	Act CLIV of 1997 on Health
NPHC (Hungarian abbreviation: 'NNK')	National Public Health Centre
Decree of the Minister of Welfare	Decree of the Minister of Welfare 18/1998 (3 June) NM on the Epidemic Control Measures Required for the Prevention of Infectious Diseases and Epidemics
WHO	World Health Organisation

GLOSSARY

infectious disease	Disease caused by specific infectious agents or their toxic products caused by the direct or indirect transmission of a given pathogen or product from an infected person, animal or reservoir to a susceptible host organism. (source: Section 3/A (5) of the Decree of the Minister of Welfare)
source of infection	The living organism (human or animal) that carries the pathogen, creating a disease when the agent enters the susceptible organism after being released into the outside world. (Ádány, 2011)
susceptible organism	The susceptible individual does not have an effective defence against the given pathogen. Immunity against a particular disease can be congenital (maternal) and acquired. (Ádány, 2011)
official quarantine	The epidemiological authority may, in the event of entry from certain countries or in the event of infection or illness, order the person subject to the epidemiological measure not to leave the dwelling assigned to them, the fenced area belonging to it, or any other place not classified as a medical institution for the period specified in the decision. (source: Section 67/A (1) of the Health Act)
epidemic	The occurrence of a given infectious disease is significantly higher than expected or exceeds a specified threshold in a given area or community over a specified period of time, or at least two interrelated cases that can be substantiated by epidemiological evidence. (source: Section 3/A (9) of the Decree of the Minister of Welfare)
epidemiological lockdown	Epidemiological lockdown is strict surveillance or segregation based on special requirements, which must be performed at a designated location. (Source: Section 67 (1) of the Health Act)
campaign vaccination	Age-specific mandatory vaccinations should be administered from the age of 11 as part of school vaccinations. At the age of 11-14, children can be reached much more effectively at school than individually. A campaign vaccination can provide adequate protection in a short period of time. (source: Methodological letter of the NPHC on mandatory vaccinations in 2020)
population immunity	Immunity to an infectious disease that develops by inoculating or healing a certain section of the population, which, in turn, also provides protection for the unvaccinated individuals. (John-Samuel, 2000)

mode of transmission	It can be direct if the disease-causing agent enters the susceptible organism directly from the source of infection without a transmitting medium (e.g.: sexual contact, infection from animal bites). Indirect transmission happens when the pathogen reaches the susceptible individual through a living or inanimate transmitter. In some inanimate transmitting media (drinking water, bathing water, wastewater, food), pathogens can sometimes multiply, while others (objects, underwear, towels, etc.) are only mechanical carriers, in which no pathogen multiplication can be detected. The infection can also be transmitted by airborne pathogen particles (aerosols, liquid droplets, dust particles) that enter the body by inhalation. (Ádány, 2011)
vaccination	a healthcare activity, in which a vaccine is administered into the body for the purpose of active or passive immunisation, with the help of which specific immunity against the given disease can be established and enhanced (source: Section 3/A (19) of the Decree of the Minister of Welfare)