

COVID 19: Health, Statistical and Constitutional Aspects

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Abstract. Starting from the assumption that "*health is the primary good*" and although the humanitarian character of the epidemic remains the most urgent aspect to be treated, unfortunately it is not the only one. As acknowledged by the World Health Organization on 11 March, the COVID-19 epidemic has become a worldwide pandemic. The response to the emergency connected with the spread of the virus, to limit its negative impact on the economic system, must consist in a rapid and targeted intervention. The aim of this paper is to analyse the main aspects of Covid 19 from the point of view of health, constitutional and statistical, highlighting the evolution of the/phenomenon and its territorial diffusion, with reference to the spread of the virus in Italy.

Keywords: Covid 19 · Constitutional aspects · Statistical data · Public health

1 Introduction

Starting from the assumption that "*health is the primary good*" and although the humanitarian character of the epidemic remains the most urgent aspect to be treated, unfortunately it is not the only one.

The restrictive measures aimed at containing the virus have a negative economic effect both through the closure of commercial activities and changes in household spending decisions, and through the blocking of certain industrial activities, with interruptions even in global value chains.

It's not easy to quantify the effects of these measures on the economic system as they will depend on a number of factors such as duration, the spread of contagion in the

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territorial context and the rigidity in the implementation of containment measures in other countries, especially those linked to trade relations with ours.

The negative effects on the economic system are propagated through a double shock, of the demand (reduction of the consumption of the families, decrease of the tourist flows, decrease of the external demand) and of the supply (closing of the activities, lack of intermediate assets of production) which is widespread in all productive sectors (wholesale and retail trade, transport, accommodation and catering services, real estate).

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The response to the emergency connected with the spread of the virus, to limit its negative impact on the economic system, must consist in a rapid and targeted intervention.

The aim of this paper is to analyze the main aspects of Covid 19: that is, to analyze the phenomenon from the point of view of health, constitutional and statistical, highlighting the evolution of the phenomenon and its territorial diffusion, with particular reference to the spread of the virus in Italy, a heavily affected nation.

2 Clinical and Health-Related Features of COVID-19 Infection

2.1 Background

Coronaviruses (CoVs) are a family of respiratory viruses that induce cause mild to moderate diseases simulating flu syndrome or severe respiratory syndromes [1–3]. Past years, two respiratory infections by coronavirus have been described such the severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS).

SARS is knowns as a virus developed in southern China in November 2002 resulting in 774 deaths in in the 2002–2003 period [4]; MERS is detected for the first time in Saudi Arabia in 2012 and produced 858 deaths [5]. In December 2019, viral pneumoniae were linked to a new coronavirus in Wuhan and in following days a new coronavirus, known as 2019-nCoV, was isolated [6]. On February 11, 2020, the World Health Organization (WHO) formally designed the new coronavirus 2019 infection Coronavirus Disease 2019 (COVID-19). The increase in the number of cases and expansion of geographical areas induced WHO to declare pandemic disease on March 11, 2020 [7].

2.2 Clinical Aspects

SARS-CoV-2 infection has been associated with different several clinical manifestations ranging from mild disease to death, which occurs from sepsis and/or Acute respiratory distress syndrome (ARDS). Early diagnosis of the clinical symptoms is recommended for promptly starting the adequate restrictive measures as social quarantine and treatments to avoid spreading of the virus and complications in patients [8]. Fever, cough and dyspnea are the most common symptoms reported whereas those

patients who develop pneumonia and ground-glass opacity in radiological scans have higher risk of complications [8, 9].

Moreover, elderly patients with comorbidities can develop acute respiratory distress syndrome more rapidly and die of multiple organ failure. The case fatality rate (CFR) ranged from 10.5% to and 5.6% for cardiovascular diseases, diabetes, chronic respiratory diseases, hypertension and tumors, respectively [10]. Rare manifestations induced by COVID-19 are gastrointestinal disorders such as vomiting, diarrhea, and abdominal pain, as observed in about 2–10% of patients and nausea and diarrhea could arise early compared to respiratory signs and symptoms [11]. Myalgia, pharyngodynia and anorexia were observed but rarely early recognized. Many patients developed multiorgan dysfunction such as liver deficiency and acute renal failure and furthermore mental confusion [12].

Neurological symptoms of COVID-19 infection are common and often severe such as dizziness, loss of smell (anosmia), loss of taste (ageusia), muscle pain and weakness, impaired consciousness, and cerebrovascular complications. Furthermore, we do not yet know the acute or long-term consequences of the COVID-19 lockdown and social isolation as well as increasing unemployment, financial insecurity, and poverty on mental health [13].

2.3 Impact on Public Health

At the beginning of COVID-19 disease, restriction measures have been issued by Chinese government for limiting the spread of the virus, such as suspension of public transport, closure of airports, cancellation of celebrations and closure of parks and cinemas [14, 15].

Subsequently, more drastic containment measures were applied in China up to the suspension of all non-essential activities resulting in decrease of COVID-19 spreading progression, as observed in Wuhan. First, the WHO and the Emergency Committee under International Health Regulations have stressed the need to screen travelers from affected areas. After, the WHO has developed a strategy to contain the impact of COVID-19 that included blocking the chain of transmission (working on patients as well as close contacts), to avoid the health system disruption and to limit the impact of the pandemic as much as possible. Isolation of symptomatic subjects is mandatory to reduce transmission as well as social distancing for healthy people is essential. Recommendations about common practices of daily life included rigorous hand hygiene with soap and water or alcohol-based solutions, avoiding coughing and/or sneezing without covering the mouth [16]. Relatively to use of surgical face masks, there is no evidence of the usefulness of face masks by healthy subjects [17]. Moreover, some countries such as Italy implemented relevant social measures as school closures, smart working and cancelling meetings, sports and cultural events [18].

3 Constitutional Aspects

In the current dramatic epidemiological framework marked by the undeniable priority need for containment of contagion, the new health safety parameters that have emerged seem to be aligned in a worrying framework that, whereas, on the one hand, there is a change in the way we live and live together, on the other, it seems to seriously jeopardize the modern democratic society in which we live and the system of values and freedoms on which our constitutional order is based, constant source of inspiration of exegetical work aimed at the reconciliation of the fundamental values of the person. The need for multi-level protection of the right to health, since the post-war period, is evident first of all from the International Health Conference (New York, 1946) and the World Health Organization (WHO) and in the definition of health as A state of complete physical, mental, social well-being and does not consist only in the absence of disease or infirmity. The possession of the best state of health that can be achieved constitutes one of the fundamental rights of every human being, whatever his race, his religion, his political opinions, his economic and social condition. Governments have the responsibility for the health of his peoples: they must take the appropriate health and social measures to be part of them. For an examination of the balancing work carried out by the Constitutional Court [19–21].

An undeniable fact is that it is an emergency event (more or less intercepted in advance, given the gradual propagation in individual countries) empirically identified and scientifically proven, so as to seriously endanger the life and health of people, in which, while acknowledging that the counter-measures must in any event be classified within the framework of the extraordinary measures dictated by the emergency, it was feared that (provocatively, although we cannot be sure it is really a totally unfounded fear and unnecessarily alarmist) the risk of the restoration of a state-centric conception, so much opposed by the Constituent Fathers [22–24].

The fact that this is not, unfortunately, a short transitional period makes a systematic preliminary question legitimate: to what extent can the situation of emergency justify the suppression of fundamental human rights? We can say, in terms of certainty, that the mentioned and indispensable work of balancing between freedom and constitutional values is the inspiring criterion underlying the recent containment measures and the emergency regulatory framework put in place by the institutions with respect to the epidemiological emergency ongoing? [25–27].

Faced with these and many other questions, the community of jurists has certainly not intended to spare its efforts by highlighting, Clearly, the reasons behind the alarm cry that is being widely used to stand in the way of repeated attempts to break down the barriers set up to defend the stronghold of our constitutional guarantee system. But we can really believe that the measures implemented to contain and combat the spread of the virus throughout the national territory, have been characterized by the necessary effectiveness and that the proclaimed intention to protect the fundamental right of everyone to public health has been marked by full effectiveness?

The range of issues that would deserve rigorous and timely deepening is undoubtedly vast and there is no claim to carry out a thorough and complete analysis of the many critical profiles emerged from the examination of the measures recently

adopted in the form varied (decrees of the law, decrees of the President of the Council of Ministers, decrees of ministers, provisions of regional presidents or mayors).

It should be possible to give a brief example here. On this point, it has been widely highlighted that to guarantee the fundamental right to health of citizens, the required emergency regulatory framework has resulted in a clear and persistent imbalance to the detriment of other rights and freedoms. Relatively to "freedom to circulate" for "security and people health" (art. 16, paragraph 1) it provides for a prohibition «for proven reasons of safety or public safety», but only if meetings take place in a public place, while the measures adopted have been strictly prohibited even all meetings in private places, in addition to the known restrictions relating to religious faith and the exercise of the right to work.

Strongly affected and in some cases entirely compressed was personal freedom [28], both with the «application of the precautionary quarantine measure to persons who have had close contact with confirmed cases of spreading infectious disease or who fall within areas, located outside the Italian territory» (art. 1, paragraph 1 Legislative Decree 25 March 2020, n.19) both with the «absolute prohibition to move away from one's home or dwelling for persons subject to the quarantine measure because they were positive to the virus» (art. 1, paragraph 1 Legislative Decree n. 19), not to mention the further derogations. disposed by art. 14 Legislative Decree 9 March 2020, n.14 to the legislation on the processing of personal data, with the related and frequent violations perpetrated. Equally well known is the complex question of the abolition of the right of access for those subject to restrictions on personal freedom, then merged into equally known phenomena of violent reaction.

4 Statistical Analysis of Covid 19 Trend

4.1 Introduction

"Torture numbers, and they'll confess to anything". This sentence of Gregg Easterbrook, American journalist and writer, summarizes the questions that arise in these hours many people, daily bombarded by the "numbers of contagion", percentages and graphs on the course of the pandemic from Covid-19 in our country.

For example, the precise and certified number of infections of patients with Covid-19 does not exist and may never exist and in any case this value is closely related to the number of swabs performed. In other words, the number of new positives recorded in one day does not give much information unless it is accompanied by data on the number of tests carried out.

But we still try to work on the data trying to consider the overall values certified and not the single daily evolution.

4.2 Situation in the World

The World Health Organization data show that on May 7 the number of confirmed cases worldwide is 3,726,292 with deaths number equal to 257,405 and with 215 Countries, areas or territories with cases (Fig. 1).

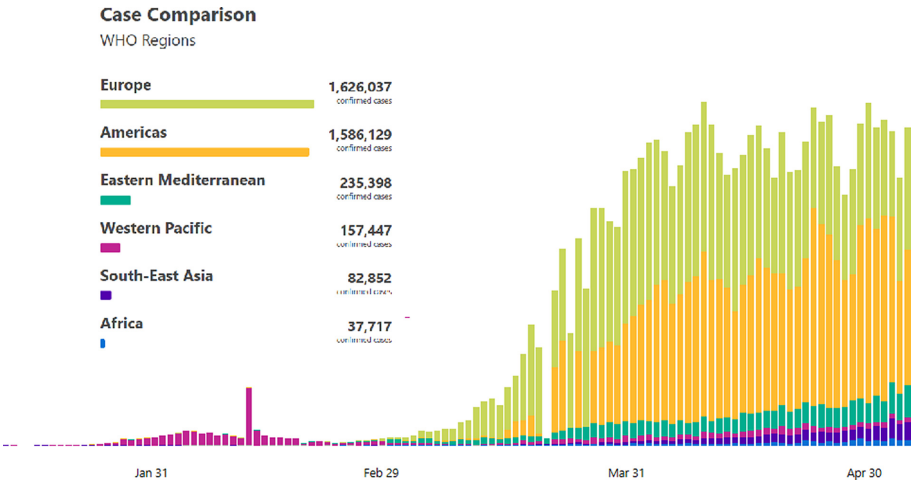


Fig. 1. Number of confirmed cases from 11/01/2020 to 07/05/2020 per Region *Source*: World Health Organization.

In particular, the countries most affected by the virus are the United States (1.2 million cases), Spain (219.329 cases) and Italy (214.457 cases). These countries are also at the top of the list for the number of deceased (Table 1). However, this situation should be compared with the percentage of infections per inhabitant and the mortality rate. Data from Johns Hopkins University show that the countries with the highest percentages of infections, as a percentage of the population, are Spain (0.469%), Belgium (0.436%), followed by the United States, Italy and Switzerland (about 0.35%). The highest mortality rate is found in Belgium (15.87%) and the United Kingdom (15.03%), followed by Italy and the Netherlands.

Table 1. Number of confirmed cases per region

Rank	Countries	Total cases	% of Covid infections per population	Number of deaths	Mortality rate
1	United States	**1,257,023**	0.38%	75,662	6.02%
2	Spaign	**221,447**	0.47%	26,070	11.77%
3	Italy	**215,858**	0.36%	29,958	13.88%
4	United Kingdom	**207,977**	0.31%	30,689	14.76%
5	Russia	**177,160**	0.12%	1,625	0.92%
6	France	**174,918**	0.27%	2,990	14.86%
7	Germany	**169,430**	0.20%	7,392	4.36%
8	Brazil	**135,773**	0.06%	9,190	6.77%
9	Turchia	**133,721**	0.16%	3,641	2.72%

(*continued*)

Table 1. (*continued*)

Rank	Countries	Total cases	% of Covid infections per population	Number of deaths	Mortality rate
10	Iran	**103,135**	0.12%	6,486	6.29%
11	China	**83,975**	0.01%	4,637	5.52%
12	Canada	**66,201**	0.18%	4,541	6.86%
13	Perù	**58,526**	0.18%	1,627	2.78%
14	India	**56,351**	0.00%	1,889	3.35%
15	Belgium	**51,420**	0.44%	8,415	16.37%
16	Netherlands	**41,973**	0.25%	5,306	12.64%
17	Saudi Arabia	**33,731**	0.10%	219	0.65%
18	Ecuador	**30,298**	0.17%	1,654	5.46%
19	Swiss	**30,126**	0.35%	1,810	6.01%
20	Mexico	**29,616**	0.02%	2,961	10.00%

Source: Johns Hopkins University (07/05/2020)

4.3 The Current Situation in Italy

In Italy the total cases confirmed on 7 May are 214,457, as already mentioned in the previous paragraph, with a deaths number equal to 29,684.

The trend of the pandemic since February 25 shows an exponential curve with regard to the number of total cases and a decreasing curve with regard to the number of cases currently positive (Fig. 2).

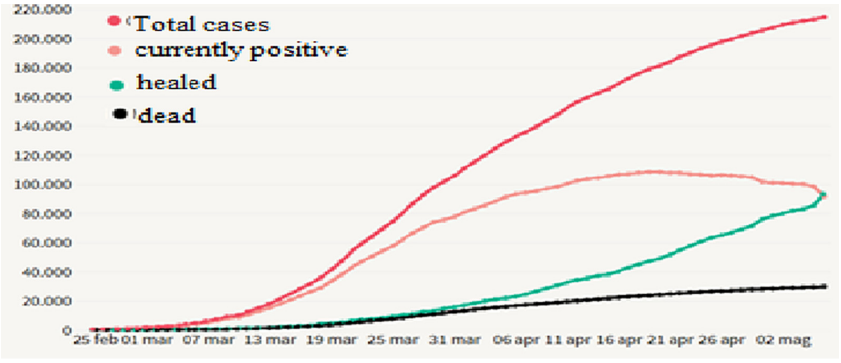


Fig. 2. Pandemic curves in Italy *Source*: https://lab24.ilsole24ore.com/coronavirus/

Going to analyze the situation in the different Italian regions we see that more than half of the positive cases are concentrated in three regions: 37% of cases in Lombardia and more than 10% in Piemonte and Emilia Romagna (Fig. 3).

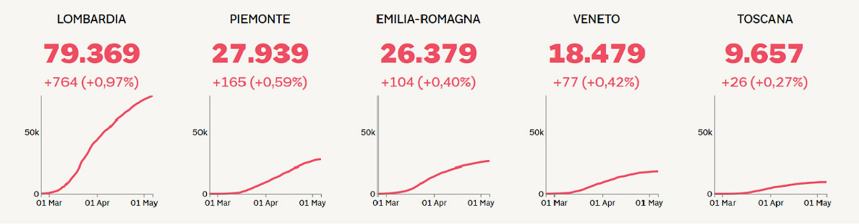


Fig. 3. Pandemic curves in some Italian regions *Source*: https://lab24.ilsole24ore.com/coronavirus/

The curve trend in some Italian provinces is also interesting. At the top of the ranking we find the province of Milan, which presents on May 7 20,711 cases, followed by Turin with 14,116 cases and Brescia with 13,267 (Fig. 4).

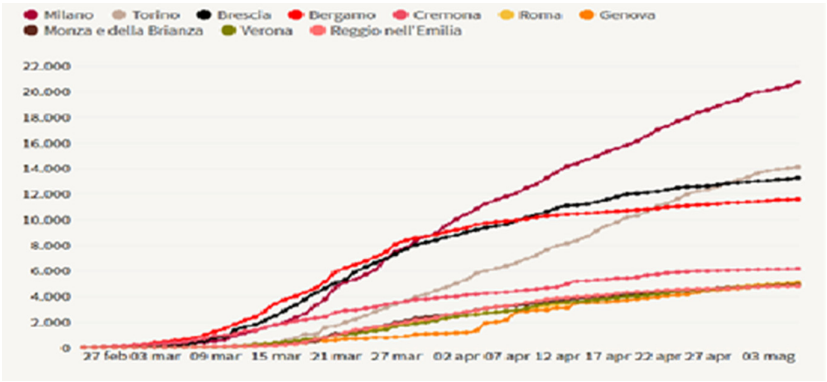


Fig. 4. Pandemic curves in some Italian regions *Source*: https://lab24.ilsole24ore.com/coronavirus/

In this case, however, by comparing the number of cases with the resident population, it emerges that the provinces with the highest incidence are Cremona with 1.7% of total cases, Piacenza, 1.5% and Lodi 1.4%, the province from which the infection initially spread.

4.4 An Application of Cluster Analysis on the Italian Provinces

Based on the results of a multitude of scientific work and reports of the Intergovernmental Panel on Climate Change (IPCC) it is clear that the air quality we breathe affects our health. Climate change acts directly and indirectly in determining a wide variety of diseases, fostering new ones and acting as a multiplying force for many of the existing problems. There are still many unanswered questions, for example on the causes, certainly many, of the high lethality of Covid-19 in Italy, especially in some provinces.

In order to respond to the many studies that have been carried out on this possible link, which has been debated worldwide, The Higher Institute of Health and the Higher Institute for Environmental Protection and Research with the National System for Environmental Protection have launched an epidemiological study at national level to assess whether and to what extent the levels of air pollution are associated with the health effects of the epidemic. What is certain at the moment is that air pollution increases the risk of infections of the lower respiratory tract, especially in vulnerable individuals, elderly and people with previous diseases, conditions that also characterize the epidemic of Covid-19.

In addition, the many data collected shows that Covid-19 was particularly severe for people with other diseases, such as cardiovascular diseases, diabetes, chronic respiratory diseases, hypertension and cancer. In the people affected and without concomitant diseases the lethality was found of the average 1.4% (Case Fatality ratio, that is the deaths on the total of the reported cases), while it is superior to the average in persons with other pathologies (7.6% in cancer patients and 13.2% in heart patients).

The present work analyzes the relationships between the environmental quality and health status indicators identified by Istat (Italian National Institute of Statistics) through the Report on Fair and Sustainable Wellness (BES). Therefore, in this work we have tried to verify if the spread of the virus in some provinces can be linked to the presence in the territory of other aspects such as:

1. High mortality rates due to cancer or nervous system diseases;
2. Environmental factors (lack of green, low waste collection capacity, low use of renewable energy).

On the basis of the mix of variables considered, a cluster analysis was carried out on the data of the 207 Italian provinces in order to create homogeneous groups.

Cluster analysis is very advantageous since it provides clusters, each consisting of units with a high degree of "natural association", that are "relatively distinct" among them (i.e. external heterogeneous) and relatively similar within themselves (i.e. internal homogeneous).

The TwoStep procedure, highly efficient for large datasets, is a cluster analysis scalar algorithm and is able to simultaneously treat variables or categorical and continuous attributes. This is achieved through two steps. In the first step, defined as pre-cluster, records are pre-classified into many small sub-clusters.

In the second step the sub-clusters produced in the pre-clusters are further classified. In this second stage, given the modest dimensions, traditional methods of clustering can also prove effective. Given a mixed model with p continuous variables x_j and q categorical variables a_j, the Bayesian Information Criterion (useful for model selection among a finite set of models, because the one with the lowest BIC has to be preferred) is defined as [29]:

$$\mathrm{BIC}_k = r_k \ln n - 2l_k$$

The results of the cluster led to the identification of 4 clusters, of which two more numerous and two less numerous (Fig. 5). In particular, Cluster 4 includes only 8 provinces (Bergamo, Brescia, Cremona, Lodi, Milan, Piacenza, Pavia and Turin) which are by far the provinces most affected by Covid 19.

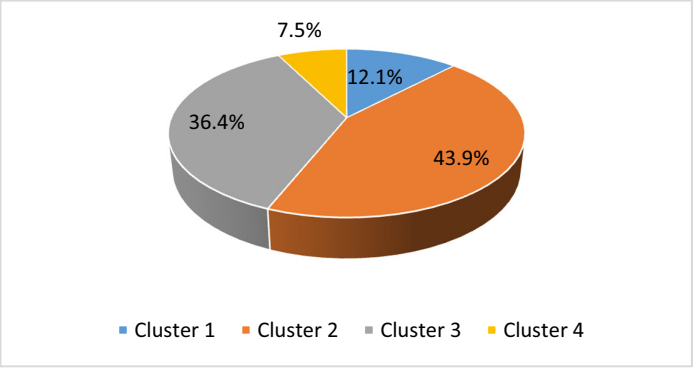


Fig. 5. Percentage composition of single cluster *Source*: Our elaboration on Two Step cluster analysis.

The average values of the individual indicators show that the first and second clusters contain those provinces poorly affected by Covid, with low number of cases (Table 2). More interesting are certainly the results of Cluster 3 and especially cluster 4 that refer to the provinces heavily affected by Covid with a very high total of cases but especially with high cancer mortality rate (8.78) or due to the nervous system (33.39). Equally high are environmental values such as the absence of green (73.59) and the absence of renewable sources (71.56).

Table 2. Average values of the variables and indicators.

	Number of provinces	Positive cases of Covid 19	Percentage cases on population	Cancer mortality rate (20–64 years)	Mortality rate due to the nervous system (over 65 years)	Absence of green	Absence of renewable sources
Cluster 1	13	824.38	0.27	8.42	27.60	12.15	34.13
Cluster 2	47	657.04	0.14	8.89	29.03	83.10	50.52
Cluster 3	39	235.,62	0.49	8.21	34.04	69.25	82.17
Cluster 4	8	9,737.88	1.09	8.78	33.39	73.59	71.56

This situation appears much more evident in the following Fig. 6, where we find the average values of the different indices. It is more evident in this figure that cluster 3 and 4 have values much higher than the average, except for the cancer mortality rate that for Cluster 4 is lower than for Cluster 2.

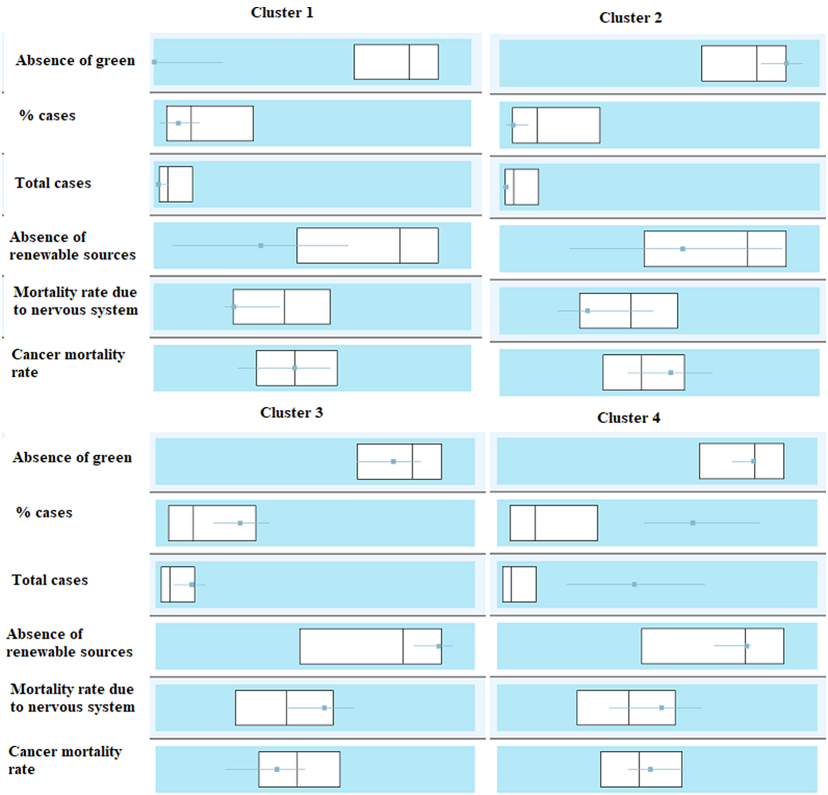


Fig. 6. Average values of the variables and indicators. *Source*: Our elaboration on Two Step cluster analysis.

5 Conclusions

As recognized by the World Health Organization on March 11, the COVID-19 epidemic has become a global pandemic, present in 215 countries.

Coronaviruses (CoVs) are a family of respiratory viruses that induce cause mild to moderate diseases simulating flu syndrome or severe respiratory syndromes. SARS-CoV-2 infection has been associated with different Several clinical manifestations ranging from mild disease to death, which occurs from Acute respiratory distress syndrome (ARDS). The case fatality rate (CFR) range from 10.5% to and 5.6% for

cardiovascular diseases, diabetes, chronic respiratory diseases, hypertension and tumors, respectively.

The need for multi-level protection of the right to health, since the post-war period, is evident first of all from the International Health Conference (New York, 1946) and the World Health Organization (WHO) and in the definition of health as A state of complete physical, mental, social well-being and does not consist only in the absence of disease or infirmity.

The possession of the best state of health that can be achieved constitutes one of the fundamental rights of every human being, whatever his race, his religion, his political opinions, his economic and social condition. Strongly affected and in some cases entirely compressed was personal freedom, both with the «application of the precautionary quarantine measure to persons who have had close contact with confirmed cases of spreading infectious disease or who fall within areas.

Precise and certified number of infections of patients with Covid-19 does not exist and may never exist. The data show different trends according to the territories analyzed and the timing of spread of the virus

On the basis of the mix of variables considered, a cluster analysis was carried out on the data of the 208 Italian provinces in order to create homogeneous groups. This application was carried out in order to demonstrate as already anticipated in other studies conducted by The Higher Institute of Health and the Higher Institute for Environmental Protection and Research with the National System for Environmental Protection that the virus develops in relation to other factors. In fact, the results showed that the Italian provinces in which a greater number of cases occurred, also have high mortality rates from cancer and diseases of the nervous system, as well as problems related to environmental aspects.

Further developments will be made in the coming months based on the trend of the phenomenon, unfortunately still in the evolution phase.

We could hypothesize that a multidisciplinary approach including medical figures, epidemiologists, researchers, jurists, associations of patients and government workers is advisable to identify the best strategy to prevent other hypothetical emergencies.

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