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Corona-regionalism? Differences in regional responses to COVID-19 in Italy



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ABSTRACT

The paper discusses the responses to the COVID-19 crisis in the acute phase of the first wave of the pandemic (February–May 2020) by different Italian regions in Italy, which has a decentralised healthcare system. We consider five regions (Lombardy, Veneto, Emilia-Romagna, Umbria, Apulia) which are located in the north, centre and south of Italy. These five regions differ both in their healthcare systems and in the extent to which they were hit by the first wave of COVID-19 pandemic. We investigate their different responses to COVID-19 reflecting on seven management factors: (1) monitoring, (2) learning, (3) decision-making, (4) coordinating, (5) communicating, (6) leading, and (7) recovering capacity. In light of these factors, we discuss the analogies and differences among the regions and their different institutional choices.

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1. Introduction

With over 180 mln confirmed cases and almost 4 mln deaths [1] worldwide, the COVID-19 pandemic, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV2), has been the worst public health challenge in recent history, placing extraordinary pressure on healthcare systems.

A key and long-standing debate in health policy refers to the effect of decentralisation on health care system performance, which can be exacerbated in times of (health) crisis [2–5]. The degree of decentralisation varies markedly across OECD countries and it is often a way to stimulate efficiency or to provide a more focused set of healthcare services based on needs [3]. In countries with decentralised healthcare systems central governments tend to be

responsible for decisions regarding the overall policy framework of healthcare and for coordination and monitoring, while lower tiers of government have control over decisions regarding the inputs and outputs of healthcare services.

How did decentralised healthcare systems respond to the COVID-19 pandemic? In this paper, we examine the case of the Italian healthcare system and compare the responses provided by a subset of regional governments to the pandemic. In doing so, we employ the analytical lens suggested by Bouckaert et al. [6] and consider seven dimensions of crisis management in the context of a decentralised healthcare system.

In their study, Bouckaert et al. [6] compared the national response of four EU countries (France, Germany, Belgium and Italy) and argued that country-specific responses could depend on differences in institutional arrangements, administrative cultures and state traditions. During the height of the pandemic, several decision-makers and experts called for a strong centralised response to the COVID-19 pandemic. For example, experts from dif-

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ferent European countries called for strategies to overcome national boundaries for a more efficient operations management, such as sharing intensive care unit (ICU) beds [7]; sharing information related to policies, practices and strategies [8]; and sharing scientific and clinical knowledge about the effectiveness of therapies [9]. However, despite the necessity to cope with the pandemic under a common international strategy, the policy responses were invariably national, leading to what has been labelled by Bouckaert et al. as “coronationalism” [6]. This term was coined to indicate a certain degree of nationalism displayed by European countries (but not only) in their crisis management responses: “coping with the crisis was first and foremost an issue of the national states” ([6], p. 765). In Europe, for example, health remains a primary responsibility of the member states, not of the EU, which only provides a coordinated approach at both EU and global level.

We argue that differences in response to the pandemic could also emerge at a sub-national level, particularly when the healthcare system is decentralised or devolved [3,10], as in the case of Italy. The purpose of this paper is to critically review the responses to the first wave (February–May 2020) of the COVID-19 health crisis by a selection of Italian regions and to draw some preliminary conclusions on the management of the health emergency by these regions. In particular, we have selected five regions (Lombardy, Veneto, Emilia-Romagna, Umbria, Apulia) broadly representative of the north, centre and south of Italy. These five regions differ in both the organisation and delivery of healthcare, and in the way they were affected by the first wave of COVID-19. We investigate their different responses to COVID-19 reflecting on the seven dimensions of crisis management reported by Bouckaert et al. [6]: (1) monitoring, (2) learning, (3) decision-making, (4) coordinating, (5) communicating, (6) leading, and (7) recovering capacity. Based on the analysis of these different responses, we provide insights on the issues that decentralised healthcare governments may face during a crisis, such as the recent pandemic.

In the rest of the article, we first provide an overview of the Italian healthcare system. We next focus on the five selected regions to analyse their responses to the COVID-19 crisis through the lens of the seven dimensions mentioned above. We conclude by discussing the analogies and differences among the regions in light of their choices and by critically reflecting on the idea of “coronaregionalism”, that is the equivalent of “coronationalism” in a decentralised healthcare system.

2. Overview of the Italian Servizio Sanitario Nazionale

The Italian *Servizio Sanitario Nazionale* (SSN), founded in 1978, is based on principles of universal coverage and of (almost) free care at the point of use. It is mainly financed through general taxation, with a variable financing mix across regions [11]. Health funds collected at national level are shared among regions according mainly to demographic criteria (capitation system). As a consequence, the per-capita resources might vary greatly across regions. Regions also have the possibility to increase the funding by choosing different co-payment levels and by (marginally) increasing income taxation. Currently, the percentage of GDP for healthcare expenditure is 8.8% with the current level of user charges above 20% of total health spending [12].

Despite the unitary nature of the Italian State, since the establishment of the SSN, both the central government and the regions have been entrusted with specific responsibilities, which have, over the past forty years, progressively led to the actual decentralisation of the national healthcare system in 2001. In particular, and since its creation, the central government has been responsible for ensuring universal coverage and equity of access, while regions have been exclusively responsible for organising and regulating health

services and for establishing financing mechanisms for *Unità Sanitarie Locali* (USLs), the local health authorities.

USLs were established as the entities responsible for managing healthcare services in a pre-defined catchment area. In the early 1990s, on the basis of market-oriented reforms, USLs were transformed into public enterprises (*Aziende Sanitarie Locali*, ASLs) managed, in collaboration with a top management team, by a chief executive officer appointed by, and responsible to, the regional government. Many major hospitals, previously managed directly by the USLs, were also converted into public enterprises (*Aziende Ospedaliere*, AOs) with a strong managerial autonomy. Progressively, regions were given greater power in the administration and organisation of healthcare services in exchange for their acceptance of tighter budget constraints on healthcare spending. Each region ended up adopting its own healthcare organisation model but every model could be traced back to some of the more general organisation models. Specifically, France [13] offered a classification of the more general organisation models, based on the relationship between purchasers (ASLs) and providers (AOs and hospitals). France [13] identified three main models: i) third payer model; ii) programmer model; and iii) sponsor model. In the third payer model, characterised by high degree of competition and low degree of public administration, patients freely choose between public and private hospitals; ASLs, acting as third payers, remunerate providers ex post on the basis of the services offered. In the programmer model, characterised by low degree of competition and high degree of public administration, ASLs and AOs are fully integrated in the SSN and the supply of health services is mainly public. In the sponsor model, positioned between the third payer and programmer models, patients can only choose between public and private hospitals previously selected by the ASLs.

The decentralisation process, following the market-oriented reforms of the early 1990s, culminated in the 2001 constitutional reform, with the introduction of an essential healthcare benefit package (defined as *Livelli Essenziali di Assistenza*, LEA) guaranteed to all citizens. A national fund was established in order to provide the necessary resources to regions to deliver on the LEA. Any care provided above the LEA has to be funded through the regional budget. This reform granted more power to the regions and made healthcare the joint responsibility of regional and central governments [14].

The current institutional arrangement implies that the central government is responsible for channelling general tax revenues, defining benefit packages, exercising overall management and governance, and, more recently, monitoring regional budgets. Meanwhile, regional governments are responsible for the organisation and delivery of health services through the ASLs and public and accredited private hospitals, and can also raise local taxes and fund additional health services. Overall the SSN is currently a network of 21 regional health systems (RHSs) with different models of healthcare service delivery and organisation [14].

3. Regional responses to COVID-19

3.1. Selection of the regions

The selection of the regions was based on the following criteria: geographical position, degree of COVID-19 outbreak, and model of organisation and delivery of healthcare.

Lombardy (North-Western Italy), Emilia-Romagna and Veneto (North-Eastern Italy) were selected because they were the first regions significantly impacted by the first wave of COVID-19. On 24th February 2020, 98% of total COVID-19 cases in Italy were reported in these regions: 75% in Lombardy, 14% in Veneto and 8% in Emilia-Romagna. Umbria and Apulia were selected from Central and Southern Italy, respectively, and were less affected by the first

wave: on 24th February 2020, both regions reported zero cases. Despite contagions being distributed more evenly across the country by the end of May 2020, almost 60% of total COVID-19 cases were still reported in Lombardy (38%), Veneto (8%) and Emilia-Romagna (12%), while extremely low percentages of contagions were reported in Umbria (<1%) and Apulia (around 2%). Therefore, the epidemiological north-south gap was still wide at the end of the first wave of the pandemic, which explains why regions adopted some measures and not others in the period February-May 2020 (e.g. reopening of dismissed hospitals to accept less severe COVID-19 patients in Veneto, or creation of ‘drive through’/transit points for COVID-19 testing in Lombardy or Emilia-Romagna).

Regarding the delivery and organisation of healthcare, the regions considered in this study have experienced over time a very different evolution, although all have attempted to better integrate health and social care [15]. Lombardy, which in the late nineties moved from an integrated production and purchasing system toward a purchaser-provider split, with all hospitals acting as independent providers (third payer model), has recently (2015) reviewed the RHS in light of a greater integration between primary and community healthcare provision and hospital care. In Emilia-Romagna, in 2011, ASLs were grouped into bigger health authorities (*Aree Vaste*, AV). The provision of hospital services is guaranteed by ASLs through their directly managed hospitals or through larger, more equipped and independent hospitals organised in “hub and spokes” (sponsor model). The region has also strengthened primary community care with the creation of so-called “medical homes”. In Umbria, the system is mixed with some smaller hospitals operating within the ASL, and two autonomous AOs (programmer model). Moreover, the system has strengthened community care over time, by setting up a network of health and social care small units distributed at the very local level and operating in strict coordination with GPs. Apulia, which follows instead the sponsor model where ASLs are both providers of services (community care and the majority of hospital care) and purchasers of services provided to residents, has recently undergone a vast reform of the RHS, completed in 2020. The reform aimed to reinforce community and primary care, also by strengthening community hospitals intended for less severe and chronic patients and by streamlining the hospital network. Differently from the other four regions, Veneto has retained its original organisational framework over the years, with ASL top management teams managing hospitals and community care and also elements of social care (sponsor model). Similarly to Emilia-Romagna, Veneto reduced the number of ASLs through merging processes in 2016, integrating health and social care services along with the establishment of an overarching organisation for their support and management [13,16–18].

3.2. Measures implemented in the selected regions to counteract COVID-19

The five regions selected for this work had pre-pandemic differences in terms of population density, GDP, hospital beds, SSN personnel, and healthcare expenditure (Table 1) which were reflected in variations in both primary and community healthcare and hospital capacity at the time the pandemic struck.

To tackle the first wave of the pandemic (February-May 2020), the regions introduced different policy measures that we analyse through the categorisation in terms of the seven crisis management dimensions proposed by Bouckaert et al. [6] (Table 2). It should be noticed that the selected regions introduced policies across all seven factors.

3.2.1. Monitoring

The crisis management dimension monitoring comprises of all the systems put in place by the regions for monitoring, processing

Table 1
Key dimensions of the selected regions. Lombardy, Veneto, Emilia-Romagna, Umbria and Apulia.

	Year	Lombardy	Veneto	Emilia-Romagna	Umbria	Apulia	Italy
Geographical extension (km ²)		23844	18345	22510	8456	19541	302068
Total population (mil)	2018	11.22	5.48	5.03	1.00	4.47	60.42
Population density		471	299	223	118	229	200
GDP (per capita)	2018	34814	29886	32173	22282	16798	26187
Ordinary acute beds (100,000 inhabitants)	2018	252	247	262	244	231	260
Ordinary acute public beds (% total ordinary acute beds)	2018	98.17	99.18	99.46	99.63	99.96	99.09
SSN doctors (% total SSN staff)	2018	15	13	14	17	18	16
SSN nurses (% total SSN staff)	2018	39	42	43	42	42	41
Public healthcare expenditure (EUR per capita, 2018, gross)	2018	2020	1951	2114	2017	1853	1958
Public healthcare expenditure (EUR per capita, 2018, net)	2018	1944	1919	2033	1992	1896	1958
Public healthcare expenditure (% GDP per capita)	2018	5.6	6.4	6.3	8.9	11.3	7.5
Private healthcare expenditure (mean values, per capita)	2016-2018	793	673	710	541	480	604
Private healthcare expenditure (% GDP per capita)	2018	2.3	2.3	2.2	2.4	2.9	2.3

Table 2
Regional measures introduced to tackle the COVID-19 emergency (February–May 2020).

	North-West	North-East		Centre	South	Measures included in national decrees
	Lombardy	Veneto	Emilia Romagna	Umbria	Apulia	
Crisis management dimensions						
Monitoring						
Nursing home monitoring system				✓		
Enforcement of self-registration and self-isolation for people returning to the region				✓	✓	
Testing of whole local population (Vo')		✓				
Testing of healthcare professionals	✓	✓	✓	✓	✓	
Learning						
Establishment of special units (USCA) to manage COVID-19 patients at home	✓	✓	✓	✓		✓
Decision-making						
COVID-19 containment strategies in RSA				✓		
Home delivery of medical devices/drugs for elderly/fragile population		✓		✓	✓	
Reduced physical access to healthcare organisations by easing bureaucratic procedures/extending rights to access public health care (e.g. automatically extending deadline for exemption status from co-payments; prescriptions sent directly to pharmacies)	✓	✓		✓	✓	✓
Closure of primary care practices to reduce social contacts and introduction of phone/home consultations	✓	✓	✓	✓	✓	
Use of experimental COVID-19 drugs in a home setting		✓				
Creation of psychological support units for health professionals, caregivers and people not necessarily affected by COVID-19		✓	✓	✓		
Creation of 'drive through'/transit points for COVID-19 testing	✓		✓			
Coordinating						
Emergency management task-forces with scientific teams	✓	✓	✓	✓	✓	✓
Involvement of charitable organisations	✓	✓		✓	✓	
Communication						
Daily press conference on new cases, hospitalisations, ICU hospitalisations, deaths, discharges and testing	✓	✓	✓		✓	
Recovering capacity						
Building new hospitals	✓					
Conversion of hospitals/beds in existing hospitals to treat COVID-19 patients only	✓	✓	✓	✓	✓	
Creation of temporary out-of-hospital triage/pre-triage units	✓	✓	✓	✓		
Reopening of dismissed hospitals to accept lower need COVID-19 patients		✓				
Introduction of new ICU units (more than doubling)	✓	✓	✓	✓	✓	✓
Recruitment of additional healthcare workforce	✓	✓	✓	✓	✓	✓
Retired doctors and nurses allowed to go back to practice	✓	✓	✓	✓		✓
Strengthening of existing testing labs' capacity to analyse swabs	✓	✓	✓	✓	✓	
Increased use of home screening tests cases to avoid hospitalisation		✓	✓	✓		
Use of facilities (hotel, nursing homes) to care for discharged/self-isolating patients	✓	✓		✓	✓	
Centralisation of procurement of medical devices and PPE	✓	✓	✓	✓	✓	✓

and transforming data into information to cope with the COVID-19 emergency and the subjects involved in. On the one hand, regional monitoring systems were characterised by a certain degree of homogeneity due to the type of health data requested by the central government (daily number of COVID-19 new cases, hospitalisations, ICU hospitalisations, deaths, discharges and testing). On the other hand, they were characterised by a certain degree of heterogeneity in terms of screening methods adopted to detect new cases and to control the spread of the virus. For example, a mass testing campaign was launched very early on in the municipality of Vo', Veneto. Enforcement of self-registration through an online platform and self-isolation for people returning to the region were implemented in Umbria and Apulia, in line with the containment strategy appropriate to the level of infection in these areas. Unlike the other regions, Umbria promptly introduced a nursing home

monitoring system to track and contain any potential COVID-19 infection in nursing homes.

3.2.2. Learning

According to Bouckaert et al. [6], learning from own past crises and from others' experiences with crises is a necessary part of good crisis management. With respect to 'learning from own past crises', the Italian regions all have experience of specific emergencies (such as flu and earthquake), of limited nature in both time and space, but had never experienced a pandemic.

As for 'learning across regions', we find very little evidence of what was happening. If anything, the opposite seems to have occurred with respect to screening practices. The use and level of diagnostic and serological testing in the population has been one of the most contested issues across the regions in the first phase

of the pandemic. Veneto was the first region to adopt mass testing with the result of controlling the rapid spread of the virus. In the municipality of Vo', one of the first hotspots in Veneto, the whole population was swab-tested at the start (85.9% of the population) and at the end (71.5% of the population) of the first wave of COVID-19. Both surveys confirmed a significant proportion (43.2%) of asymptomatic individuals with confirmed infections and a prevalence of around 1.2% and 2.6% in the city [24]. Veneto became vocal about the need for mass testing (on 3rd May Veneto tested more than 7,700 per 100,000; Lombardy, Emilia-Romagna and Umbria about 4,000 per 100,000; Apulia only 1,641 per 100,000) and invested in purchasing diagnostic machineries that allowed the use of in-house produced agents [25], but none of the other four regions followed its example.

Some convergence and learning across regions actually resulted from the intervention by the central government. For example, the central government instructed all regional governments to create special units (*Unità Speciali di Continuità Assistenziale*, USCA) for managing COVID-19 patients in the community and monitoring those in home-isolation. Where operative, USCA had a pivotal role in the home-based care provision (through telephone and video consultations and, less frequently, home visits) and provided significant support to local GPs. However, some delays were recorded in the timing of implementation for some regions: Lombardy and Veneto activated USCA by the end of March 2020, Emilia-Romagna and Umbria by the end of April.¹

3.2.3. Decision-making

Decision-making refers to choices made by the regions in pursuing strategies of containment. Over the unfolding of the crisis, the main decision-making on dealing with the pandemic shifted from the regions to the central government. At the very early stage of the pandemic (end of February), when only northern regions were affected, the national government adopted local containment measures: closure of regional boundaries between Lombardy, Veneto and Emilia-Romagna; shutdowns of businesses; closure of schools, museums and libraries, and cancellations of public events. Moreover, some regions intervened with decisions related to the treatment of COVID-19 patients: in Lombardy, for example, patients originally admitted in the A&E of a hospital already above its capacity were occasionally transferred to another hospital of a neighbouring province within the region, but were never transferred to hospitals outside Lombardy, even when those hospitals could have had the capacity to treat them. Within two weeks' (beginning of March), as the pandemic quickly spread, the "regional logic [...] resulted in national political coordination, which then became a national or coordinated strategy of resource allocation ([6], p. 769)", providing clear indication on what should be done at the regional operational level. The central government rapidly became the key actor, with regional governments playing a subordinate role.

Despite the national government role, regions still played an important role by taking local decisions, which were critical for the COVID-19 response. For instance, the different choices about COVID-19 testing and management of COVID-19 cases are path-dependent: the combination of efficient community care, rooted social care and a capillary system of screening through swabs may explain why Veneto and Emilia-Romagna immediately departed

¹ According to the Law Decree 14/20 dated 9th March 2020, USCA should include a number of doctors equal to that already present in the continuity of care service in the area. The following can be part of the special unit: doctors work in continuity of care services; doctors attending the specific training course in general medicine; residually, graduates in medicine and surgery who are qualified and enrolled in the order of competence. In some Regions, family doctors, paediatricians of free choice and doctors of territorial emergency services have also been given the opportunity to participate [26].

from the initial hospital-focused path followed by Lombardy. Moreover, the different percentage of private providers across the regions could have been a factor that creates barriers in the chain of command and decision-making [27], thus leading to less smooth or not timely responses [28]. This was clear for instance in the case of the management of nursing homes (*Residenza Sanitaria Assistenziale*, RSA) which is another example of differences in regional decision-making. An extraordinary excess mortality in RSA, flagged up by a newspaper investigation, prompted the National Institute for Health (*Istituto Superiore di Sanità*, ISS) to conduct a survey covering the period 1st February - 14th April 2020 [29]. The survey revealed on average 8% of all RSA residents in Italy died, with a peak of 13% for Lombardy (of which about 53% due to COVID-19 symptoms), which was twice that registered in Veneto (6.5%) and in Emilia-Romagna (7%) [29]. However, a closer look at Lombardy, Veneto, Umbria and Emilia-Romagna highlights differences in decisions taken. In Veneto, once the first COVID-19 cases emerged, the nursing home association, in collaboration with the medical staff, introduced strict guidance for its members (for example, no visitor access). Both Veneto and Umbria immediately invested resources to guarantee enhanced hand hygiene and personal protective equipment (PPE) for staff and visitors within the nursing homes. Emilia-Romagna adopted a strategic plan to contrast the spread within RSAs, consisting of early detection, contact tracing, isolation of positive patients in special rooms or transfer to extra-hospital facilities dedicated to COVID-patients. As already mentioned, also Umbria promptly introduced specific strategies to track and contain any potential COVID-19 infections in nursing homes.

Other measures adopted by the five regions are reported in Table 2.

3.2.4. Coordinating

Coordination concerns operational and managerial practises and procedures, coordination of measures, the subjects involved in coordination and the degree of relationship between the different layers of the system. In what follows we will consider three different forms of coordination: within the region, across regions, and between the regions and the central government.

At the central level, operational and managerial practices and procedures are entrusted to two main distinct and separate bodies: the Civil Protection Department (CPD) and the ISS. The CPD coordinates national and local resources and actively intervenes in the implementation of post-crisis responses to natural disasters and natural emergencies. It, however, lacks any specific expertise on epidemics. Also, it is not a monitoring body or an independent agency, because it operates as a task force on the ground only when prompted to do so by the Prime Minister, to whom it is subordinated and to whom it is directly accountable. The ISS, alongside its scientific committee, is instead an independent public agency which has scientific expertise on public health and infectious diseases. During an epidemic the ISS and its committee act as a monitoring agency. However, they do not have any decision-making power, playing a merely advisory role when consulted by the national Minister for Health. The lack of independence of these two bodies, CPD and ISS, implies they cannot enforce procedures without the approval of either the Prime Minister or the Ministry of Health, respectively.

Besides these two main bodies, other special bodies were set up within the remit of the national government. For example, on 5th February 2020 the CPD established the so-called Technical Scientific Committee (CTS) with expertise in consulting and support for coordination activities to overcome the emergency.

Coordination between central government and regions on how to tackle the pandemic belongs to the *Conferenza Stato-Regioni* (Joint State-Regions Committee), a consultancy body established in 1983 and involved in economic and budget planning, coordina-

tion and supervision. One of the challenges of the *Conferenza Stato-Regioni* is precisely to ensure an effective coordination between regions and central government which often requires a long time to reach a decision.

At the regional level, monitoring agencies and emergency task-forces (*unità di crisi*) have been established directly by each region: their nature, composition and role vary greatly across regions to the point that comparisons are hardly possible (e.g. in Lombardy virtually all the 154 members of the regional task force are either managers of the regional administration itself, or managers of public hospitals nominated by the same region) [30–33].²

Some issues (among others, teleworking, fast-track processing, limitations/restrictions on electronic transfers of data) were faced and solved in an effective and coordinated way by experts or technical committees, at the national (or EU) level. However, issues related to the allocation of resources and capacity (masks, ventilators, PPE) at regional level caused some tensions between delivery chains such as hospitals and other settings of care.

A fragmented coordination between the central government and the regions contributed to delay the timely introduction of some containment measures. For example, neither the Lombardy region nor the central government decided to take actions during the three critical weeks (1st – 23rd March 2020) in the Bergamo province – the early epicentre of the outbreak – where the infections and the number of deaths, were rapidly growing out of control (see [35] and the Appendix). This seems to indicate that the dispersion of responsibilities and the lack of integration among the participating decision-makers made coordination difficult in this health crisis, with consequent delays in implementing appropriate strategies.

Table 2 provides examples of forms of coordination established by the regions.

3.2.5. Communicating

Communication plays a key role in crisis management, both at national and regional levels. Moving from data monitoring to concrete decisions requires framing the message in an official communication strategy, especially when the response to the crisis critically relies on changing the behaviours of the wider population. Throughout the initial phase of the crisis, a general thread across all levels of government communications was to collaborate to “contain and stop the spread of the virus” ([6], p. 5).

During the first phase of the pandemic, a daily update on the numbers of new COVID-19 cases, deaths and swabs was provided through a televised live stream by the head of the CPD, the President of the ISS and other experts, along with comments on the evolution of the pandemic. Some regions (see Table 2) aligned their communication strategy to that of the national government, with regional governors and health councillors offering daily updates of the evolution of the epidemic at the regional level. Nonetheless, political communication was very heterogeneous in both content and style across the country, and not always consistent across different regions and between regions and the central government. Furthermore, some Mayors started Facebook live streams which hit the headlines of international press [36–38]. The multitude of interventions (government, regions, municipalities) often resulted in mixed or conflicting messages about both public health containment measures and re-opening strategies. For example, at some point the use of masks in public spaces was enforced by single municipalities, rather than by regions.

² Further details on institutions or subjects in charge in Lombardy, Veneto and Emilia-Romagna and their specific role at the outbreak of the pandemic can be found in [34].

3.2.6. Leading

Leadership is fundamental when time is a critical factor in the control of a rapidly spreading pandemic. There were tensions between scientists and politicians, and also between central and regional governments. For example, both the central government and the regions initially ignored the scientific advice of the CTS who asked for a lockdown of Alzano and Nembro, two small towns at the heart of in Lombardy’s epicentre (see the Appendix for further details). It took six days of discussions before the government started to enforce national lockdown measures. Regarding balancing the need of the central government to steer the response at the national level vis-à-vis the aspiration of (some) regions to go ahead with complete autonomy, there were recurring tensions between central and regional governments at the time of lifting the lockdown restrictions and re-opening the economy between April and May 2020, when 13 regions and an autonomous province asked for more freedom to take decisions targeted to the local population [39]. After a long discussion, it was agreed that regions were allowed to diverge from centrally established measures only after the second half of May, given the high variability in the epidemiological curves across the country. Consequently, regional governors adopted a variety of leadership approaches in managing the situation.

Therefore, as leading became a critical dimension only at the end of the first wave of the pandemic (May 2020), Table 2 does not provide any specific example of leadership strategy or approach adopted by the regions.

3.2.7. Recovering capacity

Recovering capacity considers the different responses put in place by regions to increase the number of ICU beds, SSN personnel, and medical devices and PPE. Table 2 reports several examples of different recovering strategies adopted by the regions.

The historical differences in the organisation and delivery of healthcare, and more specifically, the integration of hospital and territorial care, might explain the diverse set of policies implemented by the regions (Table 2). Among the five regions considered, Lombardy was the only region to build brand-new hospitals, although in hindsight one of the new hospitals (Fiera Milano hospital) was less needed than initially thought. Some regions converted entire hospitals to treat COVID-19 patients, and all had hospital beds dedicated to COVID-19 patients (Table 2). During the pandemic, the number of ICU beds in Italy increased on average by almost 63%, with Emilia-Romagna being the region with the highest increase (114%), followed by Lombardy (93%), Veneto (69%), Umbria (53%) and Apulia (27%) [40].

The activation of the USCA, introduced by the national government on 9th March 2020, proceeded at different speeds across the country. Where operative, USCA had a pivotal role in home-based care provision (through telephone and video consultations and, less frequently, home visits) and support to local GPs/GP networks.

As noted above, the use and level of diagnostic and serological testing in the population has been one of the most contentious issues across the regions in the first phase of the pandemic. The rate of testing was higher in Veneto than in other regions and many laboratories equipped themselves within weeks to perform the test in-house [24,25]. Of course, the mass testing conducted in the municipality of Vo’ was an important albeit small-scale exercise. Mass testing in Bergamo at the beginning of the pandemic would have been much more difficult to implement.

Overall, it seems that the recovering capacity was higher in regions, such as Veneto, where investment in hospital care (such as ICUs) was coupled with widespread testing and distribution of PPE, with a stronger pre-existing network of community care, and with integrated social and health care.

More measures adopted by the five regions are reported in Table 2.

4. Discussion

The outbreak of the COVID-19 pandemic in Italy affected a healthcare system characterised by profound interregional differences. The variation that characterises our selected regions (Apulia, Emilia-Romagna, Lombardy, Umbria, Veneto) reflect thirty years of increasing decentralisation policies in both healthcare financing and delivery, leading to a high variability in the supply of health services, in the public-private mix, in the capacity of community and hospital care facilities, and in public healthcare resources [28].

Over the past thirty years, decentralisation has also generated tensions and challenges both between the central and the regional levels (leading to a sort of permanent negotiation in the healthcare policy making process [14]), and between regions. The tensions relate to issues such as the criteria for allocating resources, the level of regional autonomy, and the possibility to increase local fiscal revenues. Within this context, it does not come as a surprise that the COVID-19 emergency has once again highlighted these tensions and particularly the difficult balance between the need of the central government to provide a response at the national level and the request of (some) regions to take decisions autonomously. The COVID-19 crisis has also highlighted different approaches adopted by the regions to tackle the public health emergency according to their local population's needs. Similarly to the experience at the European level where "coronationalism" prevailed instead of a coordinated European response [6], Italy has experienced some form of "corona-regionalism". Indeed, despite a fair level of coordination between the central and regional governments, some divergence emerged, particularly in balancing hospital-community care and in testing and screening policies.

The seven crisis management dimensions (i.e. monitoring, learning, decision-making, coordinating, communicating, leading, and recovering capacity) proposed by Bouckaert et al. [6] provided a valid lens to understand the complexity and varied answer incurred within the Italian RHSs. While decentralisation allows regions to adopt policies aligned with regional needs, the pandemic, i.e. a situation of national emergency, has highlighted important challenges in the capacity of decentralised health systems to deal with healthcare emergencies single-handedly and the need for a coordinated response at the national level. In particular, there is the need to set up standards for the pandemic monitoring system across regions, for data communication and sharing, and for a better harmonisation of strategies put in place with the national level.

Differences in recovering capacity emerged among regions, which can be linked to pre-existing regional differences in the organisation and delivery of healthcare, and to whether the regional healthcare model included an integration between health and social care or the role played by primary care or the prevention departments. Additionally, the heterogeneity in the role and the level of involvement of the scientific community in advising policy makers across regions may explain the different solutions and policies developed, even when addressing similar problems and needs. It would therefore be advisable to reduce variations in the composition of regional task forces, while possibly increasing the role of independent scientific experts.

Resources invested in hospital care (ICUs in particular) alone did not automatically improve the recovering capacity of the regions considered. This appears to be better, when coupled with widespread testing and distribution of PPE, a stronger pre-existing network of community care and the integration of social and health care. It is worth noticing that the whole system benefited from widespread contributions by charitable organisations and single individuals, which supported the public sector's efforts in en-

surging access to health and social care services at the local level for the more disadvantaged socio-economics members of society. The help and support of charitable and voluntary sector organisations can prove to be an essential resource when dealing with a crisis.

5. Conclusions

In the light of the analysis carried out in the paper, among the seven dimensions of crisis management reported by Bouckaert et al. [6], the most interesting ones are, in our opinion, leadership and recovery capacity.

Regarding leadership, misunderstandings and consequent tensions between central government and regions are most likely the reason why some regions either took autonomous decisions ignoring the central government (centrifugal drive), or followed the government to avoid taking the burden of owning the responsibility (centripetal drive).

Concerning recovery capacity, differences between regions are attributable to differences in the organisation, equipment and design of RHSs, prior to the COVID outbreak. As changes to recovery capacity are difficult under normal conditions, even more so in an emergency, it does not surprise that RHSs are naturally heterogeneous.

Given the multi-layer nature of the SSN and the outlined stark differences across regions, we conclude that the Italian healthcare system currently needs to enforce the power of an authoritative public health body in charge of taking decisions and directly coordinating responses nationwide during epidemics. We do not suggest a return to a centralised SSN, nonetheless we think it is important to have a management system of pandemics and other public health emergencies at the national level able to coordinate and interact efficiently and equitably with regional governments, thereby increasing the preparedness of the whole country. Our results are also consistent with recent evidence reporting on the variety of responses of the RHSs of Lombardy, Veneto and Emilia-Romagna to the first COVID-19 outbreak, although through a different approach based on policy capacity [41].³ The comparison between different strategies revealed that the decentralised institutional arrangements of the Italian health policy and the high organisational autonomy in healthcare delivery have produced very diverse outcomes in the three regions. Thus, rethinking the arrangements by which healthcare is designed is crucial to promptly adjust the combination of vertical coordination and decentralisation to the issue at stake [41, p. 19]. Not surprisingly, part of the literature on crisis management is moving back towards forms of (formal and informal) decentralisation and network systems, as proposed by [43].

In addition, in analysing countries' response to the coronavirus pandemic, our study has highlighted the bias in reports focusing on the national level only and stressed the importance of looking also at sub-national levels, especially in decentralised systems like the Italian one (as also pointed to in [44]). For Italy, this is an issue that deserves further investigation. Particularly, additional analyses are deemed to be of interest: i) from a political point of view, to understand if during pandemic the seven factors identified by Bouckaert et al. [6] have exacerbated or smoothed the tensions between the central and the lower levels of governments; ii) from a managerial point of view, to analyse the effect,

³ Policy capacities can be understood as 'the set of skills and resources—or competences and capabilities—necessary to perform policy functions' [42]. Skills and competences can be analytical, operational or political, while resources/capabilities are embedded at the individual, organizational and systemic levels. More specifically, at the organizational level, the analytical capacity relates to gathering the needed information about how the virus is spreading; the operational capacity concerns the governance of healthcare delivery, coordination and inter-organizational relations; the political capacity pertains to the necessary political legitimacy and ability to be heard by policy-makers and stakeholders.

in terms of performance measures, of the different solutions applied by the regions; iii) from an economics point of view, to analyse if corona-regionalism led to greater regional divergence or convergence in healthcare resource allocation and public expenditure. Further work on the impact of ‘corona-regionalism’ and its handling not just in Italy, but comparatively in other decentralised healthcare systems, is warranted.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix

The case of Bergamo

Bergamo, in Lombardy region, has been the early epicentre of the COVID-19 epidemic in Europe. At the end of the outbreak, Bergamo counted 6,000 excess deaths compared to the mortality patterns of the previous years, with a drop in life expectancy that has not been witnessed in the area since WWII [45]. The world watched in shock as the deaths in Bergamo became so many that military trucks had to carry the coffins for cremation to other provinces – an unprecedented scene in peace time [46].

The timeline of the events and policies in Bergamo draws a mixed picture about its response to the crisis [35]. The first official COVID-19 death in Bergamo province was recorded on 23rd February 2020, only two days after patient 1 in Codogno was diagnosed. However, it is now believed that the virus was already present in Italy, with evidence showing that COVID-19 arrived in Lombardy no later than early January [47]. If so, the Champions League football match on 19th February when 45,000 Atalanta supporters went to Milan to attend it, is likely to have been at the centre of the spread of the virus.

At the beginning of the crisis, decision-makers seemed to underestimate the virulence, spread and impact of the new disease, and to lack a systematic plan on how to respond to it. In the last week of February, *Confindustria Bergamo* (Bergamo’s influential Confederation of Business Industries) lobbied against the lockdown, setting up the campaign “Bergamo is running”, initially supported, among others, by the Mayor of Bergamo. Even after the severity of the situation started to become clear, the lockdown of the province (and especially of Alzano Lombardo and Nembro, the two hardest hit municipalities) was implemented only on 8th March when the whole region closed down. Delays also affected: i) the lockdown of all non-essential economic and manufacturing activities, which only happened two weeks after on 23rd March; ii) the closure of the Alzano Lombardo hospital, which likely worked as another spreader in the area; and iii) the lockdown of RSA to external visitors: strikingly, the local health authority in Bergamo continued allowing visits from relatives until early March. Judicial investigations are under way about the legal responsibilities of these delayed responses.

On the other hand, Bergamo’s later response to the emergency has been extraordinary, with healthcare staff in hospitals strenuously working around the clock to cope with the overwhelming emergency, and rapidly reorganising Bergamo’s hospital to use 60% of its entire capacity for COVID-19 patients; with retired and trainee doctors and nurses volunteering to help; with local people and NGOs donating millions of Euros to provide PPE to frontline

healthcare staff, and the setting up of a new field hospital with 72 ICU beds in only one week.

References

- [1] Johns Hopkins University Coronavirus Resource Centre: Home - Johns Hopkins Coronavirus Resource Center (jhu.edu) [accessed 10.07.2021].
- [2] Schneider A. Decentralization: conceptualization and measurement. *Stud Comp Int Dev* 2003;38(3):32–56.
- [3] . Decentralisation in health care strategies and outcomes European observatory on health systems and policies series. Saltman RB, Bankauskaite V, Vrangbæk K, editors. McGraw-Hill Education: Open University Press; 2007.
- [4] Mauro M, Maresso A, Guglielmo A. Health decentralization at a dead-end: towards new recovery plans for Italian hospitals. *Health Policy* 2017;121(6):582–7.
- [5] Marchildon G, Bossert T, editors. Federalism and decentralization in health care: a decision space approach. University of Toronto Press; 2018.
- [6] Bouckaert G, Galli D, Kuhlmann S, Reiter R, Van Hecke S. European coronationism? A hot spot governing a pandemic crisis. *Public Admin Rev* 2020;80:765–73 [accessed 25.09.2020]. doi:10.1111/puar.13242.
- [7] De Maeseneer J, Barros P, McKee M, Anastasy C, Azzopardi-Muscat N, Barry M, et al. Saving lives by European solidarity and cooperation in response to COVID-19. *BMJ GH Blogs* 2020. Available at: <http://blogs.bmj.com/bmjgh/2020/03/27/saving-lives-by-european-solidarity-and-cooperation-in-response-to-COVID-19> [accessed 06.10.2020].
- [8] Kringos D, Carinci F, Barbazza E, et al. Managing COVID-19 within and across health systems: why we need performance intelligence to coordinate a global response. *Health Res Policy Syst* 2020;18:80 Available at:[accessed 21.11.2020]. doi:10.1186/s12961-020-00593-x.
- [9] Organisation for Economic Co-operation and Development Why open science is critical to combatting COVID-19. OECD Publishing, Paris: OECD; 2020. Available at: https://read.oecd-ilibrary.org/view/?ref=129_129916-31pgjnl6cb&title=Why-open-science-is-critical-to-combatting-COVID-19 [accessed 21.11.2020].
- [10] Saltman RB, Bankauskaite V. Conceptualizing decentralisation in European health systems: a functional perspective. *Health Econ Policy Law* 2006;1(2):127–47 Available at:[accessed 25.09.2020]. doi:10.1017/S1744133105001209.
- [11] Citoni G, De Matteis D, Giannoni M. Disuguaglianze socioeconomiche in salute, equità nell’accesso e nel finanziamento dei servizi sanitari in Italia: quale evoluzione in tempi di SAR-COV-2? *Sistema Salute. La Rivista italiana di educazione sanitaria e promozione della salute* 2020;64:204–21.
- [12] Organisation for Economic Co-operation and Development. Health at a Glance OECD Indicators. OECD Publishing, Paris: OECD; 2019. 2019 [accessed 21.11.2020]. doi:10.1787/4dd50c09-en.
- [13] France G. Healthcare quasi markets in a decentralised system of government in. *A revolution in social policy: quasi-market reforms in the 1990s*. Bartlett W, Roberts JA, LeGrand J, editors. Bristol: The Policy Press; 1998.
- [14] France G, Taroni F. The evolution of health-policy making in Italy. *J Health Polit Policy Law* 2005;30:169–87 Available at:[accessed 21.11.2020]. doi:10.1215/03616878-30-1-2-169.
- [15] Libera Università di Studi Sociali - Luiss “Guido Carli. Libro bianco sui principi fondamentali del servizio sanitario nazionale Centro di ricerca sulle amministrazioni pubbliche “V. Bachelet”, LUISS, Rome; 2008. Available at http://www.salute.gov.it/imgs/C_17_pubblicazioni_808_allegato.pdf [accessed 06.10.2020].
- [16] Maino, F. La politica sanitaria. Il Mulino, Bologna; 2001.
- [17] Cicchetti A. L’organizzazione dell’ospedale. Fra tradizione e strategie per il futuro. Trattati e manuali. Economia. Vita e Pensiero. Università Cattolica del Sacro Cuore, Milano; 2002.
- [18] Ugolini C. Verso una rilettura del modello di concorrenza amministrata? *La Rivista delle Politiche Sociali* 2004;4:197–212.
- [19] Istituto Nazionale di Statistica. Health for all – Italia. 2020. ISTAT, Rome. Available at: <https://www.istat.it/it/archivio/14562>.
- [20] Istituto Nazionale di Statistica. Annual regional accounts. ISTAT, Rome. Available at: http://dati.istat.it/Index.aspx?DataSetCode=DCCN_PILPRODT#.
- [21] Ministero della Salute. Posti letto per stabilimento ospedaliero e disciplina. Ministero della salute, Open data, Rome. Available at: <http://www.dati.salute.gov.it/dati/dettaglioDataset.jsp?menu=dati&idPag=96>.
- [22] Ministero dell’Economia e delle Finanze. Dati pubblicati. Available at: <https://www.contoannuale.mef.gov.it/struttura-personale/occupazione>.
- [23] CERGIS – Bocconi. Osservatorio sulle Aziende e sul Sistema sanitario Italiano. Rapporto OASI 2019. Available at: https://www.cergas.unibocconi.eu/wps/wcm/connect/dc990366-4170-47f5-a9ee-cdd7c6b77f6/Cap2OASI_2019.pdf?MOD=AJPERES&CVID=mWPFZD2.
- [24] Lavezzo E, Franchin E, Ciavarella C, Cuomo-Dannenburg G, Del Vecchio C, et al. Suppression of a SARS-CoV-2 outbreak in the Italian municipality of Vo’. *Nature* 2020;584:425–9 Available at:[accessed 21.11.2020]. doi:10.1038/s41586-020-2488-1.
- [25] Gabanelli, M., Ravizza, S. Coronavirus, pochi tamponi: ecco le ragioni mai spiegate. *Corriere della Sera, Dataroom*, 24th May 2020. Available at: <https://www.corriere.it/dataroom-milena-gabanelli/coronavirus-perche-italia-non-si-fanno-abbastanza-tamponi/1ba64c10-9dcb-11ea-b9b6-8e4b7089692f-va.shtml> [accessed 22.06.2020].

- [26] Indagine Fimmg per Quotidiano Sanità. Coronavirus. Le Unità speciali di continuità assistenziale sono attive solo in 12 Regioni. A loro il compito di assistere i positivi a casa. http://www.quotidianosanita.it/studi-e-analisi/articolo.php?articolo_id=83945.
- [27] Ferrucci L, Vainieri M. Un'analisi delle azioni e politiche sanitarie regionali nella lotta al COVID in. Il COVID-19 tra emergenza sanitaria ed emergenza economica: Riflessioni dal mondo delle scienze sociali. Ferrucci L, editor. Perugia: Morlacchi editore; 2020.
- [28] Mauro M, Giancotti M. Italian responses to the COVID-19 emergency: Overthrowing 30 years of health reforms? *Health Policy* 2021;125(4):548–52 [accessed 13.01.2021]. doi:10.1016/j.healthpol.2020.12.015.
- [29] Istituto Superiore di Sanità. Survey nazionale sul contagio COVID-19 nelle strutture residenziali e sociosanitarie, Epidemia COVID-19, Terzo report. ISS, Rome. Available at: <https://www.epicentro.iss.it/coronavirus/pdf/sars-cov-2-survey-rsa-rapporto-3.pdf> [accessed 22.07.2020].
- [30] Lombardia, chi sta gestendo l'emergenza COVID-19. Available at: <https://www.openpolis.it/chi-sta-gestendo-lemergenza-COVID-19-in-lombardia/> [accessed 24.07.2020].
- [31] Componenti del comitato tecnico scientifico di regione Lombardia. Available at: <https://www.lecconews.news/wp/wp-content/uploads/2020/04/all-decreto-cts.pdf.pdf> [accessed 24.07.2020].
- [32] Veneto, chi sta gestendo l'emergenza COVID-19. Available at: <https://www.openpolis.it/veneto-chi-sta-gestendo-lemergenza-COVID-19/> [accessed 24.07.2020].
- [33] Emilia-Romagna, chi sta gestendo l'emergenza COVID-19. Available at: <https://www.openpolis.it/emilia-romagna-chi-sta-gestendo-lemergenza-COVID-19/> [accessed 24.07.2020].
- [34] Toth F. How the health services of Emilia-Romagna, Lombardy and Veneto handled the Covid-19 emergency. *Contemporary Italian Politics* 2021;13(2):226–41. doi:10.1080/23248823.2021.1903174.
- [35] Galizzi, M.M., Ghislandi, S. Bergamo's response to the coronavirus pandemic. Cambridge; 2020. Core blog: <https://www.cambridge.org/core/blog/2020/04/18/bergamos-response-to-the-coronavirus-pandemic/>.
- [36] Horowitz J. Comic insults aside, mayors act as sentinels in Italy's Coronavirus tragedy, *The New York Times*. Published April 26, 2020. Updated April 27, 2020. Available at: <https://www.nytimes.com/2020/04/26/world/europe/italy-mayors-coronavirus.html>.
- [37] Giuffrida A. 'This is not a film': Italian mayors rage at virus lockdown dodgers, *The Guardian*. Mon 23 Mar 2020 10.56 GMT. Available at: <https://www.theguardian.com/world/2020/mar/23/this-is-not-a-film-italian-mayors-rage-coronavirus-lockdown-dodgers>.
- [38] Tidman, Z. 'We will send police. With flamethrowers': Italy's mayors rage at residents ignoring coronavirus lockdown, *Independent*. Tuesday 24 March 2020 18:02. Available at: <https://www.independent.co.uk/news/world/europe/coronavirus-italy-mayors-lockdown-covid-19-video-a9422166.html> [accessed 21.11.2020].
- [39] Proposte al Governo per la Fase 2: più competenze alle Regioni. Conferenza delle regioni e delle province autonome. Available at: <http://www.regioni.it/download/news/611161/> [accessed 29.04.2020].
- [40] Aimone Gigio, L., Citino, L., Depalo, D., Francese, M., Petrella, A.. Contrastare l'emergenza. L'espansione della capacità produttiva del sistema sanitario italiano: progressi conseguiti. Note COVID-19, 21st April 2020. Banca d'Italia, Rome. Available at: <https://www.bancaditalia.it/media/notizia/contrastare-l-emergenza-l-espansione-della-capacit-produttiva-del-sistema-sanitario-italiano-progressi-conseguiti/>.
- [41] Capano G, Lippi A. Decentralization, policy capacities, and varieties of first health response to the COVID-19 outbreak: evidence from three regions in Italy. *J Eur Public Policy* 2021;28(8):1197–218. doi:10.1080/13501763.2021.1942156.
- [42] in Wu X, Ramesh M, Howlett M. Policy capacity: conceptual framework and essential components. Policy capacity and governance. Wu X, Howlett M, Ramesh M, editors Palgrave; 2018.
- [43] 't Hart P, Rosenthal U, Kouzmin A. Crisis decision making: The centralization thesis revisited. *Admi Soc* 1993;25(1):12–45. doi:10.1177/009539979302500102.
- [44] Bosa I, Castelli A, Castelli M, Ciani O, Compagni A, Galizzi M, et al. Response to COVID-19: was Italy (un)prepared? *Health Economics. Policy Law* 2021:1–13. doi:10.1017/S1744133121000141.
- [45] Ghislandi, S., Mutarak, R., Sauerberg, M., Scotti, B. News from the front: estimation of excess mortality and life expectancy in the major epicentres of the COVID-19 pandemic in Italy. *MedRxiv* 2020.04.29.20084335 2020. doi:10.1101/2020.04.29.20084335 [accessed 22.07.2020].
- [46] Nel cuore dell'epidemia di coronavirus più mortale al mondo. Available at: <https://www.nytimes.com/it/interactive/2020/03/29/world/europe/coronavirus-italy-bergamo.html> [accessed 22.07.2020].
- [47] Cereda, D., Tirani, M., Rovida, F., Demicheli, V., Ajelli, M., Poletti, P. et al. The early phase of the COVID-19 outbreak in Lombardy, Italy. *arXiv* 2003.09320 2020. Available at: <https://arxiv.org/abs/2003.09320> [accessed 22.07.2020].