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**MANAGEMENT MODEL OF THE COVID-19 PANDEMIC IN
THE CITY OF SOFIA**

**ABSTRACT OF THE DISSERTATION
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The defence materials are available in the secretariat of the Dean's Office of the Faculty of Public Health

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INTRODUCTION

In the end of 2019, in the Chinese municipality of Wuhan, an epidemic broke out, which was caused by a new coronavirus, which quickly spread to other regions of China and the world. Later, the World Health Organization officially recognized the new coronavirus as SARS-CoV-2 type, and the disease was called COVID-19.

On January 30, 2020, the World Health Organization (WHO) declared a public health emergency of international significance related to the coronavirus infection spread. On March 11, WHO, due to the rapid spread of COVID-19 and after an assessment of the setting, determined the situation as “pandemic”.

As per data of the European Center for Disease Prevention and Control from 31.12.2019, and as of the 9th week of 2022, **446,363,008 COVID-19 cases** have been reported (in accordance with the applied case definitions and testing strategies in the affected countries), and **6,019,640 deaths**. [113] From the official announcement of the COVID-19 pandemic in Bulgaria and the notification for the first patients on 8.03.2020, until 24.03.2022 the total number of registered cases is 1,129,641 (morbidity 314,51‰ on 100,000 for 14-day period). [123]

The situation caused by coronavirus is of an unprecedented scale. This made necessary the imposition of new measures worldwide, which put the health system capacity under immense pressure.

The challenges of the COVID-19 pandemic caused unprecedented collaboration in the European Union (EU), which surpassed the traditional framework of actions. The cross-border nature of the crisis forced the search for solutions for common actions and applying more structured and comprehensive policy within the European Community based on the enhanced coordination at all levels and the adoption of decisions by consensus at EU level. The European Community institutions approved documents with a package of measures that covered an increasing number of areas of health care and other public life policies in order to coordinate the actions of the member states and assist them in monitoring and limiting the consequences of the pandemic.

When there is a new pandemic outbreak, a need arises for finding new solutions and implementing them on national level. So far, there were five COVID-19 waves in the country that have put the hospital system under pressure.

The challenge that COVID-19 posed in 2020-2021 tested the entire health care system in Bulgaria. The pandemic situation has been extraordinary, very dynamic, and it required quick and adequate actions. This necessitated periodic assessments and analyzes of the epidemic situation and proposing measures related to limiting its spread, both at national and regional level.

In this context, this dissertation paper presents the necessity of the establishment of a management model of the pandemic in the conditions of COVID-19 in Sofia.

METHODOLOGY OF THE RESEARCH

PURPOSE

The purpose of the dissertation paper is based on thorough research and analysis of the main epidemiological indicators characterizing the spread of COVID-19 in the Sofia-City District in the period 2020-2021 and the measures taken for decreasing the spread of the disease and developing a management model of the COVID-19 pandemic in Sofia.

TASKS

For the realisation of the formulated purpose, the following main *tasks* have been established:

1. Presenting the responsible institutions and the activities during the COVID-19 pandemic in the Republic of Bulgaria.
2. Performing a review, analysis and assessment of the health care system in Bulgaria in terms of resources (labour and material — beds and medical facilities), results (morbidity), and effects (death rate — total and paediatric, causes of death and average life span).
3. Analysing the economic and social development of the countries in the EU due to the COVID-19 pandemic in the following aspects: business and economic, labour market, state finances, and death rate.
4. Presenting and analysing the main epidemiological indicators characterizing the spread of COVID-19 in the Sofia-City District in the period 2020-2021.
5. Research and analysis of the activities on the territory of Sofia-City, related to the spread of COVID-19 in the period 2020-2022.
6. Analysis of the financial, material, and technical security of the Sofia Regional Health Inspectorate in the conditions of COVID-19 and the announced state of emergency and epidemic situation on the territory of the Republic of Bulgaria.
7. Research and analysis of the public opinion, awareness and fears regarding COVID-19 in Bulgaria.
8. Developing and proposing a management model for the COVID-19 pandemic in Sofia.

WORKING HYPOTHESIS

To prove that, in order to ensure high-quality medical treatment and management of the pandemic based on the results of the researches and analyses of the main epidemiological indicators characterizing the spread of COVID-19 and the activities on the Sofia-City territory related to decreasing the spread of the disease, the following are of utmost importance:

- ✓ the epidemiological information for spreading the disease; necessity of timely anti-epidemic measures at various levels in view of limiting the spread of COVID-19;
- ✓ the role of specific immunoprophylaxis against COVID-19, in order to limit the spread of the virus by reaching a high immunization coverage among the population;

- ✓ The necessity of optimizing the activity of the Regional Health Inspectorate related to the control of the spread of COVID-19.

The analysed and assessed factors could be used to develop a management model of the COVID-19 pandemic in Sofia.

MATERIALS AND METHODS OF THE RESEARCH

Depending on the set scientific tasks, the observation object, the units, and their characteristics are specified.

The object of this research is the COVID-19 pandemic.

The research is complex. The specific scientific tasks, the object, the units, and the characteristics of the observation are related to the specificity of the development.

One of the components includes research and analysis of the main epidemiological indicators characterising the spread of COVID-19 in Sofia-City District in the period 2020-2021. The analysis is based on the data of the epidemic research of 178,147 cases confirmed with RT-PCR or rapid antigen test (RAT) for SARS-CoV-2 in the laboratories, affirmed with Order No. 724/22.12.2020 of the Minister of Health, located in Sofia and registered in the Unified Information System for Combating COVID-19.

The second component includes analysis of the activities on the territory of Sofia-City, related to the spread of COVID-19 in the period 2020-2022, related to:

- Laboratories opened for Covid-19;
- Covid zones opened;
- Designated sites for Covid-19 vaccination;
- Mobile teams for Covid-19 vaccination;
- Allocation of beds in inpatient medical facilities for Covid-19 patients;
- The medical products used in the treatment of Covid-19 patients;
- Oxygen necessity in the medical facilities for treatment of Covid-19 patients;
- Covid-19-infected staff in the medical facilities for inpatient care;

The third component is an analysis of the financial, material, and technical security of the Sofia Regional Health Inspectorate in the conditions of COVID-19 and the announced state of emergency and epidemic situation on the territory of the Republic of Bulgaria.

The fourth component includes survey of 1,861 people throughout the whole country selected at random, ages 18-69+, conducted in one month in the period from 01.08.2022 until 01.09.2022. The research was conducted via anonymous survey consisting of 24 closed-ended questions.

The anonymity of the respondents has been fully protected as per all requirements and the confidentiality ethics code.

The survey aimed at presenting and analysing the public opinion, the awareness and fears in terms of the COVID-19 disease in Bulgaria, as the following have been researched:

- the awareness of the respondents on COVID-19;
- their fears in terms of the spread and course of COVID-19;
- the manifestations of post-COVID-19 syndrome;
- opinion of the citizens on the measures taken by the executive authority in terms of limiting the spread of COVID-19;

- readiness for observing the measures for prevention and limiting the spread of COVID-19;

The statistical processing of data has been implemented via MS Excel spreadsheet. The system supports a module for the implementation of a number of activities, such as statistical analysis of data that is used to analyse experimental procedures, including descriptive statistics, construction of histograms, charts, various methods of comparing samples, calculation of correlation coefficients, regression, analysis of variance, etc.

The obtained results were processed, achieving a quantitative and qualitative analysis of the obtained data.

The logical units from the observations are:

- the registered patients in the Unified Information System for Combating COVID-19;
- The activities on the territory of Sofia-City related to the spread of COVID-19;
- The Sofia Regional Health Inspectorate.

Technical unit for the observation of Sofia-City District.

Research documents

The main documents used for collecting primary information are:

- **Data from laboratories in medical and health facilities and the Sofia Regional Health Inspectorate.**
- **The Unified Information System for Combating COVID-19**
- **Survey for citizens – APPENDIX 2.**

Methods of the research

For collecting the necessary information

The following methods have been used in the dissertation paper:

Sociological methods:

- Documentary method: various regulatory documents related to the COVID-19 pandemic in Bulgaria and the European countries have been researched: reports on the activity of the health care system, data of the National Statistical Institute, the National Health Insurance Fund, the National Center for Public Health and Analysis, and the Ministry of Health; various reports, articles, publications of official institutions and organizations; scientific publications on the topic in national and international literary sources;
- descriptive retrospective epidemiological study — describing the spread of the disease in relation to various variables such as time, place and personal characteristics, compare the patterns of the disease manifestations between and within a certain population;
- survey method – citizens from the whole country, age 18 - 69+, have been surveyed.

Methods for processing the information:

Statistical methods. In the development, a wide number of descriptive and analytical-statistical methods have been used:

1. *Descriptive analysis* in a table, the frequency distribution of the considered

parameters, broken down by study groups, is presented.

2. ***Pearson's chi-square test and Fisher's Exact Test*** — for checking hypothesis for the presence of correlation between the category variables.
3. ***Variation analysis*** — for assessing the characteristics of the central tendency and statistical dispersion.
4. ***Graphical analysis*** – for visualization of the obtained results.

The specified methods of conducting the research complement each other, which allows the information to be assessed in many ways.

A complex methodology was used to objectify the observed regularities and analyse the collected information. The indicators have been evaluated at a significance level $\alpha=0.05$.

Quantitative analyses have been performed with a statistical application package — SPSS 22.0. MICROSOFT OFFICE products were used for tabular and graphic processing and presentation.

OWN RESEARCH. RESULTS AND DISCUSSION.

1. Analysis of the COVID-19 pandemic in the Sofia-City District for the period 2020-2021

This analysis presents the main epidemiological indicators characterising the spread of COVID-19 in Sofia-City District in the period 2020-2021. The analysis is based on the data of the epidemic researches of 178,147 cases confirmed via RT-PCR or rapid antigen test (RAT) for SARS-CoV-2 in the laboratories, affirmed with Order No. 724/22.12.2020 of the Ministry of Health, located in Sofia and registered in the Unified Information System for Combating COVID-19.

The multi-fold increase in the incidence of acute infectious diseases (AID) in the Sofia-City District in the last two years (2021 and 2020) compared to the previous years, is due to the registered incidence of COVID-19, almost equal to the total incidence for the district (respectively – 9710.71‰ and 4327.25‰) – Table 1.

Table 1. Morbidity, mortality, and lethality from acute infectious diseases* in the Sofia-City District for a five-year period (2017-2021)

Year	Number of infected	Morbidity /100,000/	Number of deceased	Mortality /100,000/	Lethality (%)
2021	127,048	9,710.71	2,426	185.42	1.90
2020	57,500	4,327.25	863	64.95	1.50
2019	12,414	940.59	20	1.52	0.16
2018	8,698	657.19	19	1.44	0.22
2017	11,797	893.84	20	1.52	0.17

* Excl. influenza, acute respiratory infections, AIDS, and sexually transmitted infections

The official annual data on COVID-19, submitted by the Sofia Regional Health Inspectorate to the National Center for Disease Control and Prevention for 2021, indicate a two-fold increase in both registered cases (124,861) and annual morbidity (9542.94‰), compared to the previous year 2020, when 53,286 confirmed cases were registered, and the incidence was 4,010.11‰.

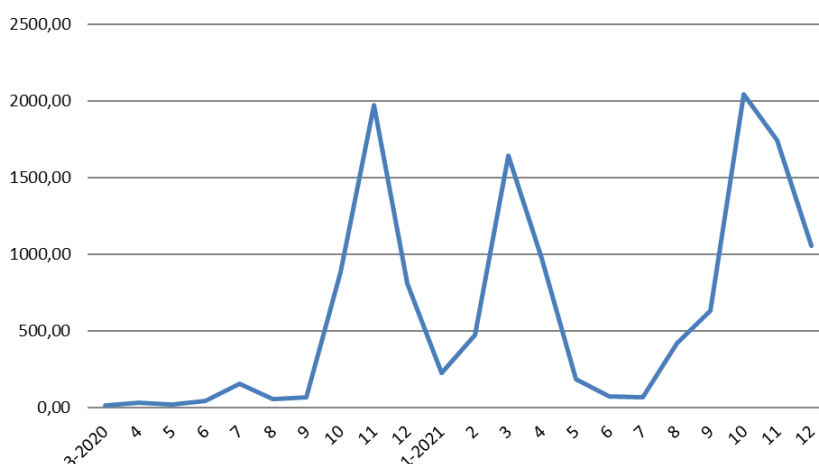
Thus, for the second year in a row since the beginning of the COVID-19 pandemic, the disease has a leading role in the structure of the infectious morbidity in Sofia-City District with a relative share in 2021 of 98.17% — far more than chicken pox (0.86%), gastroenteritis/enterocolitis (0.59), scarlet fever (0.25) and other acute infectious diseases (0.13).

The registered deaths and mortality from acute infectious diseases (2,426 cases; 185.42‰) in 2021 and 2020 (863 cases; 64.95‰) significantly exceeded those in the previous years — Table 4. The mortality, which was over 120 times higher in 2021 and over 40 times higher in 2020 compared to the previous three non-epidemic years, was due to deaths

from COVID-19 — 859 deaths in 2020 (mortality of 64.65‰) and 2424 in 2021 (mortality of 185.26‰). The total lethality from acute infectious diseases in 2020 and 2021 was respectively 1.50% and 1.90%, and the lethality from COVID-19 alone was higher than the total lethality from acute infectious diseases in both years, respectively — 1.61% and 1.93%.

The start of the epidemic spread of COVID-19 in the district was on 10.03.2020 — Table 2. The morbidity curve in the district resembles that of the country. After the first two recorded waves of the epidemic in 2020 (July-August and October-November) and the reported decrease in the total incidence in December to 225.16‰, a smooth rise was observed in January 2021 and in March it reached 1642.30‰ (a third wave). This was followed by a steep decline in May reaching very low levels (below 100‰) in June and July, respectively – 72.07‰ and 70.31‰, and a new epidemic rise (a fourth wave) with a peak in October reaching 2046.22‰ (with a maximum 14-day morbidity in week 44 of 1373.10‰) – Figure 1.

Figure 1. Morbidity of the COVID-19 pandemic in the Sofia-City District for the period 2020-2021



The incidence was equal for both genders. The male:female ratio was 1:1.1 (83488/94659).

Age-related morbidity varied widely. Adults were most affected, with the highest incidence in the 50-54 age group — 17965.9‰ - Figure 2. Although the rate of incidence was high, the disease in this age group was more often mild or asymptomatic.

Figure 2. Morbidity by age

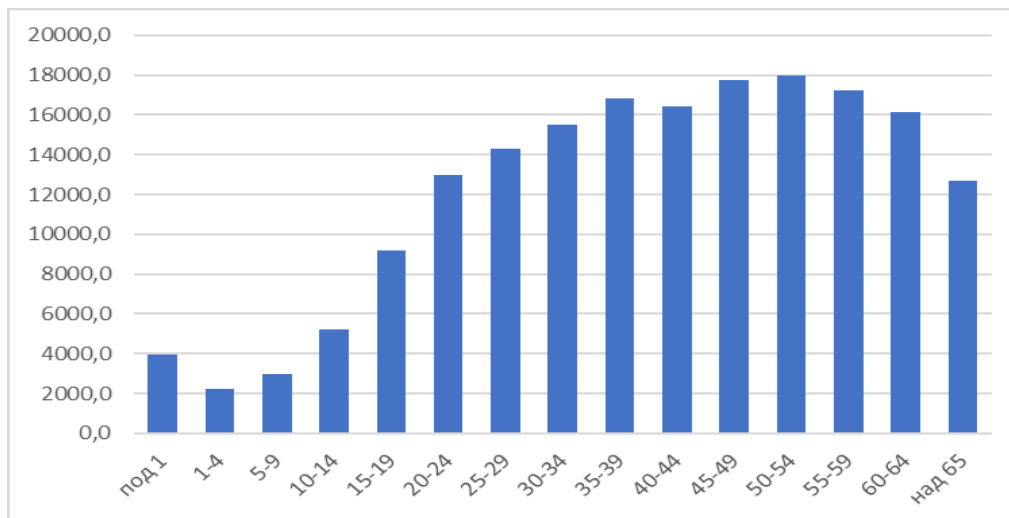
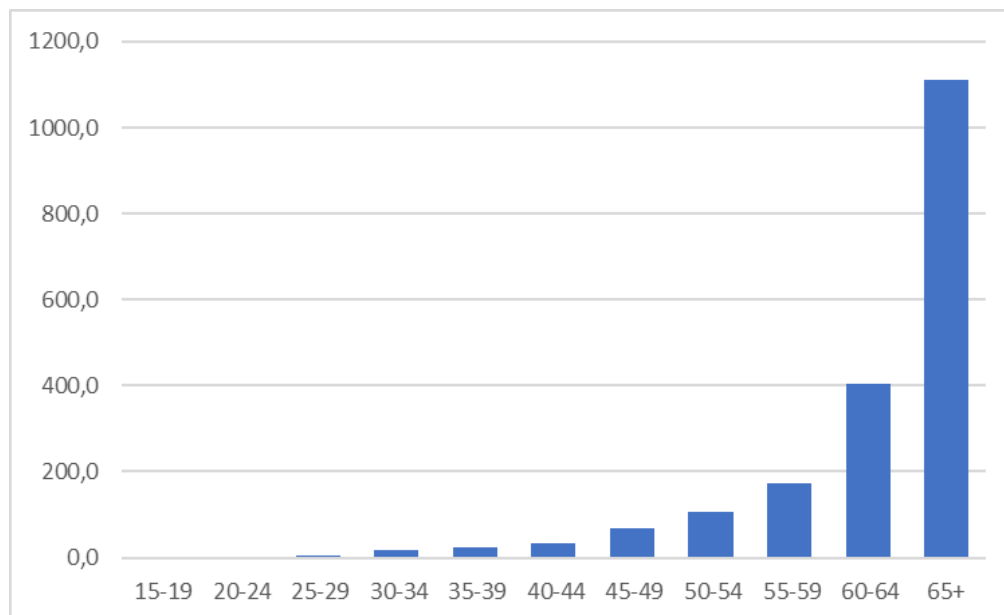


Figure 3. Mortality by age



In the group of people over 65 years of age, a lower incidence was observed (12660%000), compared to other age groups. Regardless of the observed lower morbidity, the severity of the disease in seniors over 65 was much greater. The course was characterized by pronounced clinical symptoms, complications, and much higher mortality (1110.2%000) — Figure 3. The lethality reached 8.61%. Out of a total of 3,283 deceased, 79.5% (2,611 cases) were over the age of 65!

For the entire period, the relative share of people that were treated at home, with a mild or asymptomatic course, was 81.5% (145,263 cases). 32,884 people were hospitalized, of which 4,321 patients (13.1%) required intensive care.

Most often, excluding the specialized COVID-wards of the medical facilities, cases were registered in the emergency rooms, in the emergency centres, in the surgery wards, the urology wards, intensive care units, orthopaedics and traumatology, pulmonology, internal medicine, ophthalmology, vascular surgery wards, cardiology, neurological and psychiatric wards in the Sofia hospitals and medical centres, in independent or group practices for primary care, as well as in pharmacies in various regions in Sofia.

Of all confirmed COVID-19 cases, 4,386 were medical professionals. Of these, 38.8% were doctors, 36.6% were nurses, midwives, laboratory assistants and paramedics, and 24.6% were orderlies, caregivers, pharmacists, physiotherapists, and employees from the administration and maintenance of medical facilities, incl. coordinators, secretaries, maintenance technicians, drivers. The most affected were the medical specialists in the specialized COVID-19 wards, the infectious wards, anaesthesiology and intensive care units, in the emergency rooms and the emergency medical centres.

In 84.5% (3,706 cases), the clinical manifestation of the diseases required hospitalization. In 165 medical professionals, the disease was severe, with complications and the need for intensive care and respiratory resuscitation. The disease was fatal for 19 medical professionals. According to data of the medical facilities, for the two-year period, 11,831 people from the staff and 5,104 patients were tested as contacts of confirmed COVID-19 cases. Of these, 131 staff and 86 patients (including people in social homes) were with a positive RT-PCR result.

In 96.7% of the cases, the infection took place on the workplace while the medical staff was performing their official duties — during direct contact with or treating/servicing people sick with or carrying COVID-19.

During the considered period, there were numerous outbreaks of COVID-19 in medical facilities, schools, kindergartens, and public facilities in the territory of the district. The epidemiological information on the more significant outbreaks was reported on a monthly basis to the Ministry of Health in the period July 2020 – December 2021, namely 2010 infected people and 17,508 people exposed to Covid-19, in 307 outbreaks.

In the medical facilities with registered nosocomial outbreaks, immediate anti-epidemic measures were carried out, and the confirmed cases were promptly isolated or transferred to hospitals with available COVID sectors, where they were treated by separate personnel. All people exposed to COVID from the staff were examined periodically, and the positive ones were isolated. Orders were issued to temporarily suspend the activities of the wards until the staff tested negative. Bedridden people exposed to COVID were examined and, if possible, discharged for home treatment, with a recommendation for GP observation during their quarantine. The affected units of the medical facilities were thoroughly disinfected.

Although during the period under review, all current guidelines and recommendations of the WHO and ECDC, as well as orders and regulations of the Ministry of Health on the limitation of the spread of COVID-19, were periodically discussed, at the basis of the existing risk of the occurrence of nosocomial COVID transmission and infection of health care professionals, several important risk factors stand out. At the beginning of the epidemic, when

there were just a few cases, there was no clinical guidance for COVID-19 in combination with high workload due to a shortage of personnel, extended working hours, working with potentially exposed patients, which often lead to the masking of the main manifestations of the disease, the work “at any cost” with priority on the patient’s life often lead to risking the safety of the medical professionals, which was aggravated by the absence of habits to use PPE and its proper use. With the progress of the epidemic in the medical facilities in Sofia, there was a switch to the other extreme — for a short period of time, every patient was treated as potentially infected with COVID-19.

The developed guidelines and protocols and their implementation under the control of the Sofia Regional Health Inspectorate, the carrying out of periodic briefings, as well as the allocation of specialized structures for the isolation and treatment of infected, potentially infected, or people suspected of having COVID-19, significantly improved the work organization. Strict compliance with the introduced measures, the established organization for systematic internal control for compliance with work protocols and rules, monitoring and timely replenishment of PPE stocks and the establishment of stereotypes of behaviour guaranteed the safety of the staff and the prevention of nosocomial transmission.

In total, for the period 2020-2021, 361,771 people were quarantined by the Sofia Regional Health Inspectorate, as follows: 178,147 confirmed cases (isolated at home or hospitalized) and 82,985 people quarantined as contacts of confirmed COVID-19 cases. 100,639 people were quarantined because they arrived in the country from high-risk countries, through Terminals 1 and 2 of the Sofia Airport.

6,996 inspections were carried out for compliance with the anti-epidemic measures in relation to COVID-19, listed in the current orders of the Minister of Health. 761 notices and 292 tickets were issued for administrative violations in the application of anti-epidemic measures in medical or public facilities, as well as with the immunization process or the way COVID-19 tests were made by the authorized medical facilities in the district.

With the introduction of specific immunoprophylaxis against COVID-19, the main goal of the health system was to limit the spread of the virus by reaching a high immunization coverage among the population in the shortest period of time possible. From the end of 2020 (when the immunization campaign started in Sofia) until 31.12.2021, 523,114 people or 42.1% of the district residents were fully vaccinated (with a completed vaccination course). In total, the administered vaccines reached almost one million doses: 992,959. The administered booster doses were 79,727 or 15.2% of those fully vaccinated were re-vaccinated.

The focus in conducting the COVID-19 immunization campaign in the district was put on the risk groups — people who were at a higher risk of severe clinical manifestation and complications requiring hospitalization and intensive care and people at high risk of mortality and lethality. Efforts were made to vaccinate seniors (people over 65), incl. those living in social institutions, as well as medical specialists, teachers, professors, and staff working in educational and children's facilities. For this purpose, an organization was created by the Sofia Regional Health Inspectorate to open stationary, outdoor, and mobile immunization sites, in cooperation with teams of the emergency medical centres and the Sofia Municipality. As a result, 47,493

(20.6%) people over 65 years of age, 654 (31.7%) people in social institutions, 8,271 (27.2%) employees of educational facilities, and 18,252 (60.6%) medical specialists in the district were vaccinated.

2. Analysis of the activities on the territory of Sofia-City, related to the spread of COVID-19 in the period 2020-2022

2.1. Laboratories opened for Covid-19

With Order No. ПД-01-724/22.12.2020 (with its multiple amendments) by the Minister of Health and on the basis of Art. 29 of Ordinance No. 21/2005 on the procedure for registering and reporting infectious diseases and Art. 73 of the Administrative Procedure Code, medical facilities, health facilities and laboratories in regional health inspectorates were established on the territory of Sofia to conduct highly specialized medical-diagnostic test "Polymerase Chain Reaction (PCR) as proof of COVID-19"

PCR and rapid antigen testing were carried out by independent medical diagnostic laboratories, medical centres, diagnostic-consultative centres, hospital care facilities, emergency medical care centres, complex oncology centres, and the regional state inspectorate.

The highly specialized medical-diagnostic test "Polymerase chain reaction for proof of COVID-19" was carried out in the designated laboratories in medical and health facilities and regional health inspectorates according to the Order of the Minister of Health, which as of 10.03.2022 were a total of 49.

2.2. Covid zones opened on the territory of Sofia-city

In the diagnostic-consultative and medical centres on the territory of Sofia-City, COVID zones have also been opened to facilitate the work of hospitals during the coronavirus epidemic waves, in which a special package of tests was provided to the COVID-19 patients.

In the Covid zones (27 in total), a team or teams were formed to examine people with suspected COVID-19 infection, as well as to treat people with confirmed COVID-19 infection. The medical facilities teams served both patients referred with "Medical referral for consultation or conducting joint treatment" (form M3-H3OK No. 3) and people who were there at their own initiative.

The mechanism and the amount of funding for the activities carried out in the COVID sector were defined in the "Methodology for determining the amounts paid by the National Health Insurance Fund to contractors providing medical assistance, dental assistance, and medical diagnostic activities for work under unfavourable conditions if epidemic situation was to be declared".

In Sofia, four 24-hour "Covid zones" were opened, which served patients with COVID-19 symptoms.

Table 2. Activity of the COVID zones on the territory of Sofia-City for the period 01.11.2021 to 06.03.2022.

Number of examinations	Number of laboratory tests	Number of imaging tests	Number of prescriptions for additional treatment	Number of tests
28,971	9,718	7,299	9,419	59,220

The examined Covid-19 patients in the municipal COVID zones from 04.01.2022 to 04.03.2022 was 21,341 people, of which 8,332 tested positive.

58,186 people with COVID-19 were examined in the municipal COVID zones from 04.01.2021 to 31.12.2021, of which 14,268 tested positive.

2.3. Designated sites for Covid-19 vaccination

Pursuant to Art. 59 (1.4, 2) of the Health Act and Art. 5 of Ordinance No. 15/2005 on immunizations in the Republic of Bulgaria and in connection with the implementation of the National COVID-19 Vaccination Plan in the Republic of Bulgaria, adopted by Decision No. 896/December 7, 2020, of the Council of Ministers, temporary COVID-19 vaccination sites were opened.

Currently, there are 81 vaccination sites on the territory of Sofia-City according to the latest Order ПД-01-102/22.02.2022 of the Minister of Health.

In connection with the launch of the COVID-19 vaccination campaign by the WHO, the vaccination of children was allowed — in June 2021 for children 12 and above, and in December 2021 for 5- to 11-year-olds.

On the territory of Sofia-City, 5 temporary immunization sites were also opened for administering the Comirnaty child vaccine.

Also, for the territory of Sofia-City, an online-based platform has been developed where citizens can sign up for vaccination against COVID-19 at a time convenient for them and at their preferred immunization site.

2.4. Mobile teams for Covid-19 vaccination

The Sofia Regional Health Inspectorate cooperates with the mobile teams of the emergency medical centres and Sofia Municipality.

The mobile teams contribute to the greater coverage of all citizens willing to be vaccinated, such as: disabled people in their homes, nursing homes, private companies, and administrative institutions. Vaccination sites in shopping malls, Metropolitan EAD Stations, Metro shops, etc. were also opened.

From the beginning of the vaccination campaign until 01.03.2022, a total of 35,077 people were vaccinated by mobile teams of Sofia emergency medical centres, as 493 of them were with reduced mobility.

The total number of mobile teams was 27. This number varied depending on schedules, the current epidemic situation, and the workload of the Sofia emergency medical

centres.

For the period from 17.05.2021 until 31.12.2021, 96,212 vaccine doses were administered by teams of the Sofia Municipality in all vaccination sites (municipal hospitals and mobile sites).

From 04.01.2022 to 04.03.2022, teams of Sofia Municipality in all municipal vaccination sites (including during the weekend), in diagnostic-consultative centres, hospitals, the subway, as well as on site in companies and social homes, a total of 24,895 vaccine doses were administered.

2.5. Allocated beds in medical facilities for inpatient care for Covid-19 patients

Based on an analysis of the morbidity in Sofia, beds in medical facilities for in-hospital care were allocated for hospitalization and treatment of COVID-19 patients.

The entire organization of the activity in the medical facilities has taken place under strict compliance with all anti-epidemic measures introduced so far and immediate isolation of people with suspected coronavirus infection in a designated area separated from other patients.

Depending on the rate of registered Covid cases, the clinical course, and the severity of the condition, an assessment was made of the need of beds for patients with COVID-19 without complications and beds in intensive care units.

Pursuant to Art. 63 (2), (3), and (5) of the Health Act in connection with Art. 10 of the Organizational Rules of the Regional Health Inspections and the state of emergency declared by the Decision of the National Assembly of the Republic of Bulgaria on 13.03.2020 in view of the COVID-19 pandemic and Order No. ПД-01-159/27.03.2020 of the Minister of Health, hospital care facilities for active treatment and the respective structures within them were designated to treat and monitor patients with COVID-19, as follows:

- Treatment and monitoring of COVID-19 patients without complications
- Treatment and monitoring of COVID-19 patients in condition requiring intensive care

The first wave of occupancy of beds for COVID-19 patients in medical facilities during the year took place in May 2020 (Table 3.).

Table 3. Average daily occupancy and available beds in May 2020.

2020	Beds occupied by COVID-19 patients		Available beds for accommodation of COVID-19 patients	
	for patients without complications	for intensive care patients	for patients without complications	for intensive care patients
May	135	23	298	162

In June 2020, with Order ПД-01-296/16.06.2020 of the director of the Sofia Regional Health Inspectorate, a mandatory number of beds was set for the treatment of patients with a primary or accompanying SARS-CoV-2 infection in the inpatient facilities on the territory of

Sofia-City: 259 beds in total, of which 196 for uncomplicated conditions and 63 beds in ICUs.

The next serious peak of COVID-19 took place in November and December 2020, which lead to a larger number of occupied beds in inpatient medical facilities for COVID-19 patients.

In November 2020, with Order ПД-01-766/13.11.2020 of the director of the Sofia Regional Health Inspectorate, a mandatory number of beds was set for the treatment of patients with a primary or accompanying SARS-CoV-2 infection in the inpatient medical facilities on the territory of Sofia-City: 3,725 beds in total, of which 3,466 for uncomplicated conditions and 259 beds in ICUs. (Table 4.)

Table 4. Average daily occupancy and available beds in November 2020.

2020	Beds occupied by COVID-19 patients		Available beds for accommodation of COVID-19 patients	
	for patients without complications	for intensive care patients	for patients without complications	for intensive care patients
November	1446	188	1,056	26

In December 2020, with Order ПД-01-796/17.12.2020 of the director of the Sofia Regional Health Inspectorate, a mandatory number of beds was set for the treatment of patients with a primary or accompanying SARS-CoV-2 infection in the inpatient medical facilities on the territory of Sofia-City: 3728 beds in total, of which 3435 for patients without complications and 293 beds in ICUs. (Table 5.)

Table 5. Average daily occupancy and available beds in December

2020	Beds occupied by COVID-19 patients		Available beds for accommodation of COVID-19 patients	
	for patients without complications	for intensive care patients	for patients without complications	for intensive care patients
December	1,664	258	1,772	34

In March 2021, with Order ПД-01-120/13.03.2021 of the director of the Sofia Regional Health Inspectorate, a mandatory number of beds was set for the treatment of patients with a primary or accompanying SARS-CoV-2 infection in the inpatient medical facilities on the territory of Sofia-City: 4057 beds in total, of which 3713 for patients without complications and 344 beds in ICUs. (Table 6.)

Table 6. Average daily occupancy and available beds in March 2021

2021	Beds occupied by COVID-19 patients		Available beds for accommodation of COVID-19 patients	
	for patients without complications	for intensive care patients	for patients without complications	for intensive care patients
March	1,758	229	1,616	126

In April 2021, according to Order ПД-01-139/24.03.2021, a mandatory number of beds in medical facilities were allocated for the treatment and hospitalization of patients with SARS-CoV-2 infection, based on the morbidity rate and to create organization and provide conditions for the necessary hospital treatment of patients with other diseases who are not infected with coronavirus. The need of specialized beds for high-flow oxygen devices in the territory of Sofia-City also arisen. **A total of 3,977** beds, of which 3,419 for uncomplicated conditions and 558 for intensive treatment were allocated according to Annex No. 2 of the order. (Table 7.)

Table 7. Average daily occupancy and available beds in April 2021

2021	Beds occupied by COVID-19 patients		Beds available for COVID-19 patients	
	for patients without complications	for intensive care patients	for patients without complications	for intensive care patients
April	1,925	370	1,494	185

In November 2021 – as per Order ПД-01-378/05.11.2021 in connection with the introduction of temporary measures and activities for the organization and restructuring of the medical facilities in the territory of the district to ensure the treatment and hospitalization of coronavirus patients, depending on the morbidity, the clinical picture of the disease, the severity of the condition and the need for hospitalization of such patients, taking into account the strategic health care framework at different levels of morbidity, defined in the National Operational Plan for dealing with the SARS-CoV-2 pandemic, adopted with a Decision of the Council of Ministers No. 518/15.07.2021 and after a meeting held, as per Order No. ПД-01-616/22.07.2021 of the Minister of Health, of the Regional Crisis Headquarters of the Sofia District on the National Operational Plan to deal with the SARS-CoV-2 pandemic in order to create an organization that takes into account the specifics and needs on the territory of Sofia and in connection with Decision No. 629/26.08.2021 of the Council of Ministers to extend the period of the emergency epidemic situation announced by Decision No. 325/14.05.2020 of the Council of Ministers, on the basis of Art. 8-c (1), (3) of Ordinance No. 49/18.10.2010 on the basic mandatory requirements on the operation and internal order of medical facilities for hospital care and homes for medical and social care – a mandatory number of beds on the territory of Sofia was determined: **3,749 in total**, of which 3,232 for patients without complications and 517 beds for patients in ICUs, as per Annex No. 3 of the Order. (Table 8.)

Table 8. Average daily occupancy and available beds in November 2021.

2021	Beds occupied by COVID-19 patients		Available beds for accommodation of COVID-19 patients	
	for patients without complications	for intensive care patients	for patients without complications	for intensive care patients
November	1567	361	1667	142

Table 9. Average daily occupancy and available beds in 2021.

2021	Beds occupied by COVID-19 patients		Available beds for accommodation of COVID-19 patients	
	for patients without complications	for intensive care patients	for patients without complications	for intensive care patients

In January 2022, with Order ПД-01-33/28.01.2022 of the director of the Sofia Regional Health Inspectorate, a mandatory number of beds was set for the treatment of patients with a primary or accompanying SARS-CoV-2 infection in the inpatient medical facilities on the territory of Sofia-City: **2286 beds in total**, of which 1962 for patients without complications and 324 beds in ICUs.

In February 2022, with Order ПД-01-50/14.02.2022 of the director of the Sofia Regional Health Inspectorate, a mandatory number of beds was set for the treatment of

patients with a primary or accompanying SARS-CoV-2 infection in the inpatient facilities on the territory of Sofia-City: **3,755 beds in total**, of which 1,435 for uncomplicated conditions and 320 beds in ICUs.

Since February 2022, in addition to beds for adult Covid-19 patients, beds for children with Covid-19 were also allocated. **Accordingly, for the month there were a total of 145 beds**, of which 140 (103 paediatric and 37 neonatological) for paediatric patients without complications and 6 paediatric beds in ICUs.

The occupancy of Covid wards in medical facilities in 2020-2022 per month for patients without complications and patients requiring intensive care treatment is presented in Figures 4 and 5.

Figure 4. Occupancy of beds for patients without complications for the period 2020-2022.

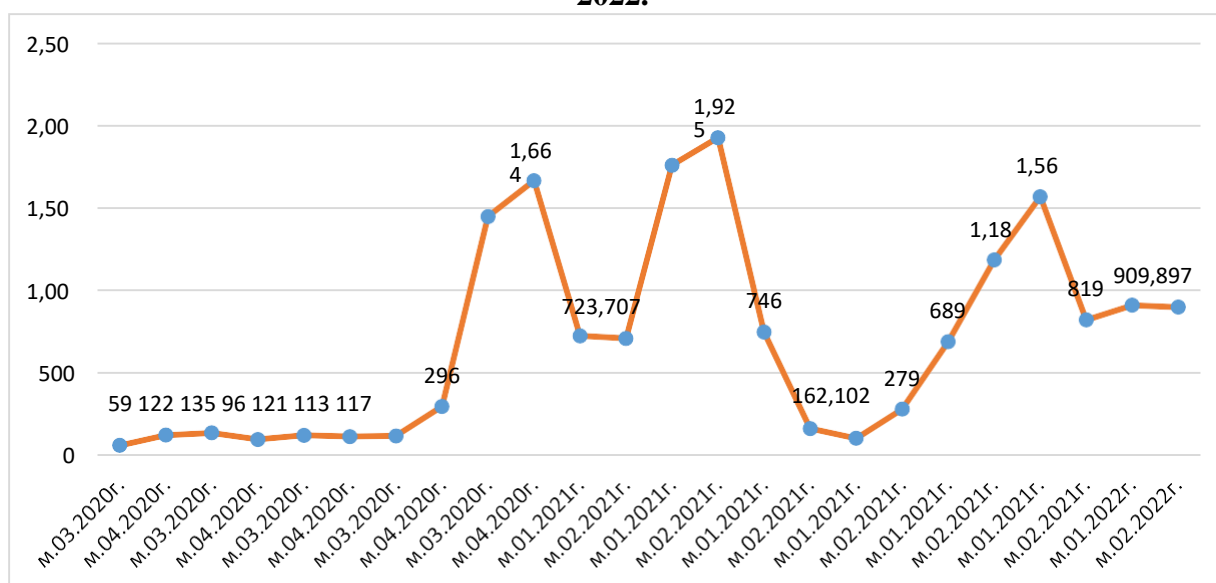
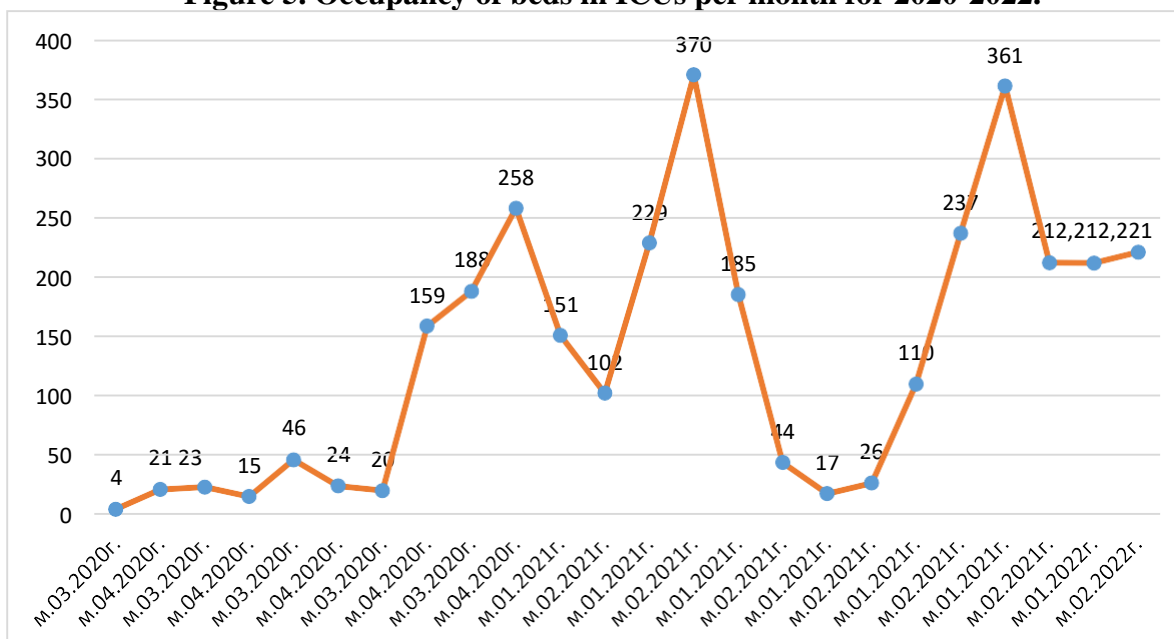


Figure 5. Occupancy of beds in ICUs per month for 2020-2022.



2.6. The medical products used in the treatment of Covid-19 patients.

In connection with the treatment of COVID-19 patients, 3 types of medicinal products were distributed on the territory of the city of Sofia: Veklury (Table 10.); Regkirona; Casirivimab and Imdevimab.

Table 10. Quantity of Veklury for the period 2020 – 2022.

period	Received quantity of Veklury	Veklury used
01.01.2020-31.12.2020	8,147	8,147
01.01.2021 – 31.12.2021	31,536	31,536
01.01.2022 – 13.03.2022	7,510	7,510
allocated in total	47,193	47,193

As for the period 2020-2022, three hospitals have the highest usage - presented in table 11.

Table 11. Usage of Veklury for the period 2020 – 2022 by Tokuda, Military Medical Academy, and Sofiamed

Medical facility	Usage of Veklury
Tokuda, 2020	1,599
Tokuda, 2021	6,613
Tokuda, 2022	1,392
Military Medical Academy, 2020	1,084
Military Medical Academy, 2021	3,536
Military Medical Academy, 2022	798
Sofiamed, 2020	593
Sofiamed, 2021	2,412
Sofiamed, 2022	592

For 2021 and 2022, a total of 5,490 monoclonal antibodies were used, presented in table 12:

- 2,900 in 2021
- 2,590 in 2022

Table 12. Quantity of Regkirona for the period 2021 – 2022

period	Quantity of Regkirona received	Regkirona usage
December 2021	2,900	2,900
February 2022	2,590	2,590
total	5,490	5,490

For 2021, a total of 604 monoclonal antibodies were used, presented in table 13:

Table 13. Quantity of Casirivimab and Imdevimab for the period 2021 – 2022

period	Quantity of Casirivimab and Imdevimab received	Casirivimab and Imdevimab usage
01.11.2021 - 30.11.2021	604	604

2.7. Oxygen necessity in the medical facilities for treatment of Covid-19 patients.

The Sofia Regional Health Inspectorate daily collected and summarized information on the available oxygen from the inpatient medical facilities with Covid wards in the territory of Sofia-City, which was daily sent to the Ministry of Health. In the event of a problem with the oxygen supply, the medical facilities promptly informed the Sofia Regional Health Inspectorate and the Ministry of Health, so that assistance for the supply could be provided. Also, once a week, the estimated amount of oxygen that would be needed for the following week was analysed and summarized.

2.8. Covid-19-infected staff in the medical facilities for inpatient care

In January 2022, information on the Covid-19-infected personnel in the inpatient medical facilities in the territory of Sofia-city began to get collected and analysed.

In the period 17.01.2022 – 23.01.2022, the morbidity of the staff was the highest.

Table 14. Covid-19-infected staff in inpatient medical facilities in the territory of Sofia-city

	as per the schedule in health care facilities for the period			of them COVID-19-infected in health care facilities			Available			Ratio of infected staff		
	number of doctors	nurses	other support staff	number of doctors	nurses	other support staff	number of doctors	nurses	other support staff	% infected doctors	% infected middle medical staff	% infected other staff
Total for the health care facilities	5,003	6,228	6,115.5	123	173	182	4,880	6,055	5,934	2.46	2.78	2.98
INCLUDING for the Covid ward	762	867	701	24	30	22	738	837	679	3.15	3.46	3.14

3. Analysis of the financial, material, and technical security of the Sofia Regional Health Inspectorate in the conditions of COVID-19

With a Decision of the National Assembly, promulgated in the State Gazette, issue 22/13.03.2020, on the proposal of the Council of Ministers and on the basis of Art. 84, item 12 of the Constitution of the Republic of Bulgaria and in connection with the growing rate of the COVID-19 pandemic, a state of emergency on the entire territory of the Republic of Bulgaria was declared, and the Council of Ministers was assigned, under item 2, to take all necessary measures to control the emergency situation in relation to the COVID-19 pandemic. In fulfilment of the functions of the Council of Ministers, related to the implementation of the management of the state health policy, including in the case of an infectious disease pandemic, carried out through the general management of activities and provision of financial means of protection, with Decision No. 884/3.12.2020 a National Plan of the Republic of Bulgaria for Pandemic Preparedness was adopted, in which the functions and duties of the regional health inspectorates, related to the management and control of the situation on the territory of the respective area in dynamical monitoring the morbidity, were comprehensively defined, as well as the used capacity of the health system, the conditions and the specificity in the spread of the infection (outbreaks) etc. At national level, organization of the vaccination process was created by adopting a National Plan for COVID-19 Vaccination on 07.12.2020 and forming a National Vaccination Headquarters to coordinate and control its implementation. In 2020, with Decree No. 401 of the Council of Ministers of 2020, Decree No. 402 of the Council of Ministers of 2020, and Decree No. 409 of the Council of Ministers of 2020 approving additional expenses under the budget of the Ministry of Health for 2020, additional funds have been provided for the purchase of vaccines and medicinal products, etc., related to the activities and measures for COVID-19 prevention and control.

Given the declared state of emergency imposed in connection with the epidemic spread of COVID-19, established in Art. 61 (1), (3) of the Health Act, the Minister of Health ordered the regional health inspectorates to introduce temporary measures and activities for the organization and restructuring of medical facilities for a period of time specified in the general administrative act, such as the establishment of an organization of the health activities related to COVID-19, as their coordination and control were assigned to the directors of the Regional Health Inspectorates, who worked in close cooperation with the medical facilities. It should be noted that at the time of the official announcement of the COVID-19 pandemic in Bulgaria and the information about the first patients on 08.03.2020, the priority for the Sofia Regional Health Inspectorate was to carry out activities on the organization and provision of health care on the territory of the Sofia City District, in connection to the spread of COVID 19, which led to the emergence of new risks affecting the activities of the Inspectorate. An organization was created for emergency mode of operation of all administrative structures in the Inspectorate, for which specialized algorithms were developed. The duties of the employees from all directorates were reassigned, as per their competences, and the work rules were updated in a timely manner in order to bring them into line with the constantly changing development of the epidemic situation and the need for an immediate reaction to any situation, given the fact that the pandemic situation was extraordinary, extremely dynamic, requiring quick and adequate actions. In view

of the complicated epidemic situation and the increased volume of work on public health protection, the employees of Sofia Regional Health Inspectorate have had to work overtime until this day, complying with the normative requirements laid down in the Act on Measures and Actions during the State of Emergency, the Labour Code, the Civil Servants Act and the orders and regulations issued by the Ministry of Health. There is overtime in the following activities:

1. Taking clinical samples for conducting laboratory SARS-CoV-2 tests from people arriving in the country from high-risk countries, from sick people or from contact persons, in social or residential institution, etc.;
2. Delivery of notices for mandatory isolation at home;
3. Delivery of notices for mandatory isolation at home upon discharge of COVID-19 patients from medical facilities;
4. Conducting epidemiological studies of COVID-19 cases;
5. Conducting laboratory tests and confirmation of COVID-19 cases;
6. Entering data on the positive persons and their contacts, ending quarantines, and any other activities in the combat against COVID-19 in the National Information System;
7. 12-hour shifts to carry out border health control at the Sofia Airport, Terminals 1 and 2, by filling in and handing quarantine certifications when checking the validity of EU digital COVID certificates or other similar document for vaccination, recovery, or testing;
8. Consultancy about COVID-19 on the emergency phone numbers and
9. Taking part in the immunization campaign against COVID-19.

Given the heavy traffic at the border checkpoints located at Sofia Airport and the impossibility of reassigning employees from other administrative units to assist the health inspectors with carrying out border health control, with letter No. 16-21-282/14.07.2020, the Minister of Health proposed to recruit volunteers to support the activities of Sofia Regional Health Inspectorate, and for the period 23.07.2020-30.09.2020, the administrative body concluded 40 contracts with volunteers. The main functions performed by the volunteers were related to supporting the activities of the border health control authorities at the border checkpoints in implementing anti-epidemic measures for stopping the spread of the COVID-19 infection, in order to ensure a continuous 24/7 work regime. The activities included administrative support to state health inspectors such as data entry, sorting documents, assisting with activities of issuing quarantine orders, filling/distributing forms/declarations to persons arriving at border checkpoints.

Considering the Decision of the Council of Ministers of 23.09.2020 to extend the emergency epidemic situation and the implementation of anti-epidemic measures in the country, in order to reduce the impact of COVID-19 on public health and the health care system, and the increasing number of positive cases with the start of the school year, continuing the activities of the volunteers to support the state health inspectors was necessary. In addition to the above duties, they were also tasked with issuing quarantine notices, they were included in taking samples and administering COVID-19 vaccines. In view of the increase in the activities carried

out until December 2021, the Sofia Regional Health Inspectorate increased the number of civil contracts concluded with individuals, the total of which was 171, and the amounts paid were BGN 209,926. As the internal verification of the data presented shows, as of February 2022, 38 civil contracts were concluded with volunteers, whose term of validity was 31.03.2022, and the amounts paid under them for the month of January were BGN 24,503.

In the course of the pandemic, there were periods in which, despite all the efforts made and the reorganization of the activities of the Inspectorate, there was a delay in the process of researching the people who had tested positive and their contact persons and entering the data into the National Anti-Covid-19 System. Urgent measures were taken to deal the problem, which consisted in not being able to research the citizens and not being able to return to their workplaces on time after the end of quarantine. The virus also affected the employees of the Inspectorate, as at times the administration was understaffed due to the large number of sick employees. This forced the Sofia Regional Health Inspectorate to turn to the media with an appeal for help. The aim of the appeal to the public was to recruit volunteers. Both individuals and legal entities responded, with whom Sofia Regional Health Inspectorate concluded contracts. The statistics by period are as follows:

For the period 01.11.2020-31.01.2021, the total announced cases for the Sofia-City District were 42,847. About 8,000 surveys were delayed, which necessitated the conclusion of a contract with Saytel for the period from 16.11.2020 to 31.01.2021. The total value of the amounts paid under the contract was BGN 41,065.20.

For the period 01.03.2021 - 30.04.2021 the total announced cases were 38,589. There was a delay with about 5,000 surveys, which required the signing of a new contract with Saytel for the period from 09.03.2021 - 30.04.2021 and paid amounts of BGN 35,402.40.

Since the beginning of November, the number of positive cases rose sharply and there were a few thousand new cases per day in Sofia, which tendency continued for a long period of time. The experience of the previous COVID waves suggested, clearly and categorically, that the scope of the Inspectorate's contracts with external contractors should be increased in a short period of time.

For the period 01.11.2021 - 31.03.2022, the following contracts were concluded with legal entities, and the corresponding amounts due under them were paid monthly as follows:

Alba Center - 04.11.2021 – 31.12.2021 – for the total value of BGN 10,032.48.

UteCredit Bulgaria EOOD – 08.11.2021 – 31.12.2021 - no value -

gratuitous work was performed by the company, and all costs were borne by the contractor.

Information service - 17.11.2021 – 31.12.2021 - for the total value of BGN 3,582.00.

Information service - 05.01.2022 – 31.03.2022 - for the total value of BGN 2,786.40.

Alba Center - 05.01.2022 – 31.03.2022 - for the total value of BGN 27,317.76.

Vox On International EAD - 14.01.2022 – 31.03.2022 - for the total value of BGN 5,258.52.

Debt Collection Agency EAD - 14.01.2022. – 31.03.2022 - no value – gratuitous work was performed by the company, and all costs were borne by the contractor.

EOS Matrix EOOD – 20.01.2022 – 31.03.2022 - no value– gratuitous work was performed by the company, and all costs were borne by the contractor.

Carrying out a comprehensive analysis of the activity of the administrative body from

the moment of the declaration of the state of emergency on the territory of the Republic of Bulgaria until today, it should be noted that the Sofia Regional Health Inspectorate was facing the need to control the pandemic without having the necessary material security, which urged the emergency delivery of the first batches of personal protection equipment (PPE), needed by the medical facilities in the territory of Sofia, by purchasing them directly from their manufacturers and importers. In a timely manner, organization was created to deliver personal protective equipment from other regional health inspectorates to the Sofia Regional Health Inspectorate where it was needed the most, given its large number of citizens and the type of medical facilities on its territory. As a result of the joint efforts of the Ministry of Health and the Sofia Regional Health Inspectorate in January 2021, when COVID-19 rates were higher, the process of delivery, transport, storage, and distribution of PPE was normalized so that the medical facilities, as well as all anti-Covid units, could be supplied in a timely manner with all necessary supplies and equipment. The employees of the Sofia Regional Health Inspectorate working on the border checkpoints of Sofia Airport (Terminals 1 and 2), the employees of the border police, as well as the employees of all state institutions providing administrative and other services to citizens, were fully equipped with personal protective equipment, disinfectants, and rapid antigen tests. The Sofia Regional Health Inspectorate ensured the safety of the people involved in the organization and conduct of the elections for representatives of the people and the elections for the President of the Republic of Bulgaria, by carrying out the overall organization of the provision and transportation of PPE, disinfectants, and all necessary consumables to the polling sections on the territory of Sofia. Given the organization created and the control on their delivery carried out by the Sofia Regional Health Inspectorate, for the period from March 2020 to February 2022, almost 2,000,000 protective masks, 4,500,000 gloves, 1,500,000 disposable shoe covers, 200,000 pieces of protective clothing, as well as over 30 tons of different types of disinfectants were delivered to individuals and legal entities. As the report attached to this analysis shows, during the period under consideration, 1,638,570 rapid antigen tests were provided to the Sofia Regional Health Inspectorate, and respectively purchased by it, with the available quantity as of 28.02.2022 being 209,200 pieces. So far, the employees of the Inspectorate have received and provided 1,429,370 of them for the needs of all applicants. The organization of the transportation of the above PPE, consumables, materials and vaccines was carried out by the Sofia Regional Health Inspectorate with the assistance of a number of companies that provided motor vehicles for the needs of the administrative body for a certain period of time, against a fee or free of charge, such as RIDE SHARE BULGARIA EAD, which provided 5 electric cars, MOTO PFOHE — one car, Bulgarian Automobile Industry EAD assisted the Inspectorate with a Great Walt pickup truck and it leased a multi-purpose pickup truck

Volkswagen Caddy for the transportation of vaccines and PPE. They were used by the Inspectorate to secure the mobile teams that were created, which carried out the activities of handing out prescriptions for the isolation of people sick with COVID-19.

With regard to the financial and accounting policy of the Sofia Regional Health Inspectorate, it should be noted that the reports on usage of the budget of the Sofia Regional Health Inspectorate for the period 2020 - 2021 were compiled in accordance with the funds spent from the budget of the Sofia Regional Health Inspectorate and the funds allocated by the

Ministry of Health to deal with the emergency situation in the country.

Carrying out a comprehensive analysis of the expenses of the Sofia Regional Health Inspectorate as of 31.12.2020, it was found that expenses in the amount of BGN 3,206,957.85 were incurred, reported in paragraphs and sub-paragraphs of the Unified Budget Classification, which were presented in detail in the tables, prepared to the present analysis, as follows:

- ✓ Total amount for additional remuneration for COVID-19 /1000.00 BGN/ The Sofia Regional Health Inspectorate has spent the sum of BGN 871,000.00.
- ✓ Total amount for overtime - BGN 539,558.93.
- ✓ The total amount for materials, rents, PPE, disinfectants, consumables to deal with the spread of COVID-19 spent by the Sofia Regional Health Inspectorate was BGN 1,796,398.92, of which 1,789,822.79 were paid via bank transfers to the suppliers and 6,576.13 were paid by the treasury of the Sofia Regional Health Inspectorate.

As of 31.12.2021, the expenses of the Sofia Regional Health Inspectorate were BGN 2,945,835.03. They were reported in sections and subsections of the Unified Budget Classification:

- ✓ Total amount for additional remuneration for COVID-19 /BGN 1000.00/ The Sofia Regional Health Inspectorate spent BGN 2,256,972.20.
- ✓ Total amount for overtime - BGN 335,883.94.
- ✓ The total amount for materials, rents, PPE, disinfectants, consumables to deal with the spread of COVID-19 spent by the Sofia Regional Health Inspectorate was BGN 352,978.89, of which BGN 348,313.81 were paid via bank transfers to the suppliers and 4,665.08 were paid by the treasury of the Sofia Regional Health Inspectorate.
- ✓ Acquisition of fixed tangible assets.

In 2020, funds in the amount of BGN 233,214 were allocated for the purchase of:

- ✓ 23 tablets for the needs of state health control - BGN 18,000.
- ✓ thermal cameras - 5 pcs. for the Sofia airport terminals – BGN 53,117, for measuring the temperature of arriving passengers.
- ✓ air and surface disinfection system - 4 pcs. – BGN 25,988
- ✓ An apparatus for express ATP control was provided - BGN 3,876.
- ✓ Hygiene control system - 3 pcs. – BGN 6,102
- ✓ Freezer (-70°C) for storing vaccines – BGN 20,448.
- ✓ PCR machine – BGN 60,000.
- ✓ Plate Thermo–Shakers – BGN 2,820.
- ✓ Centrifuge for 96-well plates – BGN 1,680.
- ✓ Digital thermal block with orbital shaking – BGN 6,144.
- ✓ Freezer (-86°C) for storing vaccines – BGN 35,039.

In 2021, funds in the amount of BGN 167,404 were allocated for the purchase of:

- ✓ Filtration system – BGN 6,000.
- ✓ Smart2Pure Deionizer – BGN 14,760.
- ✓ Portable business configuration, 30 laptops – BGN 46,080
- ✓ Frames for disinfection against COVID-19, 3 units - BGN 29,800.
- ✓ Freezers, 2 units – BGN 35,496.

- ✓ Freezer, 1 unit – BGN 6,468.
 - ✓ Extraction system - BGN 28,800.
- Acquisition of intangible fixed assets.
- In 2020 – BGN 20,776 for software for tablets – 43 units
- In 2021 – BGN 16,870 for a temperature system – 1 unit

4. Analysis of the public opinion, awareness, and fears regarding the spread of COVID-19 in Bulgaria

4.1. Demographic characteristics and social status of the respondents

A total of 1,861 persons were surveyed, of which 847 were women with a relative share of 45.6% and 1,011 were men - 54.4%, and three of the participants did not indicate their gender identity.

The people were divided into age groups in 10 years: 18-29; 30-39; 40-49, 50-59, 60-69 and over 69 years of age. A total of 1,854 (99.6%) of the respondents gave answers - 846 women and 1,008 men. Distributed by age, the largest number of men and women aged 50-59 is 25.8%, followed by those aged 30-39 – 23.5% and 40-49 – 22.9 %. The percentage of respondents in the 18-29 age group is lower – 18.9%. And the smallest share of participants is those of people 69+ — 8.5%. 72% of the respondents fall into the active age group of 30 to 59 years. (Table 15.)

Table 15. Distribution of respondents by age group

Age group - gender distribution	Women	Men
18-29	85	85
30 -39	241	194
40-49	185	240
50-59	173	306
60 -69	97	91
69+	65	92

A total of 1851 (99.5%) people - 842 women and 1009 men - answered the question related to the place of residence. 82% of them live in Sofia, and 15% in another city or district centre. Only 3% of the respondents answered that they lived in a village.

The largest number and relative share of respondents were the employed people — 1,397 or 73.9%, and the inactive (not working and not looking for work) were only 1.5%. The unemployed, looking for work, were 3.5%, and the students — 7%. Part of those who indicated "retired due to illness" marked working or retired at the same time, which also lead to a larger number of answers. (Table 16.)

Table 16. Social status and gender distribution of the respondents

Social status	Women	Men
Students	58	74
Employed (incl. self-employed)	599	798
Unemployed (actively looking for work)	47	20
Inactive (not working and not actively looking for work)	19	10
Retired	98	102
Retired due to illness	36	29
TOTAL	857	1033

People with higher education (bachelor's and master's) represented the largest share – 957 or 51.7%, and the smallest was of people with primary education – 15 or 0.8%, followed by those with a middle school degree — 23 (1.2%).

Among women, the relative shares of those with secondary education and those who have defended dissertations were greater than the same among men - 38.2% and 2.9%, compared to respectively 28.7% and 1.4%.

For the answer "defended a dissertation", some respondents also indicated a level of education, which lead to the larger total number of answers. (Table 17.)

Table 17. Education level and gender distribution of the respondents

Education level	Women	Men
Primary	9	6
Middle School	13	10
Secondary School	328	290
College	76	132
Higher – Bachelor's	215	322
Higher – Master's	192	238
Doctor / defended dissertation	25	14
Total	858	1012

The number of married people who participated in the survey was 1,042 or 56.4%, and the number of unmarried people was 479 – 25.9%. Among women, the married and unmarried have larger relative shares than those of men (58.0% and 30.6% for women and 55.0% and 22.0% for men). For the widowed and divorced, the ratio is the opposite - for men 9.6% and 13.4%, and for women - 5.7% and 5.6%.

A total of 1,769 (95.0%) of the respondents gave an answer to the question “What is your income?” (811 women and 958 men). The largest share was for people with an income of BGN 1,000-1,500. – 552 people or 31.2%, followed by those with an income of BGN 1500-2000. – 23.6% (417 persons). The smallest share was for people with an income of below BGN 300 - 2% or 36 of the respondents; and the shares of people with income of BGN 2,500 - 3,000 and over BGN 3,000 were very similar - 4.4% and 4.7%, respectively. The remaining shares of income groups were from 3.3% to 8.1%.

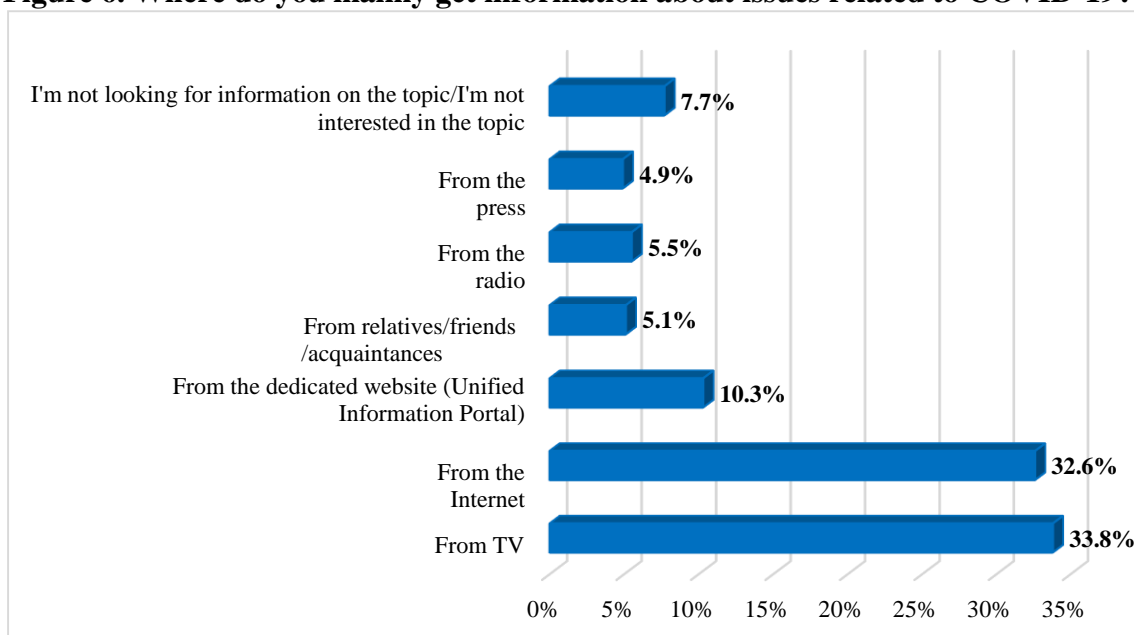
4.2. Respondents' awareness and fears of COVID-19

The results of the conducted survey show a high level of interest in the issues related to COVID-19. The question “Where do you mainly get information about COVID-19?” allows for more than one answer. A total of 2409 responses were given.

The top answer "from television" was given 815 times with a relative share of 33.8%. The relative share of women who used this source of information was greater compared to the same for men - 36.3% for women and 31.8% for men. Television was the main information source more often for people who feared the infection and respondents over 50 years of age. Second as a source of information about COVID-19 was the Internet (786 responses) with a share of 32.6%. There was no difference between the two genders regarding the use of this source, with the shares of men and women matching the total. The use of information resources on the Internet as a source of information about the coronavirus increased as the age of the respondents decreased, as well as among people living in the big cities in Bulgaria. Third came the Unified Information Portal with a share of 10.3% (248 responses), and men used this source of information to a greater extent than women — 7.1% of women and 12.9% of men.

The answer “from relatives/friends/acquaintances” received a relative share of 5.1%. 5.4% of men and 4.7% of women gave this answer. “From the radio” had a 5.5% share of all answers, for women – 6.0%, and for men – 5.1%. The answer “from the press” was given by 4.9% of the respondents as 5.9% of women gave this answer and 4.2% of men. 7.7% of the respondents gave the answer “I am not looking for information on the topic/ the topic does not interest me” — 7.4% of women gave this answer and 8.0% of men. (Figure 6.)

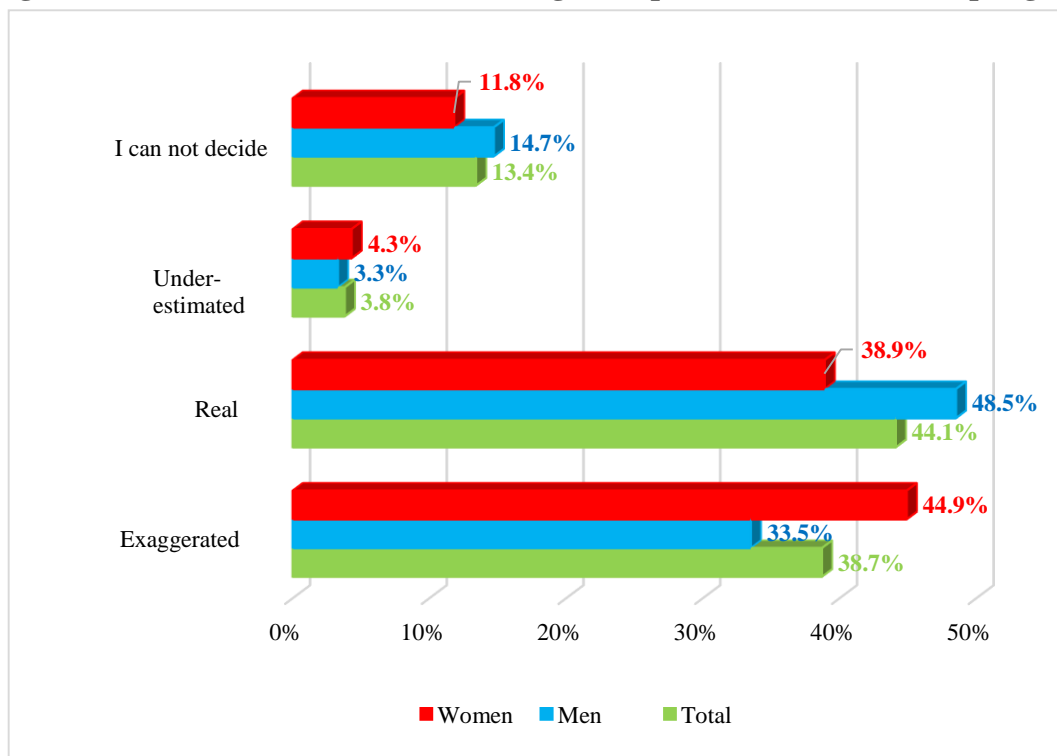
Figure 6. Where do you mainly get information about issues related to COVID-19?



The awareness is in direct correlation with the coronavirus thread. The results of our survey show that according to 44.1% of the respondents, the threat of COVID-19 was real. Men

supported this opinion to a greater extent than women – 48.5% of men and 38.9% of women. The threat of COVID-19 was defined as real more often by respondents who were afraid that they might get infected — people over the age of 50, highly educated respondents and Sofia residents. According to 38.7% of the respondents, the threat of COVID-19 was exaggerated. This opinion was supported by 44.9% of women and 33.5% of men. These were more often people who did not fear getting the infection and young people (in the age group 18-29). The share of those who considered the threat of COVID-19 underestimated was below 5%, i.e. a total of 3.8%, which constituted of 4.3% among women and 3.3% among men. “I can not decide” was answered by 13.4%, of which 11.8% women and 14.7% men. (Figure 7.)

Figure 7. The COVID-19 threat according to respondents – overall and per gender



Asked “Do you feel afraid that you can get infected with COVID-19?”, out of the 1,850 respondents (847 women and 1003 men – a total of 99.4% of the respondents), 650 gave a positive answer (35.1%). The relative share of women who feared getting the infection is 27.9% and it is significantly lower than the same for men – 41.3%. A total of 1,200 respondents gave a negative answer, which represents 64.9%. The relative share of women who were not afraid of getting infected was 72.1%, while for men the share was significantly smaller - 58.7%.

These results were contrary to the results of a nationally representative survey among 1,000 citizens conducted at the end of 2020 by the National Center for Parliamentary Studies (NCPS) to the National Assembly of the Republic of Bulgaria. Then nearly two-thirds /64%/ of the adult population of the country was afraid of getting the COVID-19 infection.

35.1% of the respondents had been sick with COVID-19, as 844 (68.0%) of them had mild symptoms. 336 or 27% of the respondents answered that they had severe symptoms, but did not require hospitalization. 54 (4.4%) said that they had required hospital admission and 8 or 0.6% were treated in intensive care units.

For 70.7% of women the disease was mild, while in men the percentage was 65.8%. 29.6% of the men and 23.8% of the women reported severe symptoms of the disease although they were not admitted in a hospital. In the same period, the share of women admitted to a medical institution was higher than men – 4.9% and 3.9%, respectively. For those admitted in ICUs, the ratio was the opposite — 0.5% for women and 0.7% for men.

The question “Did you develop post-COVID-19 syndrome and what did it include?” allows for more than one answer. A total of 2546 responses were given – 1025 from women and 1521 from men. The most common manifestation of the post-COVID-19 syndrome was fatigue, which occupied 26.7%, followed by shortness of breath - 13.4%, persistent cough - 11.6%, joint and muscle pain - 10.8%, insomnia - 8.4%, cardiovascular complaints - 6.9% and hair loss - 6.1%. (Table 18.) In women, fatigue - 28.5% and persistent cough - 13.4% were more pronounced, and in men hair loss - 9.0% and anxiety – 6.6%.

Table 18. Manifestations of post-COVID-19 syndrome in those who have recovered from the disease

Manifestations of post COVID syndrome	women		men	
	number	relative share in %	number	relative share in %
Shortness of breath	147	14.3	195	12.8
Fatigue	292	28.5	388	25.5
Persistent cough	137	13.4	159	10.5
Joint and muscle pain	112	10.9	163	10.7
Cardiovascular complaints /high blood pressure, palpitations/	71	6.9	84	5.5
Disorder in the kidney and liver parameters	36	3.5	14	0.9
Venous thrombosis	28	2.7	13	0.9
Depression	21	2.0	50	3.3
Anxiety	25	2.4	101	6.6
Insomnia	95	9.3	120	7.9
Brain fog	19	1.9	70	4.6
Hair loss	19	1.9	137	9.0
Skin rashes	23	2.2	27	1.8

4.3. Public opinion on the anti-epidemic measures taken by the government and the National Assembly

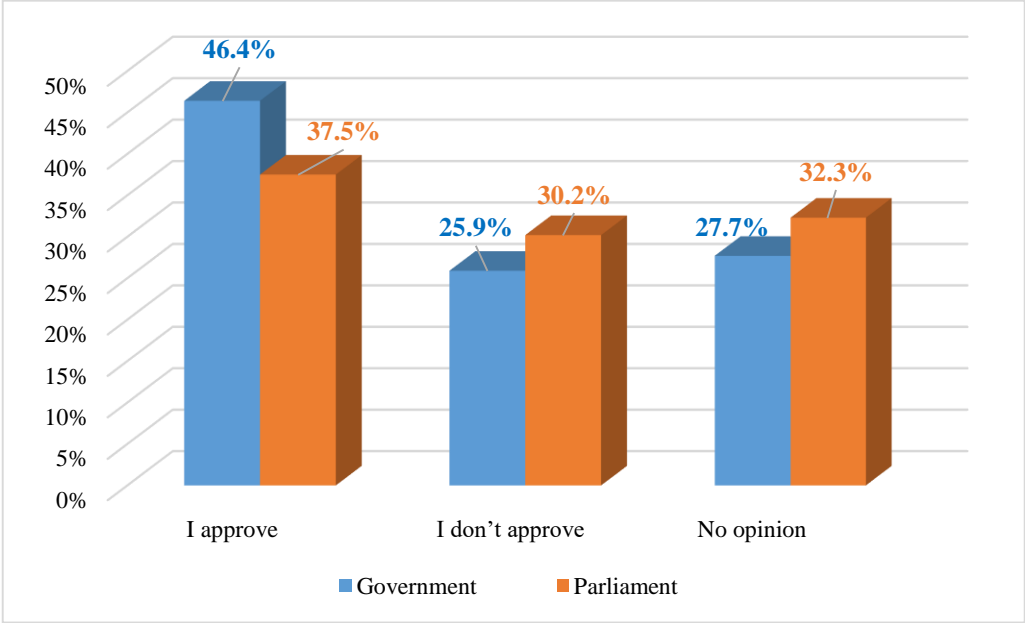
The measures taken by the executive branch for limiting the spread of COVID-19 were more broadly approved among Bulgarian citizens compared to the measures taken by the legislative branch. (Figure 8.)

The higher approval rating of the government’s actions to prevent the spread of the infection is normal, whereas the legislature assigned the executive branch with this process.

The government’s actions in relation to COVID-19 were approved by 46.4% of respondents — 40.0% of women and 51.9% of men. 25.9%, of which 26.3% women and 25.6%

men, disapproved. The answer “no opinion” was given by 27.7%, as the share of women who had given this answer was significantly greater compared to the same for men - 33.8% for women and 22.5% for men.

Figure 8. Do you approve or disapprove of the actions of the following institutions in relation to COVID-19?



The parliament’s actions in relation to limiting the spread of COVID-19 were approved by 37.5% of respondents — 32.5% of women and 41.8% of men. 30.2% of respondents, of which 35.0% women and 26.2% men, disapproved the actions by the Parliament. The proportion of respondents who answered “I have no opinion” was 32.3%, with no significant difference between the two genders — women 32.5% and men 32.1%.

Approval of the government’s actions in relation to COVID-19 prevailed among respondents;

- who were afraid of contagion;
- respondents who believed that the anti-epidemic measures taken would limit the spread of COVID-19 in the country;
- those vaccinated and those who indicated that they planned to get vaccinated;
- people between 50 and 59 years of age;
- people who lived in the big cities in the country.

The approval of the actions of the government and the parliament in relation to the COVID-19 epidemic was directly dependent on the assessment of the extent to which the measures taken would lead to limiting the spread of COVID-19 in the country.

The opinion of the respondents was divided in their assessments of the effectiveness of the measures taken to counter and limit the spread of COVID-19. The results showed a slightly higher share of people who believed that the anti-epidemic measures will not achieve the desired effect of limiting the spread of the virus (37.1%) - with equal ratio between men and women - 37.1%. The answer “the anti-epidemic measures taken will lead to limiting the spread

of COVID-19 in the country” was given by 35,2% of the respondents – 34,6% of women and 35,7% of men. “I can not decide” was answered by 27.8% of the respondents, of which 28.4% women and 27.2% men.

The approval of the measures was higher among respondents who feared contracting the coronavirus, who would get vaccinated, who believe the threat of COVID-19 is real, and people over 50 years of age residing in Sofia.

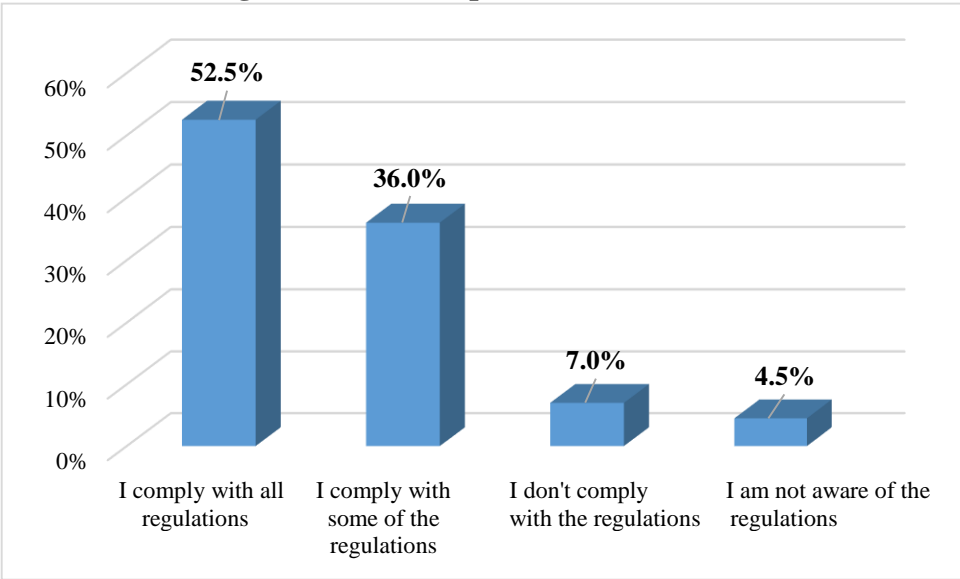
More often respondents who were not afraid of contracting COVID-19, who disapproved of the actions of both the government and the parliament in relation to the containment of the virus, according to whom the threat of the coronavirus was exaggerated and mostly the younger generation (between 18 and 29 years of age) had reservations regarding the effectiveness of the measures.

4.4. Readiness to comply with the measures taken by the government for the prevention and limiting the spread of COVID-19

More than half of the respondents (52.5%) were categorical that they complied with all the regulations of the state authorities related to limiting the COVID-19 pandemic, while 36% of the respondents complied with just some of the regulations. A small share of respondents (7%) indicated that they did not comply with the regulations. The share of people who were not familiar with the regulations was also low — only 4.5%. (Figure 9.)

To the greatest extent, the provisions were observed by those who approved of the measures taken, by those who were afraid of getting the infection, as well as by the oldest residents of the country. Mainly respondents who were not afraid of getting COVID-19, respondents under the age of 39, and respondents with secondary and lower education observed only part of the measures.

Figure 9. Are you complying with all the regulations of the state authorities related to limiting the COVID-19 pandemic?



When asked "Which of the following measures for the prevention of the spread of COVID-19 do you personally comply with?" the surveyed citizens gave the following answers presented in table 19. The results showed that the measure for limiting the spread of COVID-19 most often complied with by the respondents was frequent hand washing – 55.5%, followed by wearing a protective mask in public places – 46.1%, and wearing a protective mask in public transport – 43%. The mass wearing of masks in closed public spaces was a good prerequisite for limiting the spread of the coronavirus, since the majority of researches conducted worldwide showed the crucial role of nose and mouth coverage in terms of the prevention of the spread of COVID-19.

Table 19. Which of the following measures to prevent the spread of COVID-19 do you personally observe?

Measures to prevent the spread of COVID-19	relative share in %
I wear a protective mask in stores	42.9%
I wash my hands often	55.5%
I wear a protective mask in closed public places	46.1%
I try to keep my distance when communicating with other people	28.2%
I wear a protective mask in public transport	43.0%
I limit my social contacts	10.3%
I often use hand and surface sanitizer	27.9%
I wear a protective mask outdoors when there are many people around	3.3%
I wear a protective mask at my workplace	9.2%
I work remotely	8.4%

The other important condition for preventing the spread of COVID-19 is social distancing. 28.2% of the respondents indicated that they tried to keep their distance when communicating with other people, and 10.3% generally limited their social contacts.

Disinfection was one of the important measures related to the prevention of the COVID-19 infection. The results of the conducted survey show that 27.9% of the respondents often use disinfectant for hands and surfaces.

4.5. Behaviour of the respondents when getting COVID-19 symptoms and their opinion on the vaccination

In our survey we included a question to help us investigate the behaviour of the respondents in the presence of COVID-19 symptoms. The results showed that 60.6% of respondents would first consult their GP in the presence of COVID-19 symptoms, as 55.0% of the responses were given by women and 65.2% by men. (Table 20.) The general practitioners are best aware of their patients, their conditions, chronic diseases, etc. and could make an

appropriate consultation for treatment or referral to a specialist. The response “I will call 112” was given five times less or by 11.8% (12.0% of women and 11.7% of men) of the total. The probable cause for this response was that some of the respondents did not have a GP and therefore 112 was the only choice in case of any symptoms.

Table 20. If you have any COVID-19 symptoms, which of the following actions will you take?

Actions for COVID-19 symptoms	Total	Women	Men
I will call 112	11.8%	12.0%	7.9%
I will contact my GP	60.6%	55.0%	65.2%
I will seek hospital care	10.2%	13.0%	7.9%
I will treat myself	6.6%	10.4%	3.3%
I will seek help from relatives/acquaintances/friends	3.1%	2.7%	3.3%
I will seek help in the nearest city/town	0.6%	1.1%	0.3%
I will seek help from a nearby doctor	3.8%	2.7%	4.7%
I can not decide	3.3%	3.0%	3.4%

Answer "I will seek hospital care" ranks third with a share of 10.2% – /13.0% for women and 7.9% for men/. The answer "I will treat myself" has a share of 6.6%, which is extremely dangerous considering the course of infection with this virus and the frequent cases of complications as a result. The relative share of people who gave this response is 10.4% for women and just 3.3% for men.

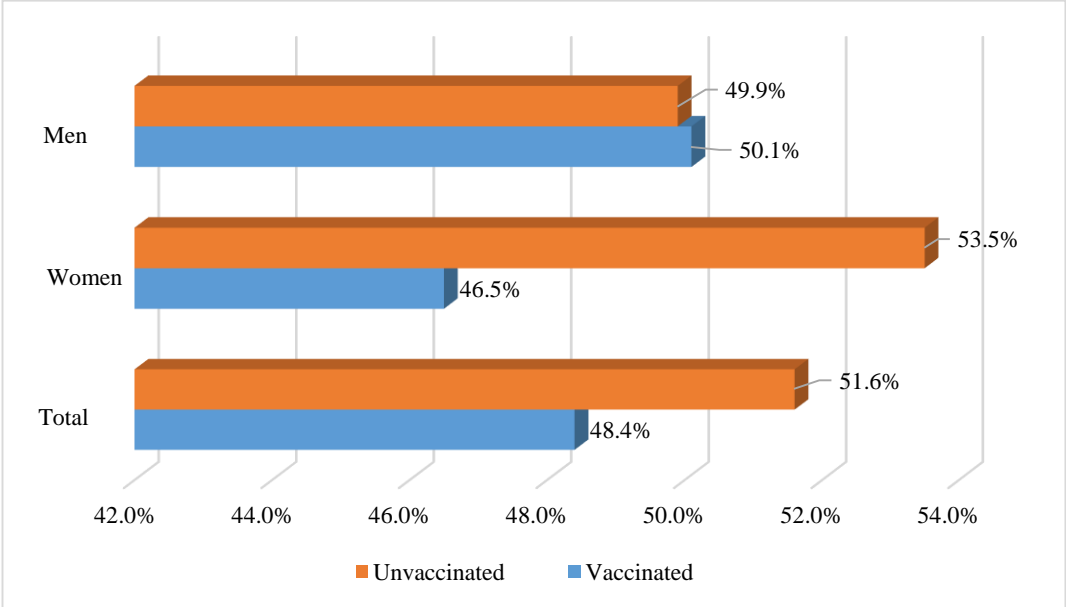
3.1% of the respondents indicated that they would seek help from relatives/acquaintances/friends, and there was no significant difference between the two genders - 2.7% for women and 3.3% for men. The answer "I will seek help from a nearby doctor" has a relative share of 3.8%. This response was given by 2.7% of women and 4.7% of men. “I can not decide” had a relative share of 3.3%, and the answers of both genders did not differ significantly — 3.0% for women and 3.4% for men.

The smallest share has the answer “I will seek help in the nearest city/town”. – 0.6%. The responses from women were more than three times higher than those from men — 1.1% for women and 0.3% for men.

Despite a large portion of the population being afraid of getting sick from the virus, less than half of the respondents (48.2%) were vaccinated. Of them, 388 (46.5%) were women and 495 (50.1%) were men. The number of people who were not vaccinated was 943 (51.6%), as 446 (53.5%) of them were women and 497 (49.9%) were men.

The relative share of vaccinated men is greater compared to the vaccinated women, and the ratio is the opposite for the unvaccinated. (Figure 10.)

Figure 10. Vaccination status of the respondents



When asked “If you are not vaccinated, do you plan of getting the COVID-19 vaccine?” 46.8% answered “yes”. There was no significant difference between the genders — 46.9% for women and 46.7% for men, which corresponds to the general data. 53.2% answered “no” to this question. The results by gender and overall are very close here as well — 53.1% of women gave a negative answer and 53.3% of men.

The respondents were worried about the characteristics of the vaccines, as well as the possible side effects of their administration. These and other factors influence the decision of half of the country's adult population (53.2%) not to get vaccinated.

Carrying out a larger-scale information campaign in relation to vaccines, their characteristics and type suitable for the relevant groups of people, is necessary. This campaign needs to be carried out by experts in this field who in simple terms could explain to the citizens all matters they were interested in regarding the vaccines. As a result, changing the public opinion on vaccination is likely and as a consequence more people would get vaccinated.

We were also interested in the opinion of the respondents regarding whether vaccination against COVID-19 should be mandatory or recommended. In this regard, we asked a question in our survey.

The absolute number and relative share of those who believe that the vaccine should be recommended are significantly larger — a total of 1237 of the respondents (67.2%). There is no significant difference between the two genders: 565 (67.3%) of women and 672 (67.1%) of men supported recommending the vaccine.

203 people (84 women and 119 men), which represents 11.0%, said that the vaccine against COVID-19 should be mandatory. The relative share of women who gave this answer is 10.0%, and 11.9% of men.

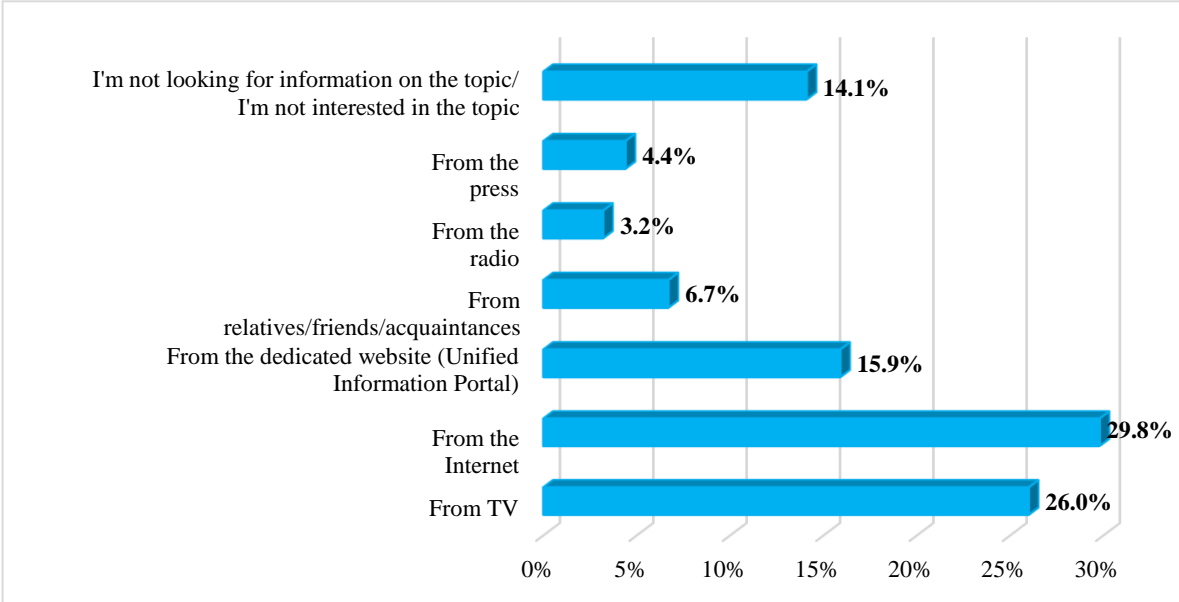
Asked “Are you interested in how the vaccines against COVID-19 work?” – 58.9% responded positively. Women were less interested in the effects of vaccines than men – 53.7% of women and 63.3% of men gave a positive answer.

The ratio for a negative answer is the opposite. A total of 41.1% gave this answer. Women were to a greater extent not interested in the vaccine than men — 383 (46.3%) women and 366 (36.7%) gave a negative answer.

190 women (22.6%) and 210 men (21.0%) answered with “I cannot decide”. A total of 400 people did not indicate a definite answer, which is 21.7% of the respondents. The results of the conducted survey show a high level of interest in the issues related to the way the COVID-19 vaccines work. The Internet is the main source of information on these issues — 29.8% of respondents. 29.5% of women and 30.1% of men rely mainly on information on the

Internet. The use of information resources on the Internet as a source of information about vaccination against the coronavirus increased as the age of the respondents decreased, as well as among people living in the big cities in Bulgaria. 26% of Bulgarian citizens got their information from television news and broadcasts, and the third most common source of information was the dedicated website (Unified Information Portal) — 15.9%. The relative share of 14.1% of the country’s adult population, who indicated that they were not interested in the topic and did not seek information, was not small. More often, respondents who were not afraid of getting COVID-19, young people, and low-educated people fell into this group. (Figure 11.)

Figure 11. Where would you get information about the issue related to the action of COVID-19 vaccines?



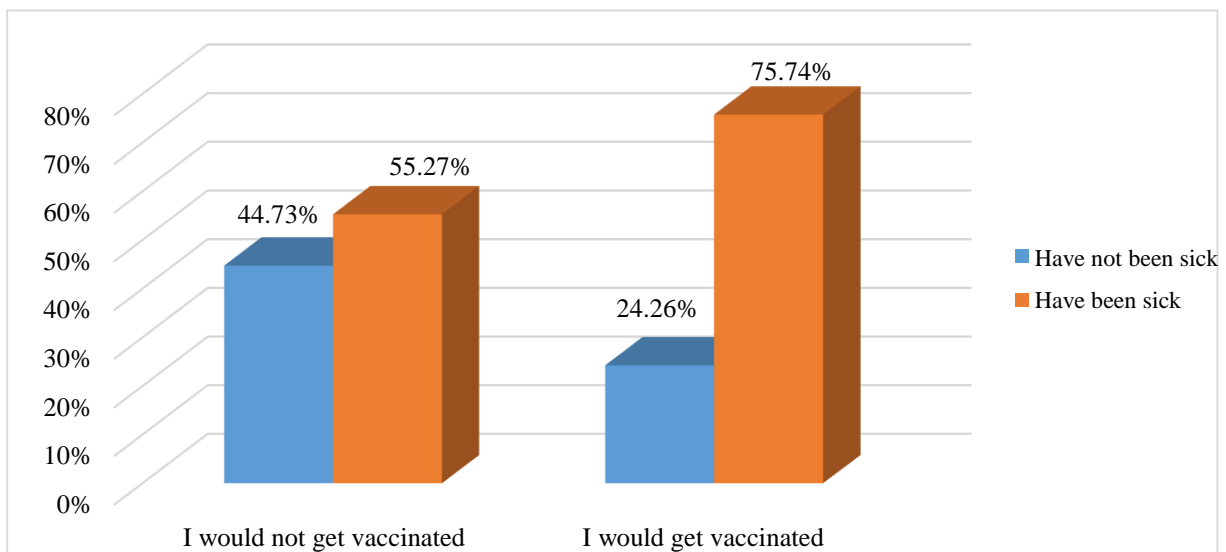
In order to determine a correlation between a COVID-19 infection and the opinion of patients on vaccination, we applied Pearson's chi-squared test. The results are presented in Table 21.

Table 21. Results on the correlation between getting COVID-19 and patients' attitudes towards vaccination

Questions	Pearson χ^2	P	Cramer's V
Are you afraid that you might get COVID-19	72.368	<0,0001	0.197
Are you vaccinated against COVID-19?	38.802	<0,0001	0.144
Would you get vaccinated against COVID-19	82.209	<0,0001	0.210
Should the COVID-19 vaccine be mandatory or recommended, in your opinion	46.268	<0,0001	0.158
Are you interested in how the COVID-19 vaccine works	120.787	<0,0001	0.255

The Pearson χ^2 test performed showed the presence of a statistically significant correlation between getting COVID-19 and the people's opinion on vaccination, with a test performance value of $\chi^2 = 82.209$ and a significance level of $p < 0.0001$.

Figure 12. Correlation between the question "Would you vaccinate against COVID-19?" and getting COVID-19



The results show that in the group of those who answered that they would get vaccinated, the percentage of those who were sick with COVID-19 (75.74%) exceeded three times the percentage of those who were not sick (24.26%). It can be assumed that getting COVID-19 to a certain extent has affected patients' attitudes toward vaccination.

We also looked for a correlation between the answers to the questions "Should the COVID-19 vaccine be mandatory or recommended, in your opinion" and "Have you ever had

Table 22. Results for the existence of a correlation between the questions “Should the COVID-19 vaccine be mandatory or recommended, in your opinion” and “Have you ever had COVID-19?”

		Have you ever had COVID-19?	
		No	Yes
In your opinion, should the vaccine against COVID-19 be mandatory or recommended?	Mandatory	66	139
		9.80%	11.70%
	Recommended	397	841
		59.00%	70.80%
	I cannot decide	210	208
		31.20%	17.50%

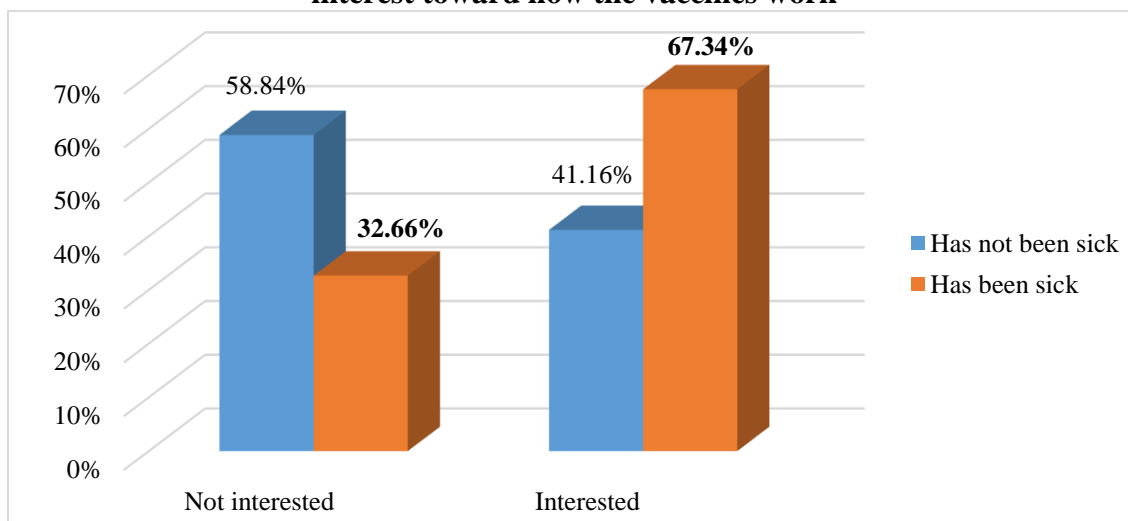
When analysing the question "Should the vaccine against COVID-19 be mandatory or recommended, in your opinion?", Pearson’s test showed that there was a statistically significant association with the incidence of COVID-19, with a test performance value of $\chi^2 = 46.268$ and level of significance $p < 0.0001$.

The obtained results show the low percentage (9.8%) of respondents who did not suffer from COVID-19, who believe that vaccines should be mandatory, and nearly a third who cannot decide. At the same time, the number of respondents who indicated that the vaccine should be mandatory or recommended and have had the disease (139 and 841) was twice as large as the number of those who have not had the disease (66 and 379). This confirms that getting COVID-19 shapes the attitude towards accepting the vaccine as a means of protection against the disease.

It can be expected that being sick with COVID-19 increases the interest of patients in the mechanism of action of vaccines. For this purpose, we analyse the correlation between the questions “Are you interested in how the COVID-19 vaccine works” and “Have you ever had COVID-19?” (Figure 31.) Fisher's Exact Test shows the existence of a statistically significant correlation with a significance level of $p < 0.0001$, strength of the relationship according to Cremer's of $V = 0.255$.

The percentage of respondents who were interested in the mechanism of action of vaccines in the group of people who had had COVID-19 (67.34%) exceeded twice the percentage of those who were not interested (32.66%), which proved an increase in the willingness of patients to get information on matters related to vaccines after already having had COVID-19. At the same time, the percentage of those who were interested was also lower (41.16%) in the group of respondents who did not suffer from COVID-19, which confirms the fact that only after getting sick, the respondents showed interest in immunoprophylaxis. (Figure 13)

Figure 13. Correlation between getting sick from COVID-19 and the respondents' interest toward how the vaccines work



The correlation between the fear of infection with COVID-19 and the respondents' opinion on vaccination was also analysed. The conducted Pearson's test confirmed the assumption that the fear of infection affected people's opinion regarding the vaccine (Table 23).

Table 23. Results on the existence of a relationship between fear of contracting COVID-19 and respondents' opinion on vaccines

Questions	Pearson χ^2	P	Cramer's V
Are you vaccinated against COVID-19?	32.423	<0,0001	0.132
Would you get vaccinated against COVID-19?	11.843	0.000579	0.082
Should the COVID-19 vaccine be mandatory or recommended, in your opinion	64.994	<0,0001	0.187
Are you interested in how the COVID-19 vaccine works?	127.870	<0,0001	0.262

The results showed that respondents who were afraid of getting the infection would get vaccinated, and they believe that vaccination should be mandatory and are interested in how the vaccines work.

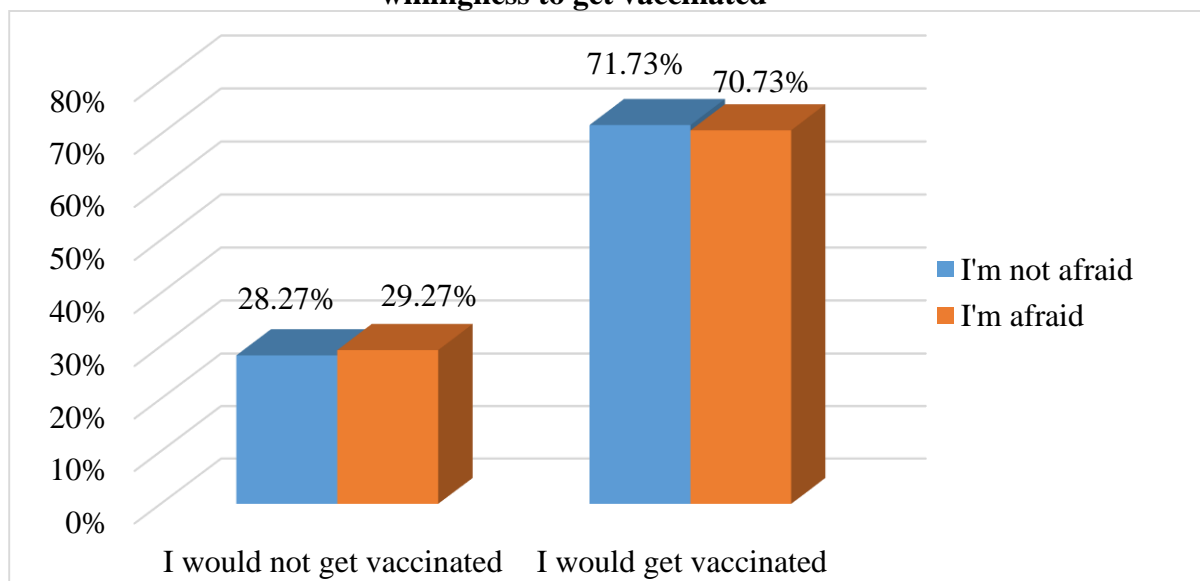
It is worth asking whether the fear of contracting COVID is the reason why respondents would get/were vaccinated. Therefore, we analysed only the vaccinated group of 893 respondents and to what extent the fear of infection influenced their choice. /Table 24./

Table 24. Results on the existence of a relationship between fear of contracting COVID-19 and the vaccinated respondents' opinion on vaccines

Questions	Pearson χ^2	P	Cramer's V
Would you get vaccinated against COVID-19?	0.105	0.746	0.011
Should the COVID-19 vaccine be mandatory or recommended, in your opinion?	29.482	<0,0001	0.182
Are you interested in how the COVID-19 vaccine works?	41.742	<0,0001	0.217

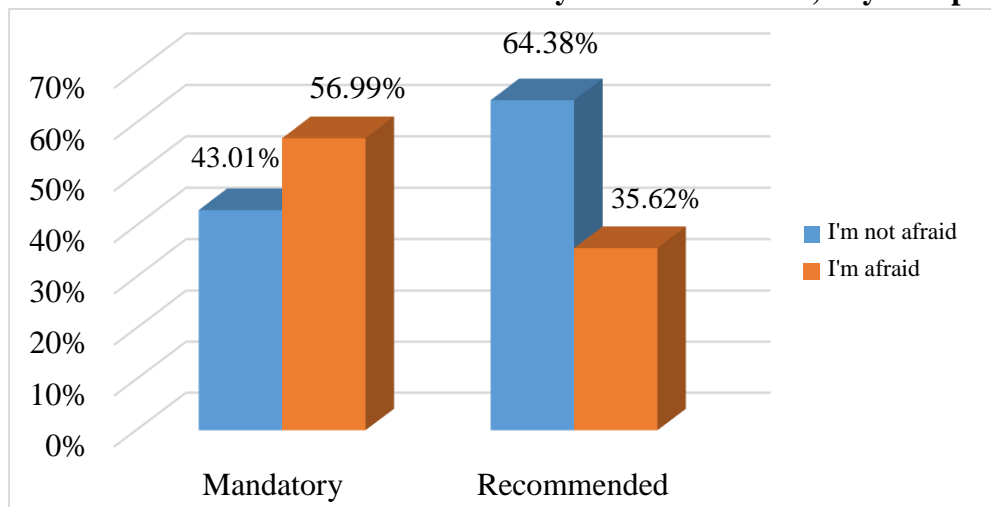
The Pearson's χ^2 test did not establish statistically significant correlation between the fear of contracting COVID-19 and the willingness to be vaccinated with a test result of $\chi^2=0.105$ and $p=0.746 > 0.05$. Figure 14 shows that for both groups, “I'm afraid” and “I'm not afraid”, have about the same percentage of respondents.

Figure 14. Correlation between fear of contracting COVID-19 and respondents' willingness to get vaccinated



Regarding the opinion of the respondents on whether vaccines should be recommended or mandatory, a Pearson's test showed the presence of statistically significant correlation with the fear of infection with a test result of $\chi^2=29.482$ and $p < 0.0001$.

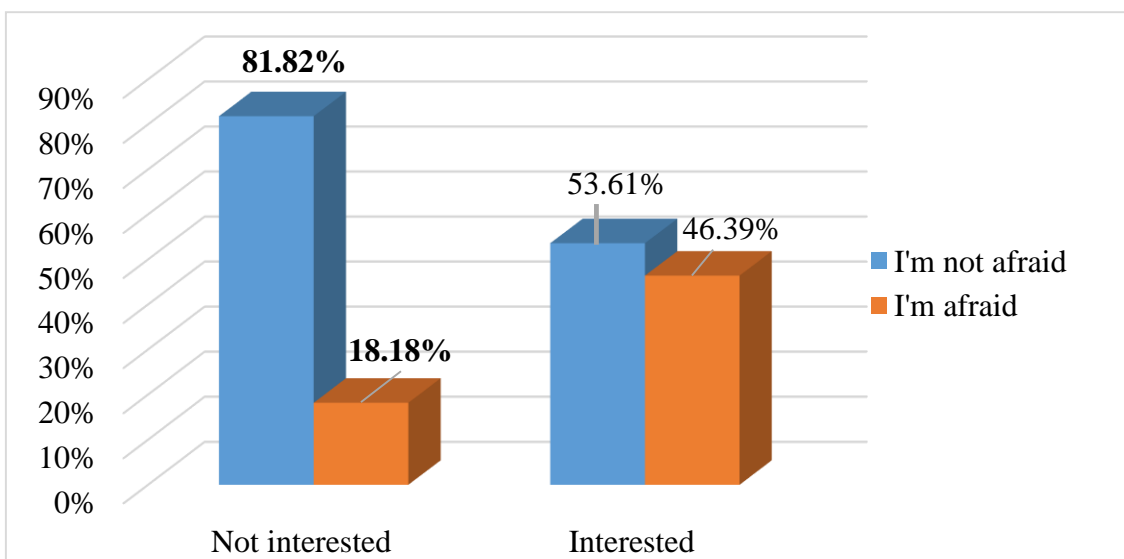
Figure 15. Correlation between the fear of contracting COVID-19 and the question “Should the COVID-19 vaccine be mandatory or recommended, in your opinion?”



The correlation can also be seen on figure 15, as in the group of respondents who believe that vaccination should be mandatory, the percentage of those who feared getting sick was higher than those who indicated that they were not afraid (respectively 56.99% and 43,01%). At the same time, in the group of respondents who believed that vaccination should be recommended, the percentage of those who feared the disease (35.62%) was almost twice as low as those who indicated they were not afraid (64.38%).

In respect to the awareness on the way vaccines work, similar result is observed. Out of the respondents who were not interested on how the vaccines worked, the percentage of those who were not afraid (81.82%) exceeded more than four times those who indicated they were afraid of getting the disease (18.18%). (Figure 16)

Figure 16. Correlation between the fear of getting sick with COVID-19 and interest toward the way vaccines work



CHAPTER IV. MANAGEMENT MODEL OF THE COVID-19 PANDEMIC, SOFIA

The steps, stages, and tasks that must be followed in the preparation of an epidemic management model on the territory of Sofia are innovative, since the process itself is fundamentally different from the epidemiological situations we have dealt with so far. This is why identifying the differences with the situations known to us so far is necessary, namely:

- The spread of COVID-19 is not a sudden situation.
- The disease is an imported infection spreading by airborne droplets among all ages of the population
- The observed varying degree of response of each individual to the disease.
- The spread follows the course of a typical acute respiratory disease from cluster (familial, social, collective) to diffuse spread, and cannot be formatted for a definite time order.
- Periodicity of the disease (waves) with different extensive invasion of the virus depending on its mutation.
- The development of the disease on a global, European, and regional scale must also be taken into account.
- Due to the lack of previous experience with this type of disease and scale of spread, there is no possibility of using past data or good practice to help guide the process.
- Need for coordination and work with other institutions at different levels, unaware of the specifics of measures to limit the epidemiological process.
- Lack of a legislative framework that would allow for quick and timely introduction of measures.

On this basis, it is extremely important to correctly grade the stages, steps and tasks, as well as the persons responsible for their implementation.

This necessitates a radically new approach to the construction of the model for dealing with the situation on the territory of the Sofia City District. The epidemiological situation itself must be considered as a process that has constantly changing parameters and they cannot be precisely predicted. In the context of the above, it is clear that in most cases the actions will lag behind the events and the system management factor will need to make quick, correct and sustainable decisions based on the obtained accurate information, as well as to implement these decisions in activities of the system itself.

The factors that will be of particular importance in the implementation of the model are:

- obtaining accurate and true information and its correct interpretation by the experts;
- verification of the received information and grading it by importance;
- structuring the capacity of human resources in relation to the activities of the system;
- synergy between the individual structures in the field of expertise, both horizontally and vertically;
- refinement of the prepared action proposals;
- realistic analysis of the results of the activities performed;
- proper planning of measures to limit the epidemic and proposals to reduce the consequences.

Stages, steps, and tasks	System management	Activities of the system and officials
I. BEGINNING		
1 Origin (receiving the alert).	The director of the Sofia Regional Health Inspectorate receives information (the alert) about the situation that has arisen. After reviewing the alert and verifying the initial information, the director informs the management team and operatives of the Sofia Regional Health Inspectorate and created a task force of experts	The management, the operatives of the Sofia Regional Health Inspectorate prepare for work.
II. ORIENTATION		
1. Analysis and assessment of the situation.	The director of the Sofia Regional Health Inspectorate gives guidelines on the preventive measures (collection, verification, and clarification of information, analysis and assessment of the situation and the risk, if necessary, informing the population about the degree of risk).	The members of the operational group collect the necessary data to create a complete picture of the situation and assess the direct consequences on the Sofia residents. The Sofia Regional Health Inspectorate task force clarifies: <ul style="list-style-type: none"> - the type and extent of the epidemic situation; - number of sick people and their contact persons - location; - number of those affected; - possible routes for transportation and isolation of the infected; - nearest health facilities for admitting the infected; - degree of the risk of spreading; - possible damage to health care facilities and their staff.

Stages, steps, and tasks	System management	Activities of the system and officials
2. Analysis and assessment of the members and status of the response forces.	The director of the Sofia Regional Health Inspectorate assigns the task force members with analysing the situation and preparing reports on the state of the designated response forces, on the necessary measures for medical provision of the population.	The members of the Sofia Regional Health Inspectorate task force collect the necessary data and prepared proposal reports on the necessary medical provision, number of emergency teams, current medical staff, available means of transport, analysis of available hospital beds, and the possibility of admission, the need to restructure clinics and wards in medical facilities.
3. Analysis of the actions taken to handle the outbreak.	The director of the Sofia Regional Health Inspectorate listens to the reports of the experts on the actions taken for timely medical provision of the residents of the Sofia City District.	The task force members report to the Director on the actions taken. The members of the forces and resources of medical provision on the territory of the district are updated. An up-to-date list of available medications, personal protective equipment, disinfectants, and oxygen is being prepared.
4. Conclusions from the situation at hand.	Considering the increased morbidity, the pressure on the health care system, the rise in the number of sick and hospitalized people due to the epidemic situation in the Sofia City District, the director of the Sofia Regional Health Inspectorate assigns the preparation of an order for the introduction of extraordinary anti-epidemic measures, restrictive in the beginning and later defensive.	The members of the task force support the activity of the director with current data on the situation.

Stages, steps, and tasks	System management	Activities of the system and officials
	The measures in the order are introduced in stages based on 14-day morbidity and 7-day growth rate.	
5. Guidelines to the medical and health facilities in the Sofia City District, emergency medical centres and general practitioners	The Director of the Sofia Regional Health Inspectorate sends instructions (protocols) to the health and medical facilities on the activities and tasks of the medical teams for adequate actions for admission and treatment of people who had COVID-19.	<p>The members of the operational group of the Sofia Regional Health Inspectorate prepare instructions (protocols) to the health and medical facilities on the activities in the current situation and the implementation of hygienic and anti-epidemic activities.</p> <p>The protocols and guidelines are complied with the instructions and information received from the WHO and the European Commission on the control of the spread of infectious diseases</p>
6. Introduction of the administrative units (District Leaders, Sofia Municipality, Sofia Directorate of Internal Affairs, the Ministry of Health) with the forces and resources for medical provision	The director of Sofia Regional Health Inspectorate informs the interested structures on the current epidemic situation and what forces and resources for medical provision the Sofia city district has at its disposal in the current situation and the measures taken for medical provision of the population.	<p>The experts are preparing a report on the current epidemic situation, the forces and resources for medical provision, and for organizing the introduction and implementation of anti-epidemic measures.</p> <p>The report covers all aspects of the epidemic process, taking into account morbidity (proven cases, according to the confirmation methods used), mortality, extensive invasion, number of occupied beds in intensive care units, number of calls to an address by infected people to the emergency medical centres, how many of them were hospitalized, age of the sick, number of contact people. Number of medical staff who got sick as a result of contact with confirmed cases.</p>

III. DEVELOPING A SOLUTION TO OVERCOME THE EPIDEMIC

Stages, steps, and tasks	System management	Activities of the system and officials
<p>1. Development of options for controlling the epidemic, limiting and overcoming the consequences.</p>	<p>Preliminary discussion of possible options. Analysis of the options proposed at the European and regional level. Possibility of their application on the territory of Sofia City District.</p>	<p>After the analysis of the situation, the Sofia Regional Health Inspectorate task force jointly developed options on how to deal with the epidemic and on medical provision of the population.</p>
<p>2. Decision briefing.</p>	<p>The director of the Sofia Regional Health Inspectorate listens to the proposals on the activities and tasks of the Sofia Regional Health Inspectorate and decided on what actions to be taken by taking into account the current situation, trends, and legislation in force.</p>	<p>The experts report, each according to their type of activity, on the activities and tasks performed in the situation at hand and proposed specific solutions and actions, including deadlines.</p>
<p>3. Developing a plan to handle the epidemic.</p>	<p>The Director of the Sofia Regional Health Inspectorate provides guidelines on the planning of actions, the use of forces and resources for medical provision, the introduction of restrictive and preventive anti-epidemic measures, and the coordination.</p> <p>In the planning process, the possibility of growing number of diseased from other infectious diseases (characteristic of certain seasons), epidemic outbreaks of a different nature, as well as the possibility of the occurrence of disasters and accidents that could additionally burden the health care facilities and health care system, are taken into account.</p>	<p>Developing and updating a plan, agreeing, coordinating, and ensuring the actions of the forces and resources of the directorates.</p> <p>The possibility of other force majeure circumstances, such as epidemic outbreaks or disasters and accidents, must also be included in the plan.</p>

Stages, steps, and tasks	System management	Activities of the system and officials
IV. ORGANIZING THE IMPLEMENTATION OF THE PLAN AND COORDINATING THE ACTIONS FOR CONTROLLING THE EPIDEMIC		
<p>1. Setting the tasks. Organizing the interaction.</p>	<p>Guidelines on the implementation of the assigned tasks.</p> <p>Reporting to the Ministry of Health and other departments about the decision made.</p> <p>Argumentation of the presented plan, as well as the activities therein, before the administrative and political leaders.</p> <p>Given the peculiarities of the Sofia City District, as the capital and largest city in Bulgaria, the report needs to pay particular attention to the financial security of the plan for the purchase of PPE and other consumables needed by the citizens, the institutions, and the health care facilities.</p> <p>And when introducing restrictive and prohibiting measures, in addition to the effect on the infectious process, their expected results should be taken into account.</p> <p>The presentation of the plan should be consistent with the social, public, and economic consequences for the residents of the city of Sofia as well as for Bulgaria as a whole.</p>	<p>Informing the directorates and health and medical facilities, GPs, emergency medical centres, Sofia Directorate of Internal Affairs, the Regional Management of Education, Sofia City Municipality and other interested institutions of the plan</p>

Stages, steps, and tasks	System management	Activities of the system and officials
	Compromising the activities at the expense of personal or group financial and political interests should not be allowed.	
2. Ensuring constant exchange of information.	The director of the Sofia Regional Health Inspectorate was informed daily about the progress of the tasks, the current epidemic situation, and in the event of an extraordinary event — immediately with reports on the situation development. The information on the performance of tasks is periodically reported to the Ministry of Health and other interested departments	The members of the task force collect, analyse, summarize and report on any changes in the situation and prepare proposals for its improvement.
3. Interaction with other state and municipal bodies	The director of the Sofia Regional Health Inspectorate gave instructions on the organization of an interaction with the Ministry of Health, the Ministry of Interior, the Sofia Municipality, the emergency medical centres, inpatient hospital facilities, general practitioners and other interested institutions	The experts interact and exchange information with the Ministry of Health, the Ministry of Interior, Sofia Municipality, the emergency medical centres, medical facilities, etc.
V. CONTROL ON THE PERFORMANCE OF THE TASKS AND THE APPLICATION OF MEASURES TO DEAL WITH THE EPIDEMIC		
1. Control of the activity of the means and activities of the health care facilities per time, place, and tasks.	The Director of the Sofia Regional Health Inspectorate coordinates and controls the activity of the health care system on the territory of the Sofia City District, the forces and resources necessary for its normal activity	The task force daily collects information on the course of the epidemic, on the status of the health care system on the territory of the Sofia City District, the forces and resources necessary for medical provision of the population.

Stages, steps, and tasks	System management	Activities of the system and officials
		<p>Making proposals for the relocation and transfer of medical supplies, medicines and, if necessary, medical specialists or patients from one medical facility to another.</p> <p>Collecting and aggregating information from other areas of the country.</p> <p>Monitoring the international development of the pandemic.</p> <p>Controlling the compliance with the restrictive and preventive measures introduced by the director of the Sofia Regional Health Inspectorate with an order.</p>
<p>2. Analysis of the progress of the epidemic and the activity of the health care facilities, the development capacity and trends, and all necessary means.</p>	<p>The director of the Sofia Regional Health Inspectorate informs the Ministry of Health on a weekly basis about the course of the epidemic, the state of the health care system, its needs to operate normally, and the activities of the Sofia Regional Health Inspectorate related to ensuring the health of the population and the required funds.</p>	<p>The task force prepares reports on the course of the epidemic, the workload of the health care facilities, the number of free and occupied beds in hospital facilities, the workload of the teams of the emergency centres, the number of infected, isolated or quarantined medical specialists, the quantities of used medicines, personal protective equipment, disinfectants, and oxygen as well as for the quantities necessary for the normal functioning of the health care system, for the number of cases of infected people who arrived from other countries, found during border health control studies, and the activities that need to be</p>

Stages, steps, and tasks	System management	Activities of the system and officials
		carried out to optimize the medical provision.
<p>3. Informing the public about the progress of the epidemic and the activities of the forces and resources.</p>	<p>If necessary, together with a representative of the Ministry of Health, informing the mass media about the course of the epidemic, the activities of the forces and resources for medical provision, the possible risks and dangers, carefully specifying the way in which the data would be exported so as not to cause panic among the residents of the Sofia City District.</p> <p>When informing the public, the focus should never be on specific individual cases highlighted by reporters, and the exposition should be directed to current data and future measures outlining the trends.</p> <p>In the course of the epidemic in the territory of Sofia, the media appearances of a number of pseudo-experts caused confusion and in some cases panic among the population.</p> <p>Inadmissible action in the course of an epidemic</p>	<p>The members of the task force are preparing the necessary reports, references and information on the course of the epidemic and the activities of the forces and means of medical provision.</p>
VI. GROWING EFFORTS TO DEAL WITH THE EPIDEMIC		
<p>1. Planning additional forces and resources to increase the efforts to overcome the epidemic,</p>	<p>The director of the Sofia Regional Health Inspectorate gives guidelines for the preparation of additional forces and resources to be included if necessary.</p>	<p>The members of the headquarters develop a plan to prepare additional forces and resources.</p>

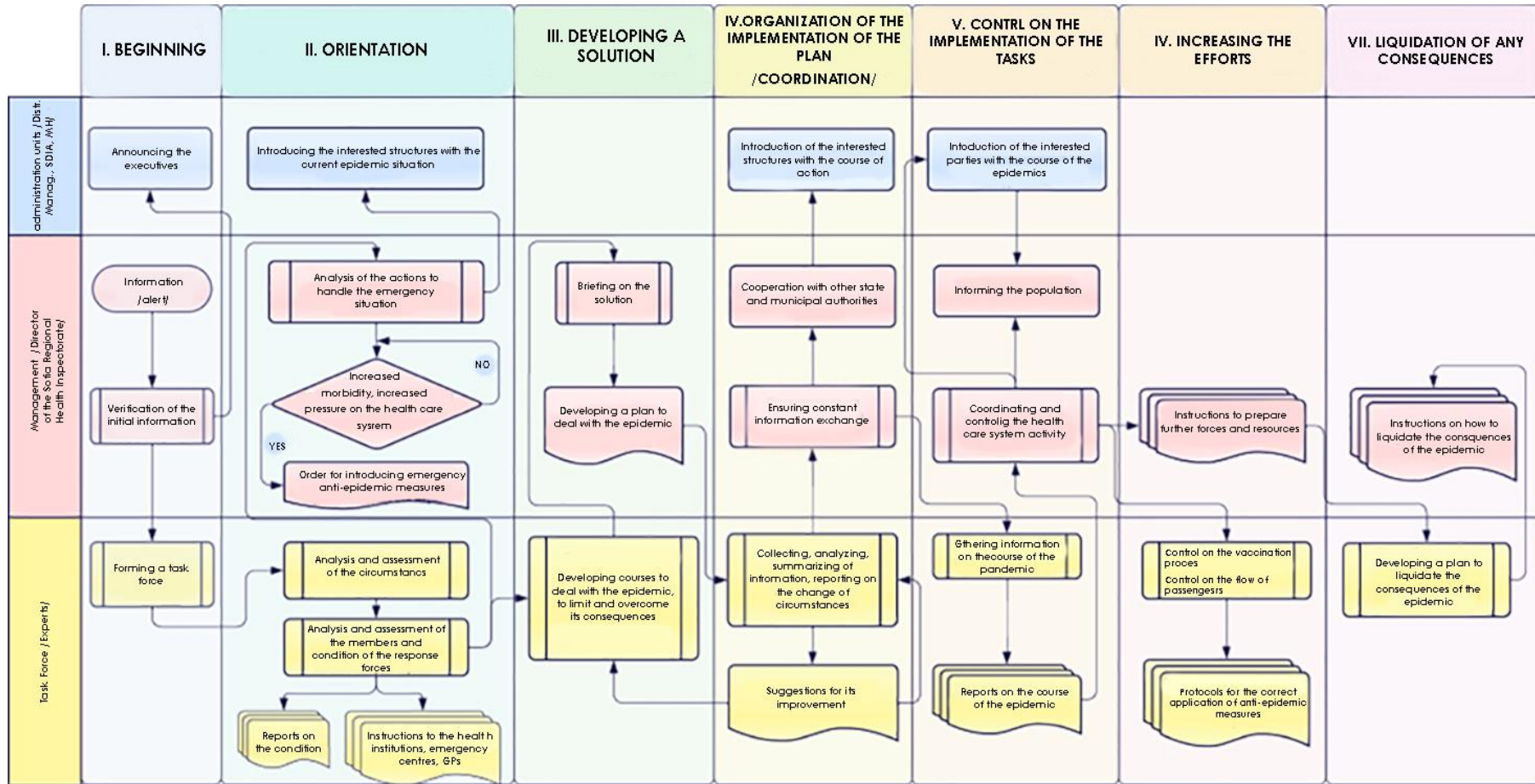
Stages, steps, and tasks	System management	Activities of the system and officials
<p>in line with global and European trends.</p>	<p>Orders the preparation of estimates for providing the health care facilities with personal protective equipment, disinfectants, medicines and other bioproducts, such as monoclonal antibodies and vaccines, in order to meet the needs of the health care system, the population, and medical staff directly involved in the process of preventing the epidemic.</p> <p>Orders organizing the setting of vaccination points in certain medical facilities, at places with high flow of people, and at testing sites around the city of Sofia.</p> <p>Approves a developed system for mobile vaccination points and testing sites.</p> <p>Issues an order for the introduction of measures at the border points complied with the order of the European Commission.</p>	<p>Analysing the need, based on the morbidity, hospitalizations and mortality, of personal protective equipment, medicinal products, vaccines, and other bioproducts for the population.</p> <p>Developing, coordinating and distributing protocols for the correct application of anti-epidemic measures and the correct treatment method for COVID-19 patients.</p> <p>Preparing strategies for the proper development of the vaccination process and implementation, with the aim of covering a larger group of the Sofia residents.</p> <p>On a daily basis, collecting information on the number of administered vaccines, as well as the deliveries to the vaccination sites. Submitting the collected information to the national information system for further processing.</p> <p>Monitoring the passenger flow at the border points of Terminals 1 and 2 of the Sofia Airport, controlling the number of sick people who enter the country and their placement under quarantine.</p>

VII. ELIMINATION OF THE CONSEQUENCES OF THE EPIDEMIC

Stages, steps, and tasks	System management	Activities of the system and officials
<p>1. Planning measures to eliminate the consequences of the epidemic.</p>	<p>Based on a retrospective analysis of the situation and in the course of subsiding infectious process and stabilization of the epidemic situation, the director of the Sofia Regional Health Inspectorate gives instructions on the planning of events, activities, to eliminate the consequences of the epidemic, as well as on activities to prevent the spread of new waves of the disease.</p> <p>The analysis and measures proposed in the indicative plan should not be mandatory, considering how dynamic the situation is. The plan should have a recommendatory nature, due to the fact that the disease has not yet passed, and it is in the hypothesis of a subsiding infectious process.</p> <p>The proposals in the plan should be based on the results achieved due to the anti-epidemic measures introduced, the clinical experience based on the development and treatment of COVID-19, the mortality, the strain on the health care system in all aspects, the periodicity of epidemic waves, and the clinical manifestations of the various mutations of the virus, its contagiousness and virulence.</p> <p>The plan should allow for additional follow-up of post-covid syndromes and the impact on those who got sick at a later stage.</p>	<p>The task force starts developing a plan to eliminate the consequences of the epidemic. The development should be linked to own experience, collected data, and good EU and global practices</p>

Stages, steps, and tasks	System management	Activities of the system and officials
	<p>The plan should include the measures and activities that have a positive effect on reducing the spread of COVID-19, taking into account the areas in which improvement of the activity is necessary.</p> <p>As a document in which the liquidation of the consequences is required, the plan should have a complex nature, as it should necessarily include social, public, economic and, last but not least, political aspects.</p> <p>When preparing the plan, it should be noted that it is based on factual data received at the moment and it is not a final document.</p> <p>The activities and events proposed in the plan are indicative and they can be changed and supplemented.</p>	

Scheme 1. MANAGEMENT MODEL OF THE COVID-19 PANDEMIC IN SOFIA



CONCLUSIONS

We can draw the following conclusions based on the data presented:

1. The multi-fold increase in the incidence of acute infectious diseases in the Sofia-City District in the last two years (2021 and 2020) compared to the previous three years (2019, 2018, and 2017), is due to the recorded morbidity of COVID-19.
2. COVID-19 occupies a leading role in the structure of infectious morbidity in the Sofia-City District with a relative share in 2021 of 98.17%.
3. Over 120 times higher mortality in 2021 and over 40 times higher mortality in 2020 compared to the previous three non-epidemic years due to deaths from COVID-19 – respectively, 859 deaths in 2020, 2424 died in 2021, with the death rate being many times higher in the risk group over 65 years of age.
4. The laboratories opened for COVID-19 on the territory of Sofia in the period 2020-2022, were 49, and the Covid zones, the diagnostic-consultative and medical centres on the territory of Sofia-city were 27, (four of which were 24/7).
5. There were 81 vaccination sites on the territory of Sofia City as per the latest Order of 22.02.2022 of the Minister of Health, as from the beginning of the vaccination campaign until 01.03.22, a total of 35,077 people were vaccinated, 493 of which were with reduced mobility, by mobile teams of the emergency centres in Sofia.
6. During the period from 17.01.2022 to 23.01.2022, the morbidity of the staff in the inpatient medical facilities in the territory of Sofia City is the highest.
7. The main source of information for the respondents on issues related to COVID-19 was television (33.8%), followed by the Internet (32.6%) and the dedicated website (Unified Information Portal) – 10.3%.
8. More than a third (35.1%) of the respondents were afraid of infection, as were those who had been sick with COVID-19. For 68.0%, the course of the disease was mild, and 27% stated that it was severe but they did not require hospitalization.
9. The most common manifestation of the post-COVID-19 syndrome was fatigue (26.7%), followed by shortness of breath (13.4%), persistent cough (11.6%), joint and muscle pain (10.8%), insomnia (8.4%), cardiovascular complaints (6.9%) and hair loss (6.1%).
10. The government's actions in relation to limiting the spread of COVID-19 were approved by 46.4% of respondents, and the actions of the parliament — by 37.5%.
11. More than half of the respondents (52.5%) said that they complied with all the regulations of the state authorities related to limiting the COVID-19 pandemic, while only 36% of the respondents complied with just some of the regulations. The measure respondents most often complied with, related to limiting the spread of COVID-19, was frequent hand washing – 55.5%.
12. More than half (60.6%) of the respondents would consult their GP first if they were to feel any COVID-19 symptoms, since they were the ones to best know their patients, their condition, chronic diseases, etc. and could make an appropriate consultation for treatment or referral to a specialist.
13. 48.2% of the respondents were vaccinated against COVID-19, while 53.1% would not

get vaccinated, which necessitated the implementation of a larger information campaign in relation to vaccines - their characteristics and type suitable for the respective groups of people. More than 2/3 of the respondents believe that the vaccine against COVID-19 should be recommended.

14. The main source of information for the respondents on issues related to the way the COVID-19 vaccines work is Internet (29.8%), followed by television (26%) and the dedicated website (Unified Information Portal) – 15.9%.

SUMMARY

The global COVID-19 pandemic has forced inevitable changes in the way of life of individuals and society, in the working conditions, the crisis management, the restructuring of various areas based on new information and communication technologies, in public opinion and the approach of society and business to the globalization processes. This has given important strategic importance to the lessons, measures, and actions for handling the severe consequences of this global cataclysm. Considering that the pandemic was caused by unknown but aggressive infectious disease that has spread over vast continental regions and the entire world, resulting in massive human infection, it is inevitable to conclude that we are facing the risks and challenges of an uphill battle to overcoming the pandemic crisis in the conditions of dynamic changes in the overall economic, social and political life.

The conducted survey examined in detail the data obtained from the 1,861 respondents regarding their attitude towards COVID-19. The questions aimed to establish whether they feared, felt anxiety or worry related to the spread and course of the disease, as well as the appearance of post-COVID-19 syndrome.

The opinion and attitude of the respondents towards the measures for limiting the spread of the disease and the readiness to comply with the introduced measures for the prevention and limitation of COVID-19 were surveyed. The survey included questions about the need of information and from what sources it was drawn, as well as the application and effect of vaccines against the disease.

The anxiety of the unknown, along with the situation created by COVID-19, was a big challenge, both for the Bulgarian society and for the humanity as a whole.

The impact of the COVID-19 pandemic has had a disproportionate impact on the various EU Member States, in particular the Bulgarian society, affecting different groups of people, in terms of gender, age, education, and social status.

The purpose of this survey was to more quickly collect important and necessary data from the Bulgarian citizens with the aim of preparing an adequate preventive response on the part of the Bulgarian government.

Demographic factors — gender, profession, age, and education have a significant impact on the individual questions of the researched construct, and the obtained results were indicated and discussed in the data analysis.

In a crisis situation, the normal rules of the human mentality are altered, along with the lack of control over our lives, this definitely leads to mental strain and increased stress levels. Anxiety and stress can affect your immune system, which generally and directly affects mental and physical health and well-being.

The health and demographic situation of a country and its population is an important aspect in order to improve the health strategy for high-quality health services and good health status of the population.

To maintain good, high-quality, and healthy lifestyle, it is important to focus on good prophylaxis and prevention, both for the physical and mental health of the individual and the community as a whole.

RECOMMENDATIONS

From the presented analysis of the COVID-19 pandemic and the activities related to its spread in the Sofia City District for the period 2020-2021, and the conducted survey of the public opinion, awareness, and fears in relation to the spread of COVID-19 in Bulgaria, we can lay out the following recommendations to the responsible institutions:

TO THE MINISTRY OF HEALTH AND PATIENT ORGANIZATIONS

1. Promotion of the “+ me” campaign among the population to raise awareness about the benefits of the vaccines and vaccination against COVID-19.
2. Organizing campaigns to inform citizens in simple terms about the benefits of the vaccination against COVID-19, the effect of the vaccines, the types of vaccines that are administered in Bulgaria, and their safety in order for them to make an informed decision.
3. Introducing patients, in simple terms and via different channels, with COVID-19 symptoms and what their behaviour should be if they have any, as well as the need to consult a doctor.

TO THE MINISTRY OF HEALTH AND SOFIA MUNICIPALITY

1. Implementation of the developed model for managing the COVID-19 epidemic in Sofia in order to optimize the actions of all institutions.

CONTRIBUTIONS

This dissertation has contributions in the following several directions:

✓ **Scientific and applied contributions:**

1. A model for managing the COVID-19 pandemic in Sofia has been developed and a proposal on its practical application has been made, aiming to optimize the actions of all institutions in the region.

✓ **Scientific and theoretical contributions:**

1. The main epidemiological indicators characterizing the spread of COVID-19 in the Sofia-City District in the period 2020 – 2021 have been researched and analysed for the first time.
2. The activities on the territory of Sofia-City, related to the spread of COVID-19 in the period 2020-2022, have been analysed.
3. The financial, material, and technical provision of the Sofia Regional Health Inspectorate in the conditions of COVID-19 was presented and analysed.
4. The thoughts of the respondents regarding the public opinion, their awareness, and fears regarding the spread of COVID-19 in Bulgaria was comprehensively studied, analysed, and assessed.
5. The readiness to comply with the measures taken by the government for the prevention and limiting the spread of COVID-19 has been researched and analysed.
6. The behaviour of the respondents when getting COVID-19 symptoms and their opinion on the vaccination has been researched and assessed.

LIST OF PUBLICATIONS IN RELATION TO THE DISSERTATION

1. Penchev D., R. Zlatanova-Velikova, Analysis of the COVID-19 pandemic in Sofia-City District for the period 2020-2021, Health Policy and Management, ISSN 1313-4981, 2022, volume 22 #3, pp. 5-10
2. Penchev D., Analysis of the financial, material, and technical security of the Sofia Regional Health Inspectorate in the conditions of COVID-19, Forty-eighth scientific and technological session, CONTACT 2022, 24 June 2022, Civic idea in action, Issue TEMTO, ISSN 1313-9134, p. 270-275
3. Pantelev S., T. Zlatanova, D. Penchev, Evaluation of the effectiveness of the health care system in Bulgaria, Forty-eighth scientific and technological session, CONTACT 2022, 24 June 2022, Civic idea in action, Issue TEMTO, ISSN 1313-9134, p. 25-29
4. Penchev D., D. Petkova, R. Zlatanova-Velikova, PUBLIC ATTITUDES, AWARENESS AND FEARS RELATED TO THE SPREAD OF COVID-19 IN BULGARIA, Sciences of Europe, No 109 (2023) ISSN 3162-2364, pp. 28-31