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THEORETICAL RESEARCH ASPECTS OF THE KEY COVID-19 TRENDS AND TRANSFORMATION OF INDICATORS IN THE HEALTHCARE SPHERE

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Abstract: *New cases of the coronavirus disease and its fatal consequences continue to be recorded even now, almost three years after the first detected case. The problem of the COVID-19 spread worries the world community because the virus affects the social, economic, environmental, political, and other spheres of every person's life. The pandemic reality has brought a massive range of changes to the everyday life of both Ukrainians and representatives of other nations. The purpose of this study is to identify general trends in the dynamics of indicators of the COVID-19 rate and transformation vectors of critical indicators in the healthcare system. The article reviews modern publications on COVID-19 and healthcare. This study presents the dynamics of changes in Ukraine's health, life, and mortality indicators concerning the COVID-19 pandemic. The urgency of this problem is due to the further detection of new cases of illness and death from COVID-19 in Ukraine. The issue of its spread requires further new research. Analytical and graphical methods were used to predict structural changes in morbidity, mortality, and factors affecting it. The data forecast period covers the years 2021-2023. The accuracy of forecasts is assessed by the MAPE and RMSPE quality criteria. The obtained results showed that the number of cases of illness and death from COVID-19 in Ukraine would decrease over the forecast period due to the increase in the birth rate and vital activity in the pandemic conditions. In the current realities of the world, human resources are of integral importance both for Ukraine with its current situation and for the world in general. The results of further research will play an essential role in the timely detection of new cases of coronavirus disease and the prevention of fatal consequences in the future. For the political structure, this study will help to predict possible changes in the behaviour of coronavirus spread for the following months or years. Also, it will introduce the necessary quarantine restrictions promptly. A comprehensive in-depth study of this problem in science and medicine can help determine new factors of behaviour in everyday human life, which affects the virus spread speed. Even though the attention of Ukrainians has shifted from the problem of morbidity and mortality from COVID-19 to the war beginning, this virus still poses a threat to our state and humanity in general.*
Keywords: COVID-19; dynamics of changes; forecasting; healthcare; Ukraine; visualization.

JEL Classification: G11, G32, O16

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Introduction. At the end of 2019, news appeared in the information space about the appearance of previously unknown viral pneumonia, which would later be called as «coronavirus». In just a few months, the outbreak of COVID-19 is causing international concern and worldwide panic, which significantly impacts all areas of society. In a short period, new infection cases reached a record number and were recorded far outside China. The quarantine and lockdowns did not fully contribute to reducing the coronavirus spread. In Ukraine, the first case of COVID-19 was recorded in March. Some quarantine measures were taken, such as mandatory masking, a ban on visiting recreation areas, keeping a distance, online study, etc.

Every day, morbidity and mortality statistics are increasing, which causes severe global socio-economic consequences. It is known that more than a million people have already died from COVID-19. The coronavirus pandemic has become a global problem that humanity is still trying to overcome.

Literature Review. With the appearance of the first COVID-19 cases, the scientific community has been very actively involved in the study of the relationship between this new disease and other indicators in healthcare. In general, during the years 2019-2023, over 63,000 scientific publications with the keywords «COVID-19» and «healthcare» appeared in the Scopus base (Figure 1).

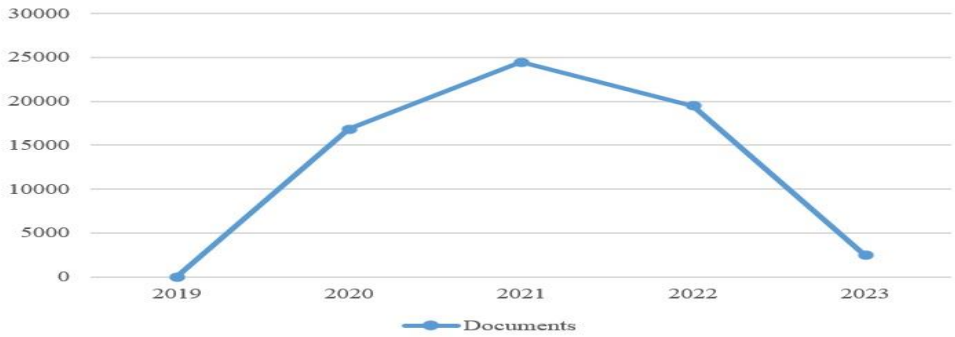

Figure 1. Dynamics of publication activity for the keywords «COVID-19» and «healthcare» in the Scopus base during 2019-2023

Sources: developed by the authors based on Scopus.

Considering Figure 1, the most significant number of publications according to these keywords was published in 2021 (more than 25,000). The list of leading countries whose scientists published the most scientific publications during the studied period includes the USA, Great Britain, Italy, India, Canada, Australia, China, Spain, Germany, and Brazil (Figure 2). We note an exciting aspect that Chinese scientists do not occupy the first positions in terms of publishing activity on the given topic. However, the world recognizes this country where the first COVID-19 case was recorded.

If you focus on the keywords «COVID-19» and «healthcare», you can get the following redistribution of scientific publications by topic (Figure 3). In total, the three largest clusters stand out: red, blue, and green. The red cluster is based to a greater extent on such concepts as «COVID-19», «pandemic», «healthcare system», «healthcare delivery», «prevalence», «mental health», «depression», «psychology», «qualitative research», «qualitative analysis» and others. We can mention the scientific works of such scientists who focused on the listed concepts: Van Stekelenburg et al. (2023), de Mélo et al. (2023), Kuzior et al. (2022), Vasylieva et al. (2020), Letunovska et al. (2022), Kuzmenko et al. (2022).

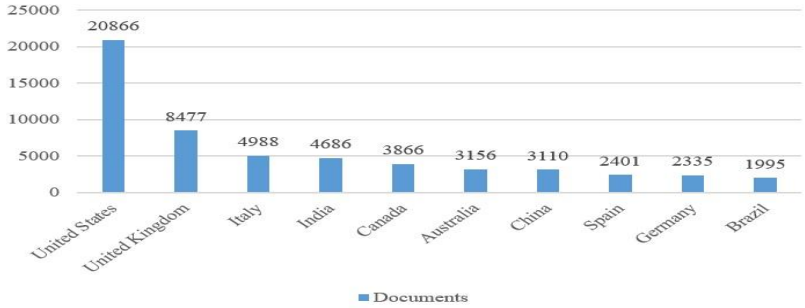

Figure 2. Dynamics of publication activity by the keywords «COVID-19» and «healthcare» in the Scopus base by country during 2019-2023

Sources: developed by the authors based on Scopus.

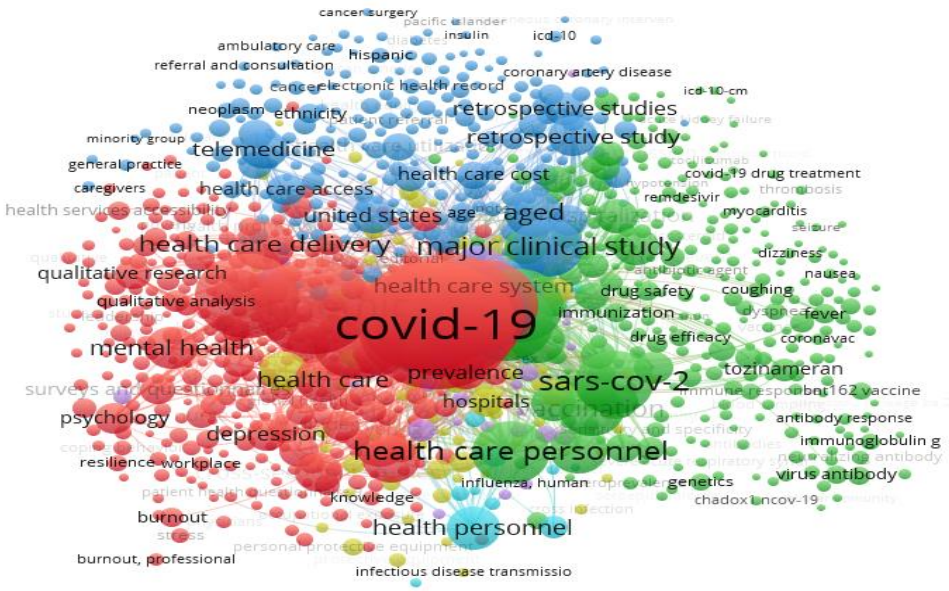

Figure 3. Clustering of scientific publications on the topic of COVID-19 and healthcare in the Scopus base during 2019-2023

Sources: developed by the authors based on Scopus.

The blue cluster combines concepts dedicated to innovative methods of conducting scientific research and healthcare access – Kwan et al. (2023), Ude et al. (2023), Molenberghs (2023), Appleton et al. (2023), Kuzmenko et al. (2021a; 2021c), Kashcha and Dun (2022).

The green cluster brings together scientific publications dedicated to specific comorbidities of COVID-19, vaccination, and specific medical concepts («SARS-CoV2», «care personnel», «tozinameran», «remdesivir», «vaccination», «virus antibody», «immunoglobulin g», «hospitalization» and others). Some scientisits made appropriate accents in their publications: Kuzmenko et al. (2020; 2021b), Vysochyna et al. (2023), Vysochyna ans Jakubowska (2022), Rahmanov et al. (2020), Thanik et al. (2023), Liu et al. (2023).

Given the degree of research into the problem of COVID-19, this topic does not lose its relevance since society must form a straightforward program for the post-epidemic recovery of all areas of the economy and build a scheme that will help minimize the risks from possible repeated waves of the spread of this disease to related diseases. Therefore, the purpose of this study is to identify general trends in the dynamics of indicators of the COVID-19 rate and transformation vectors of critical healthcare indicators.

Methodology and research methods. Let's consider the statistical data of COVID-19 cases and the fatal consequences associated with it in Ukraine for the period from March 2020 to February 2023 (Table 1).

Table 1. Cases of disease and mortality from COVID-19 in Ukraine, 2020-2023

Year-month	COVID-19 cases	Death
2020-Mar	371	6
2020-Apr	3168	68
2020-May	2695	103
2020-Jun	5406	113
2020-Jul	5321	102
2020-Aug	10863	167
2020-Sept	18441	367
2020-Oct	34572	575
2020-Nov	64891	1144
2020-Dec	90627	1375
2021-Jan	43719	1005
2021-Feb	29551	1010
2021-Mar	44472	894
2021-Apr	98153	2034
2021-May	77317	2518
2021-Jun	27855	1252
2021-Jul	5868	340
2021-Aug	3460	127

Continued Table 1

Year-month	COVID-19 cases	Death
2021-Sept	6878	169
2021-Oct	19517	359
2021-Nov	90079	1811
2021-Dec	152263	4530
2022-Jan	388153	4513
2022-Feb	628496	4901
2022-Mar	104341	1409
2022-Apr	33490	411
2022-May	8763	128
2022-Jun	3496	67
2022-Jul	3496	67
2022-Aug	3496	67
2022-Sept	162288	601
2022-Oct	119037	1403
2022-Nov	40039	802
2022-Dec	18445	497
2023-Jan	15393	254
2023-Feb	11964	155

Sources: developed by the authors based on State Statistics Service of Ukraine

Based on this data, it can be noted that the peak incidence occurs from the end of December 2021 to March 2022, while the highest number of deaths is recorded from December 2021 to February 2022.

It is worth noting that such factors influence the statistical indicators of coronavirus disease and deaths from it as birth or death rates, life expectancy, compliance with essential sanitary and hygienic services, etc. It is necessary to study these indicators for a deeper study of this problem and more accurate forecasting in the future.

Let's consider Ukrainian health and population indicators from 2000 to 2020 (Table 2).

Table 2. Baseline data on fertility and health from 2000 to 2020

Year	Birth rate, crude (per 1,000 people)	Life expectancy at birth, total (years)	People using at least basic sanitation services (% of population)
2000	7.80	67.68	94.15
2001	7.70	67.84	94.33
2002	8.10	68.28	94.51
2003	8.50	68.21	94.69
2004	9.00	68.19	94.93
2005	9.00	67.96	95.17
2006	9.80	68.08	95.40
2007	10.20	68.22	95.64
2008	11.00	68.25	95.87
2009	11.10	69.19	96.10
2010	10.80	70.27	96.33
2011	11.00	70.81	96.55
2012	11.40	70.94	96.78
2013	11.10	71.16	97.00
2014	10.80	71.19	97.23
2015	10.70	71.19	97.40
2016	10.30	71.48	97.57
2017	9.40	71.78	97.73
2018	8.70	71.58	97.74
2019	8.10	71.83	97.74
2020	7.80	71.19	97.74

Sources: developed by the authors based on World Bank

Based on these data, the peak birth rate occurred from 2008 to 2013, and life expectancy and people's compliance with minimum sanitary standards began to increase in 2016.

To analyse the dynamics of changes in the studied indicators, the absolute increase and growth rate are used, which are calculated according to the following formulas:

$$\Delta i = y_i - y_{i-1}, i = 1,2 \dots n \quad (1)$$
$$\Delta t = y_t / y_{t-1}, t = 1,2 \dots n \quad (2)$$

where n – the number of levels of the row; t – time component; y_i, y_t – the current value of the row.

For the new values in the forecast period, such forecasting methods as forecast by average absolute growth, average growth rate, and growth curves are used.

Average absolute growth Δ_{AAG} is calculated by formula 3:

$$\Delta_{AAG} = \frac{\sum \Delta i/n}{y_n} \quad (3)$$

Average growth rate Δ_{AGR} is calculated by formula 4:

$$\Delta_{AGR} = \frac{\sum \Delta t/n}{y_n} \quad (4)$$

For forecasting by growth curves, it is necessary to construct a graphical representation of the values and plot trend lines on these graphs by displaying the relevant functional equations and the coefficient of determination. The selection of the best equation takes place based on the coefficient of judgment, the value of which should be as close as possible to unity.

Results. Let's consider the dynamics of changes in morbidity and mortality rates from coronavirus (Table 1) at the end of each month during this period, calculating their absolute growth and growth rate (Table 3):

Table 3. Structural changes of the coronavirus indicators in Ukraine as of 2020-2023

Year-month	Cases of COVID-19	Absolute growth	Growth rate	Death	Absolute growth	Growth rate
2020-Mar	371			6		
2020-Apr	3168	2797.0	8.5	68	62.0	11.3
2020-May	2695	-473.0	0.9	103	35.0	1.5
2020-Jun	5406	2711.0	2.0	113	10.0	1.1
2020-Jul	5321	-85.0	1.0	102	-11.0	0.9
2020-Aug	10863	5542.0	2.0	167	65.0	1.6
2020-Sept	18441	7578.0	1.7	367	200.0	2.2
2020-Oct	34572	16131.0	1.9	575	208.0	1.6
2020-Nov	64891	30319.0	1.9	1144	569.0	2.0
2020-Dec	90627	25736.0	1.4	1375	231.0	1.2
2021-Jan	43719	-46908.0	0.5	1005	-370.0	0.7
2021-Feb	29551	-14168.0	0.7	1010	5.0	1.0
2021-Mar	44472	14921.0	1.5	894	-116.0	0.9
2021-Apr	98153	53681.0	2.2	2034	1140.0	2.3
2021-May	77317	-20836.0	0.8	2518	484.0	1.2
2021-Jun	27855	-49462.0	0.4	1252	-1266.0	0.5
2021-Jul	5868	-21987.0	0.2	340	-912.0	0.3
2021-Aug	3460	-2408.0	0.6	127	-213.0	0.4
2021-Sept	6878	3418.0	2.0	169	42.0	1.3
2021-Oct	19517	12639.0	2.8	359	190.0	2.1
2021-Nov	90079	70562.0	4.6	1811	1452.0	5.0
2021-Dec	152263	62184.0	1.7	4530	2719.0	2.5
2022-Jan	388153	235890.0	2.5	4513	-17.0	1.0
2022-Feb	628496	240343.0	1.6	4901	388.0	1.1
2022-Mar	104341	-524155.0	0.2	1409	-3492.0	0.3
2022-Apr	33490	-70851.0	0.3	411	-998.0	0.3
2022-May	8763	-24727.0	0.3	128	-283.0	0.3
2022-Jun	3496	-5267.0	0.4	67	-61.0	0.5
2022-Jul	3496	0.0	1.0	67	0.0	1.0

Continued Table 3

Year-month	Cases of COVID-19	Absolute growth	Growth rate	Death	Absolute growth	Growth rate
2022-Aug	3496	0.0	0.0	67	0.0	0.0
2022-Sept	162288	158792.0	0.0	601	534.0	0.0
2022-Oct	119037	-43251.0	0.7	1403	802.0	2.3
2022-Nov	40039	-78998.0	0.3	802	-601.0	0.6
2022-Dec	18445	-21594.0	0.5	497	-305.0	0.6
2023-Jan	15393	-3052.0	0.8	254	-243.0	0.5
2023-Feb	11964	-3429.0	0.8	155	-99.0	0.6

Sources: developed by the authors.

The following figures (Figures 4-5) show the visualization of these indicators' growth rates and absolute growth for the period under study.

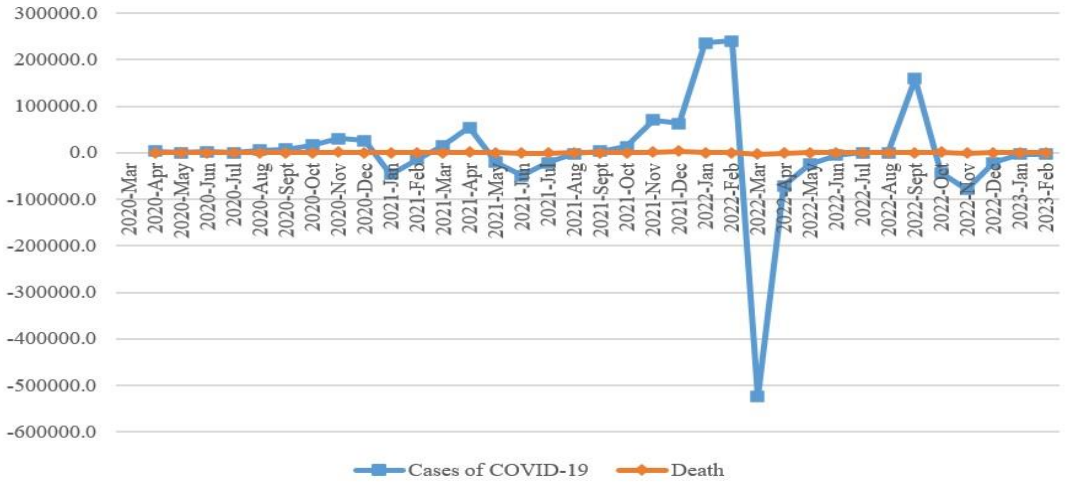

Figure 4. The absolute increase in COVID-19 cases (disease and mortality) in Ukraine as of 2020-2023

Sources: developed by the authors.

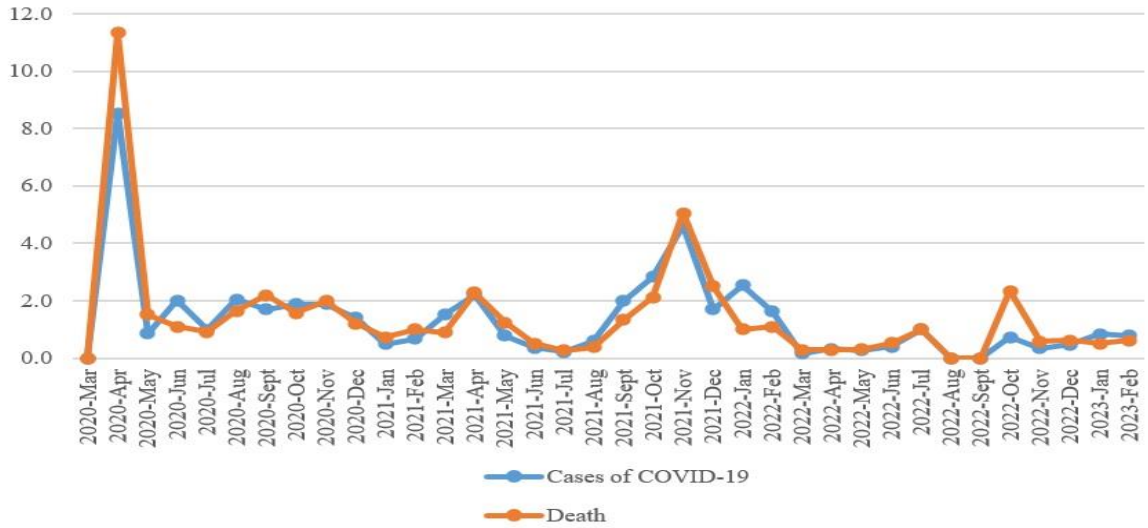

Figure 5. The growth rate of the indicators of COVID-19 cases (disease and mortality) in Ukraine as of 2020-2023

Sources: developed by the authors.

Considering these graphs, we can note that neither the growth rate nor the absolute increase in COVID-19 cases (disease and mortality) have a clearly defined character. There are very sharp changes in the number of diseases between February and March 2022. The growth rate of infection and mortality among the population

of Ukraine did not exceed its peak in April 2020. However, in November 2021, the number of patients again peaked for the entire period, while the highest rate of deaths was recorded in December 2021.

Structural changes characterize the morbidity and mortality of the coronavirus in Ukraine. To conduct the further analysis of dynamic changes in these indicators, it is necessary to study their trends. These dynamics will be researched and forecasted from March 2020 to December 2021. We choose this period due to the abnormal values of the indicators from February 2022, which were caused by the war in Ukraine. The forecast will be built from January to March 2022.

To forecast the values of morbidity and mortality for January – March 2022, we will use the following methods: the average value of the absolute increase and the rate of increase, as well as the help of the growth curve. After performing all necessary mathematical operations, the following predictive values were obtained (Table 4).

Table 4. Predicted values of morbidity and mortality for January – March 2022 based on average values of absolute growth and growth rate

Forecasting indicator	COVID-19 cases	Death
Forecast value by absolute growth	159496.0	4745.4
Forecast value by the growth rate	285698.2	8999.227863

Sources: developed by the authors.

The forecast value will be constructed using the growth curve in the next step (Figure 6).

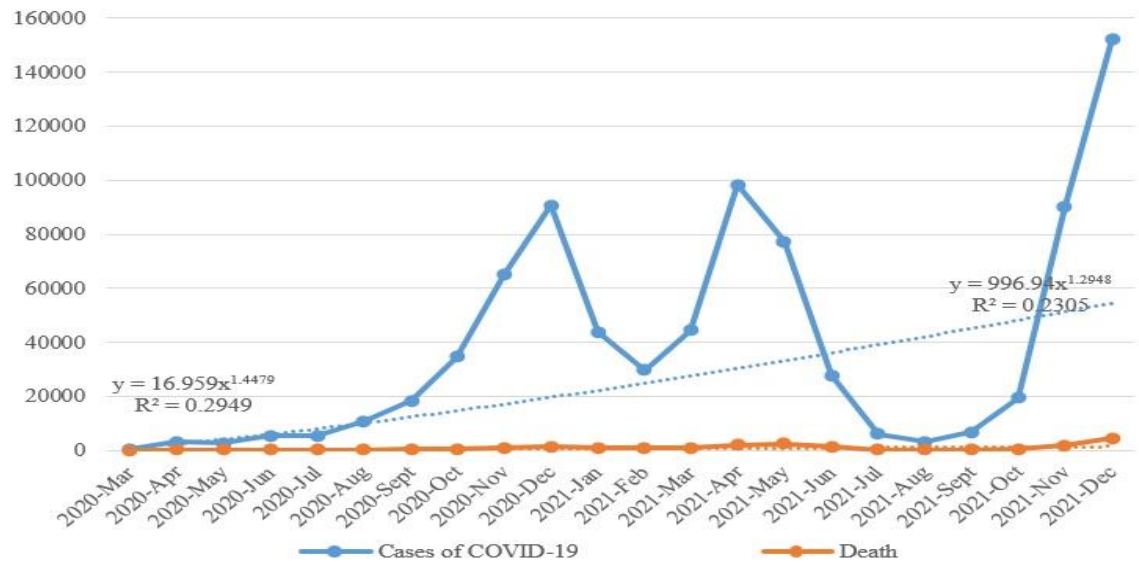

Figure 6. Growth curves for COVID-19 incidence and mortality

Sources: developed by the authors.

In the presented graphs, we can see the curves of the growth rates of COVID-19 cases and deaths with trend lines drawn on them, selected following the maximum coefficients of determination. To construct the forecast values, it is necessary to substitute the numbers «23», «24», and «25» (since the forecast is built for the next three months) instead of x in each of the equations plotted next to the lines on the graphs. The obtained predictive values are presented in Table 5.

Table 5. Predicted values of indicators based on growth curves

Period	COVID-19 cases	Death
2022-Jan	57787.54219	1588.714919
2022-Feb	61061.36903	1689.694137
2022-Mar	64375.66742	1792.576005

Sources: developed by the authors.

Thus, two forecast values were obtained for each of our indicators during forecasting. It is possible to determine which of the forecasts gives the most accurate prediction using the criteria for evaluating quality of

the estimates. We will use the fundamental mean percentage error (MAPE) and RMSPE criteria in this case. The smaller the value of the calculated values of these criteria is, the higher the forecast quality is. The obtained values of the requirements are given below (Table 6).

Table 6. Criteria for assessing quality of constructed forecasts

Predictive value	MAPE	RMSPE
Average absolute growth	9.29%	9.02%
Average growth rate	8.33%	8.27%
Growth curves	5.95%	5.25%

Sources: developed by the authors.

Given the MAPE and RMSPE criteria values, the most accurate forecast was obtained using the growth curve.

A graphical representation of the confirmed forecast values is given in Figure 7.

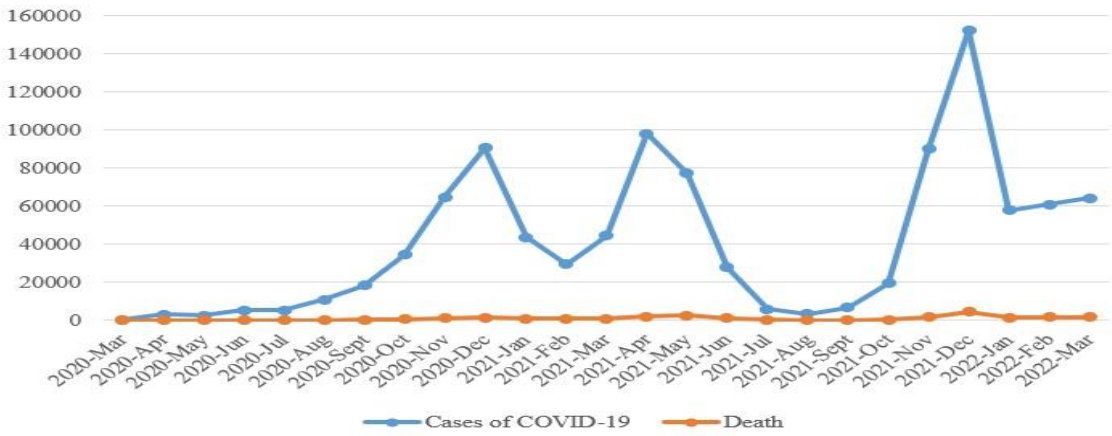

Figure 7. Indicators of morbidity and mortality from COVID-19 in Ukraine with the forecast for January – March 2022

Sources: developed by the authors.

Table 7 is applied to consider the dynamics of changes in indicators such as birth rate, life expectancy, and compliance with essential sanitary and hygienic services from 2000 to 2020, their absolute growth, and growth rate.

Table 7. Structural changes in the birth rate and vital signs in Ukraine during 2000-2020

Year	Birth rate, crude (per 1,000 people)	Absolute growth	Growth rate	Life expectancy at birth, total (years)	Absolute growth	Growth rate	People using at least basic sanitation services (% of population)	Absolute growth	Growth rate
1	2	3	4	5	6	7	8	9	10
2000	7.80			67.68			94.15		
2001	7.70	-0.1	1.0	67.84	0.2	1.0	94.33	0.17636	1.0
2002	8.10	0.4	1.1	68.28	0.4	1.0	94.51	0.180992	1.0
2003	8.50	0.4	1.0	68.21	-0.1	1.0	94.69	0.183607	1.0
2004	9.00	0.5	1.1	68.19	0.0	1.0	94.93	0.237405	1.0
2005	9.00	0.0	1.0	67.96	-0.2	1.0	95.17	0.237651	1.0
2006	9.80	0.8	1.1	68.08	0.1	1.0	95.40	0.235303	1.0
2007	10.20	0.4	1.0	68.22	0.1	1.0	95.64	0.233886	1.0
2008	11.00	0.8	1.1	68.25	0.0	1.0	95.87	0.232521	1.0
2009	11.10	0.1	1.0	69.19	0.9	1.0	96.10	0.231105	1.0
2010	10.80	-0.3	1.0	70.27	1.1	1.0	96.33	0.22645	1.0
2011	11.00	0.2	1.0	70.81	0.5	1.0	96.55	0.225899	1.0
2012	11.40	0.4	1.0	70.94	0.1	1.0	96.78	0.225389	1.0
2013	11.10	-0.3	1.0	71.16	0.2	1.0	97.00	0.224875	1.0

Continued Table 7

1	2	3	4	5	6	7	8	9	10
2014	10.80	-0.3	1.0	71.19	0.0	1.0	97.23	0.224356	1.0
2015	10.70	-0.1	1.0	71.19	0.0	1.0	97.40	0.170735	1.0
2016	10.30	-0.4	1.0	71.48	0.3	1.0	97.57	0.170063	1.0
2017	9.40	-0.9	0.9	71.78	0.3	1.0	97.73	0.164131	1.0
2018	8.70	-0.7	0.9	71.58	-0.2	1.0	97.74	0.007144	1.0
2019	8.10	-0.6	0.9	71.83	0.2	1.0	97.74	0.001004	1.0
2020	7.80	-0.3	1.0	71.19	-0.6	1.0	97.74	0.001122	1.0

Sources: developed by the authors.

The following figures (Figures 8-9) show the visualization of growth rates and the absolute increase of indicators for the period under study.

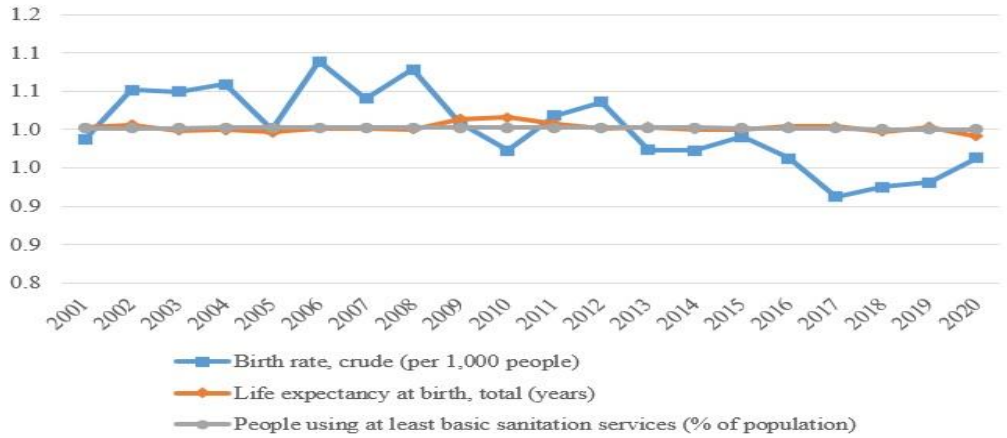

Figure 8. The growth rate of fertility and health indicators in Ukraine during 2000-2020

Sources: developed by the authors.

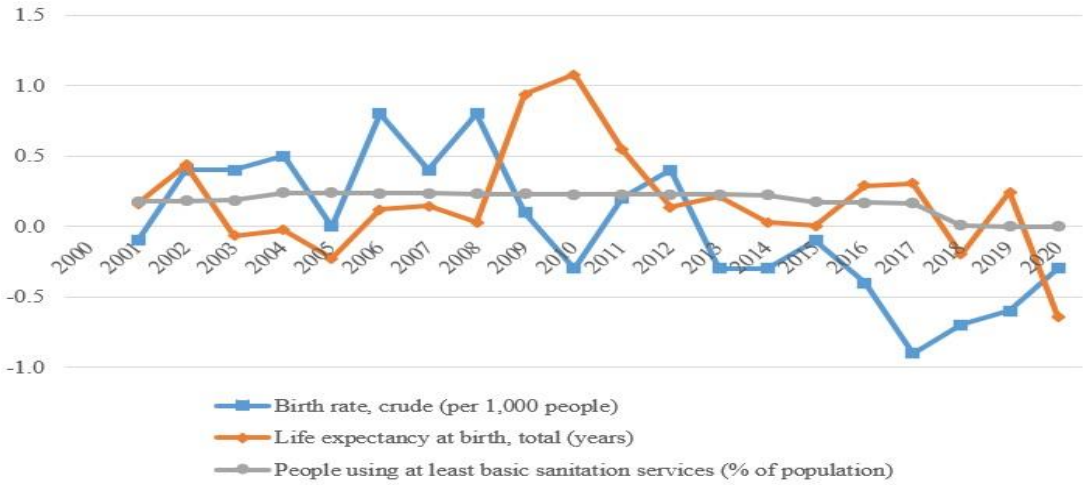

Figure 9. Absolute growth of fertility and health indicators in Ukraine during 2000-2020

Sources: developed by the authors.

The growth rate of indicators of people's compliance with minimum sanitary norms and life expectancy during the studied period almost does not change. The birth growth rate does not have a clearly expressed character. We can note that the highest birth rate was observed in 2006 and 2008, then a decline in this indicator was observed, and only in 2019 the total birth rate began to increase again. The absolute increase in compliance with sanitary standards from 2000 to 2020 is almost unchanged. The highest life expectancy was observed in 2010, while the birth rate in this period has nearly the lowest value for the entire studied period.

The next step is calculation of forecasts of these indicators for the period 2021-2023. We use a methodology similar to data analysis on the COVID-19 cases and deaths.

After performing all the necessary mathematical operations, the following predictive values were obtained (Table 8).

Table 8. Predicted values of birth rate and health in Ukraine during 2000-2020 based on average values of absolute growth and growth rate

Forecasting indicator	Birth rate, crude (per 1,000 people)	Life expectancy at birth, total (years)	People using at least basic sanitation services (% of population)
Forecast value by absolute growth	7.8	72.0	97.92
Forecast value by the growth rate	7.8	71.40935157	97.92580087

Sources: developed by the authors.

The next step is to construct the forecast value using growth curves (Figure 10).

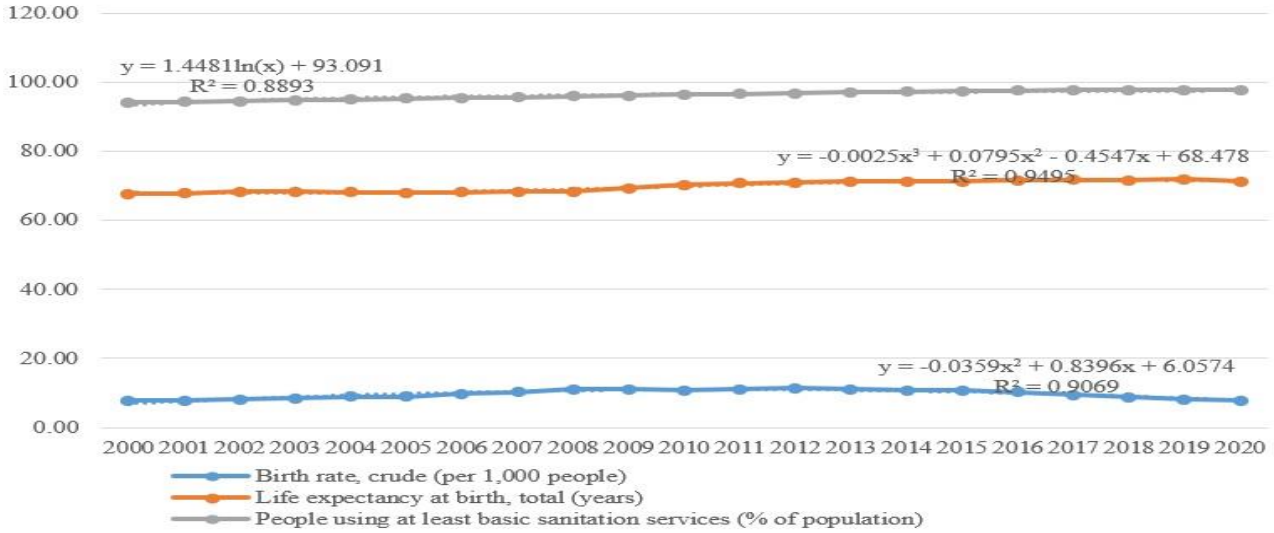

Figure 10. Growth curves for fertility and health indicators, 2000-2020

Sources: developed by the authors.

On the presented graphs, we can see the curves of the birth rate growth, life expectancy, and people's observance of minimum sanitary services with trend lines drawn on them, selected following the maximum coefficients of determination. Table 9 shows the forecast values of these indicators for the period 2021-2023.

Table 9. Forecast values for fertility and health indicators in Ukraine based on growth curves

Period	Birth rate, crude (per 1,000 people)	Life expectancy at birth, total (years)	People using at least basic sanitation services (% of population)
2021	7.153	70.3326	97.56713858
2022	6.3771	69.6579	97.63150917
2023	5.5294	68.7972	97.69313975

Sources: developed by the authors.

Forecast quality coefficients will be calculated using a similar method to select the most accurate forecast. (Table 10).

Table 10. Criteria for assessing quality of constructed forecasts

Predictive value	MAPE	RMSPE
Average absolute growth	5.32%	4.69%
Average growth rate	4.97%	4.62%
Growth curves	13.50%	8.51%

Sources: developed by the authors.

Based on the results of MAPE and RMSPE criteria calculations, the most accurate forecast was obtained using the average growth rate.

A graphical representation of the confirmed forecast values is given in Figure 11.

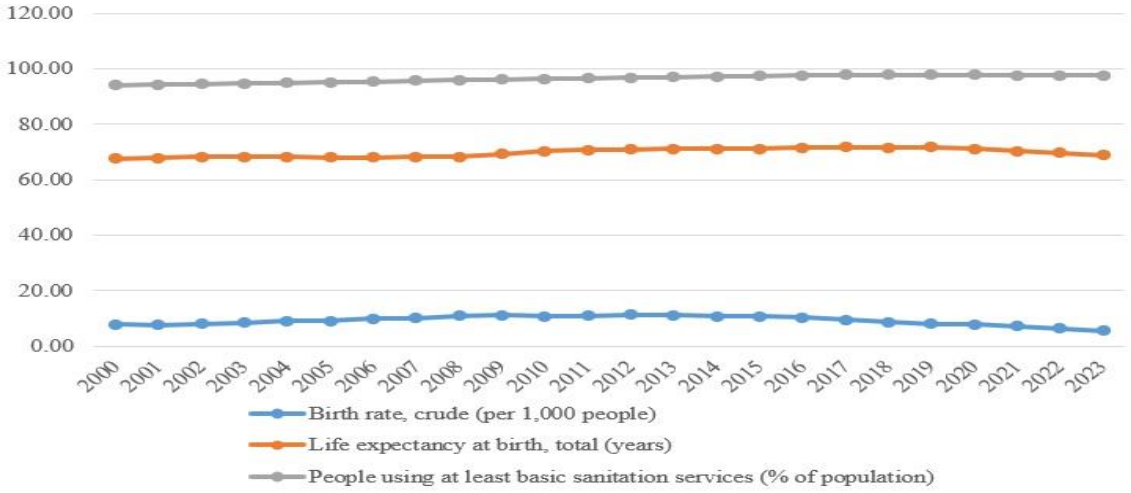

Figure 11. Rates of birth, life expectancy and human compliance

Sources: developed by the authors.

To study the issue of COVID-19 spread in Ukraine and the factors that affect it, such indicators as cases of coronavirus disease, fatal cases of the disease, birth rate (per 1000 people), life expectancy at birth (total, in years) were chosen. Besides, the population percentage and essential sanitation services were applied. Because of abnormal values of the COVID-19 morbidity and mortality at the beginning of 2022 and due to the war start in Ukraine, the forecast for these data is built from January to March 2022. For all other indicators, the forecast values are calculated for the period from 2021 to 2023. Calculations of absolute growth and growth rates of the investigated indicators were carried out. Their dynamics of change need to have a clearly expressed character. Methods such as average complete growth, average growth rate, and growth curves were used to forecast values for the studied period. Quality criteria such as MAPE and RMSPE were calculated to analyse the quality of forecasts and select the most accurate from the presented ones. For study of the COVID-19 morbidity and mortality, the most negligible result, symbolizing the high accuracy of the estimates, was calculated by the growth curve forecasting method. In the analysis of the birth rate, life expectancy, and the percentage of people who observe basic hygiene standards, the most accurate forecast was calculated by the method of the average growth rate. As a result of the study, it was found coronavirus disease and deaths from it showing a downward trend. Life expectancy and the number of people using minimal sanitary and hygienic services are increasing. The birth rate will hardly change from 2020.

Conclusions. This study presents the results of the predicted dynamic changes in indicators of vital activity, disease, and death related to COVID-19. The period of the studied data covers the years 2000-2022; forecasting of indicators is carried out as of 2021-2023. Among the analysis methods of structural changes, average absolute growth, average growth rate, and growth curves were used for the research. Visualization of the results is presented as graphs. The forecast accuracy was calculated according to the MAPE and RMSPE quality assessment criteria. As a study result, a trend towards a decrease in the indicators of the coronavirus disease and fatal consequences in Ukraine as of 2022 was revealed. Values of birth rate, life expectancy, and the percentage of people who observe basic sanitary and hygienic norms during 2021-2023 are increasing. The analysis results may be further helpful to forecast various scenarios of the pandemic development in Ukraine and worldwide.

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Теоретичні аспекти дослідження ключових трендів COVID-19 та трансформацій індикаторів у сфері охорони здоров'я

Нові випадки захворювання на коронавірус і летальні наслідки від нього продовжують фіксуватися і зараз, майже через 3 роки після першого виявленого випадку. Проблема розповсюдження COVID-19 турбує світову спільноту, оскільки вірус впливає на соціальну, економічну, екологічну, політичну та інші сфери життя кожної людини. Пандемічна реальність внесла величезний спектр змін в повсякденне життя як українців, так і представників усіх національностей. У цьому дослідженні представлено динаміку змін показників здоров'я, життя та смертності в Україні у зв'язку з пандемією COVID-19. Актуальність даної проблеми обумовлена подальшим виявленням нових випадків захворювання і смерті від COVID-19 в Україні, питання стану його поширення потребує подальшого більш широкого дослідження. Для прогнозування структурних змін захворювання, смертності та відповідних чинників були використані аналітичні та графічні методи. Період прогнозування даних охоплює 2021-2023 роки. Точність прогнозів оцінюється критеріями якості MAPE та RMSPE. Отримані результати показали, що за прогнозований проміжок часу кількість випадків захворювання і смерті від COVID-19 в Україні буде зменшуватись, що зумовлено збільшенням показників народжуваності та життєдіяльності в умовах пандемії. У нинішніх реаліях світу людський ресурс має невід'ємне значення як для України з її поточним становищем, так і для світу в цілому. Результати подальшого дослідження зіграють важливу роль у вчасному виявленні нових випадків захворювання на коронавірус та запобіганню летальним наслідкам у майбутньому. Для політичної структури дане дослідження допоможе спрогнозувати можливі зміни у поведінці розповсюдження коронавірусу на подальші місяці або роки та вчасно запровадити необхідні карантинні обмеження. Більш глибоке і всебічне вивчення цієї проблеми у сфері науки і медицини може стати корисним під час визначення нових чинників поведінки в повсякденному житті людини, що впливають на швидкість поширення вірусу. Незважаючи на те що фокус уваги українців змістився з проблеми захворюваності та смертності від COVID-19 на початок війни, цей вірус усе ще становить загрозу для нашої держави і людства загалом.

Ключові слова: візуалізація; динаміка змін; охорона здоров'я; прогнозування; Україна; COVID-19.