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From Healthcare Services to Healthcare Profiling: The Success of Public Health Measures In Europe during the COVID-19 Emergency

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Abstract

In line with what has happened in other sectors of the Public Administration, where the change process has, as an objective, the search for efficiency and efficacy, in Europe, the awareness that an efficient, effective and equal healthcare service is a major success factor for the socio-economic development of each is growing. The healthcare system is at the centre of great attention, having to demonstrate the adequate use of constantly decreasing available resources against a growing healthcare demand. This entails an incentive oriented toward the ability to improve services. Such need has been consolidating in the overall corporatization process, leading to a growing orientation toward performance and to the use of programming tools. In this context must be considered the diseases characterized by the length of the healthcare assistance plan and high complexities in terms of treatments and complications. Such diseases are relevant in epidemiological terms and also in terms of resources employed and improvement potential from the point of view of intervention policies, of public healthcare offer and of efficiency. The above may refer to the healthcare emergency still in place following the spread of the COVID-19 virus, employing an enormous amount of resources from both a human and a financial point of view. SARS-CoV-2, a serious threat to sustainable development prospects, is spreading within countries at varying speeds, among other things depending on their population density, behavioural responses, cultural factors, personal hygiene practices and habits. This has led to significant variation in countries' policy responses aimed at stemming the proliferation of the virus. Using crisp-set qualitative comparative analysis, we conducted a comparative study at the European level to study the performance of different combinations of COVID-19 containment measures along with the response speeds. A set of configurations for two different scenarios (above- and below-median death rates) helps to illustrate how specific containment measures in each examined European country are related to the number of deaths. The main observation arising from the analysis is that the speed of response along with the decision to suspend international flights might determine the epidemic outbreak's impact on fatality. The results also imply that several different combinations of containment measures are associated with death rates across Europe. The outcome of this analysis can assist in identifying which set of containment measures in the event of an epidemic outbreak is beneficial/detrimental.

This work considers combining theoretical considerations and empirical evidence related to the treatment of COVID-19, within what it is the success of public health measures in Europe during the COVID-19 emergency.

Keywords: healthcare, COVID-19, pandemic, service, efficiency, management, assistance, emergency, containment measures.

1. Introduction

The higher purpose of any Government is to promote the dignity of its citizens, avoiding the identification of people like mere tools to reach political and financial objectives. If any Government considers people as an absolute value and wants to grant their dignity, it must ask itself what are their ambitions and their qualities. Only by trying to answer to these questions it will allow them, available resources permitting, to satisfy their ambitions: in other words, to promote the dignity of a nation means to guarantee its citizens the capability and freedom to make and implement their own choices. Obviously, such capability depends from individual abilities (influenced by genetics and by environmental factors), from the political, social and financial context and, indeed, from the general health conditions. It is the indicators related to our state of health that allow the Country to enhance us: the life expectancy at birth, the quality of life free from diseases and disabilities, the ability to keep a good state of health, the psychological well-being, the possibility to express feelings and emotions, the attitude toward environmental preservation. Governments, therefore, need to invest in the health systems in order to grant their citizens the freedom to fully realize objectives and ambitions, because the higher purpose of a healthcare service is to offer its users the best opportunities to choose the life they desire. In this view, it is useful to refer to the capability approach, a tool to evaluate the wellbeing of people and the social policies aimed at implementing it. According to this approach, development is not intended as financial growth, but rather as human progress, the realization of which cannot overlook fundamental elements such as freedom, wellbeing and health. The capability approach applied to health allows the identification of the higher purpose of a healthcare system, confirming the relevance of the healthcare policies as the foundation on which lies the commitment of the Governments to grant dignity for all citizens. This is why the success of a healthcare service (tab. 1), together with the measurement through classifications and indicators, must be evaluated also on the basis of the freedom that our state of health allows us in order to choose the life we wish to live. (Previtali, 2018; Bloomberg, 2020).

Table 1: Index of the level of assistance per population, year 2020.

Rank	Country	Health Grade	Population 2020
1	Spain	92.75	46.754.778
2	Italy	91.59	60.461.826
3	Iceland	91.44	341.243
4	Japan	91.38	126.476.461
5	Switzerland	90.93	8.654.622
6	Sweden	90.24	10.099.265
7	Australia	89.75	25.499.884
8	Singapore	89.29	5.850.342
9	Norway	89.09	5.421.241
10	Israel	88.15	8.655.535
11	Luxemburg	87.39	625.978
12	France	86.94	65.273.511
13	Austria	86.3	9.006.398
14	Finland	85.89	5.540.720
15	Netherland	85.86	17.134.872
16	Canada	85.7	37.742.154
17	South Korea	85.41	51.269.185
18	New Zealand	85.06	4.822.233
19	United Kingdom	84.28	67.866.011
20	Ireland	84.06	4.937.786

21	Cyprus	83.58	1.207.359
22	Portugal	83.1	10.196.709
23	Germany	83.06	83.783.942
24	Slovenia	82.72	2.078.938
25	Denmark	82.69	5.792.202
26	Greece	82.29	10.423.054
27	Malta	81.7	441.543
28	Belgium	80.46	11.589.623
29	Czech Republic	77.59	10.708.981
30	Cuba	74.66	11.326.616
31	Croatia	73.36	4.105.267
32	Estonia	73.32	1.326.535
33	Costa Rica	73.21	5.094.118
34	Chile	73.21	19.116.201
35	United States	73.02	331.002.651
36	Bahrain	72.31	1.701.575
37	Qatar	71.97	2.881.053
38	Maldives	70.95	540.544
39	Lebanon	70.53	6.825.445
40	Poland	70.25	37.846.611
41	Montenegro	69.69	628.066
42	Bosnia and Herzegovina	69.66	3.280.819
43	Albania	68.04	2.877.797
44	Brunei	67.96	437.479
45	Slovakia	67.28	5.459.642
46	United Arab Emirates	67.14	9.890.402
47	Uruguay	65.66	3.473.730
48	Hungary	64.43	9.660.351
49	Oman	64.07	5.106.626
50	Panama	64.01	4.314.767
51	Turkey	62.81	84.339.067
52	China	62.52	1.439.323.776
53	Mexico	62.09	128.932.753
54	Argentina	61.19	45.195.774
55	Serbia	60.99	8.737.371

Source: Bloomberg 2020, Healthiest Country index.

We all have the duty to protect the S.S.N., each of us according to their responsibilities, both public and private, cementing a new generational agreement, to pass down to our children the most valuable inheritance: a public, universalistic, and equal healthcare service.

In this context must be considered diseases characterized by the length of the healthcare assistance journeys and the high complexities in terms of treatment and complications. Such diseases have relevance in epidemiological terms, but also in terms of employed resources and improvement potential from the point of view of the intervention policies, of the public healthcare offer and of the efficiency. (AA.VV., 2014).

The above may refer to the healthcare emergency still in place following the spread of the COVID-19 virus, which is harshly testing the endurance of the National Healthcare Services, employing an enormous amount of resources from both a human and a financial point of view (Comite, 2020).

This work considers the application of the quality of the healthcare assistance profile, trying to obtain a full frame work related to the resources employed across the entire management journey of the emergency to the purpose of understanding the necessary information in order to set up activity improvement policies. The analysis, combining theoretical considerations and empirical evidence related to the treatment of COVID-19, develops the approach described within a complex process of creation of a more efficient and effective healthcare assistance plan.

The COVID-19 pandemic is an exogenous shock for almost the entire world, hitting countries unevenly in terms of citizens' health. They have been exposed to the virus at various times and have

different numbers of cases and case fatality rates. European countries have yet to experience such an epidemiological picture and have therefore responded to the COVID-19 outbreak at varying speeds and with policy measures of different severity. If the shock had been symmetrical, joint action at the EU level could probably have been seen. In general, such asymmetries may create a range of institutional, economic, and political challenges that undermine the EU's stability and the effectiveness of the various containment measures. Consequently, differences in the steps taken by European countries may have exacerbated the losses caused by the health asymmetries of the crisis.

According to the WHO, member states are encouraged to develop flexible plans to manage the health risks from pandemic influenza based on a national risk assessment that considers the global risk assessment conducted by the WHO (WHO, 2009).

To contribute to what is currently known about the COVID-19 pandemic, this paper discusses the link between fatality rates and the stringency of the most common containment measures being implemented in the EU and the United Kingdom. Although all countries in Europe, except for Sweden, have taken a wide variety of prevention measures, our study focuses on the most imposing decisions that bring social interaction to a complete halt as the most effective way of stemming the spread of COVID-19 (Anderson et al, 2020; McNeil et al, 2020). By determining any links between the stringency of the measures applied and the fatality rates, we aimed to explore ways in which the results could be of value in future health emergency responses at the national/international level. Generating information based on real data for and especially during pandemic outbreaks is crucial for supporting governments and international organisations in their public health decision-making.

2. Theoretical and Methodological Prerequisites of the Healthcare Assistance Profiles

The healthcare authorities, by nature, are characterized by a high level of complexity; indeed, they have to manage relevant resources (human, instrumental and financial) for the purpose of guaranteeing heterogeneous and technically advanced services. In their production activity, the healthcare professionals assume a key role, since the quality of the services provided is a function of their experiences, competences, knowledge, quality and behaviours. It is possible to identify two different types of competences needed by healthcare professionals: on one side, the competences linked to clinical assistance activities, on the other, those linked to the typical corporate decision-making processes. The specialty-professional competences are the by-product of a training process that has its roots in Graduate and Post-graduate education, and that grows with field experience linked to clinical and healthcare processes. The management and organizational competences derive from the field experience and from ad hoc training activities (Osservatorio Nazionale sulla Salute nelle Regioni Italiane, 2017).

The methodological approach exam used in the research imposes the consideration of some starting factors. First of all, there are diseases that stand out because of the length of the treatments and the high complexity in terms of treatment and complications (for example, the treatment of a patient infected with Covid-19). Such diseases demonstrate a considerable relevance in epidemiological terms, but also in terms of employed resources and improvement potential from the point of view of the intervention policies, of the efficacy of the public healthcare offer and of the efficiency. (Barsanti, Nuti, 2014; Birley, 2011; Boeckxstaens et al. 2011).

A further aspect to be considered is that the healthcare system is characterized by a type of sectorial organization, in which, special relevance is assumed by the specialization of its functions. In this context, the citizen may independently decide for the request of a first level service, whereas the following ones are submitted to the independent judgment of the general practitioner, although the user is granted the possibility to choose the professional or the second level organization he wants for the fruition of the service (Anselmi, 1990, 1996; Borgonovi, 2013). If on one hand this system grants the possibility, for the patient, to freely choose, and a relative ease in obtaining services, given the high distribution, on the territory, of the offer points, on the other hand, the adequacy of the services does

not often reach adequate levels, causing an increase in the waiting time. The communication between the various intervention areas is often scarce and, at these conditions, the plan followed by the patient rarely shows adequate integration levels. (Foglietta, 2020).

A third element to take into account is that, in a situation such as that of health authorities, in which the integration between competences and components (territory and hospital) becomes a determining factor for the satisfaction of one's needs, the identification of the interdependence amongst the activities, and, therefore, of the processes, becomes essential in order to activate adequate control modalities or to proceed to the redesign, to the purpose of improving coordination in quantitative, qualitative and temporal terms. (Del Bene, 2000; Marinò, 2001).

Despite the growing sectoring of the knowledge and its main depths, often, the satisfaction of a healthcare need implies, even in coherence with the organization of the National Healthcare System, the participation of several units and professionals. The result is often a fragmentation of the assistance plan through which the patients obtain all the services needed in order to respond to their needs. Sometimes, the lack (total or partial) of protocols or guidelines makes it further complex to coordinate the units involved in the production of the overall services.

The management difficulties deriving from this entail long waits to obtain a service, duplications of surgeries, process lengthening, all due to a loop in which the patient finds himself involved, passing from one unit to the other. For the Health Service this may determine an increase of the financial burden due to the lack of coordination existing amongst the units, which often leads to the creation of facilities that are oversized compared to the real needs (Borgonovi, 2013).

For this purpose, all the literature has, for a long me, highlighted the possibility to apply, to these situations, the logic by processes management, (Manganelli, Klein, 1995; Merli, Biroli, 1996; Hammer, Champy, 1995; Borgonovi, 2013), which, in the healthcare sector, has already found many application with reference to the assistance profiles or to the so-called "treatment plans" (Carmichael, 1994; Griffit, 1994; Zimmermann, 1994; Casati, 1999), and which results to be an in-progress subject in relation to the several situations it is applied to. The search for managerial and logic tools based on the healthcare assistance profiles places itself in a prospect of strategic analysis, which focuses transversal dimensions of the production processes, in order to monitor the performance of some organizational areas, constituted by the functional or processing aggregation of operational units concerning hospitalization and territorial area. In this respect, it is possible to assess the results of organizational areas that include operational units belonging to a scope of homogeneous activities (for example, the Department of surgical treatments, or the C.O.U. of Anaesthesia and Intensive Care – that belongs to the emergency department), or of transmural aggregations that coordinate activities related to operational units at the beginning or at the end of a service process and that are dislocated on the territory and in hospitals.

Even in medical literature there are some approaches inspired to the logic by processes, particularly there are reference to Disease management and Case management.

The starting point to set up a management oriented toward the processes is to understand what the available paths for the identified diseases are. In truth, it is opportune to underline that a structured approach to the treatment might not be already.

The approaches might be based on an external or internal orientation. In the first case, the analysis is conducted designing the processes starting from the demand, highlighting, therefore, those deemed necessary in order to satisfy the spotted needs; they will be then classified in primary, supporting or managerial, according to the assumed role. According to the second prospect, instead, the processes are identified starting from the existing organizational structure. It will then be conducted a check of the activities that are carried out within the various organizational units and that are meant to treat the considered disease.

Furthermore, the patient becomes crucial since he assumes an active role within the scope of the plan, (Normann, 1992; Borgonovi, 2012). It is enough to think, in this respect, to all the situations in which the treatment of a disease provides the patient with the custody of the respect of a certain treatment that has been prescribed, the efficacy of which depends from the level of compliance with the

regulations provided (Baccarani, Ugolini, 2000). Through proper information and education initiatives, the citizens will be able to more consciously and autonomously face the issues linked to their diseases, adopting, even in the choice of facility, of professionals and of services, a more conscious approach.

The sharing of the knowledge and of the plan become unavoidable elements for the operators involved to comply with the common needs of the team. In other words, although respecting the professional autonomy, the interested actors homogenize (not adapt) the approach to the problems in the respect of the coherences established on a process level.

In the designing (or re-designing) phase, the professionals involved are stimulated to research alternative solutions that may improve the fruition modalities of the overall services needed by the patient in terms of timing, accessibility, and linearity, without neglecting the possibility, all other conditions being equal, to rationalize the usage of the resources.

An internalization of the values to which the organizational behaviours should inspire is needed and obtainable through the scientific-cultural exchange regarding the specific problems that will have to be faced (access conditions, facility changing conditions, or conditions related to the diagnosis etc.).

3. The COVID-19 Health Emergency

The novel coronavirus disease (COVID-19), caused by the virus named SARS-CoV-2 (previously 2019-nCoV), is a highly infectious disease (Chen et al, 2020; Zhu et al, 2020) and, due to the rapid increase in the number of cases from December 2019, it was classified by the World Health Organization (WHO) as a pandemic on March 11, 2020 (Wang et al, 2020).

Specifically, in late December 2019, Chinese doctors highlighted clusters of patients with pneumonia of unknown cause, epidemiologically linked to a wholesale market in Wuhan, Hubei Province (Zu et al, 2020; Yan et al, 2020). The situation became so critical that, on December 31, 2019, the Chinese Center for Disease Control and Prevention promoted an epidemiologic investigation on this new disease. As a result, both the Chinese public health and international scientific communities began to work on this topic and quickly recognized a new coronavirus, sharing the viral gene sequence with the world (Zhu et al, 2020; Wu et al, 2020).

Meanwhile, despite the security and mitigation measures taken by the Chinese government, including quarantine in Hubei Province, infections spread across China and, today, it has affected more than 200 countries worldwide (Bordi et al, 2020; Holshue et al, 2020). Consequently, on January 30, 2020, the WHO declared this outbreak a Public Health Emergency of International Concern (PHEIC) (Wang et al, 2020). According to the International Health Regulations (WHO, 2015), a PHEIC occurs when there is an unusual or unexpected event

with a serious health impact, a significant risk of international spread, and a significant risk of restrictions on international trade or traffic.

Thus, SARS-CoV-2 is primarily affecting a common good, that is public health. Its spread is resulting in a public health disaster that is evolving in a cascading way because of the strong and high interdependency between most countries from political, economic, and societal points of view (Pescaroli et al., 2015). As a matter of fact, in a strongly interconnected world, several negative consequences are happening beyond the health systems from local to international scales, e.g., the interruption of production, and consequent negative consequences on global financial markets and the tourism industry (McKibbin et al, 2020; Yu et al, 2020).

The public perception of biological hazard plays a key role in the response to health emergencies, affecting risk management and risk communication strategies (Slvic, 1987; Slovic, 2000). Therefore, the public perception of health risks can influence markets, public policies, and individual behaviors (Krewski, 1995).

In the last decades, many countries have been implemented policies to cut public spending. As a consequence, despite the United Nations have stressed the necessity to strengthen health resilience

(UNDRR, 2015), the investment in public health systems have decreased (Garrett, 2000; Smith, 2009), increasing vulnerability and exacerbating the negative effects of this pandemic (Alexander et al, 2019).

Another factor affecting the rapid worldwide spread of the SARS-CoV-2 is related to the difficulty in detecting infected people because of the lack of symptoms, as well as to similarities with symptoms of common cold and flu (Yan et al, 2020; Chan et al, 2020). Consequently, as already happened during the first coronavirus spreading (Olsen et al., 2003), it gives the opportunity to infected people to travel a significant distance from the infection site, transporting the biological agent and potentially spreading the virus in uncontaminated areas (Lindell et al., 2007).

As reported during other similar health emergencies (Lindell et al., 2007), decision makers at international, national, regional, and local levels should implement strict and unpopular public health measures to prevent and reduce the biological risk consequent to the virus spread, such as lockdown and quarantine. Beyond being restrictive measures that limit displacement and gatherings, social distancing contributes to divide many families and groups of friends (Blendon et al., 2008; Juckett, 2006). These measures are focused on slowing the outbreak spread and reducing the peak healthcare demand, with the scope of flattening the infection curve and reducing the peak of the outbreak (Cowling, 2020; Wilder, 2020). Moreover, these actions attempt to protect, as in this case, those people who are most at risk of severe disease from infection, in particular those with chronic health conditions and older people (Wang et al., 2020; Zhou et al., 2020). However, the radical change in daily habits, the limitation of social life and the stress resulting from the public health emergency could have a strong impact on the well-being of individuals (Brooks et al., 2020; Zhang et al., 2020).

As highlighted by the WHO during the spreading of the first coronavirus (WHO, 2015), the SARS-CoV-2 emergency represents a major global public health threat which requires a coordinated global response. However, there is a general interest towards the promotion of public health measures at individual and local scales to prevent disease rather than common public health actions (Vineis, 2014; Vineis, 2017). In particular, the lack of coordinated responses among the governments of countries involved in this public-health emergency has been observed both in terms of response time and adopted actions. This might be due to the creeping nature of this kind of hazard, which begins to concern only when the negative effects of the trigger factor become visible and tangible and the emergency could already have reached the critical transition, shifting in a cascading disaster (Pescaroli et al., 2015; Scheffer, 2009). As an example of the uncoordinated responses, even if the Chinese government applied draconian mitigation measures in

the worst-affected areas from January 23, 2020, in the EU, UK, and USA, it was necessary to wait at least one month to see similar containment measures applied. Therefore, although in China few or no cases of internal infections caused by SARS-CoV-2 have been currently registered, other countries are still faced with the virus spreading and its negative effects.

Generally, some cross-cutting aspects, such as communication, stakeholder engagement and context, are fundamental in order to cope with hazards and risks in situation of high complexity, uncertainty, and ambiguity (Alexander, 2002; IRGC, 2020). As argued by Slovic (Slovic, 2000; Krewski, 1995), those who assess and manage public health and safety should deeply investigate the way in which people perceive and face with risks. As a matter of fact, most of people who face hazardous phenomena rely on intuitive risk evaluation, so

called risk perception, which is unavoidably influenced by both mass media and social contacts with friends, relatives, and colleagues (Short, 1984). With regard to the influence of mass media, it is important to stress their role in public perception of health risk, inasmuch they often give information mainly focused on mishaps and threats occurring in affected countries (Slovic, 2000). Since people usually make decisions based on their risk perception rather than the effective risk (Slovic, 1987), public perception of health risk plays a key role in the adoption of measures, in their acceptance, in the feelings of the population, and in the decisions that people will take.

During a public-health emergency, measures taken by governments, such as lockdown and quarantine, may heavily interfere with the individual choices of citizens, varying their daily habits and behaviors. Thus, decision makers, who are usually prone to act according to the effective risk (Smith,

2006), should consider public perception of health risk, as well as its communication for an effective emergency and risk management (Alexander, 2002). Moreover, risk management and communication need to be structured considering both public perception of health risk and experts contributions as a two-way process, otherwise efforts to manage public emergencies risk to fail (Slovic, 2000).

In particular, the public underestimation of health risk might reduce the acceptance of the strict mitigation measures enforced by governments (Alexander, 2000). On the contrary, some feelings, such as fear and anxiety, are more likely to cause overestimation of the health risk (Tripp et al., 1995; Goodall et al., 2012). Notably, previous studies suggest that the spread of a virus can contribute to a widespread sense of panic and concern in the community (Goodall et al., 2012; Lau et al., 2010). The perception of the level of lethality of a virus seems, in fact, to be associated

with the development of emotional distress (Lau et al., 2010; Wang et al., 2020), which involves the need to structure psychological assistance interventions (Braunack-Mayer et al., 2010). Moreover, at list in the short term, social media may affect feelings and, consequently, risk perception (Af Wahlberg et al., 2000). Consequently, the information provided by the media and other official sources, as well as the way in which they are communicated, play a key role during these emergencies (Falagas et al., 2006).

4. Background Information

After the causative virus, SARS-CoV-2, was detected in Wuhan (China) at the end of 2019 and formally identified in early January 2020, the country undertook severe interventions to mitigate and limit the spread of the virus. Kraemer and his colleagues confirmed that the drastic, agile, and aggressive health and social measures that were imposed in China have greatly helped to contain the COVID-19 pandemic (Kraemer et al, 2020). In addition, they found that laboratory testing in the early stages of the epidemic was vital to limiting the virus' spread and that the primary driver of the pandemic was the movement of humans from Wuhan to other areas before putting the city into quarantine. By mid April 2020, a new outbreak in the east of the country was already being witnessed, starting with imported cases mostly from Russia (Rosen, 2020). It has emerged that the traditional public health measures similar to those adopted in 2003 to curb the outbreak of severe acute respiratory syndrome (SARS), such as syndromic surveillance, the prompt isolation of patients, and enforced quarantine, are less effective with SARS-CoV-2, and, above all, we have learned that containment measures must be strict and broad, and not loosened too early. At the moment, however, there is a belief that traditional public health measures may be insufficient for containing the entire outbreak but effective for reducing the peak incidence (Wilder et al, 2020). China had faced five pandemics in the last century, three of which originated in China, namely the "Asian flu" (1957), the "Hong Kong flu" (1968), and the "Russian flu" (1977) (Qin et al, 2018). These experiences have made the country able to react relatively quickly and effectively. However, when the disease appeared en masse in Europe, both the health profession and governments were quite unprepared.

This was especially evident in Italy, one of the first countries in Europe with a large number of infected. As the number of infected grew exponentially after 21 February, the capacity of the public health system was soon under pressure. Public health measures and their level of severity at the start of the outbreak were considerably different to those adopted in China, seeing cases skyrocket (Remuzzi et al, 2020). In Italy, approximately 40% of cases required hospitalisation, whereas in China, the reported numbers are considerably lower (15%–20%) (Lazzerini et al, 2020; Wu et al, 2020; WHO, 2020). The variability in acute and critical care bed numbers across Europe is considerable. The number of critical care beds per 100,000 population ranges from 4.2 in Portugal to 29.2 in Germany, with 6.6 in the United Kingdom, 9.7 in France, and 12.5 in Italy. The number of doctors per 1000 population ranges from 1.9 in Turkey to 5.2 in Austria, while the need for critical care capacity is continually rising.

The increase in demand is particularly problematic in times of quick and unexpected events, where healthcare and the supporting system have no time to accommodate. When the population is old,

like in Italy - which has the oldest population in Europe and the second oldest in the world, with 23 percent of older adults (65+) and a life expectancy at birth that amounts to 81 years for men and 85.3 years for women (Ministero della Salute, 2020; Statista Life, 2020) - a disaster is likely to occur (Protezione Civile, 2020). The success of public health measures to curb the transmission of the virus is a critical step in reducing the surge-capacity needs. Therefore, to plan for changes in a timely manner, we need to better understand the current situation in each country and its policy responses in past pandemics and the current one. It is only with a combination of an effective set of policies that are suitably aligned that we will be able to successfully respond to outbreaks.

5. Material and Methods for the Analysis

The data for the analysis were obtained from the Oxford COVID-19 Government Response Tracker (Blavatnik School of Government, 2020), which collects publicly available information on a set of indicators of government responses; POLITICO, a policy news organisation (POLITICO, 2020); and Worldometer for the number of deaths per 1,000,000 population on 15 April 2020 (Worldometer, 2020). The cut-off date for the data on containment measures is 1 April 2020, a date when European countries reached peak values on the stringency index that records the number and strictness of government policies, published by Hale and his colleagues (Hale et al., 2020). Our study explores the adoption of containment measures in 24 European Union member states and the UK (Table 2).

Table 2. A list of countries with the corresponding country codes included in the study. Source: pers. proc.

Country Name	Country Code
Austria	AT
Belgium	BE
Bulgaria	BG
Croatia	HR
Cyprus	CY
Czech Rep.	CZ
Denmark	DK
Estonia	EE
Finland	FI
France	FR
Germany	DE
Greece	EL
Hungary	HU
Ireland	IE
Italy	IT
Luxembourg	LU
Netherlands	NL
Poland	PL
Portugal	PT
Romania	RO
Slovakia	SK
Slovenia	SI
Spain	ES
Sweden	SE
United Kingdom	UK

For a detailed description of the measures by countries, see Appendix.

This study adopts a crisp-set qualitative comparative analysis (csQCA) approach. csQCA is a common QCA technique used in the case of categorical variables to identify multiple causal pathways and derive logical conclusions supported by a data set. One key operation of the csQCA is Boolean minimisation to reduce complex expressions into more parsimonious expressions (Rihoux, 2009). The obtained minimal formula allows an easier interpretation of the phenomenon of interest, which in our

study is fatality in relation to the measures taken, and thus clearly shows what is common to all countries that share above-median or below-median death rates. The conditions (i.e., measures) and an outcome (i.e., fatality rate) are codified and described in Table 3.

Table 3. Coding and describing the conditions and outcomes. Source: pers. proc

Condition/Outcome	Codification	Description
Above-median deaths *(outcome)*	AMD	1 = more than 44 deaths per 1,000,000 population
Below-median deaths *(outcome)*	BMD	0 = less than 44 deaths per 1,000,000 population
Speed of response	TIMING	0 = first measure (school closure or public event cancellation) taken after first death, 1 = first measure taken before first death
State of emergency	EMERGENCY	0 = no, 1 = yes
Borders and travel	BORDERS	0 = restrictions, 1 = closed/banned
International flights	FLIGHTS	0 = restricted, 1 = suspended
Lockdown	LOCKDOWN	0 = no/partial lockdown, 1= yes

All possible combinations of conditions (technically known as configurations) for which empirical evidence exists are presented in Table 4. The present study includes five conditions, leading to 25 configurations. To illustrate, Row 15 represents European countries that share the following set of conditions: national lockdown, emergency state declared, restrictions on borders, restricted international flights, and first measures taken after the first deaths. All countries (Spain, Italy, and France) in this set have above-median levels of death.

The following section presents the results of an analysis of necessity and sufficiency to help determine the conditions required for the outcome (analysis of necessity), and which combination of conditions produces which outcomes (analysis of suffciency) (Rihoux et al, 2012). To perform these analyses, we used the fsQCA 2.5 software (Ragin et al, 2013). To assess how well the cases in the data set fit a relation of necessity and suffciency, we report the following parameters of fit: consistency and coverage. If consistency or coverage scores for the solution are low (below 0.75), this signals a badly specified model (Legewie, 2013).

Table 4: truth table. Source: pers. proc.

	Conditions					n° of cases	Case	Raw
Row	**Lockdown**	**Emergency**	**Borders**	**Flights**	**Timing**		**Consistency (outcome)**	
1	0	1	0	1	0	1	LU	100% (1)
2	0	1	1	1	1	2	SK, DK	50%
3	1	1	0	1	1	1	BG	100% (0)
4	1	0	1	1	1	2	PL, CY	100% (0)
5	0	0	0	1	1	1	HR	100% (0)
6	0	1	1	0	1	1	HU	100% (0)
7	1	1	1	0	1	1	FI	100% (0)
8	1	0	0	0	1	2	EL, AT [1]	100% (0)
9	1	1	1	1	1	1	CZ	100% (0)
10	1	1	0	0	1	2	RO, PT	50%
11	1	0	0	1	1	1	SI	100% (0)
12	0	0	1	0	0	1	DE	100% (0)
13	1	0	0	0	0	3	IE, NL, UK	100% (1)
14	0	0	0	0	0	1	SE	100% (1)
15	1	1	0	0	0	3	FR, IT, ES	100% (1)
16	1	0	1	0	0	1	BE	100% (1)
17	0	1	0	1	1	1	EE	100% (0)

Note: The rows use the following labelling system: 1 = set membership, 0 = no set membership. Since they do not add empirical evidence, rows 25-17 are not shown in the above table. 1 Austria is a country with a median death rate. The decision to place it in the group of member states with below-median deaths (BMD) is due to the fact that the number of deaths in Austria is below the average in the observed countries (98 deaths/1 million population).

6. Results

The first part of the analysis is intended to examine the existence of necessary conditions. When the value for consistency exceeds 0.9 and the coverage is greater than 0.5, a condition is regarded as necessary (Schneider et al, 2012). A test of necessity reveals that the presence of TIMING is necessary for below-median deaths (Table 5).

Table 5: individual conditions: test of necessity. Source: pers. proc.

Condition	Above-Median Deaths	Consistency for Belw-Median Deaths
LOCKDOWN	0.67	0.69
EMERGENCY	0.50	0.54
BORDERS	0.25	0.46
FLIGHTS	0.17	0.80
TIMING	0.17	1 (cov.: 0.87)
lockdown	0.33	0.31
emergency	0.50	0.46
borders	0.75	0.54
flights	0.83	0.33
timing	0.83	0.00

Note: Capital letters denote the condition's presence; lower-case ones point to the condition's absence.

Table 6 shows the results for the combination of conditions associated with above-median deaths. The csQCA generated three complex solutions. The analysis clearly shows that all three configurations include the condition of the late introduction of the first quarantine measures (TIMING). According to the first minimal part of the formula (AMD1), a late response, an undeclared state of emergency, and restricted - but not suspended - international flights led to above-median deaths (the presence or absence of the conditions LOCKDOWN and BORDERS are irrelevant for this configuration). These are Germany, Belgium, Sweden, the UK, the Netherlands, and Ireland. In the next solution, AMD2, one finds countries that share a late response, national lockdown, restricted international flights, and restrictions on borders (the condition EMERGENCY is redundant for this solution to emerge).

Representatives of this configuration are France, Italy, and Spain. For three countries, namely Ireland, the UK, and the Netherlands, both paths are valid. This combination of conditions is seen in countries with the highest fatality rates. Similarly to AMD1, this implies that the countries opted for less stringent measures to combat COVID-19. The only stringent measure in these two reduced expressions is national lockdown. The third solution, AMD3, covers the case of Luxembourg with two stringent measures - a declared state of emergency and stopping international flights, but coupled with a late response, partial lockdowns, and restrictions on borders.

To examine which set of conditions leads to below-median deaths (Table 7), we performed a separate analysis of suffciency. Four alternative paths lead to the outcome. The first two cover most cases. The cases in BMD1 all share an early response, stopped international flights, and restrictions on borders. This combination corresponds to Bulgaria, Croatia, Slovenia, and Estonia. The second configuration combines an early response, national lockdown, and stopped international flights

(Bulgaria, Poland, Czech Republic, Slovenia, and Cyprus). The other two solutions are composed of an early response, national lockdowns put in place, an undeclared state of emergency, and restrictions on borders (BMD3); and an early response, a declared state of emergency, closed borders, and restricted international flights (BMD4). Solution BMD3 is specific to Greece, Austria, and Slovenia, while solution BMD4 corresponds to Hungary and Finland.

According to our expectations, an early response is common to all countries in the set of below-median deaths. Likewise, the suspension of international flights is seen in many countries in the set of BMD. The results also imply that these countries implemented more stringent measures compared to those facing above-median and severe deaths. In terms of redundant conditions, the state of emergency

does not play a role in configurations BMD1 and BMD2; likewise, the LOCKDOWN condition has no role in BMD1 and BMD4.

Table 6: configurations for above-median deaths (AMD) with a consistency cut-off of 1. Source: pers. proc.

Condition	**Configuration**		
	AMD1	**AMD2**	**AMD3**
TIMING	X	X	X
LOCKDOWN		*	X
EMERGENCY	X		*
BORDERS		X	X
FLIGHTS	X	X	*
Consistency	1	1	1
Raw coverage	0,50	0,50	0,08
Unique coverage	0,25	0,25	0,08
Solution consistency +		1	
Solution coverage #		0,83	

Note: * condition (present); x condition (absent); blank spaces mean "do not care". + Solution consistency: the accuracy of the approximation of the perfect subset relation. # Solution coverage: the proportion of cases that are covered by all of the terms.

Table 7: configurations for belowe-median deaths (AMD) with a consistency cut-off of 1. Source: pers. proc.

Condition	**Configuration**			
	BMD1	**BMD2**	**BMD3**	**BMD4**
TIMING	*	*	*	*
LOCKDOWN		*	*	
EMERGENCY			X	
BORDERS	X		X	*
FLIGHTS	*	*		X
Consistency	1	1	1	1
Raw coverage	0,31	0,38	0,23	0,15
Unique coverage	0,15	0,23	0,15	0,15
Solution consistency +		1		
Solution coverage #		0,85		

Note: * condition (present); x condition (absent); blank spaces mean "do not care". + Solution consistency: the accuracy of the approximation of the perfect subset relation. # Solution coverage: the proportion of cases that are covered by all of the terms.

7. Discussion and Conclusion

In this study, we conducted an analysis to help understand how the responses of individual EU member states and UK are linked to the fatality rates caused by SARS-CoV-2. csQCA minimal formulas allow us to focus on the "ingredients" producing (or not) an outcome of interest, with an eye on within-case narratives and cross-case patterns (Rihoux et al, 2009). Our results imply that no single combination of conditions leads to the outcome of non-high or high fatalities related to the disease. In other words, more than one combination of measures leads to either outcome. If a similar situation were to occur in the future (also including repeated waves of the virus), it would be beneficial to have all the information available from past experiences to respond as effectively as possible. This explains the important need to investigate this extreme health phenomenon from a policy perspective, promptly, spatially, broadly, and in depth, allowing for the specifics of countries and their different responses.

One month after learning of the outbreak of a new disease in Wuhan on 31 December 2019, the WHO declared a Public Health Emergency of International Concern. Depending on how they assessed the severity and magnitude of the coronavirus' presence in the country, many governments decided to

declare a state of emergency to unlock certain government powers to deal with the pandemic. However, this measure is present and absent in both outcomes; namely, in the sets of

countries with above-median fatality rates and below-median ones. Therefore, our results imply that a state of emergency can bring about different outcomes based on how it is combined with other causal conditions. The same applies to the national lockdown measure since this condition is present in two of the four paths leading to the BMD outcome and in one path leading to AMD. On the other hand, the roles of closed borders and restrictions on borders in fighting the COVID-19 pandemic remain unclear. A core condition for below-median fatality rates seems to be a quick response because this condition is present in all BMD paths. In Europe, the adoption of measures before the first deaths was a characteristic of Central and Eastern European countries and Finland. Their decisions were most likely based on the experiences of other European countries that were first exposed to the outbreak.

By contrast, countries in the set with above-median fatality rates are characterised by a late response. This set contains countries with an older population with at least one other health condition (asthma, chronic obstructive pulmonary disease, diabetes, and heart problems) in Europe, while the association with smoking patterns is uncertain.

Moreover, the many interactions and trade-offs between containment measures significantly add complexity to the decision-making on combatting the COVID-19 pandemic. For example, suspending international flights is a prerequisite in two configurations related to below-median deaths (BMD1 and BMD2). By the same token, the restriction of only (but not suspended) international flights is present in two configurations leading to above-median deaths (AMD1 and AMD2). In configuration BMD4, in which only international flights were restricted, the countries (Hungary and Finland) seem to have compensated for the outcome of this decision by closing their borders quickly enough to appear in the set of countries with below-median fatalities. Therefore, we may conclude that the decision to suspend international flights might be critical in successful virus control.

The adoption of various measures at different speeds in the member states has depended not only on a health risk assessment but on an estimation of possible economic losses. The biggest challenge in decision-making in health risk prevention is to strike a balance between reducing the risk of viral transmission and the economic costs, through the sustainable development goals (Anderson et al, 2020; Gong et al, 2020). Given the varying death statistics in individualmember states, itmay be argued that the COVID-19 pandemic is an asymmetric health shock.

Still, the global socioeconomic disruption suggests a symmetrical shock at the economic level. The EU is expected to act quickly and together to prevent the crisis from becoming a long-term demand-side crisis, which would signal its deepening and transformation into a structural one. Especially in the area of public health, we expect that globalisation will prevent any achievement of the pre-crisis level and thus restructuring will occur. For example, health diagnostics and medical treatments performed in other countries have been completely interrupted during the pandemic. Once the situation returns to normal, quarantine will probably still be required before referring a patient abroad and after a patient comes home. International medical treatment will therefore slow down, and health professionals fromindividual countries will need to undertake specific specialist training to acquire knowledge and develop skills that are currently lacking in their own country. Moreover, the role of the public healthcare system is expected to be strengthened as experts call for an institutionalised private–public sector partnership for future critical cases such as epidemic emergencies (Armocida et al., 2020).

Future studies could to examine a link between the share of private and public healthcare systems in each country. During the pandemic, we can observe a growing preference for public hospitals (IBIS, 2020).

However, in the most affected regions of Italy, the National Healthcare Service suffered financial cuts, privatisation, and a deprivation of human and technical resources (Armocida et al. 2020; Istituto Superiore di Sanità, 2020).

This unexpected situation is certainly bringing new challenges to our current healthcare systems (Borgonovi et al., 2013).

9. References

[1] AA.VV. 2014, Standards for equity in health care for migrants and other vulnerable groups. Task Force Migrant Friendly Hospital and Health Services.

[2] Af Wåhlberg, A., Sjöberg, L., 2000. Risk perception and the media. J. Risk Res..

[3] Alexander, D., 2000. Confronting Catastrophe: New Perspectives on Natural Disasters; Oxford University Press: Oxford, UK.

[4] Alexander, D., 2002. Principles of Emergency Planning and Management; Oxford University Press: Oxford, UK.

[5] Alexander, D.A., Pescaroli, G., 2019. What are Cascading Disasters? UCL Press: London, UK.

[6] Anderson, R.M., Heesterbeek, H., Klinkenberg, D., Hollingsworth, T.D., 2020. How will country-based mitigation measures influence the course of the COVID-19 epidemic? Lancet.

[7] Anselmi L. 1990, L'Azienda pubblica sanitaria, in: L'Azienda Salute, Giuffrè, Milano.

[8] Anselmi L. 1996, L'equilibrio economico nelle aziende sanitarie, Il Sole 24 Ore, Milano.

[9] Armocida, B., Formenti, B., Ussai, S., Palestra, F., Missoni, E., 2020. The Italian health system and the COVID-19 challenge. Lancet Public Health.

[10] Baccarani C., Ugolini M. 2000, Quality in health service: using patient charter as a management tool, Paper presented to the International Conference QMED 2000, Aahrus, Denmark.

[11] Barsanti S., Nuti S. 2014, The equity lens in the health care performance evaluation system, The International Journal of health Planning and Management, 29, Wiley onlie, Library, UK.

[12] Birley M. 2011, Health Impact Asessment: principles and practice, NY, Hearthscan.

[13] Blavatnik School of Government, University of Oxford, 2020. [database] Oxford COVID-19 Government Response Tracker. Available online: https://www.bsg.ox.ac.uk/research/research-projects/oxford-covid-19-governmentresponse-Tracker.

[14] Blendon, R.J., Koonin, L.M., Benson, J.M., Cetron, M.S., Pollard, W.E., Mitchell, E.W., Weldon, K.J., Herrmann, M.J., 2008. Public response to community mitigation measures for pandemic influenza. Emerg. Infect. Dis..

[15] Bloomberg 2020, Healthiest Country index, USA.

[16] Boeckxstaens P., De Smedt D., De Maeseneer J., Annemans L., Willems S. 2011, The equity dimension in evaluations of the quality and outcomes framework: A systematic review, BMC Health services research, 11, Biomed Central, UK.

[17] Bordi, L., Nicastri, E., Scorzolini, L., Di Caro, A., Capobianchi, M.R., Castilletti, C., Lalle, E., 2020. Differential diagnosis of illness in patients under investigation for the novel coronavirus (SARS-CoV-2), Italy, February 2020. Eurosurveillance.

[18] Borgonovi E., Lecci F., Ricci A., Salvatore D. 2012, Strumenti di governo per la gestione delle patologie croniche in medicina generale, in AA.VV. 2012, Il Sistema Sanitario in controluce, Rapporto 2011, F. Angeli, Milano.

[19] Borgonovi E., Lecci F., Ricci A., Salvatore D. 2013. L'impatto dell'adozione di strumenti di governo clinico sulla risposta assistenziale. Il Sistema Sanitario in controluce. Rapporto 2012. F. Angeli, Milano, in AA.VV 2013, (Fondazione Farmafactoring), Milano.

[20] Braunack-Mayer, A.J., Street, J.M., Rogers, W.A., Givney, R., Moss, J.R., Hiller, J.E., 2010. Including the public in pandemic planning: A deliberative approach. BMC Public Health.

[21] Brooks, S.K., Webster, R.K., Smith, L.E., Woodland, L., Wessely, S., Greenberg, N., Rubin, G.J., 2020. The psychological impact of quarantine and how to reduce it: Rapid review of the evidence. Lancet.

[22] Carmichael B.D. 1994, Business process reengineering: a remedely for health care, Healthcare Management Forum, Sage, USA.

[23] Casati G. (a cura di) 1999, Il percorso del paziente, Egea, Milano.

[24] Comite U. 2020. Businesses and Public Health between using Lock Down as a Tool against Covid-19 pandemic in Italy: The Impact in a Global Perspective, Advances in Management, Vol. 13 (2).
[25] Cowling, B.J., Aiello, 2020. A. Public health measures to slow community spread of COVID-19. J. Infect. Dis..
[26] Del Bene L. 2000. Criteri e strumenti per il controllo di gestione nelle aziende sanitarie, Giuffrè, Milano.
[27] Falagas, M.E., Kiriaze, I.J., 2006. Reaction to the threat of influenza pandemic: The mass media and the public. Crit. Care 2006.
[28] Foglietta F. (a cura di) 2020, Management in Sanità, Maggioli, Rimini.
[29] Garrett, L., 2000. Betrayal of Trust: The Collapse of Global Public Health; Hyperion: New York, NY, USA.
[30] Gong, B., Zhang, S., Yuan, L., Chen, K.Z., 2020. A balance act: Minimizing economic loss while controlling novel coronavirus pneumonia. Available online: https://www.tandfonline.com/doi/full/10.1080/23812346.2020. 1741940.
[31] Goodall, C., Sabo, J., Cline, R., Egbert, N., 2012. Threat, Efficacy, and Uncertainty in the First 5 Months of National Print and Electronic News Coverage of the H1N1 Virus. J. Health Commun..
[32] Griffit J.R. 1994, Reengineering, healthcare: management system for survivors, Hospital and health services administation, Gavin Publisher, USA.
[33] Hale, T., Webster, S., Petherick, A., Phillips, T., Kira, B., 2020. Data use policy: Creative commons attribution CC by standard. Available online: https://www.bsg.ox.ac.uk/research/research-projects/coronavirusgovernment-response-tracker.
[34] Hammer M., Champy J. 1995, Reengineering the corporation: a manifesto for business revolution, Harpers business, HarperCollins Publishers, UK.
[35] Holshue, M.L., DeBolt, C., Lindquist, S., Lofy, K.H., Wiesman, J., Bruce, H., Spitters, C., Ericson, K., Wilkerson, S., Tural, A., 2020. First Case of 2019 Novel Coronavirus in the United States. N. Engl. J. Med..
[36] Chan, J.F.W., Yuan, S., Kok, K.H., To, K.K.W., Chu, H., Yang, J., Xing, F., Liu, J., Yip, C.C.Y., Poon, R.W.S., 2020. A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-toperson transmission: A study of a family cluster. Lancet.
[37] Chen, H., Guo, J., Wang, C., Luo, F., Yu, X., Zhang, W., Li, J., Zhao, D., Xu, D., Gong, Q., 2020. Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: A retrospective review of medical records. Lancet.
[38] IBIS, 2020. World Effects of COVID-19 on Global Healthcare Systems. Available online: https://www.ibisworld. com/industry-insider/coronavirus-insights/effects-of-covid-19-on-global-healthcare-systems/.
[39] International Risk Governance Council (IRGC), 2017. Introduction to the IRGC Risk Governance Framework; International Risk Governance Council (IRGC): Geneva, Switzerland, 2017; Available online: https://irgc.org/risk-governance/irgc-risk-governance-framework/ (accessed on 27 April 2020). Int. J. Environ. Res. Public Health 2019.
[40] Istituto Superiore di Sanità 2020, Sezione Coronavirus, https://www.epicentro.iss.it/coronavirus/.
[41] Juckett, G., 2006. Avian influenza: Preparing for a pandemic. Am. Fam. Physician.
[42] Kraemer, M.U.G., Yang, C.-H., Gutierrez, B., Wu, C.-H., Klein, B., Pigott, D.M., du Plessis, L., Faria, N.R., Li, R., Hanage, W.P., 2020. The e ect of human mobility and control measures on the COVID-19 epidemic in China. Science.
[43] Krewski, D., Slovic, P., Bartlett, S., Flynn, J., Mertz, C.K., 1995. Health risk perception in Canada I: Rating hazards, sources of information and responsibility for health protection. Hum. Ecol. Risk Assess. Int. J..

[44] Lau, J.T.F., Griffiths, S., Choi, K.C., Tsui, H.Y., 2010. Avoidance behaviors and negative psychological responses in the general population in the initial stage of the H1N1 pandemic in Hong Kong. BMC Infect. Dis..
[45] Lazzerini, M., Putoto, G., 2020. COVID-19 in Italy: Momentous decisions and many uncertainties. Lancet Glob. Health.
[46] Legewie, N., 2013. An introduction to applied data analysis with qualitative comparative analysis. Forum. Qual. Soc. Res.
[47] Lindell, M.K., Perry, R.W., Prater, C., 2007. Introduction to Emergency Management; Wiley: Hoboken, NJ, USA.
[48] Manganelli R.L. 1993, Klein M.M., The reengineering revolution, Harpers business, HarperCollins Publishers, UK.
[49] Marinò L. 2001, Dinamiche competitive ed equilibrio economico nelle aziende sanitarie, Giuffrè, Milano.
[50] McKibbin, W., Fernando, R., 2020. The economic impact of COVID-19. In Economics in the Time of COVID-19; CEPR Press: London, UK.
[51] McNeil, D., 2020. The Virus Can Be Stopped, but Only With Harsh Steps, Experts Say. Available online: https://www.nytimes.com/2020/03/22/health/coronavirus-restrictions-us.html.
[52] Merli G., Biroli M. 1996. Organizzazione e gestione per processi, Isedi, Torino.
[53] Ministero della Salute 2020, Sezione COVID-19, http://www.salute.gov.it/nuovocoronavirus?gclid.
[54] Normann R. 1992, La gestione strategica dei servizi, Etas, Milano.
[55] Olsen, S.J., Chang, H.-L., Cheung, T.Y.-Y., Tang, A.F.-Y., Fisk, T.L., Ooi, S.P.-L.,
[56] Osservatorio Nazionale sulla Salute nelle Regioni Italiane, Rapporto Osservasalute 2017, Roma.
[57] Pescaroli, G., Alexander, D., 2015. A definition of cascading disasters and cascading effects: Going beyond the "toppling dominos" metaphor. GRF Davos Planet Risk.
[58] Politico, 2020. [database] Coronavirus in Europe, Available online: https://www.politico.eu/article/europescoronavirus-lockdown-measures-compared/.
[59] Previtali P. (a cura di) 2018. Management sanitario e governance della complessità, Pavia University Press, Pavia.
[60] Protezione Civile, Presidenza del Consiglio dei Ministri 2020. Dipartimento della protezione Civile, Sezione Coronavirus, http://www.protezionecivile.gov.it/attivita-rischi/rischio-sanitario/emergenze/coronavirus.
[61] Qin, Y., Zhao, M.J., Tan, Y.Y., Li, X.Q., Zheng, J.D., Peng, Z.B., Feng, L.Z., 2018. History of influenza pandemics in China during the past century. Zhonghua Liu Xing Bing Xue Za Zhi.
[62] Ragin, C.C., Davey, S., 2009. fs/QCA [Computer Program], Version 2.5. University of Arizona, Tucson Available online: http://www.socsci.uci.edu/~{}cragin/fsQCA/software.shtml.
[63] Remuzzi, A., Remuzzi, G., 2020. COVID-19 and Italy: What next? Lancet
[64] Rihoux, B., De Meur, G., 2009. Crisp-set qualitative comparative analysis (csQCA). In Configurational Comparative Methods: Qualitative Comparative Analysis (QCA) and Related Techniques; Benoît Rihoux, C.C.R., Ed.; Sage Publications: Shozende Oaks, CA, USA.
[65] Rihoux, B., Ragin, C., 2012. Configurational Comparative Methods: Qualitative Comparative Analysis (QCA) and Related Techniques; Sage Publications: Shozende Oaks, CA, USA.
[66] Rosen, K.R., 2020. China's new Covid-19 hotspot on Russian border raises tensions between two allies. Available online: https://www.newsweek.com/china-russia-tensions-border-coronavirus-1498785.
[67] Severe Acute Respiratory Syndrome on Aircraft. N. Engl. J. Med. Short, J.F., 1984. The social fabric at risk: Toward the social transformation of risk analysis. Am. Sociol. Rev..
[68] Scheffer, M., 2009. Critical Transitions in Nature and Society; Princeton University Press: Princeton, NJ, USA.

[69] Schneider, C.Q., Wagemann, C., 2012. Set-Theoretic Methods: A User's Guide for Qualitative Comparative Analysis and Fuzzy Sets in Social Science; Cambridge University Press: Cambridge, UK.
[70] Slovic, P., 1987. Perception of risk. Science.
[71] Slovic, P., 2000. The Perception of Risk; Earthscan Publications: London, UK; Sterling, VA, USA.
[72] Smith, R.D., 2006. Responding to global infectious disease outbreaks: Lessons from SARS on the role of risk perception, communication and management. Soc. Sci. Med..
[73] Smith, K., Petley, D.N., 2009. Environmental Hazards: Assessing Risk and Reducing Disaster, 5th ed.; Routledge: Abingdon, UK.
[74] Statista Life Expectancy at Birth in Italy from 2002 to 2019, by Gender, 2020. Available online: https://www.statista.com/statistics/568929/life-expectancy-at-birth-by-gender-in-italy/
[75] Tripp, G., Tan, S., Milne, J., 1995. Risk perception and anxiety. N. Z. J. Psychol. 1995.
[76] UNDRR, 2015. Sendai Framework for Disaster Risk Reduction 2015–2030; UNDRR: Geneva, Switzerland.
[77] Vineis, 2017. P. Public Health as a Common Good. In Health Without Borders; Springer: Cham, Switzerland.
[78] Vineis, P., 2014. Public health and the common good. J. Epidemiol. Community Health.
[79] Wang, C., Pan, R., Wan, X., Tan, Y., Xu, L., Ho, C.S., Ho, R.C., 2020. Immediate Psychological Responses and Associated Factors during the Initial Stage of the 2019 Coronavirus Disease (COVID-19) Epidemic among the General Population in China. Int. J. Environ. Res. Public Health.
[80] Wang, H., Zhang, L., 2020. Risk of COVID-19 for patients with cancer. Lancet Oncol..
[81] Wang, J., Wang, Z., 2020. Strengths, Weaknesses, Opportunities and Threats (SWOT) Analysis of China's Prevention and Control Strategy for the COVID-19 Epidemic. Int. J. Environ. Res. Public Health.
[82] WHO, 2015. Scientific Research Advisory Committee on Severe Acute Respiratory Syndrome (SARS). In Proceedings of the First Meeting, Geneva, Switzerland, 20–21 October 2003; WHO: Geneva, Switzerland.
[83] WHO, 2016, International Health Regulations, 3rd ed.; WHO: Geneva, Switzerland, 2016; Volume 2005.
[84] Wilder-Smith, A., Chiew, C.J., Lee, V.J., 2020. Can we contain the COVID-19 outbreak with the same measures as for SARS? Lancet Infect. Dis..
[85] World Health Organization, 2009. Pandemic Influenza Preparedness and Response; WHO: Geneva, Switzerland.
[86] World Health Organization, 2020. Strengthening the Health System Response to COVID-19; WHO: Geneva, Switzerland.
[87] Worldometer, 2020. [database] Reported Cases and Deaths by Country, Territory, or Conveyance. Available online:https://www.worldometers.info/coronavirus/.
[88] Wu, F., Zhao, S., Yu, B., Chen, Y.-M., Wang, W., Song, Z.-G., Hu, Y., Tao, Z.-W., Tian, J.-H., Pei, Y.-Y., 2020. A new coronavirus associated with human respiratory disease in China. Nature.
[89] Wu, Z., McGoogan, J.M., 2020. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China. JAMA.
[90] Yan, Y., Shin, W.I., Pang, Y.X., Meng, Y., Lai, J., You, C., Zhao, H., Lester, E., Wu, T., Pang, C.H., 2020. The First 75 Days of Novel Coronavirus (SARS-CoV-2) Outbreak: Recent Advances, Prevention, and Treatment. Int. J. Environ. Res. Public Health.
[91] Yu, K.D.S., Aviso, K.B., 2020. Modelling the Economic Impact and Ripple Effects of Disease Outbreaks. Process. Integr. Optim. Sustain..

[92] Zhang, Y., Ma, Z.F., 2020. Impact of the COVID-19 Pandemic on Mental Health and Quality of Life among Local Residents in Liaoning Province, China: A Cross-Sectional Study. Int. J. Environ. Res. Public Health.
[93] Zhou, F., Yu, T., Du, R., Fan, G., Liu, Y., Liu, Z., Xiang, J., Wang, Y., Song, B., Gu, X., 2020 et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: A retrospective cohort study. Lancet.
[94] Zhu, N., Zhang, D., Wang, W., Li, X., Yang, B., Song, J., Zhao, X., Huang, B., Shi, W., Lu, R., 2020. A novel coronavirus from patients with pneumonia in China, 2019. N. Engl. J. Med..
[95] Zimmermann D.H. 1994, Reengineering health care: a vision for the future, Eagle Press, Roma.
[96] Zu, Z.Y., Jiang, M. Di, Xu, P.P., Chen, W., Ni, Q.Q., Lu, G.M., Zhang, L.J., 2020. Coronavirus Disease 2019 (COVID-19): A Perspective from China. Radiology.

Appendix

	Total deaths +	**Speed of response ***	**State of emergency**	**International flights**	**Lockdown**	**Borders and travel**
Austria (AT)	AMD	Before	No	Restricted. Austrian Airlines grounted until April 19	Yes. Internal movement banned, except to go to work, go shopping, or visit helath facilities. Schools, universities, restaurants and large shops closed	Open, but checks and screenings
Belgium (BE)	AMD	After	No	Brussels Airlines is grounded. Some airlines flying but with reduced service	Yes, except to to work, supermarkets, health facilities and to care for other people.	Closed for “non essential” travel
Bulgaria (BG)	BMD	Before	Yes	Stopped	Yes. Restrictions on internal movement	Restrictions, travel screenings at airports since March 8
Croatia (HR)	BMD	Before	No	Stopped	No national lockdown, but restrictions	Restrictions
Cyprus (CY)	BMD	Before	No	Stopped	Yes, internal movement banned except to go work, grocery shopping and medical treatments or the bank. Curfew from 9 p.m. to 6 a.m.	Closed
Czech Rep. (CZ)	BMD	Before	Yes	Stopped	Yes, national quarantine order, but essential shopping and visiting family allowed. More shops allowed to reopen as of April 9 and travel restrictions eased for workers in critical infrastructure.	Closed
Denmark	AMD	Before	Yes	Stopped	No national lockdown,	Closed

	Total deaths +	Speed of response *	State of emergency	International flights	Lockdown	Borders and travel
(DK)					but schools, restaurants and many shops closed until May 10.	
Estonia (EE)	BMD	Before	Yes	Stopped	No national lockdown, but many shops closed	Restrictions, helath screenings at borders
Finland (FI)	BMD	Before	Yes	Restricted	Yes. Restrictions on internal movement	Yes. Travelling abroad banned until April 13
France (FR)	AMD	After	Yes	Restricted	Yes. Provide form for authorities when outside	Open
Germany (DE)	AMD	After	No	Restricted	Partial lockdown, with rules differing across states. Many shops closed.	Closed for "non essential" travel. Checks at borders
Greece (EL)	BMD	Before	No	Restricted. Aegen Airlines has suspended all international flights, apart from weekly flights to Brussels	Yes. Internal movement banned except to go to work, grocery shopping and for medical reasons. Curfew on island of Mykonos.	Borders with neighboring Albania, North Macedonia and Turkey are closed
Hungary (HU)	BMD	Before	Yes	Restricted	No national lockdown, but all citizens asked to stay at home. Complusory home quarantine order can be issued.	Closed
Ireland (IE)	AMD	After	No	Restricted	Yes, except for grocery shopping and essential family visits. Non-essential shops closed.	No
Italy (IT)	AMD	After	Yes	Restricted	Yes, strict lockdown nd non-essential production halted. Bookshops, stationary shops and stores for children clothes allowed to reopen as of April 14.	Open, but all neighboring countries have restricted entry
Luxembourg (LU)	BMD	After	Yes	Stopped	No national lockdown, but non-essential shops closed and home working advised.	No
Netherlands (NL)	AMD	After	No	Restricted	Yes, but exceptions for shopping.	Restrictions for Non-EU citizens
Poland (PL)	BMD	Before	No	Stopped	Yes. Non-essential movement banned.	Closed
Portugal (PT)	AMD	Before	Yes	Restricted	Yes. Non-essential movement banned.	Restrictions at border with Spain
Romania (RO)	BMD	Before	Yes	Stopped to Italy, Spain, Germany and	Yes. Restrictions	Restrictions

	Total deaths +	**Speed of response ***	**State of emergency**	**International flights**	**Lockdown**	**Borders and travel**
Slovakia (SK)	BMD	Before	Yes	France Stopped	No, but all schools closed	Closed
Slovenia (SI)	BMD	Before	No	Stopped	Yes. Non-essential movement banned.	Restrictions
Spain (ES)	AMD	After	Yes	Yes	Yes. National lockdown extended, non-essential economic activity stopped. Certain sectors allowed to work again as of April 14.	Restrictions
Sweden (SE)	AMD	After	No	No	No	Ban on non-essential travel since March 17
United Kingdom (UK)	AMD	After	No	No	Yes, non-essential movement banned, exceptions for necessary shopping, medical tratment and travelling to work.	No

Note: + Total deaths as of 15th April 2020: AMD – above-median deaths, BMD – below-median deaths; * Speed of response: Before – first measure was implemented before first death, After – first measure was implemented after first death. Sources: Worldometer; Politico - Coronavirus in Europe and Blavatnik School of Government, University of Oxford: Oxford COVID-19 Government Response Tracker.