CONSIDERATIONS REGARDING THE EVOLUTION OF COVID-19 IN THE SOUTH-WEST OLTENIA REGION OF ROMANIA, IN THE PERIOD APRIL - SEPTEMBER 2020

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Abstract

COVID-19 is an infectious disease that appeared in late 2019 in Wuhan, a city in central China. The rapid spread of the disease turned it into a pandemic only a few months after its onset affecting all countries of the world. Controlling and stopping it are real challenges for all mankind. This paper analyzes the evolution of COVID-19 in the South-West Oltenia region of Romania, between April and September 2020, as well as the similarities and disparities between the counties belonging to this region. In this regard, two indicators were used, namely the cumulative infection index at 14 days per 1000 inhabitants (CII) and the total number per person infected with Covid-19 (STNI) in county i, at time j, per 100,000 inhabitants with home in that county. The research was based on the series of data collected by authors from the daily communiqués of the Strategic Communication Group within the Romanian Ministry of Internal Affairs.

Keywords: *COVID-19, Romania, dynamics, territorial inequality*

Classification JEL: *I140, I190, R190*

1. Introduction

The spatial spreading of COVID-19 and its temporal evolution is a complex process that involves various factors, sectors and individuals. Among the factors that determine the rapid spread of the COVID-19 pandemic can be listed: personal hygiene (Pogrebna, Kharlamov, 2020), climate (temperature, precipitation, humidity, wind speed and solar radiation), (Ahmadi, M & al, 2020), population density (Rocklöv, Sjödin, 2020)

In overcrowded cities, the risk of spreading the virus is much higher because social distancing is difficult to implement on the one hand due to the fact that the vast majority of citizens live in apartments and on the other hand the high degree of use of public transport.

Control of COVID-19 or rather the inability of governments to stop the pandemic caused by this disease has become apparent to everyone. The pandemic highlighted the vulnerability of socio-economic systems whose resilience has diminished due to practices of ignoring those necessary investments that are found under the concept of "dynamic capabilities of the public sector" (Kattel and Mazzucato, 2018).

The COVID-19 pandemic also highlights problems of inequality within societies, which requires an orientation towards inclusive innovation rather than innovation that does not take into account distributive effects. (Klingler-Vidra, & al, 2020)

COVID-19 has spread rapidly throughout Romania since the community transmission was identified for the first time in February 2020, the first case being registered in Gorj County, one of the counties of the South-West Oltenia Region subject to analysis.

The study was structured in five sections, as follows: in the first section were captured some ideas about the impact of COVID-19 pandemic on socio-economic systems, the second section described the research methodology, the third section was dedicated results and discussions, and the last two sections were dedicated to the conclusions and challenges for future research.

2. Research methodology

The research is based on the series of data collected by authors from the daily communiqués of the Strategic Communication Group within the Ministry of Administration and Interior between April 1 and August 31, 2020.

For the analysis of the evolution of COVID-19 disease in the counties of the South-West Oltenia Region (Gorj, Vâlcea, Dolj, Mehedinți, Olt), eight variables were identified and used. The list of abbreviations, the meaning and the units of measurement of the variables used are shown in Table 1.

Table no. 1 Description of variables used

Variables	Significations	Units
Total_RO	Total number of Covid-19 cases registered in Romania	number
Total_SWO	Total number of Covid-19 cases registered in South-West Oltenia region	number
Total_countyX	Total number of Covid-19 cases registered at the level of county X	number
INC_RO	Daily increase of Covid-19 cases in Romania	number
INC_SWO	Daily increase of Covid-19 cases in the South-West Oltenia region	number
INC_countyX	Daily increase of Covid-19 cases at the level of county X	number
SWO%RO	The share of Covid-19 cases registered in South-West Oltenia region, in the total number of cases in Romania	%
countyX%SWO	The share of Covid-19 cases registered in county X in the total number of cases from South-West Oltenia	%

For the names of the counties, their official abbreviations were used. For example, for the total number of Covid-19 cases registered at the Gorj County level, the variable is Total_GJ.

Also, to facilitate both comparisons between counties and between the South-West Oltenia and Romania development region, regarding the evolution of Covid-19, in the analyzed period, as well as to estimate the evolutions of the cumulation coefficients accumulated at 14 days per 1000 inhabitants, the population was used by residence on January 1, 2020 at the level of Romania, at the level of the South-West Oltenia development region, as well as at the level of each of its counties.

In a first stage of the research, the main characteristics of the data series used were analyzed (Table 2).

Table no. 2 Characteristics of the variables used in the analysis

Variables	Mean	Std. Error	Std. Dev.	Skewness	Kurtosis
Total_RO	31172.26	1851.38	22750.19	1.01	-0.08
Total_DJ	438.39	36.21	444.92	1.47	1.07
Total_GJ	414.14	38.34	471.13	1.20	0.05
Total_MH	327.01	29.02	356.57	1.15	-0.26

Variables	Mean	Std. Error	Std. Dev.	Skewness	Kurtosis
Total_OT	350.64	32.51	399.43	1.10	-0.18
Total_VL	224.93	26.63	327.29	1.57	1.16
Total_SWO	1755.12	161.86	1988.92	1.29	0.31
INC_RO	561.60	38.31	470.81	0.46	1.81
INC_SWO	45.35	4.07	50.02	1.14	0.21
INC_DJ	11.23	1.26	15.48	2.15	5.51
INC_GJ	10.23	1.02	12.48	1.44	1.38
INC_MH	7.44	0.97	11.98	4.06	19.79
INC_OT	8.64	0.77	9.48	1.02	0.09
INC_VL	7.83	1.05	12.91	1.90	3.16
SVO%RO	4.15	0.17	2.10	0.60	-1.07
DJ%SWO	31.80	0.64	7.86	0.03	-1.26
GJ%SWO	21.24	0.39	4.82	-1.46	1.07
MH_SWO	19.72	0.19	2.29	0.88	0.94
OT%SWO	17.59	0.35	4.36	-0.05	-1.07
VL%SWO	9.65	0.33	4.00	0.26	-1.47

Source: Created by authors using SPSS

The vast majority of data series characteristic values show that the respective data series have an approximately normal distribution, in the sense that both Skewness and Kurtosis values fall in the range (-1.96, +1.96). Exceptions are the data series on Daily increase of Covid-19 cases at the level of Dolj county (INC_DJ), which has a positive leptocurtic and asymmetric distribution, and respectively, Daily increase of Covid-19 cases at the level of Vâlcea county), a distribution also leptocurtic.

A special case is represented by the variable Daily increase of Covid-19 cases at the level of Mehedinți county (INC_MH) for which the distribution is very strongly leptocurtic (Kurtosis = 19.79) and asymmetrically positive (Skewness = 4.06). This distribution is a consequence of the fact that during the period 24-28 July, INC_MH took very high values (82 cases on 25 July, 68 cases on 26 July and 71 cases on 28 July) compared to the number of new cases registered in the other days of the analyzed period (generally less than 20 new cases).

In order to highlight the similarities and disparities between the counties of the South-West Oltenia region, we used two indicators.

a) the cumulative infection index at 14 days per 1000 inhabitants (CII):

$$CII_{ij} = \frac{\sum_{j-14}^{j} INC_{ij}}{\frac{H_i}{1000}}, \quad i = \overline{1,5},\ j = \overline{15,151} \tag{1}$$

CII_{ij} represents the cumulative infection index from the fifteenth day of the analyzed period until its end;

INC_{ij} represents the daily increase of Covid-19 cases at the county level i at time j;

H_i is the number of the population that on January 1, 2020 had the domicile in county i.

b) the total number of persons infected with Covid-19 (STN_{ij}) in county i, at time j, per 100,000 inhabitants residing in that county, determined by relation:

$$STNI_{ij} = \frac{\sum_{k=1}^{j} INC_{ik}}{\frac{H_i}{100000}}, \quad i = \overline{1,5},\ j = \overline{1,151} \tag{2}$$

For the comparability of the results obtained at the level of each county with the values registered at the regional level, as well as the values registered at the level of the South-West Oltenia development region and those registered at the Romanian level, the values registered at their level were determined (CII_{SWO}, $STNI_{SWO}$, CII_{RO} și $STNI_{RO}$).

Data series processing was performed using SPSS.

3. Results and discussions

The research begins with an analysis of the evolution of the total number of Covid-19 infections in the South-West Oltenia development region, between April and August 2020.

During the period under analysis, the total number of COVID-19 cases in the South - West Oltenia Region was 6902 people, which represents 8% of the total cases in Romania (87540 people).

At the level of the analyzed region, Dolj County is on the first place with 1717 cases (24.87%), and the least affected was Mehedinți County with 1133 cases (16.41%). With 1551 cases, Gorj County has 22,47% of the total in the South-West Oltenia region, followed by Olt County (19,01%) and Vâlcea County (17,23%).

An exponential trend of the total number of Covid-19 infections can be observed in the South-West Oltenia development region, in the analyzed period (Figure no.1)

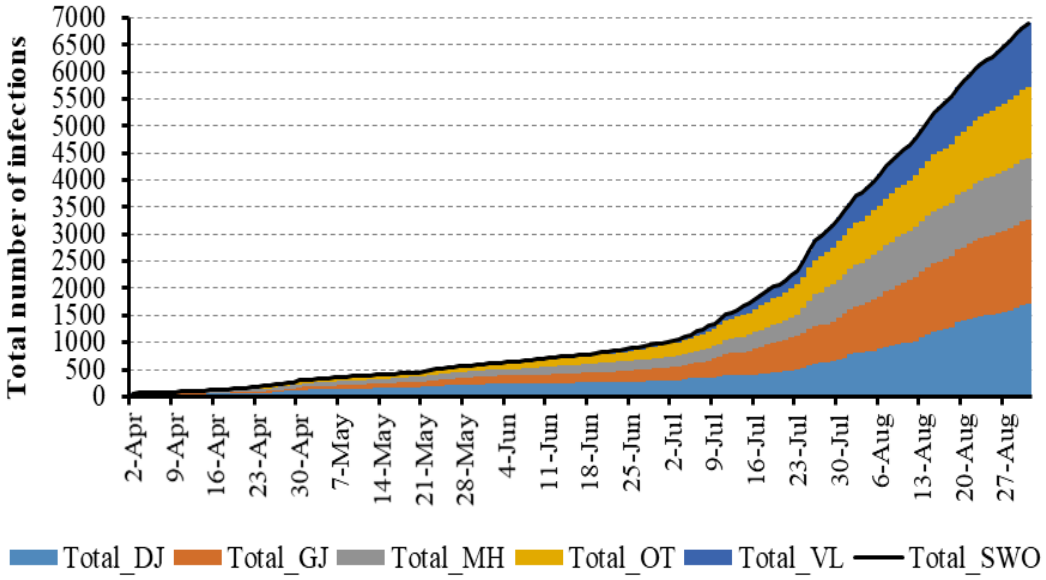

Figure no.1 Evolution of the total number of Covid-19 infections
in the South-West Oltenia development region, between April and August 2020

Regarding the evolution of the infection index cumulated at 14 days per 1000 inhabitants, at the level of the South-West Oltenia region for the analyzed period, the highest value is registered on August 5 in Mehedinți County. (Figure no.2)

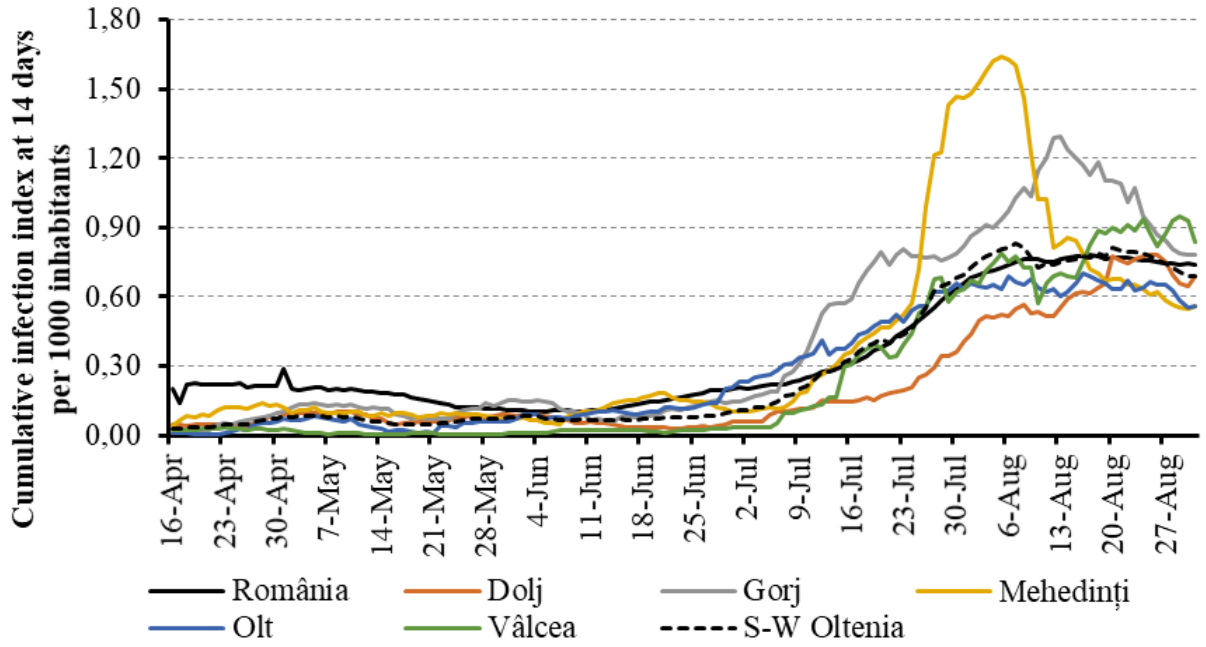

Figure no.2 The infection index cumulated at 14 days per 1000 inhabitants

The evolution of the daily increase of Covid-19 cases in the counties from the South-West Oltenia region, shown in Figure no. 2, highlights two aspects:

a) the general trend of increasing infections in all five counties, a trend that becomes more and more evident starting from July;

b) the very irregular evolution of the daily values registered around the general trend, especially in the counties of Dolj, Mehedinți and Vâlcea.

During the period under analysis (April 2 - August 31, 2020), the most significant daily increases were recorded in Dolj which recorded a maximum increase of 91 daily cases of COVID-19 on August 19 compared to August 18 transposed into an increase relatively daily of 32.96%, followed by Mehedinți which registered a maximum increase of 82 daily cases of COVID-19 on July 25 compared to July 24, transposed into a relatively daily increase of 29.26% and Vâlcea which recorded a maximum increase of 82 daily cases of COVID-19 on July 26 compared to July 25, translated into a relatively daily increase of 21.66%.

To highlight the characteristics of daily increase of Covid-19 cases at the level of each county, the data series were leveled using the method of moving averages calculated for an interval of seven days (Figure no. 3). For example, the value calculated for April 5 is the average of the values recorded between April 2 and 8, for April 6, this is the average of the values recorded between April 3 and 9, and so on.

The obtained results highlight the fact that at the level of the South-West Oltenia Region, Olt County registered the most significant increases of the average number of new cases calculated at 7 days in the analyzed period.

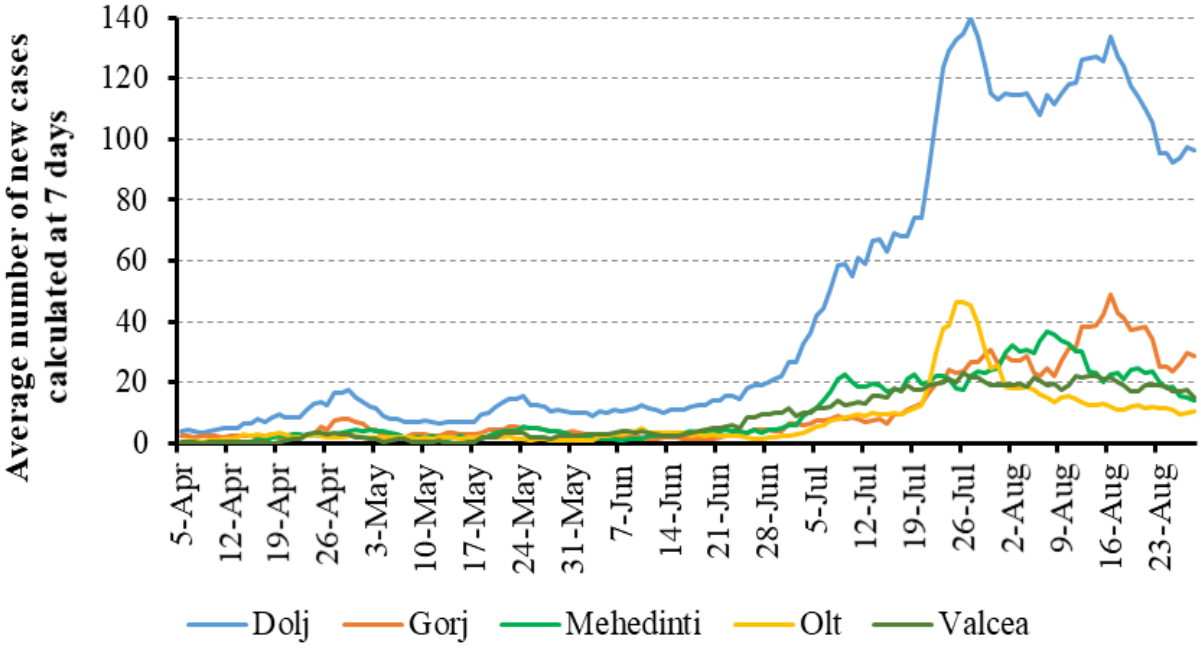

Figure no. 3 Evolution of the average number of new cases calculated at 7 days

Also, during the analyzed period, there were fluctuations in the evolution of the weights of the total number of cases of Covid-19 infection registered in the counties in the total cases registered in the South-West Oltenia development region (Table no. 3).

Table no. 3. Evolutions of the weights of the total number of Covid-19 infection cases registered at county level in the total region (%)

Indicator	Calendar date					
	2-Apr	30-Apr	31-May	30-Jun	31-Jul	31-Aug
DJ%SWO	43.55	39.39	37.61	29.77	20.85	24.88
GJ%SWO	12.90	15.82	24.11	22.81	23.40	22.47
MH*SWO	17.74	20.88	18.89	18.77	20.99	16.42
OT%SWO	12.90	15.15	14.33	23.41	21.22	19.01
VL%SWO	12.90	8.75	5.06	5.25	13.54	17.23

Source: Prepared by the authors

As can be seen from table no. 3, most cases of COVID-19 infection per 100,000 inhabitants, in the South-West Oltenia development region, are registered in Dolj County. Compared to the other counties, in Dolj the evolution of COVID-19 infection cases per 100,000 inhabitants changed significantly from one month to the next in the sense of a decreasing trend over almost the entire analysis period from 43.55% and 39.39 % (April 2 and 30) to 20.85% (July 31), after which there is a slight increase to 24.88% (August 31).

This decreasing trend at the beginning of the analyzed period of cases of COVID-19 infection per 100,000 inhabitants, but at a lower level is also manifested in Vâlcea County, which recorded a share of 12.90% (April 2), reaching 5.06% (May 31), after which the trend becomes ascending, registering 17.23% cases of COVID-19 infection per 100,000 inhabitants (August 31).

The rapid spread of the coronavirus pandemic determined the decree of the state of emergency in Romania starting with March 16, 2020, just a few days after the World Health Organization declared a COVID-19 pandemic. The establishment of this state was manifested by exceptional measures of first urgency, some of which even limit fundamental rights and with direct applicability in various fields such as health, employment and social protection, public order, economy, justice, foreign affairs, education, and emergency first aid priorities with gradual applicability.

The state of emergency was imposed for a period of 2 months (March 16 - May 14, 2020), and the effects were not long in coming, the number of cases of COVID-19 infection generally registering a downward trend.

Unfortunately, with the establishment of the alert, on 15 May 2020, some of the measures imposed by the state of emergency were relaxed, such as the removal of travel restrictions, the reopening of terraces and malls. This relaxation of the rules, along with non-compliance with the epidemiological restrictions essential in combating epidemics caused by respiratory infections (facial mask, avoidance of congestion, physical distance, etc.). has led to an increasing and significant trend in the number of cases of COVID-19 infection since July. (Figure no.4)

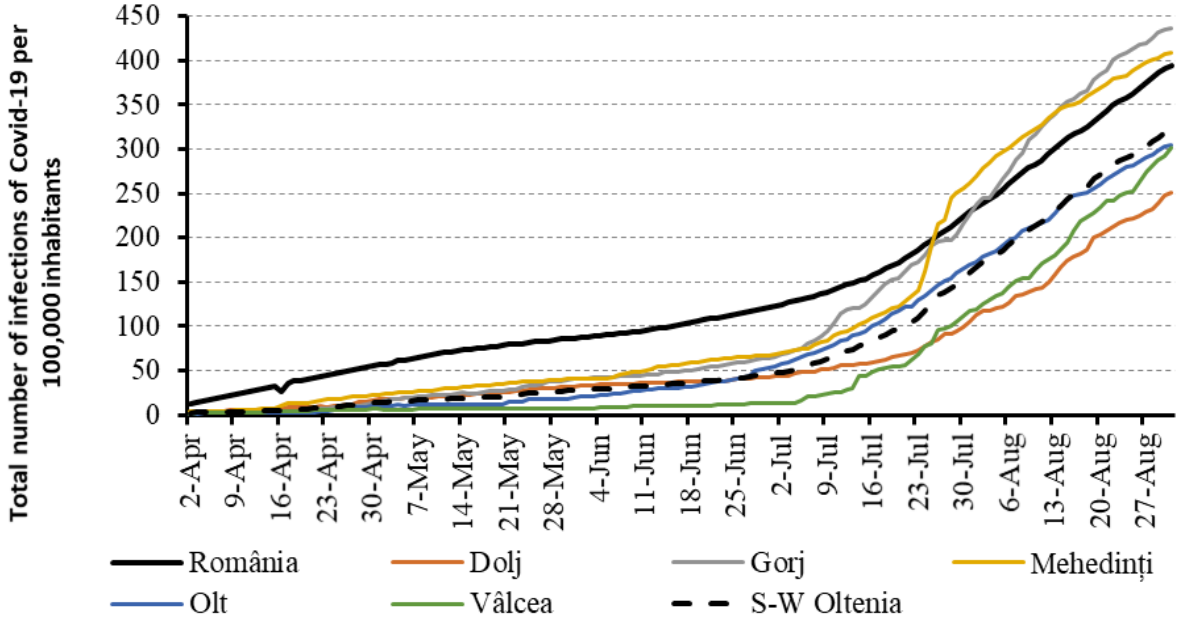

Figure no. 4. Evolutions of the total number of cases of Covid-19 infections per 100,000 inhabitants living in the respective region

The first case of COVID-19 registered in Romania was on 27.02.2020, being a person domiciled in Gorj County, in the South-West Oltenia region. The cause of the infection was close contact with an infected person from Italy who arrived in Romania for business. From that moment on, the number of infected people began to increase. The first death due to COVID-19 was registered in Romania on March 21. 2020 being a 67-year-old Romanian citizen with comorbidities (terminal cancer), hospitalized in a hospital in Craiova, Dolj County.

However, by the end of June 2020, the total number of cases of Covid-19 infections per 100,000 inhabitants living in the South-West Oltenia region were below the national average. Starting with July 2020, there are 2 counties of the South-West Oltenia region that have registered values above the national average, respectively: Gorj and Mehedinți.

As can be seen in figure no.5, the values of the infection index accumulated at 14 days per 1000 inhabitants registered in the South-West Oltenia region are on an upward trend, being at the beginning of July above the national average. The county that registered significant increases of this index was Mehedinti from 0.04 cases/1000 inhabitants (April 16, 2020) to 1.63 cases/1000 inhabitants (August 6, 2020). Gorj is the second county in the region with serious problems in terms of the spread of the disease, so from a value of the cumulative infection index at 14 days per 1000 inhabitants from 0.01 (April 16, 2020) to 1.30 (13 August 2020). Towards the end of the analyzed period (31 August 2020) the ranking of counties in the South West Oltenia region in terms of the cumulative infection index at 14 days per 1000 inhabitants changes, so Vâlcea county occupies the first position (0.84 cases/1000 inhabitants) being followed by Gorj (0 ,78 cases / 1000 inhabitants) and Dolj (0.69 cases / 1000 inhabitants).

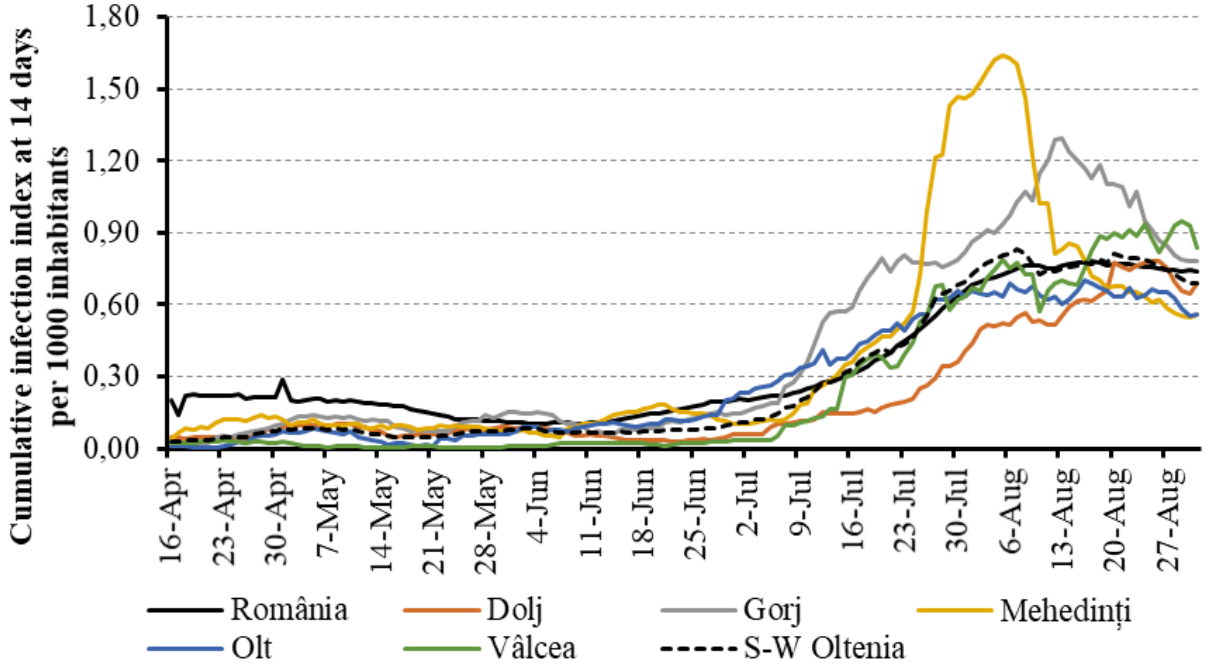

Figura 5. Evoluția indicelui infecării cumulate la 14 zile per 1000 locuitori

4. Conclusions

The aim of the paper is to provide a snapshot of the coronavirus pandemic in the South-West Oltenia region of Romania, after the first wave of the pandemic, analyzing in parallel the governmental measures and their territorial implications.

The analysis of the data regarding the evolution of the pandemic in the South-West Oltenia region of Romania highlights a constant increase of confirmed cases.

Territorial monitoring, together with the development and implementation of regionally differentiated policies, as well as socio-economic protection measures are the main tasks that the government must consider in preparing for future pandemic waves.

Bălăcescu and Babucea (2018) show that economic growth is not evenly distributed in Romania: some regions developed and others did not, which led to accentuated social inequalities within the country. It is interesting to observe in a future study whether these social inequalities have been correlated with the spread of COVID-19 in Romania. This study focuses on the South-West Oltenia Region of Romania, but later the research is intended to be extended to other areas.

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