COVINFORM

CORONAVIRUS VULNERABILITIES AND INFORMATION DYNAMICS RESEARCH AND MODELLING

D5.1 Baseline report: Public health responses

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Executive Summary

The COVINFORM project explores the impact of the COVID-19 pandemic and associated national, regional, and local responses, including a special focus on the impact on vulnerable and marginalized groups. The project aims to develop solutions, guidelines and recommendations to ensure that the needs of vulnerable and marginalised groups are appropriately considered in potential further waves of COVID-19 and future pandemics.

This report examines the public health responses to the COVID-19 pandemic across COVINFORM partner countries: Austria, Belgium, Cyprus, Israel, Ireland, Italy, Germany, Greece, Portugal, Romania, Spain, Sweden, Switzerland, and the United Kingdom (England and Wales). The report explores various dimensions of public health responses and addresses key factors which have influenced national and subnational responses.

A brief comparative analysis of countries' national health system highlights divergent structural trends which have influenced countries' health system capacity to respond the COVID-19 crisis. Graphical overviews of epidemiological outcomes and the temporal evolution of the pandemic demonstrate how both the spread of the virus and the responses to counter it have been uneven and diverse.

Processes of governance, decision-making and consultation in the COVID-19 response are analysed in-depth to reflect on differences and similarities across countries. The impact of legal and data collection factors as well as demographic and social network factors on public health responses and epidemiological outcomes are considered in turn. Key similarities and divergences in public health information and communication strategies are also considered, with a special focus on analysing how some groups in society may have been excluded.

The impact of the COVID-19 on health care workers is analysed by considering the way their working realities were transformed, their risk of infection, mental health implications, and the public perception of health workers in society. A broader discussion of differential vulnerability in the context of COVID-19 considers the importance of vulnerability linked to physical health status, social vulnerability, and vulnerability resulting from communication-related factors.

Finally, COVID-19 public health impact and response are analysed using the two main theoretical lenses of the project: intersectionality theory and complex systems theory. This highlights how the COVID-19 pandemic has reinforced and widened pre-existing vulnerabilities and disadvantage relating to gender, age, socio-economic status and ethnicity/race and migration, as well as how the COVID-19 public health impact and response cannot be understood in isolation from issues of governance, crisis communication practices, economic impact, and social inequalities.

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Acronyms & Abbreviations

Term	Description
BAME	Black, Asian and minority ethnic persons
CNSSU	National Emergency Committee for Special Emergency Situations (Romania)
EODY	National Public Health Organization (Greece)
FOPH	Federal Office of Public Health (Switzerland)
FOP	COVID-19 Future Operations Platform
ICU	Intensive Care Unit
IDF	Israeli Defense Force
IHREC	Irish Human Rights and Equality Commission
HCW	Healthcare worker
INSP	National Public Health Institute (Romania)
ISS	National Institute of Health (Italy)
LTC	long-term care
NCCN	FPS Health and the National Crisis Centre (Belgium)
NPHO	National Public Organization (Greece)
NPHET	National Public Health Emergency Team (Ireland)
OOPS	out-of-pocket spending
MOSSAD	National Intelligence Agency (Israel)
MPPs	meat processing plants
PCM	Presidency of the Council of Ministers (Italy)
PHA	Public Health Agency (Sweden)
PPE	personal protective equipment
PPPs	Purchasing Power Parities
RKI	Robert Koch Institute (Germany)
SAGE	Scientific Advisory Group on Emergencies (UK)
SC	Surge Capacity
SIR	Intensive Care Registry
WP	Work Package

1 Introduction

1.1 The COVID-19 pandemic and vulnerability

Since its emergence in December 2019, COVID-19 has had enormous social, behavioural and economic consequences around the globe. The effects of the COVID-19 pandemic go far beyond physical health, impacting individuals' and communities' everyday lives and well-being, including in the domains of mental health, education, employment, and political stability. However, the pandemic has not disrupted everybody's lives in the same way. Vulnerable and marginalized groups are disproportionately exposed to negative impact, and COVID-19 has exposed pre-existing social fault lines in societies (Kawachi, 2020). The pandemic is socially patterned not just in terms of COVID-19 morbidity and mortality rates, but also in terms of the consequences of the implemented restrictions and emergency lockdown measures (Bambra et al., 2020).

Vulnerable groups in society are not necessarily the same groups as those who face greater clinical risk of COVID-19. Clinically vulnerable groups in the COVID-19 pandemic include the elderly (Gardner et al., 2020; Sadruddin & Inhorn, 2020) and people with chronic diseases or other underlying risk factors (Gao et al., 2021). Additionally, some groups are disproportionally exposed to the virus as a result of their occupation, which is the case for frontline healthcare workers and emergency responders (Nguyen et al., 2020; Smith, 2020), as well as for other 'essential workers', such as those working in supermarkets, cleaning services, and food delivery (Purkayastha et al., 2021). Finally, groups who were already living in precarious circumstances prior to the COVID-19 pandemic may be more vulnerable to negative impact as a result of their (insecure) employment status and working conditions, housing, lack of social networks, etc. This may be the case for refugees and migrants (Brandenberger et al., 2020; Kluge et al., 2020), homeless people (Berger et al., 2020; Lancet, 2020; Lewer et al., 2020), and people of lower socioeconomic status (Lancet, 2020; Rollston & Galea, 2020). As COVID-19 interacts with and aggravates existing social determinants of health, the COVID-19 pandemic likely exacerbates pre-existing social inequalities (Dorn et al., 2020; Kawachi, 2020) as well as health inequalities (Bambra et al., 2020).

1.2 The COVINFORM project

The COVINFORM project examines how vulnerability is defined and addressed in response to the COVID-19 outbreak. Through an intersectional approach, the project analyses the impact that different national, regional, and local responses have had on vulnerable and marginalised groups, exploring the interconnection between different factors and how these may exacerbate vulnerability and marginalisation. COVINFORM will also develop solutions, guidelines and recommendations to ensure that the needs of vulnerable and marginalised groups are appropriately considered in potential further waves of COVID-19 and future pandemics.

1.3 The purpose of this report

In this report, we set out to assess the public health responses to the COVID-19 pandemic across COVINFORM partner countries: Austria, Belgium, Cyprus, Israel, Ireland, Italy, Germany, Greece, Portugal, Romania, Spain, Sweden, Switzerland, and the United Kingdom (England and Wales). This report is the first output of Work Package (WP) 5 of the COVINFORM project, which is the WP focused

on public health responses and impacts. Within the broader theme of public health responses, this report tackles the following subtopics:

- Health system structures
- Epidemiological outcomes over the course of the COVID-19 pandemic
- Governance, decision-making and consultation in the COVID-19 response
- Legal factors influencing the COVID-19 pandemic
- Data collection factors influencing the COVID-19 pandemic
- Public health information and communication strategies
- Impacts of COVID-19 on health care workers
- Demographic and social network factors influencing the COVID-19 pandemic
- Vulnerability in the COVID-19 pandemic
- Reflection on intersectionality
- Reflection on risks perceptions, tipping points, feedback loops and adaptation

1.4 Methods

For each of the fourteen countries included in COVINFORM, a report about the national context was produced following a predetermined format. All country reports were based on a single template with the same guiding questions for each subtopic, which facilitated cross-country comparative analysis for this summary report. To answer the guiding questions for each subtopic, partners conducted a literature review on COVID-19 public health responses in their respective countries. Given the relatively slow process of academic writing and publishing, they also relied on media reports and various types of grey literature. Examples of grey literature reviewed for the country reports included government documents, reports from public health agencies, working papers, and outputs produced by civil society or non-governmental organizations. This report provides a synthesis of country reports written by COVINFORM consortium partners. It is important to note that as the template with guiding questions was developed in December 2020 and partners wrote their country reports in January-March 2021, we were unable to include a detailed comparative analysis of vaccination strategies and outcomes. This important topic will be included in more depth in future WP5 outputs.

2 Health system structures

Health systems are organized and financed differently across the COVINFORM partner countries.[1] As health systems' capacity to respond to the COVID-19 crisis is intricately linked to divergent structural trends in countries' national health systems, these differences are relevant to consider. In this section, we focus on providing a brief overview of differences in health system financing; degree of centralization; organization of long-term care; and Intensive Care Unit (ICU) capacity.

2.1 System financing

Health systems are financed in different ways across partner countries. Firstly, there are considerable differences in countries' expenditure on health goods and services. Figure 1 illustrates differences in health expenditure per capita using Purchasing Power Parities (PPPs), which are rates of currency conversion which equalize the purchasing power of different currencies (OECD, 2021). These figures include all public and private spending on medical goods and services, public health programmes and administration.

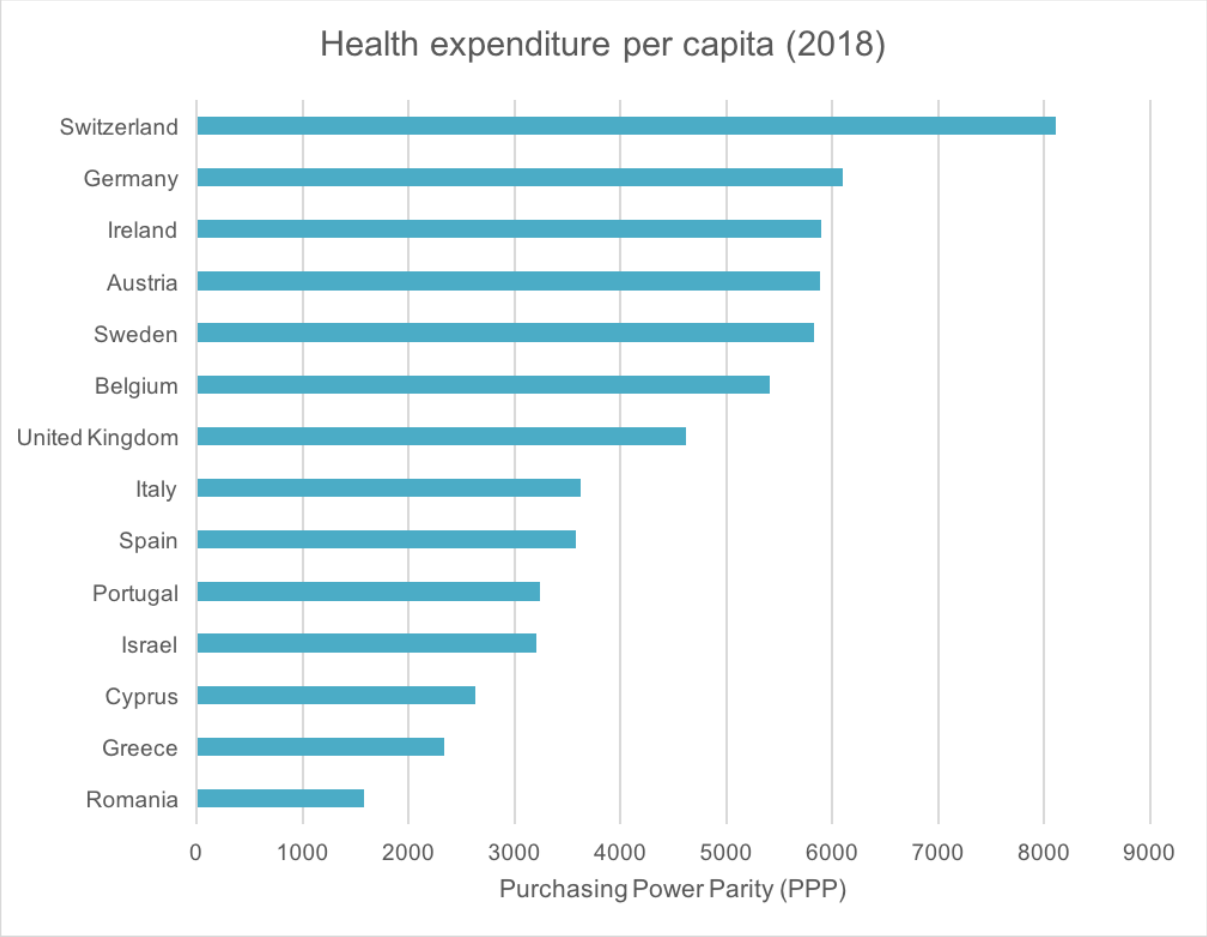

Figure 1. Health expenditure per capita, 2018 data from WHO Global Health Expenditure Database

[1] For the scope of this report, we focus on health systems at the national level. This means that the figures presented in this section may annul significant internal differences within countries. Notably, we consider the United Kingdom (UK) as a whole, although public health and the National Health Services (NHS) are largely the responsibility of the UK's devolved regions and nations.

Another key difference relates to the importance of out-of-pocket spending (OOPS) for health services borne directly by patients. Some countries have a high share of OOPS (e.g. Greece, Cyprus), whereas in other countries OOPS only represents a small fraction of total health expenditure (see Figure 2).

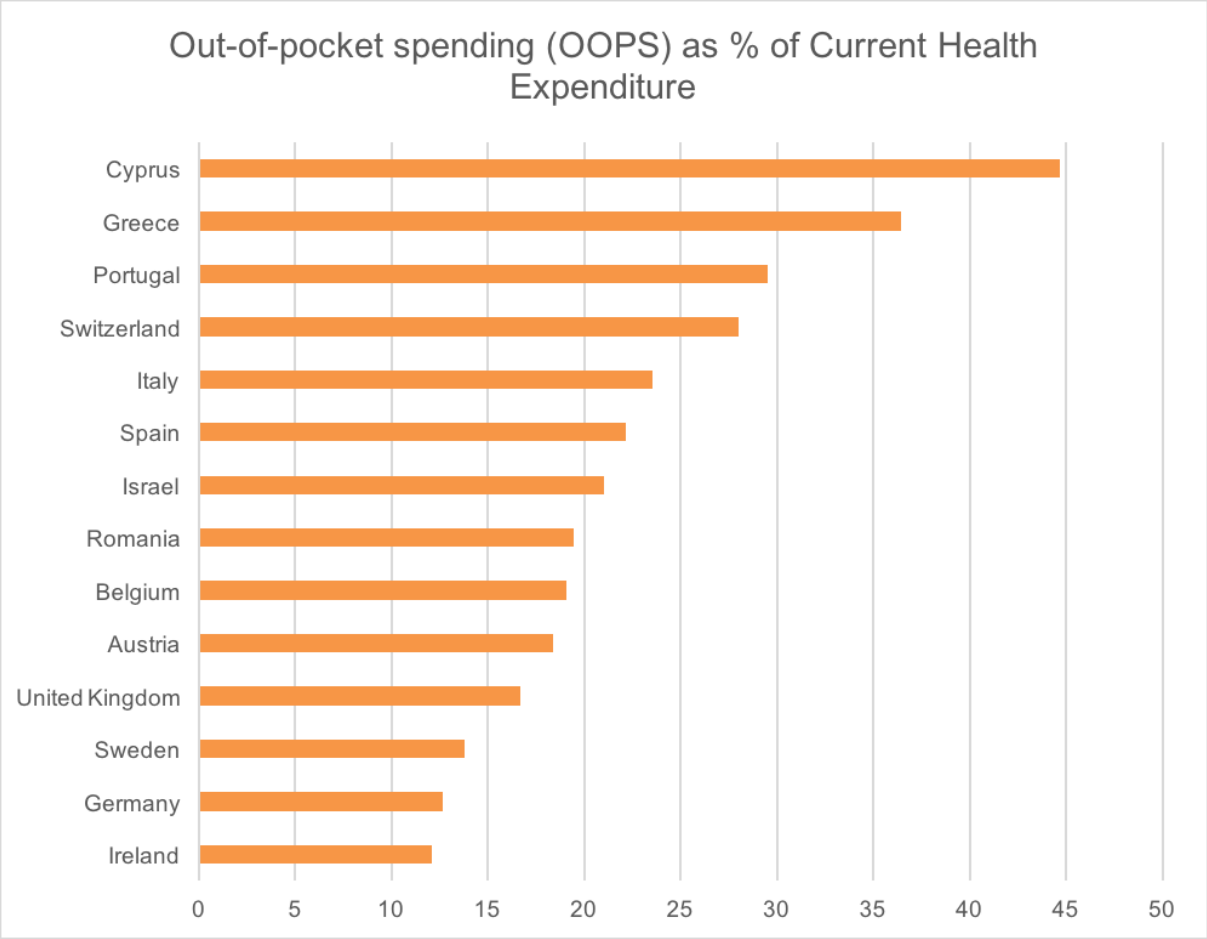

Figure 2. OOPS as % of current health expenditure, 2018 data from WHO Global Health Expenditure Database

Although the exact health financing mechanisms in each country are unique, it is possible to observe three main types of financing mechanisms: financing through social insurance contributions, tax financing, and out-of-pocket financing (Thomson et al., 2009). Table 1 below presents a categorization of partner countries' health systems based on the dominant financing mechanisms used.

Table 1. Health system categorization by financing mechanisms. Classification adapted from Thomson et al. (2009)

Health system type	Key characteristics	Countries
Social insurance	Health care is financed mainly through social insurance contributions.	Austria, Belgium, Germany, Romania
Tax financed	Health care is financed mainly through taxation.	Ireland, Italy, Israel, Portugal, Spain, Sweden, Switzerland and UK
Out-of-pocket financed	OOPS is the dominant contribution mechanism to health care financing.	Cyprus, Greece

2.2 Degree of centralization

Countries' health systems also differ in terms of organizational structure. Whereas in some countries key dimensions of decision-making authority have been decentralized to lower levels of government, in other countries all of the power lies with the central government. Based on the role of local and regional authorities with health management systems, health systems can be divided into five main groups (Soldi & Odone, 2017), as illustrated in table 2.

Table 2. Health system categorization by level of decentralization, adapted from typology by Soldi & Odone (2017)

Health system type	Key characteristics	Countries
Decentralized	With the exception of some main framing conditions, the power, responsibility and functions for health are not with the central government but with lower, elected levels of government.	Austria, Germany, Italy, Spain, Switzerland, United Kingdom
Partially decentralized	Some of the power, responsibility and functions for health are transferred/devolved from the central government to lower, elected levels of government. The central government still has a role within the health management system, the importance of this role varying depending on the level of devolution.	Sweden, Belgium
Operatively decentralized	The central government has an important role within the health management system, but some operative functions are held by lower levels of elected government.	Israel, Romania
Centralised but structured at the territorial level	Most of the power, responsibility and functions are with the central government, but lower levels of elected government still have a minor role including in relation to health expenditure.	Portugal
Centralised	All of the power, responsibility and functions are with the central government or are deconcentrated, i.e. are given to entities at the territorial level which represent the central level.	Cyprus, Greece, Ireland

2.3 Organization of long-term care

Systems for providing long-term care (LTC) to the elderly also differ widely among countries. Common trends across countries are increasing costs of LTC due to demographic ageing and increasing population expectations for better care (European Commission, 2016). However, there are considerable differences in actual supply of LTC: this includes dimensions such as the financial resources available for LTC, staffing levels, and bed density (Ariaans et al., 2021). For example, while in some countries there are more than 1100 available beds in LTC facilities per 100,000 inhabitants (Sweden, Belgium, Switzerland, Germany) in other countries there are less than 500 (Italy, Romania, Greece) (Eurostat, 2015). Other key differences relate to the quality of services, the public-private mix of LTC services (share of private expenditure, availability of cash benefits) and access regulation (levels of choice and means-testing) (Ariaans et al., 2021). Some countries rely heavily on market mechanisms in LTC service provision, either through private insurance for basic coverage (e.g. Germany) or through

public insurance (e.g. Belgium, Austria, Greece). Other countries rely mostly on public provision, often with gatekeeping mechanisms in place (e.g. Portugal, Ireland, Italy, UK) and sometimes without gatekeeping (e.g. Sweden) (European Commission, 2016).

2.4 ICU capacity

Finally, there is considerable variability in critical care bed numbers in ICUs. Bauer et al. (2020) report that whereas the ratio of intensive care beds per 100,000 population is high in some countries (e.g. Germany = 35.4 and Austria = 26.4), it is much lower in others (e.g. Sweden = 5). It is important to note that access to and availability of critical care relates not just to hospital capacity, but also to spatial accessibility of services (affecting travel distance). Geographical distribution of intensive care units is often heterogenous within countries. In some countries, such as Sweden and Italy, ICU beds are spatially more concentrated, meaning that there are areas (often thinly populated rural areas) with comparatively low spatial accessibility (Bauer et al., 2020).

3 Epidemiological outcomes and evolution during COVID-19 pandemic

The COVID-19 pandemic has had unprecedented consequences across partner countries, yet the spread of the virus and the responses to counter it have been uneven and diverse. The figures below illustrate epidemiological trends over time relating to confirmed COVID-19 cases; COVID-19 hospitalizations; confirmed COVID-19 deaths; and vaccination progress.

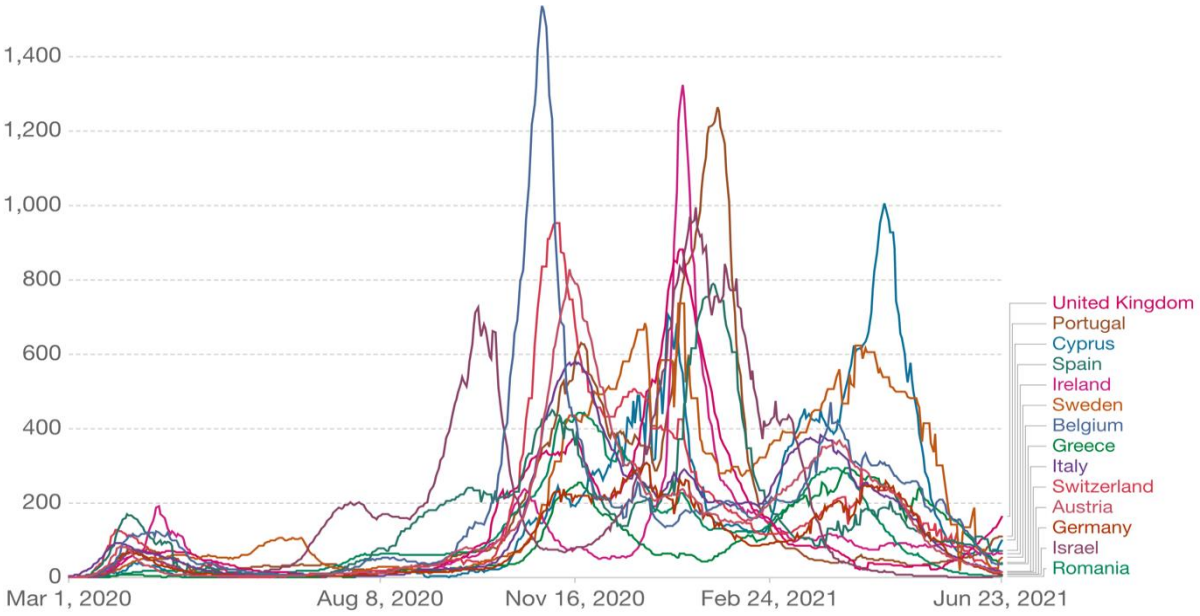

Figure 3. Daily new confirmed COVID-19 cases per million people. Shown is the rolling 7-day average. The number of confirmed cases is lower than the actual cases; the main reason for that is limited testing. Source: Our World in Data, John Hopkins University CSSE COVID-19 Data.

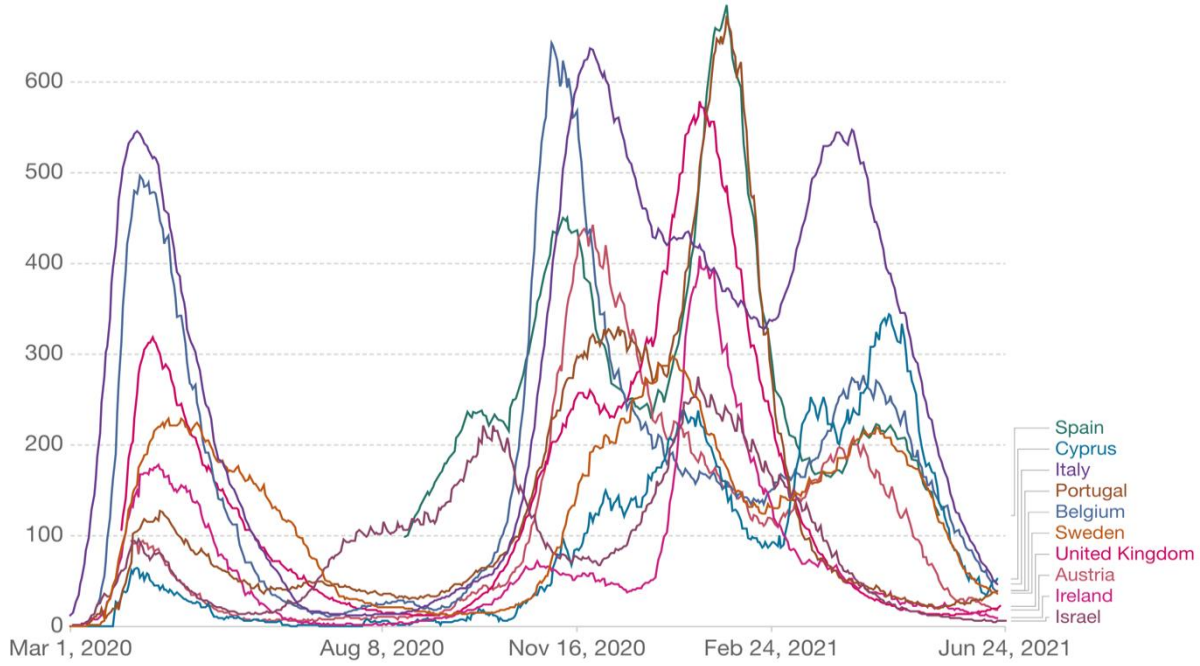

Figure 4. Number of COVID-19 patients in hospital per million people. Source: dataset maintained by Our World in Data, combining data from the ECDC, the government of the United Kingdom, and the Israeli Ministry of Health. Data was unavailable for Germany, Greece, Romania and Switzerland.

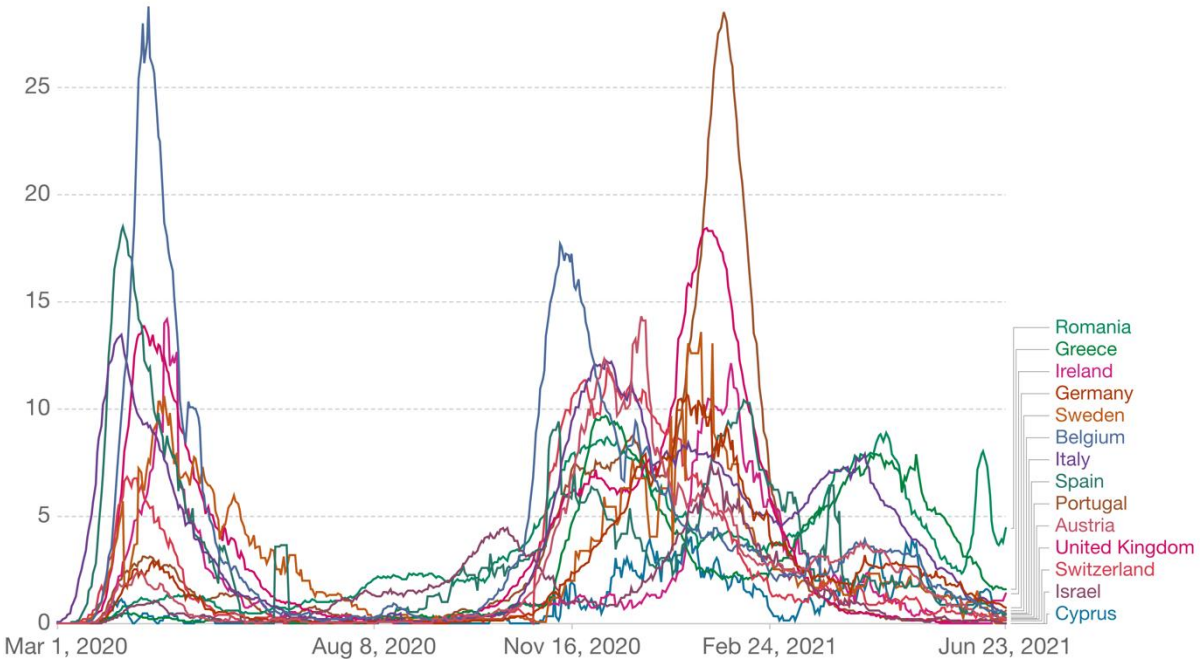

Figure 5. Daily new confirmed COVID-19 deaths per million people. Shown is the rolling 7-day average. Limited testing and challenges in the attribution of the case of death means that the number of confirmed deaths may not be an accurate count of the true number of deaths from COVID-19. Countries use varying national guidelines to complete death certificates and classify COVID-19 deaths, which may also affect the number of COVID-19 deaths registered. Source: Our World in Data, John Hopkins University CSSE COVID-19 Data.

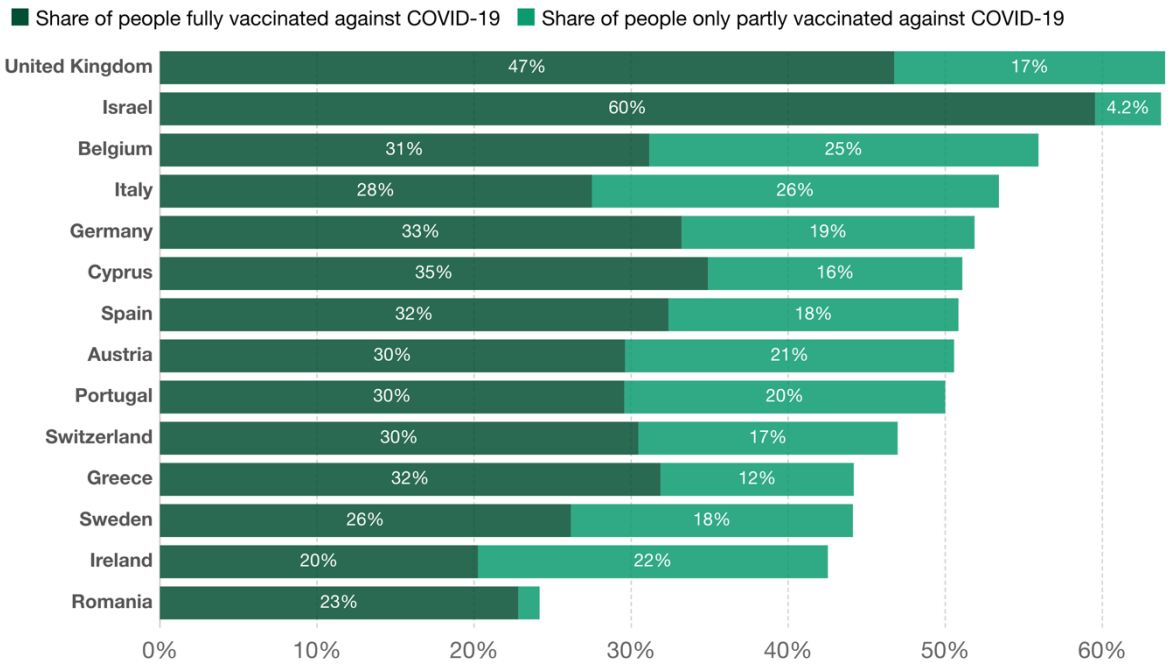

Figure 6. Share of people vaccinated against COVID-19, 23 June 2021. Source: Official data collated by Our World in Data.

4 Governance, decision-making and consultation in the COVID-19 response

Across COVINFORM partner countries, a range of key actors, organizations and initiatives were of relevance for governance and decision-making during the COVID-19 pandemic. In this section, governance and consultation structures are considered both at the national and at the regional/local level. A special focus on the role of scientific actors during the governance of the COVID-19 pandemic is included, as well as on the collaboration between different actors and governing bodies.

4.1 National-level coordination and consultation structures

Across the selected countries, measures have been implemented at the national level to curb the spread of the SARS-CoV-2-virus. Examples of such measures include travel restrictions (e.g., quarantine measures, COVID-19 tests, non-essential travel ban), shop and restaurant closures or restrictions (e.g., appointments, maximum number of entries), sports restrictions (e.g., appointments, regulations for contact and/or indoor sports), and school closures or distant learning enforced at the national level. In many countries, governance of the COVID-19 crisis has been characterized by increased centralization in order to fast-track decision-making. Even in countries where regions/provinces/cantons normally enjoy a great deal of autonomy in decision-making (e.g. Switzerland, Austria, Belgium, Italy), top-down coordination of COVID-19 responses were often centralized to national government bodies, particularly in the early stages of the pandemic in spring 2020.

Decisions taken by national governments are typically guided by coordination and consultation structures consisting of representatives from various government bodies, public health organizations, and scientific experts. Some countries rely on disaster management structures which were already in place prior to the outbreak of the COVID-19 pandemic. In Romania, for example, the pre-existing National Emergency Committee for Special Emergency Situations (CNSSU) is responsible for emergency management and coordination of COVID-19 response actions. The CNSSU operates as an inter-ministerial body under the leadership of the Deputy Prime Minister for National Security, and is composed of ministers and leaders of Romania's central public institutions (European Commission, 2020). In many other countries, special management structures or committees were established in response to the COVID-19 pandemic. For example, the Irish Government established a Special Cabinet Committee on COVID-19 Response that coordinated the state's response to the COVID-19 pandemic (SCCR, 2020). Additionally, the National Public Health Emergency team (NPHET) was established in Ireland in January 2020 to coordinate the health sector's response to COVID-19. In Israel, an ad hoc committee composed of the Ministry of Health, the Israeli Defense Force (IDF), and the National Intelligence Agency (MOSSAD) was established in early March 2020 to coordinate the national mitigation efforts. This committee was transformed into a COVID-19 "control centre" in July 2020, which runs the so-called "Israel's shield" (*Magen Israel*) program to tackle the spread of COVID-19 in Israel (Waitzberg et al., 2021).

4.2 Communication responsibilities

There are significant differences across partner countries in who is tasked with communicating national-level decisions to the public. In many countries, the head of government is in charge of this, while in other countries representatives from health authorities take the lead. In Belgium, when new

COVID-19 rules and measures are decided upon at the level of the federal government, these are communicated through press conferences organized by the federal government's Consultative Committee under the leadership of the Belgian Prime Minister (News.Belgium, 2021). Similarly, in Portugal, the Council of Ministers and the Prime Minister communicate COVID-19 related rules and legislation to the Portuguese population. In Greece, on the other hand, the COVID-19 response is officially led by the National Public Health Organization and the Ministry of Health, and public health representatives play a key role in announcing new rules and regulations (Economou et al., 2021).

4.3 The role of public health actors

Across countries, national public health organizations and institutes have played a key role in the COVID-19 response. Their responsibilities typically include a central role in data collection, surveillance, testing, contract tracing and vaccination efforts, as well as providing advice and scientific input to national governments. In Sweden, for instance, the central government has relied heavily on the Public Health Agency (PHA) for deciding which strategy to apply to handle the pandemic (Brorström et al., 2020). The PHA also has primary responsibility for coordinating surveillance, testing and communications during the pandemic in Sweden (Bergkvist et al., 2020). In Portugal, the national health authority is the Directorate-General of Health (Direção-Geral da Saúde), which coordinates all epidemiological surveillance, contact tracing and public health measures. Portugal's National Reference Laboratory, however, coordinates laboratory activity relating to the COVID-19 pandemic (Fronteira & Figueiredo Augusto, 2020). In Germany, the Robert Koch Institute (RKI) is tasked with advising the federal government on prevention and detection measures (Winkelmann & Reichebner, 2021) and has played a central role in monitoring the epidemiological situation and vaccination efforts during the COVID-19 pandemic (RKI, 2021a). Whereas some public health organizations are embedded in national Ministries of Health, others enjoy higher levels of independence. For example, the German RKI is an independent institution, even though it is funded by the German Ministry of Health (Hallam, 2020). Similarly, the Greek National Public Health Organization (EODY) is a private legal entity which operates under the supervision of the Ministry of Health (ECDC, 2020).

4.4 The role of scientists

Apart from the input provided by the scientists based at countries' public health organizations, other scientific experts and organizations from a range of scientific disciplines have also played a key role in shaping COVID-19 responses. It has been noted that the involvement of (external) scientific experts during a crisis can help provide legitimacy to the decisions being made (Broekema et al., 2018). In many cases, external experts were officially mandated by governmental agencies to provide their input and recommendations. In Ireland, for example, a coronavirus Expert Advisory Group with experts from a range of different specialties was appointed to provide advice to the NPHET and other Irish governmental agencies (HSRM, 2020b). Similarly, a National COVID-19 Science Task Force was set up by the Swiss Federal Office of Public Health as an advisory body. This Swiss Task Force builds upon an "open resource" platform for COVID-19 set up by the Swiss School of Public Health and develops policy briefs on various aspects of the COVID-19 crisis (HSRM, 2020a). In some countries, scientists also formed their own independent organizations. For instance, members of the Austrian scientific community set up the COVID-19 Future Operations Platform (FOP), which aims to promote an open exchange of research results and information relating to COVID-19. The platform operates independently, and the provision of information is not typically based on building consensus between

all institutions and experts involved in the FOP – therefore, the platform does not issue 'official' recommendations or reports (FOP, 2021). It is important to note that 'scientists' are far from a homogenous group: experts from many different scientific disciplines have provided input on COVID-19 responses, and it has not been uncommon for scientists to publicly disagree on some matters. Particularly in the first months of the pandemic, a frequently heard critique was that governments relied too heavily on scientific advisors with training in the medical sciences. For example, UK government's Scientific Advisory Group on Emergencies (SAGE) has been criticized for not sufficiently including the perspectives of social scientists (Portes, 2020). As the COVID-19 crisis turned the public eye to science, many scientists were put in the spotlight and some gained (inter)national fame as a result of their role in national policymaking (Funk, 2020). As scientists' fame grew, they have also become targets for critics and some have even faced death threats (Brady, 2020).

5 Legal factors influencing COVID-19 pandemic

COVID-19 has not only created immense challenges for human health, but also for the legal order in partner countries. In response to the pandemic, governments and institutions have enforced highly restrictive measures curtailing citizens' rights in a way unparalleled since World War II. These measures typically limited freedom of movement, freedom to exercise economic or commercial activities, and impacted the right to education, religion, assembly, and private life (Binder et al., 2020). In most countries, emergency responses included an alteration of the distribution of power, with national governments gaining more far-reaching control (Diaz Crego & Kotanidis, 2020). In this section we explore legal issues and considerations underlying the implementation of restrictive measures and disease surveillance responses across partner countries, including a focus on contested issues and controversies.

5.1 Implementation of restrictive measures

The constitutional frameworks within which restrictive measures have been taken differ significantly across countries. While some countries' constitutions include provisions to declare a state of emergency or to entrust extraordinary powers to specific institutions, others do not. Among the countries whose constitutions outline the conditions for a state of emergency in response to external or internal treats are Germany, Cyprus, Greece, Italy, Israel, Romania, and Portugal. In Italy, for instance, a state of emergency was declared in response to COVID-19 on the 31st of January 2020. This state of emergency, which gives greater powers to central government, has been prolonged several times and is still in place at the time of writing in June 2021 (Gorrasi, 2021). In Romania, a state of emergency was decreed starting on the 16th of March 2020. However, this was of relatively short duration, and it was replaced by a state of alert in May 2020 (Romania Insider, 2020). Interestingly, not all countries with specific emergency constitutional mechanisms have actually triggered a state of emergency. For example, in Germany, politicians have been reluctant to declare a state of emergency, as historical considerations related to the legal order during the Nazi period render this tool highly controversial (Binder et al., 2020; Dostal, 2020). Israel also presents a unique case, as a state of emergency has actually been ongoing in the country since it was founded in 1948 (Kosti & Gross, 2021).

In some countries, such as Belgium, the constitution does not allow for a state of emergency at all (Verrijdt, 2020). In others, like Ireland and Sweden, a state of emergency can only be declared in times of war (Cameron & Jonsson-Cornell, 2020; Greene, 2020). In other countries that could not or chose not to declare a state of emergency, reliance on ordinary or new legislation allowed restrictive measures to be implemented. In the UK, Boris Johnson's government gained additional power through the Public Health Act 1984, as well as the new Coronavirus Act 2020 (Bennett Institute, 2020). Similarly, in Ireland the 2020 Health Act amended the 1947 Health Act to authorise the minister of health to enact far-reaching measures (Grogan, 2020). In most of these countries, the national parliament oversaw or participated in adopting restrictive measures. For example, in Portugal and Romania parliaments authorized the state of emergency, while in Austria, Germany and Ireland the parliaments passed new legislation or amended existing laws (Diaz Crego & Kotanidis, 2020).

Due to these rapid and far-reaching restrictions that have been implemented since the start of the COVID-19 pandemic, without much input from the general population, the legal basis for implementing restrictive measures has been subjected to critique. For example, the Belgian COVID-19 measures are based on the 2007 Civil Security Act, which was created for acute and temporary emergencies like fires, explosions or the release of radioactive material, not for long-term health crises (Verbergt, 2020). The

Civil Security Act allows for the limitation of people's mobility in a precisely defined area during a very limited period of time, and some critics have argued that long-lasting COVID-19 measures, such as a curfew requiring people to remain indoors during certain hours, go beyond this (De Groote & Verelst, 2020). In summer 2020, the Austrian constitutional court declared certain elements of lockdown measures taken in spring 2020 as unlawful, since multiple regulations were not in line with the COVID-19 Measures Act. Ongoing constitutional complaints in Austria relate to the governmental closing of schools and the lack of a regulatory framework underlying mass testing (Gstöttner & Lachmayer, 2020). In Italy, the repeated extension of the ongoing state of emergency has been critiqued for blurring the boundaries between the executive and the legislative powers (Bosa et al., 2021).

5.2 Surveillance and contact tracing responses

Across partner countries, COVID-19 responses have involved large-scale contract tracing and surveillance strategies to collect information about viral transmission and epidemiological trends, as well as to ensure compliance with restrictions. This need for surveillance has fuelled discussions about the proportionality of limiting citizens' right to privacy (Fahey & Hino, 2020; Kolfschooten & Ruijter, 2020). When does a public health threat justify the breaching of privacy and personal freedom? During the pandemic, national and local governments have resorted to measures that many previously considered unimaginable in Western/European countries, such as the use of drones to monitor physical distancing and the mobile phone data to track people's movements (Manancourt et al., 2020). In Greece, for example, the Hellenic Police set up a scheme of air surveillance using drones and helicopters (FRA, 2020). In Italy, the use of drones by local police forces was short-lived due to a lack of guidelines for their proper use (Berardi et al., 2020).

Contact tracing applications and their implications for privacy have also been a topic of significant public debate in various partner countries. These contact tracing apps use a Bluetooth connection to detect users' COVID-19 contacts based on signal intensity. When someone tests positive for COVID-19, they can use the app to notify their exposed contacts (Ciucci & Gouardères, 2020). The use of such apps in partner countries is voluntary and the personal data of the users of these apps are typically anonymised or pseudonymised. Nonetheless, numerous security and privacy concerns have been raised regarding these apps, e.g. relating to the use of insecure cryptographic algorithms, the storing of sensitive information, and permissions to perform backups (Sun et al., 2020). For instance, after a COVID-19 contact tracing app was launched in Ireland, researchers at Trinity College Dublin criticised its "intrusive data collection", describing it as "troubling" and concluding that user privacy was not adequately protected as the app continuously shared users' location, phone details and email address with Google servers (McCurry, 2020). The NHS COVID-19 app used in the UK is not limited to contact tracing, but also allows users to check alert levels in their area, check into pubs and restaurants, track their symptoms and book a COVID-19 test (Hern, 2020). This app has been criticized for being centralized, meaning the app is connected to a central server that belongs to a health service or organisation (Zastrow, 2020). Advocates for a decentralized approach argue that such apps better protect privacy, since data is held on individuals' phone and not by a central authority (Nanni et al., 2021). In response to a proposal to make the StayAway COVID app compulsory in Portugal, Amnesty International Portugal raised serious concerns related to users' freedom and privacy, as well as to the discrimination of some groups of people. The organization pointed out that not everyone has the technological literacy, a mobile phone with certain features, and a data plan or Wi-Fi access to use such an app (Amnesty International Portugal, 2020).

6 Data collection factors influencing the COVID-19 pandemic

The collection of data has been a central component of public health responses in the COVID-19 pandemic across partner countries. Public health surveillance requires ongoing systematic collection, analysis and interpretation of data to guide the planning and implementation of public health measures and interventions. Continuous data collection provides an early warning system, helps to understand changes over time, and can help monitor the impact of implemented public health strategies (WHO, 2021). In the context of the COVID-19 pandemic, public health surveillance has been key in informing policy on "flattening the curve" of COVID-19 spread (Post et al., 2021). In this section, we discuss how data collection efforts in the COVID-19 pandemic are organized across partner countries and how this shaped responses, including a special focus on challenges related to underreporting, temporal delays, and data disaggregation.

6.1 Data collection responsibility and management for COVID-19 data

In most partner countries, responsibility for the epidemiological follow-up of COVID-19 data has been assigned to a single government body or entity. Typically, the Ministry of Health or the national public health organization or institute plays a central role – e.g. the National Public Organization (NPHO) in Greece; the National Institute of Health (ISS) in Italy; the National Public Health Institute (INSP) in Romania; and the Federal Office of Public Health (FOPH) in Switzerland. In some countries, national statistics offices contribute to data collection efforts too: e.g. in the UK, the Department for Health and Social Care, Public Health England, and the Office for National Statistics jointly support COVID-19 surveillance programmes (Department of Health & Social Care, 2021). Reporting obligations for COVID-19 vary between countries, but generally speaking they involve notification of new cases of COVID-19 to the relevant local health authority, which is then transmitted to the central government agency or body that manages the national epidemiological reporting system (West et al., 2020). Data collection for COVID-19 related information involves the combination of data from different sources, such as national reference labs; hospitals; residential care centres; and GPs. Other surveillance strategies include household surveys, sentinel surveillance systems, and wastewater surveillance (Lopreite et al., 2021).

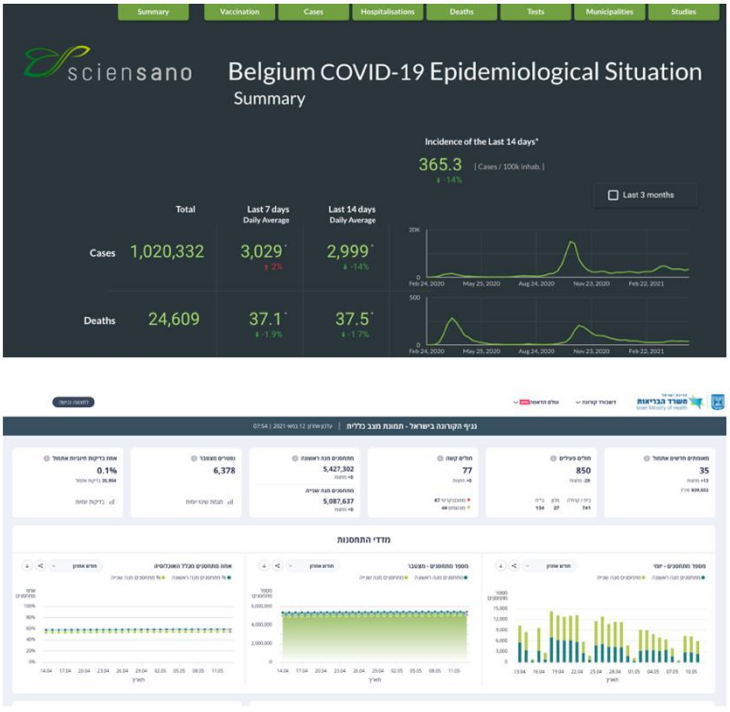

Figure 7. Online COVID-19 data 'dashboards' in Belgium (top) and Israel (bottom) (Israel Ministry of Health, 2021; Sciensano, 2021)

In some countries, specific systems were used to centralize data on COVID-19 patients from hospitals. For example, Belgium introduced a Surge Capacity (SC) survey that obliges all hospitals to collect data on numbers of COVID-19 patients, hospital capacity, and bed occupancy rates

(Van Goethem et al., 2020), while Sweden used the pre-existing Intensive Care Registry (SIR) to centralize data reported on the cases of COVID-19 that end up in Swedish intensive care units (SIR, 2021).

In most countries, epidemiological data is made public on a regular (normally daily) basis, although sometimes with significant time lags. Apart from press briefings and written surveillance reports, epidemiological figures are also frequently presented on publicly available online 'dashboards' or 'data trackers', e.g. see examples from Belgium and Israel in Figure 7. Other examples include Ireland's COVID-19 Data Hub (Government of Ireland, 2021) and Austria's AGES COVID-19 dashboard (AGES, 2021).

6.2 COVID-19 alert and warning systems

As COVID-19 rates fluctuate over time, governments have tried to devise ways to quickly alert the populations about the virus' threat level. Most of these warning systems are based on COVID-19 reproduction numbers/infection rates and use colour codes – often traffic light-inspired schemes – to indicate the level of risk. These included five-colour systems (e.g. Spain, England, Ireland) and four-colour systems (e.g. Austria, Greece, Israel, Italy, Portugal, Romania), which are often also used to distinguish between the differing local epidemiological situations within countries (Shendruk & Quito, 2021). Although these systems were designed to increase transparency about the evolution of the pandemic and associated measures, they have also created confusion and frustration. In Italy, for instance, in November 2020 regional leaders harshly criticized the national government's colour classification amid a lack of clarity on how the newly-designated coronavirus "red zones" were decided upon. As the classification system was based on a complex set of 21 criteria (ISS, 2020) and little official explanation was given about the functioning of the system, some critics perceived the warning system to have a political character. For example, the right-wing opposition party Lega accused the centre-left government of imposing lockdown in regions run by the opposition while going easy on those run by the left (The Local, 2020).

6.3 Data reporting challenges and delays

Particularly in the beginning of the pandemic, when countries' COVID-19 testing infrastructures were still limited and health systems were overwhelmed, there was significant underreporting of COVID-19 cases (Lau et al., 2021). Underreporting was especially prevalent outside of hospitals, notably in nursing homes (European Parliament, 2020). As a result, it was difficult to accurately map the spread of the virus and monitor the impact of implemented measures. Whereas in most countries a lack of testing resulted in many suspected cases of COVID-19 going unreported, some countries chose to also report suspected (but unconfirmed) cases, which significantly impacted the comparability of COVID-19 figures across countries. For example, Belgium was among the countries with the highest number of COVID-19 deaths per head of population in the world in the first wave of the pandemic. However, Belgian public health officials have pointed out that this was at least in part related to the way COVID-19 deaths were being counted in Belgium (Lee, 2020). Unlike other countries, Belgium included deaths in residential care homes which were suspected but not confirmed COVID-19 cases, significantly inflating the Belgian data. From April 2020, the Belgian National Crisis Centre started moving away from this approach to counting, and only confirmed cases were reported as COVID-19 deaths (Gyssels, 2020). Although COVID-19 surveillance systems across partner countries have improved over time, they still tend to miss many mild cases and undiagnosed infections and deaths (Post et al., 2021). Key

challenges in data usage relate to data gaps, inconsistent definitions, problems in accessing data, and timing of reporting (Galaitsi et al., 2021).

Indeed, temporal delays in COVID-19 data have also influenced public health responses to the pandemic. COVID-19 has an incubation time of about 5 days, and COVID-19 deaths typically occur 2-8 weeks after the onset of COVID-19 symptoms (Testa et al., 2020), which means there is a long delay in the feedback signal provided by figures on COVID-19 deaths. One of the key challenges in the implementation of public health responses to COVID-19 is that their impact on mortality is visible only some weeks later, making it all the more crucial to focus on smart testing techniques and contact tracing (Buchanan, 2020). Across partner countries, temporal delays are worsened by time lags in reporting and publishing COVID-19 data (Testa et al., 2020). As there is often a dearth of reporting during weekends and holidays, many surveillance systems now use 7-day moving averages to reduce the volatility of the data (Post et al., 2021).

7 Demographic and social network factors influencing the COVID-19 pandemic

The COVID-19 pandemic has had unprecedented consequences across partner countries, yet the spread of the virus and the responses to counter it have been uneven and diverse. Although the pandemic has undoubtedly had a global impact, the unfolding of the crisis has been influenced by a wide range of country-specific contextual factors. By June 2021, most COVINFORM partner countries had experienced three main pandemic waves. However, the severity and timing of the respective waves has shown significant variation. For example, in February 2021 some countries had falling case numbers (e.g. Israel, Portugal, Germany, the UK) while others, such as Greece and Germany, were facing dramatic surges in case numbers (Ellyatt, 2021). It is hard to pinpoint the exact impact of country-specific contextual factors on such trends, but a number of factors undoubtedly have shaped the diverse evolution of the crisis across countries. In this section, we offer a non-comprehensive overview of such factors, focusing on demographic factors and social contact network factors.

7.1 Demographic factors

A number of demographic variables have been hypothesised to influence the COVID-19 pandemic. These include the share of the population aged over 65, population density and the proportion of elderly people who live in nursing and residential care facilities (Mogi & Spijker, 2021). Some countries have a much higher proportion of the population aged over 65, as a result of considerable variations in the degree of population ageing across Europe (Kashnitsky & Schöley, 2018). For example, due to the relatively high degree of population ageing in Italy, Greece, Germany, Portugal, and Spain, these countries have a higher proportion of population at risk of death due to COVID-19 (Kashnitsky & Aburto, 2020). Higher population density is also thought to be positively associated with the spread of COVID-19 (Wong & Li, 2020). An analysis based on data from Germany, Italy, Sweden and Switzerland found that higher population density was positively correlated with excess mortality (EFTA, 2020). Similarly, when asked to explain why Belgium was hit hard in both the first and second waves of the pandemic, virologists have pointed out that Belgium is a “small beehive in the heart of Europe”: a country with a high population density that is located centrally in Europe, making it particularly vulnerable to both the introduction and further spread of the virus (The Brussels Times, 2020). However, other scholars have suggested that population density mostly affects the timing of COVID-19 outbreaks, not the rate of subsequent spread (Carozzi, 2020).

Another demographic variable which shows significant variation across countries regards care systems for the elderly. As noted in section 2 above, the reliance on long-term care (LTC) facilities as compared to informal care for the elderly, as well as how LTC facilities are organized and delivered, differs markedly between countries (Spasova et al., 2018). In Italy, for example, LTCF are less common and there is a heavy reliance on the capacity of family (especially women) to carry out caring and support duties (Eurocarers, 2021). In other countries, nursing homes are commonplace and a high percentage of COVID-19 deaths have occurred in LCTF. In several partner countries, a high proportion of total COVID-19-related deaths were in LTCF residents, including in Belgium (57%), Ireland (50%), Spain (50%), Austria (44%), Sweden (42%). In countries where LCTF are less prevalent, such percentages are much lower, e.g. in Greece (4%) and Italy (2%) (ECDC, 2021a). In countries where LCTF were responsible for a large proportion of total COVID-19 deaths, intense vigilance in these facilities was also a much

more pronounced element of the national response to the crisis. Both in the UK and in Belgium, Amnesty International released condemning reports concluding that the human rights of LCTF inhabitants were violated during the first wave of the COVID-19 pandemic (Amnesty International België, 2020; Amnesty International UK, 2020).

7.2 Social contact and networks

As physical proximity is crucial for the transmission of the COVID-19 virus, factors that potentially impact the COVID-19 pandemic through social interactions across countries are the percentage of people living in multi-generational households; religious attendance; and the proportion of people who have frequent social meetings with friends, relatives, or colleagues. Of these factors, Mogi and Spijker (2021) found multigenerational households to play the most important role in the spread of COVID-19. Based on their findings, they suggest that it is not necessarily the proportion of elderly people in a population that leads to high rates of COVID-19, but the level of social interaction the elderly have with younger generations. In Europe, intergenerational households are more common in Southern and Eastern Europe than in Northern Europe (Glaser et al., 2018). Naturally, isolating the elderly from younger generations and telling them to 'shelter at home' is much more challenging for those living in multigenerational households (Roxby & Gure, 2020). In Spain, for example, frequent intergenerational contact may have led to a greater spread of COVID-19 (Aparicio Fenoll & Grossbard, 2020). Conversely, the relatively low rate of intergenerational contact in Switzerland has been hypothesized to have helped protect the elderly (Desson, Lambertz, et al., 2020).

Additionally, it has also been suggested that practicing religion may facilitate the spread of the virus through the attendance of worship services (Vermeer & Kregting, 2020). Particularly in countries where a large proportion of the population regularly attends worship services (e.g. Israel, Greece, Spain) this is a relevant context-specific factor to take into account (Pew Research Center, 2018). In light of the fundamental right to religious freedom, this has been a challenging issue for countries to deal with. In most partner countries, religious services have been authorized throughout the pandemic if compliant with public health restrictions, but in some cases lockdown measures included prohibition of public religious services, including in Belgium, the United Kingdom and Ireland (ECLJ, 2020).

Finally, it has also been suggested that people's willingness to practice physical distancing and stay at home may depend on culture and social norms, including the degree to which societies are individualist versus collectivist, as well as the extent to which societies are afraid of uncertain and unstructured situations (Huynh, 2020). In Switzerland, data suggesting that German-speaking cantons were much less responsive to the federal request to "stay at home" have been attributed to a combination of cultural traits, including trust, political leaning, altruistic beliefs and preferences for re-distributive policies (Deopa & Fortunato, 2020).

7.3 Data disaggregation issues

Disaggregated data refers to data that can be grouped by multiple variables or dimensions, such as sex, age, education, geographic area, ethnicity, or socioeconomic variables. The collection of disaggregated data is important in a pandemic, because it allows for identification of factors that might slow or accelerate viral transmission and the populations that are most affected (PAHO, 2020). Across partner countries, epidemiological updates and vaccination data are typically disaggregated by age, sex, and geographical area. Such data have demonstrated that sex and gender play an important role in exposure to the virus and risks of severe outcomes, among other factors (Shreeves, 2021). However,

with the notable exception of the UK, most countries' COVID-19 data is not disaggregated along ethnic or racial lines. In fact, Waldersee (2020) has commented that COVID-19 has turned the spotlight on "Europe's taboo of data by race". In the UK, COVID-19 data disaggregated by race and ethnicity has demonstrated that some minority ethnic populations in England have a greater risk of testing positive for COVID-19 and of adverse COVID-19 outcomes compared with the white population, even after accounting for differences in clinical, sociodemographic and household characteristics (Mathur et al., 2021). Although it is likely similar trends occur in other countries, the lack of disaggregated data makes it impossible to be sure. In Ireland, for example, the unavailability of adequate data on ethnic origin and nationality in the Computerised Infectious Disease Reporting (CIDR) database has led to a lack of disaggregated statistics on COVID-19 cases and deaths among ethnic minorities, migrants, and Gypsy and Roma Travellers (NESC, 2021). COVID-19 has highlighted how structural aspects of racism and discrimination exacerbate health disparities, yet such issues may remain under the radar as a result of a lack of visibility and representation in data (Kauh et al., 2021). The European Union has indicated it wants to address this issue and vowed to look into harmonising data collection across Europe (Mathur et al., 2021).

8 Public health information and communication strategies

Across partner countries, a range of different communication and information strategies have been employed to inform the public about COVID-19 and the risks and benefits of specific actions, policies and measures. Communication strategies at the national level have differed not only in terms of the actual measures being communicated – ranging from strict lockdowns in some countries to large parts of society being kept open in other countries – but also in terms of who communicates and in what ways. This section provides an overview of trends across partner countries relating to the division of responsibilities in communication strategies; the mix of different communication strategies and channels that have been used; the use of specific communication campaigns; communication about vaccination strategies; and communication strategies to reach vulnerable groups. For a more detailed analysis of these issues, we refer to the report written in the context of COVINFORM's WP7 (deliverable 7.1).

8.1 Division of communication responsibilities

Across countries, epidemiological considerations have been key in defining responses to the COVID-19 pandemic. In line with this, public health actors have played a key role in COVID-19-related communication and information strategies. However, there is significant variation across countries in the extent to which public health actors took centre stage in communicating about the pandemic. In all countries, public health officials with training in fields like epidemiology and virology were tasked with communicating about the epidemiological situation, providing updates on figures such as COVID-19 case numbers and hospitalization rates. Moreover, in some countries, such as Sweden, broader communication strategies about COVID-19 responses have even been characterized by a strong emphasis on how all measures are based on guidance from public health authorities (the PHA in Sweden) (Rambaree & Nässén, 2020). The Swedish state epidemiologist Anders Tegnell became a central communicator in informing the public about protective measures and recommendations (Johansson & Vigsø, 2021). In most other countries, however, communication about COVID-19 responses and restrictions has been predominantly the responsibility of national government leaders and ministers, with a more limited role for independent public health actors. In Italy, for instance, communication about government measures was provided directly by the Italian Prime Minister, or on behalf of the Presidency of the Council of Ministers (PCM). In Switzerland, the main communication players have been the Federal Council, Federal President and the Federal Office of Public Health FOPH (Bundesamt für Gesundheit, BAG), particularly represented by health ministers Alain Berset and Daniel Koch. Specific crisis communication units or committees were commonly set up to bring together different actors to coordinate communication strategies. For example, Ireland's Special Cabinet Committee on COVID-19 Response had a dedicated Communications Group which coordinated the national government's communication response. In Belgium, communication about COVID-19 measures has been coordinated by the Information Unit, which is jointly chaired by the FPS Health and the National Crisis Centre (NCCN) (FPS Health, 2020). As national government and public health officials frequently collaborated in communication efforts, the line between public health recommendations and political decision-making sometimes became blurred.

8.2 General communication strategies

In efforts to ensure wide coverage and maximize coverage, countries have used a mix of a range of different communication strategies and channels. Across countries, TV and radio broadcasts have

played a key role, notably in the form of press conferences in which high-ranking politicians or government officials announce and explain new COVID-19 measures. In many countries (e.g. Belgium, Italy, Sweden), there have also been complementary or separate press conferences organized by public health authorities in which scientific experts provide epidemiological updates (Weitzel & Middleton, 2020). Press conferences have typically been broadcasted on public service television, as well as on online media outlets and social media. The frequency of the press conferences has fluctuated over time – most countries had daily press conferences in spring 2020, which reduced in frequency over summer 2020, but became more frequent again as the second and third pandemic waves hit. The use of official websites with COVID-19 information has also been widespread. Many local, regional and national government authorities have set up dedicated websites (e.g. *Krisinformation.se* in Sweden, *info-coronavirus.be* in Belgium) or created special sections on pre-existing websites to provide up-to-date information about the constantly evolving pandemic. Technology multinationals such as Google, Facebook, Twitter and Microsoft agreed to actively promote such 'authoritative sources' in an effort to counter the spread of misinformation and 'fake news' (European Commission, 2021). Communication efforts also included the use of government social media, as well as non-digital approaches such as public dissemination of information using billboards, posters, and leaflets. Independent print, broadcast and online media have played a key role in the spread of information about the COVID-19 pandemic, too, e.g. by organizing special editions of news programmes and providing airtime for government spokespeople or scientific experts. Finally, some countries' contact tracing apps also provided general information about COVID-19, sometimes including information about local area restrictions, as is the case of the NHS COVID-19 app used in the UK. Although the use of multiple communication channels increased coverage, it arguably also led to fragmentation and inconsistency of messaging (Weitzel & Middleton, 2020). As many countries did not have an official national communication strategy with a coordinated messaging plan for all involved public actors at the onset of the pandemic, it was not uncommon for discrepancies to exist between information distributed by different actors at local and national government levels. For example, it has been argued that Belgium's governmental structure, characterized by a complex division of responsibilities at federal, regional and local levels, contributed to the fragmented COVID-19 communication by Belgian authorities (Goubin, 2020).

8.3 Specific information campaigns

Over the course of the COVID-19 pandemic, various specific information campaigns have been launched in partner countries. Many of these campaigns had the dual aim of both informing and motivating citizens, often underlining the need for solidarity. For example, the Austrian information campaign *Schau auf dich, schau auf mich. So schützen wir uns* (Look after yourself, look after me. This is how we protect ourselves) was launched in March 2020 and included information about the national-level measures implemented in Austria. Similarly, in late November 2020 the Belgian federal government launched a campaign calling on all Belgian citizens to keep going and collectively beat the coronavirus as 'one team of 11 million', alluding to similar feelings of sense of belonging as during international football tournaments (Belgian Federal Authorities, 2020). Besides broadcasts on TV and radio, these campaigns also relied heavily on social media channels. In Spain, the region of Madrid set up a specific campaign to target young people around the hashtag #EresJovenNoInmortal (You are young, not immortal) which included collaborations with influencers, singers and football players.

Figure 8. The Belgian "all together" campaign logo

Figure 9. Austrian information campaign slogan/logo

8.4 Communication about vaccination strategies

By the end of 2020, many countries began to operationalize their COVID-19 vaccination strategies. As vaccination campaigns were rolled out, these were accompanied by specific communication efforts to inform the public about COVID-19 vaccines. Examples include the *Vaccination saves lives* campaign by Public Health Wales, the *Österreich impft* (Austria vaccinates) campaign by the Austrian Red Cross, and the *#ROVACCINARE* (#Rovaccinate) campaign by the Romanian government. Apart from promoting vaccination and informing citizens about vaccines' safety and efficacy, these information campaigns typically also communicate about the rationale behind the prioritization of specific groups and the timeline of vaccination efforts. As countries have faced challenges related to the limited supply of COVID-19 vaccines, as well as frequent changes in the timing of vaccine deliveries, communication efforts have had to deal with significant unpredictability and confusion. The use of a range of different vaccines, some of which were 'tainted' by reports of rare side effects, has also complicated communication strategies (ECDC, 2021b).

8.5 Communication with 'vulnerable groups'

Crisis information was typically targeted to the 'general population', and was not always appropriate for groups of people who cannot access, understand or respond to crisis information in the same way (Hansson et al., 2020). Vulnerable groups in the context of public health information and communication campaigns may include low-literate people; non-native speakers; certain groups of young people; the elderly; and ethnic-cultural minorities (Goubin, 2020). These groups may need tailored communication strategies about the COVID-19 pandemic and associated public health measures and restrictions. In some countries, efforts have been made to develop such targeted strategies and reach vulnerable groups in society. The most common strategies were to translate the latest COVID-19 guidance to a range of different languages, as well as making materials available in sign language and 'simple language'. For example, in Ireland, public health information was translated into 24 other languages and online YouTube videos were created and continually updated in Irish Sign Language (HSE, 2021b). In a number of Irish counties, communication efforts also included co-ordination with migrant representatives to help distribute information on COVID-19 to migrant groups (NESC, 2021). In Belgium, information documents about COVID-19 were made available in 39 languages on the official government website, and information about COVID-19 in 'simple Dutch' has

been developed in collaboration with the Flemish organization Wablieft. These communication materials include texts with basic information, visualizations, and videos (Wablieft, 2020). In the UK, Doctors of the World and the British Red Cross translated a variety of UK government coronavirus advice and resources into 60 languages in a project supported by the Mayor of London (Doctors of the World, 2021).

Despite some efforts to provide accessible information, many people were effectively excluded from 'official' communication strategies. In particular, many communication strategies seemed catered for people who have completed higher education. For example, the Belgian Task Force for Vulnerable Groups has criticized the widespread use of English terms like 'social distancing', which are not clear for everyone (Task Force Kwetsbare Groepen, 2020a). Translated communication materials have also been criticized for not considering cultural differences.

9 Impacts of COVID-19 on health care workers

9.1 The COVID-19 response: transformation of working realities

Health care delivery has been drastically transformed in response to COVID-19 across partner countries, leading to significant changes in health workers' daily working realities. When COVID-19 cases went up rapidly in spring 2020, hospitals expanded intensive care units (ICU), set up separate 'COVID-19 wards', paused normal care activities, created new emergency care shifts, and instituted a range of additional hygiene measures and procedures. As service delivery was remodelled and restructured to cope with the influx of COVID-19 cases, many healthcare workers (HCWs) were deallocated from their usual duties to work in different care settings with greater needs (Dunn et al., 2020). In some countries, including in Greece, Cyprus, England and Ireland, private sector staff have been redeployed into the public sector as a strategy to increase the public health system's surge capacity (Williams et al., 2020). Similarly, in long-term care facilities, all available forces have been deployed to control the outbreak and enormous additional efforts have been asked of health staff (Szczerbińska, 2020). Particularly in the early stages of the pandemic, many countries faced challenges in obtaining sufficient medical supplies, including personal protective equipment (PPE) for HCWs. As a result, many HCWs have faced a high risk of contracting COVID-19 (Smith, 2020).

It is important to consider the impact of COVID-19 on health care workers from a temporal perspective. Already at the end of the first wave, many health workers were fatigued and indicated they were not ready for a second wave of COVID-19 cases (Het Nieuwsblad, 2020; Jones et al., 2020). Nonetheless, second and third pandemic waves followed, placing immense pressure on health workers once again. One intensive care nurse in Central London commented on the mounting frustration during the second wave: "The first-time round there was a sense of we're all in this, let's sort it out, but now there's a sense of real frustration. It's very difficult to maintain the same level of working and motivation as before" (Busby, 2020).

It is also relevant to acknowledge that not all health workers have been impacted equally. In many countries, the 'baseline capacity' to deal with surging COVID-19 cases differed across regions and between types of facilities, and accordingly, some health professionals' working realities were more drastically transformed than others'. In England and Wales, for example, the hospital capacity is distributed unequally at both the regional and sub-regional level, which means some areas faced higher disproportionate health care burdens due to COVID-19 (Verhagen et al., 2020). It has also been noted that some subgroups of healthcare workers who are less well-integrated into institutions and supply chains, such as midwives and community health workers, may have been disadvantaged and left behind in the distribution of scarce PPE (Berger et al., 2020).

9.2 Risk of infection

Compared to the general population, HCWs face a higher risk of contracting COVID-19 (Gómez-Ochoa et al., 2021).Front-line HCWs working in inpatient settings or nursing homes who frequently care for or are exposed to patients with COVID-19 are likely at greatest risk (Eyre et al., 2021; Nguyen et al., 2020). There are also some indications that the prevalence of severe COVID-19 cases is significantly higher among people working in the health sector. For example, data from the UK suggests that relative to non-essential workers, medical support staff had the highest risk of severe COVID-19 (8.70 times higher risk), followed by health associate professionals (7.53 times higher risk) and healthcare

professionals (5.19 times higher risk) (Mutambudzi et al., 2021). Consequently, HCWs may also pose a significant risk of passing the virus onto patients, colleagues, family and friends, which adds considerable additional pressure on HCWs (Almaghrabi et al., 2020; Leeds, 2021). As previously highlighted, the risk of COVID-19 infection is typically heterogeneously distributed across HCWs and across geographical regions. In Italy, for example, the prevalence of health care workers who tested positive for COVID-19 shows ample variability between regions. The prevalence of COVID-19 infection among HCWs in six Italian centers ranged from 3.0 to 22.0%, and was correlated with that of the respective geographic areas (Boffetta et al., 2021).

9.3 Mental health impact

The drastic transformation of health workers' working realities has also created a great deal of physical and psycho-emotional pressure. Intense work-related stressors include strict instructions and safety measures, long working hours, a continuous need for vigilance and concentration, having to perform tasks without proper training, and reduced social contact (Santabárbara et al., 2021). Extrinsic risk factors for poor mental health among health workers, such as the trauma of caring for critically ill patients and a low level of control over the work environment, have been exacerbated by the COVID-19 pandemic (Mehta et al., 2021). A study exploring the experiences of health workers from Italian and Austrian hospitals found that moral injury – a perceived betrayal of "what's right" – was also an important stressor (Kreh et al., 2021). This related to being forced to make triage decisions; having to separate dying patients and their families; having to handle dead bodies without the usual rituals; and posing a potential threat to colleagues and family. Interviews conducted by the emergency medical service and COVINFORM partner SAMUR (Servicio de Asistencia Municipal de Urgencia y Rescate) in Spain with members of its staff revealed similar issues. SAMUR professionals also highlighted how emotional stress was worsened by a high degree of uncertainty about the future and insecurity related to inadequate or incorrect information.

9.4 Public perception

Across partner countries, the appreciation and respect for healthcare professionals got a substantial boost during the COVID-19 crisis. During the first wave of the pandemic, health workers were widely cheered on and described in admiring terms. In the Swedish news, for example, health workers were predominantly framed as heroes, describing how they continued to fulfil their duties under nearly impossible circumstances (Ekdahl et al., 2021). Many countries followed the international trend to applaud health workers for their important work during the pandemic, with daily collective applauses taking place from central London to rural Italy. Health workers welcomed the appreciation, but many also noted that they hoped the expression of appreciation would not remain limited to applause, and action would be taken to address the dire need for more resources and more trained personnel (Darlow, 2020; UHasselt, 2020). Some also critiqued the heroism narrative, arguing that it curbs meaningful discussion about what the limits of health workers' duty to treat are, and that the implication that all health workers have to be heroic can have negative psychological consequences for health workers (Cox, 2020). Indeed, if a health worker has the role of a hero, they "would not have had the right to fatigue, uncertainty, pain, or fear" (Pennella & Ragonese, 2020, p. 173). After the first pandemic wave, the public perception of health workers shifted somewhat away from the heroism narrative. The frequency of applause and other ways of appreciation died down considerably (Foubert, 2020), and there were increasing accounts of health workers being verbally or physically attacked

(McKay et al., 2020). In some countries, specific initiatives have been launched to counter violence against healthcare workers. For instance, the Italian national federation for those in the nursing profession (FNOPI) launched an awareness campaign with this purpose, using the hashtag #respettachitiaiuta (*respect those who help you*) (FNOPI, 2020).

10 Vulnerability in the COVID-19 pandemic

The main focus on vulnerability in the COVINFORM project relates not just to groups of people with increased vulnerability to clinical consequences from the SARS-CoV-2-virus, but especially to groups that have a vulnerable position in society. Different types of vulnerability often overlap and interact. Nonetheless, for the scope of the COVINFORM project it is useful to distinguish between three main types of vulnerability and discuss their relevance across partner countries. The three main types discussed in this section are vulnerability to disease in terms of physical health status; social vulnerability; and communication vulnerability. These three broad categories were chosen to illustrate the contextual and intersecting nature of vulnerability, in line with the COVINFORM project's focus on understanding how inequalities play out across the domains of physical health, social positioning, and communication.

10.1 Vulnerability in terms of physical health status

One important category of vulnerability includes people who are considered at higher risk of falling seriously ill or dying from COVID-19. These people can be labelled as medically or clinically vulnerable in terms of their pre-existing physical health status (Bradley et al., 2020). These groups of vulnerable people are often referred to in public health communication strategies as requiring protecting, shielding or cocooning. Across partner countries, such clinically groups are considered to include the elderly; adults with type 2 diabetes; adults with severe chronic cardiovascular, lung or kidney disease; and adults with decreased immunity and/or cancer (e.g. see VAZG, 2020). Some countries, such as Ireland, consider a relatively wide range of other people to be clinically vulnerable, too, e.g. including individuals with a severe mental illness and people with a learning disability (HSE, 2021c). In most countries, the strongest emphasis is placed on the vulnerability of older people, particularly those who are living in residential care homes. Compared to other types of vulnerability, medically defined vulnerability is more consistently defined and operationalized in policy documents and communication strategies. Indeed, the protection of clinically vulnerable groups is frequently leveraged as a central argument in public health communication to encourage the general population to adhere to public health measures. To varying extents, medical vulnerability, defined in terms of age and medical risk factors, has also been used to guide prioritization in vaccination strategies across partner countries.

Disruptions and delays

It is noteworthy that as well as facing vulnerability to infection, people with chronic conditions like diabetes are also particularly vulnerable to disruptions to the health system. In this sense, clinically vulnerable groups of people may also be 'vulnerable to systems' (Hartmann-Boyce et al., 2020). Across partner countries, the COVID-19 crisis resulted in disruption to regular care, as hospitals were forced to delay non-emergency interventions and reserve more beds for COVID-19 patients. As a result, some medically vulnerable groups have faced longer waiting times for non-COVID-19 related care. Screening activities have also been scaled down in many countries, including cervical cancer screening, breast cancer screening, and diabetic retinal screening (Fagan, 2020), resulting in fewer new diagnoses. For example, based on data from March-September 2020, the Belgian Cancer Registry calculated that 5,000 fewer cancer diagnoses had been made than in a 'normal' year (Belgian Cancer Registry, 2020). This suggests that many cases of cancer have been going undiagnosed, likely as a result of the pausing of population screening, people's hesitance to visit a doctor due to fear of COVID-19 infection, and as

a result of public health messages that imply that non-COVID-19 related calls upon medical staff may overload the health care system. Oncologists fear that the paralysis of prevention programmes, screening and early diagnosis across Europe might have considerable negative consequences for cancer mortality rates in the long term (Martin-Moreno & Lessof, 2021).

Structural health inequalities

It is important to acknowledge that being at higher risk from (severe) COVID-19 disease based on physical health status is also intricately linked with structural health inequalities (Bambra et al., 2020). A range of non-medical factors influence health outcomes, frequently grouped under the umbrella term 'social determinants of health'. Social, economic and environmental inequalities shape people's ability to prevent sickness, their risk of getting ill, as well as their access to treatment (Dahlgren & Whitehead, 1991), hereby influencing the distribution of health and illness in societies. In the case of COVID-19, existing inequalities in the distribution of chronic diseases – which pose important risk factors for severe COVID-19 infections – are of particular relevance. Across Europe, people in the lowest income group are much more likely to have a chronic illness than people with the highest incomes (Scholz, 2020). This highlights how vulnerability in terms of physical health status cannot be fully understood without considering the social determinants of health.

10.2 Social vulnerability

A second, very broad category of vulnerability, relates to how vulnerability may result from individuals' or groups' social positioning in society. In the case of COVID-19, socially vulnerable groups and individuals may not be able to respond to the pandemic in ways that limits the impact of the crisis on their daily lives (Gaynor & Wilson, 2020). In fact, COVID-19 has been described as "the great revealer" of persistent social inequities and associated vulnerabilities (Dahir, 2020). Within the broad label of social vulnerability, specific types of vulnerability can be distinguished, which may relate to occupation; material and social deprivation; family situation; legal status; and race/ethnicity.

1) Occupational vulnerability

Some individuals and group people are more vulnerable in the context of the COVID-19 pandemic because of their job. Lower-paid workers, such as those working in cleaning, food or delivery services, are unable to work from home and have been required to travel to work even throughout lockdown periods, often by public transport (Bambra et al., 2020). Occupational vulnerability might therefore manifest as an increased exposure to the virus. A similar type of occupational vulnerability is also experienced by health workers; an issue that has been discussed in detail in section 9. Many of the COVID-19 outbreaks in non-healthcare workplaces have been reported in industries deemed 'essential' where conditions do not allow for adequate physical distancing under the same productivity targets, such as meat processing plants (MPPs) and other food production and processing facilities. Outbreaks in MPPs have been reported in many partner countries, including Germany, Ireland, the UK, Spain, Belgium, Italy, Austria and Sweden (EFFAT, 2020). In Germany, for instance, a slaughterhouse and meat producer shut down its plant in June 2020 after over 1,500 of its workers were found to be infected with COVID-19 (Copley, 2020). Such COVID-19 outbreaks are thought not only to result from working conditions in the MPPs, such as the close proximity of workers, but also from workers' shared transportation and housing, which facilitate transmission of the virus (Dyal et al., 2020). Indeed, the COVID-19 pandemic has shed light on how workers in the meat industry often live in squalid housing,

with multiple people in badly ventilated rooms, conditions which have been described as befitting 'modern slavery' (Huet, 2020).

Sex workers are another example of a group that is facing occupational vulnerability across partner countries. Besides their heightened risk of being exposed to COVID-19, the COVID-19 pandemic has also deeply affected sex workers' ability to work (ICRSE, 2020). A survey by the Global Network of Sex Work Projects revealed that COVID-19 responses in various European countries included specific actions impacting sex work, such as the closure of massage parlors and brothels, as well as crackdowns in areas that are known for street-based sex work (NSWP, 2020). As a result, many sex workers have been unable to generate an income. In some countries, such as Romania, the COVID-19 measures have also been reported to lead to increased violence towards and harassment of sex workers (ibid.). Since in many countries sex workers work in the informal economy, they are often largely excluded from governmental social and economic aid (ICRSE, 2020).

2) Vulnerability related to poverty and social exclusion

Significant socioeconomic inequalities continue to exist across COVINFORM partner countries. According to Eurostat figures, over 21% of the EU population were at risk of poverty or social exclusion in 2019. In some partner countries more than a quarter of the population was at risk of poverty or social exclusion in 2019, including Romania, Greece, Italy and Spain (Eurostat, 2020b). Such figures are important to consider in the context of the COVID-19 pandemic, as a negative income gradient in COVID-19 incidence or mortality has already been reported in several countries, including Belgium, Sweden, and Spain (Baena-Díez et al., 2020; Decoster et al., 2020; Drefahl et al., 2020). This illustrates how poverty and social exclusion act as important determinants of health. Vulnerability related to poverty and social exclusion is relevant both in understanding inequalities in the epidemiological outcomes of the pandemic and in discerning inequalities in the indirect consequences of the pandemic.

Income is also relevant to consider in the context of access to health care. Particularly in countries where out-of-pockets spending (OOPS) for healthcare are significant, people may postpone or avoid seeking care because the cost is too high. In many countries, low-income groups and other vulnerable groups may be exempted from OOPS (e.g. in Austria, Cyprus, Romania, Sweden, UK) or pay lower user charges (e.g. in Belgium). In other countries, however, OOPS may be hefty. For example, in Ireland, patients are required to pay a co-payment of €80 per day for acute inpatient care, capped at €800 per year (Baeten et al., 2018). During the COVID-19 crisis, in some countries, attempts have been made to avoid OOPS-related unmet needs for medical care. In Belgium, for instance, this included introducing a ban on fee supplements in case of admission for COVID-19, and ensuring full reimbursement of a number of new benefits such as teleconsultation (Dokters van de Wereld, 2020).

People facing poverty and social exclusion are likely to experience disproportionate negative consequences that extend far beyond the cost of healthcare. European figures on the economic shock resulting from the COVID-19 pandemic suggest that low-income workers are more likely to lose their job or to be temporarily discharged (Eurostat, 2020a). In Wales, for example, low-income workers have been three times as likely as others to have lost their job or be furloughed during the pandemic (Rodríguez & Ifan, 2020). Low earners often do not have the savings to overcome periods of unemployment and have to resort to borrowing, especially because of the increase in daily expenses because of lockdown measures; while high earners' daily expenses decreased and their savings became higher (Dawid, 2020; Rodríguez & Ifan, 2020). Indeed, it appears that across partner countries COVID-19 has widened the income gap (Darvas, 2020). Many countries have also noted the emergence

of the "new poor": people who are in a vulnerable financial position for the first time as a result of the pandemic (Von der Brelie, 2020). Figures from Italy indicate that young workers are overrepresented in this group (Quaranta et al., 2020).

People living in poverty typically have poorer quality and smaller housing (or are homeless), which means they are more exposed to the virus and are likely to struggle more with stay-at-home orders. Evidence from the UK reveals that living in crowded housing is associated with an 11% increase in age-adjusted COVID-19 mortality rates (Daras et al., 2021). People faced with poverty and social exclusion have also been affected by disruptions to social care and assistance programmes. Across European countries, many social services were put on hold over the course of the pandemic, leaving millions of people without the support they received prior to the COVID-19 crisis (EASPD, 2020). For example, particularly in the first few months of the pandemic Belgian residents living in poverty faced greater difficulties accessing support measures such as food aid, as well as interruption of the care support networks through schools (Dokters van de Wereld, 2020).

3) Vulnerable families with children

Lockdown measures and home schooling are posing challenges to all families with children, but some families are struggling more than others. Across partner countries, single parents or large families were considered to experience disproportionate impacts, particularly those families who also face poverty and social exclusion (e.g. see FPS Social Security, 2020; Prainsack et al., 2020). As schools have closed for prolonged periods in many partner countries, existing educational inequalities are likely to be exacerbated (Markowitz, 2021). Online learning environments usually require a computer for each learner, a reliable internet connection and a suitable calm place to study, which not all families can offer (UNIA, 2020). In Romania, for instance, a study conducted in March-June 2020 revealed that only 3% of Roma children participated in online lessons (Hackl, 2020). Similarly, a research review from Ireland suggests that students from migrant backgrounds, including Irish Traveller students, were likely to be more heavily impacted by the impact of COVID-19 school closures than children from Irish backgrounds (Darmody et al., 2020). This is related to families' resources and skills to assist their child's learning at home, families' time availability (e.g. essential workers are typically able to spend less time on home-schooling), as well as to school closures' impact on students' access to additional support (e.g. literacy support and special needs support) (ibid.).

4) Vulnerability due to homelessness and legal status

Some groups face particular vulnerability and exclusion based on their living situation and/or their legal status. This includes people who are excluded from national health systems and are therefore unable to access health services, such as homeless people, people in illegal residence, and undocumented migrants and refugees (Baeten et al., 2018). In Cyprus, for example, asylum seekers in migrant reception camp Pournara face what have been called "hellish" living conditions, as well as slowed-down application processing brought on by COVID-19 restrictions (Hadjicostis, 2021). International organizations have also raised concerns about how asylum seekers in Greece are being sidelined in the country's vaccination strategy (Carassava, 2021).

5) Vulnerability related to race/ethnicity

Data from countries like the USA and the UK has revealed that individuals belonging to migrant or ethnic minority groups face systematically high levels of severe COVID-19 illness and mortality (Sze et al., 2020). In the UK, COVID-19 death rates have been reported to be highest among Black, Asian and

Minority Ethnic (BAME) persons (Otu et al., 2020). Apart from the UK, European countries do not typically report COVID-19 disaggregated by migrant status or ethnicity (Melchior et al., 2021). However, it is likely that similar trends are present in other COVINFORM partner countries. The increased vulnerability of ethnic minority groups to COVID-19 is related to previously discussed aspects of social vulnerability, including ethnic minorities' increased likelihood to have lower incomes, live in overcrowded households, and to be employed as essential workers (Sze et al., 2020). Indeed, COVID-19 death rates among BAME persons in the UK should be seen in light of pre-pandemic poverty rates being twice as high among BAME communities as among white groups (Weekes-Bernard, 2017), as well as BAME individuals' increased likelihood to reside in crowded multigenerational households and the overrepresentation of BAME individuals in frontline roles such as cleaning, caring and transport driving (Otu et al., 2020). Ethnic minorities are also more frequently affected by the financial consequences of the COVID-19 pandemic as they are overrepresented in sectors severely affected by COVID-19 closures, including accommodation and food, and in lower-paid jobs with insecure employment conditions (McGinnity et al., 2020). Vulnerability related to race/ethnicity is undoubtedly related to structural racism and discrimination operating at individual, community, and organisational levels as well (Devakumar et al., 2020; Szczepura, 2005). In Ireland, for example, there are long-standing concerns about structural discrimination experienced by Travellers and Roma in accessing healthcare (NASC, 2013).

11 Reflection on intersectionality

An intersectional analytical approach allows us to view how experiences of vulnerability and disadvantage are shaped by the interaction of different social factors such as gender, ethnicity, class, age, migration or refugee status and religion. These social factors create "multilayered and routinized forms of domination that often converge" (Crenshaw, 1990, p. 1245). In other words, connected systems and structures of power create interdependent systemic bases of privilege and oppression. In the context of the COVID-19 pandemic, an intersectional lens facilitates a move away from thinking merely about clearly delineated groups or single risk factors, instead considering the multitude of inequalities and disadvantages which determine how the impact of the pandemic is experienced by communities and individuals. As a result of interacting social factors, people often belong to more than one social grouping (Hankivsky, 2020). The COVID-19 pandemic has reinforced and widened pre-existing vulnerabilities and disadvantage relating to, amongst other factors, gender, age, socio-economic status and ethnicity/race and migration. Additionally, the introduction of COVID-19 measures such as home schooling, teleworking and social distancing brought new experiences of vulnerability to the fore. New drivers of vulnerability thus interact with existing axes of inequality to create unique intersectional vulnerabilities during the COVID-19 crisis. It is noteworthy that such intersectional vulnerabilities have emerged across countries in similar ways, despite local variations.

11.1 Living and working realities

COVID-19 measures have mixed up people's everyday lives at home and at work. For instance, since the start of the pandemic, families spend more time at home. According to an EU survey, the work-life balance has been more under pressure for women, particularly those with young children (Ahrendt et al., 2020). In Belgium, a research study on the impact of lockdown measures on the division of responsibilities within Belgian households during the first lockdown in spring 2020 revealed that traditional role divisions had been reinforced (Glorieux & Van Tienoven, 2020). Similarly, in Switzerland, these gendered role divisions led to more stress and mental health complaints for women compared to men (Kuhn et al., 2021). Furthermore, this change may have impacted the quality of family relationships, with both positive and negative effects (De Rose, 2020; Zannella et al., 2020). For instance, this could have a positive impact on parent-child bonds, especially fathers-children, but also have a negative impact for those whose home is not a safe place to be (e.g., domestic violence or abuse), which is disproportionally more the case for women and children, compared to men (e.g. in Romania: Alexandru et al., 2021; Belgium: De Baene, 2020; Italy: De Rose, 2020; Austria: Steinert & Ebert, 2020). For example, in Romania, more children were separated from their families and in need of alternative care during the pandemic. This effect was also entangled with the socio-economic impact of the COVID-19 crisis on the capacity of child care by families (Save the Children, 2020). Women have also been in an especially vulnerable position due to the sacrifice of paid work to compensate for the loss of childcare during lockdowns (Allmendinger, 2020); and domestic violence has increased during those periods, while they experienced greater difficulties in accessing support (Lally, 2020; Rodríguez & Ifan, 2020).

11.2 Digital gaps and generations

There seems to be an emerging 'digital gap' for learning related to the increased reliance on remote learning and home schooling for children. During the pandemic, the impacts of the educational

background and knowledge of caregivers of children, familiarity with the curriculum, children's age, the actual profession (teleworking or working outside the home) of the caregivers, the resources/facilities to compensate for the lack of presence/knowledge or to facilitate home-schooling (e.g., laptops, separate rooms, reliable internet connection) and the educational and migrant background of the families on children's learning progress have become more significant (e.g. Italy: Marchetti & Guiducci, 2020; Belgium: UNIA, 2020). Some countries, like Greece, have attempted to combat inaccessibility to appropriate devices by providing free devices for the use of educational platforms (Politis, 2020). This resulted in overburdened online education platforms that led to users facing difficulties after logging in or participating in an online class without connectivity interruptions (Protothema, 2020). In Romania, the organization Save the Children (2020) has noted that online teaching has exacerbated existing social inequalities, as not everyone had access to online schooling. Especially children from lower socio-economic families were more vulnerable for increased isolation, marginalization and discrimination, with long-term educational and psycho-emotional repercussions. Additionally, online teaching also resulted in an increase in internet addictions, and exposure to aggressive content, misinformation, and online bullying (Salvați Copiii, 2020; Save the Children, 2020). The elderly also face intersectional vulnerability in relation to the digital gap, as they are not only more clinically vulnerable to severe disease and death from COVID-19 (Yanez et al., 2020), but they are also more likely to lack digital skills and/or access to digital technologies, which contributes to their increased risk of isolation and loneliness (Coene et al., 2020). Thus, the digital gap intersects with vulnerabilities related to socioeconomic status and age.

11.3 Occupational structure of society

Existing professional and care structures in society have distinctly gendered characteristics (UNFPA, 2020) which create important intersections between professions and gender. For example, the economic impact of the pandemic has led to a loss of jobs in many women-dominated professions such as hairdressers, flight attendants, and workers in restaurants and shops (Buikema, 2020). In addition, these intersections are often combined with having migrant backgrounds and/or belonging to an ethnic or racial minority in society, as some ethnic/racial minority groups and/or migrant groups are overrepresented in specific professions. For instance, immigrants are overrepresented as taxi drivers in Sweden and are therefore considered more vulnerable in this respect (Keyton, 2020).Occupational vulnerability related to exposure to COVID-19 is also faced by those working in the most precarious 'frontline' healthcare and homecare jobs, occupations in which women of colour and women with fewer years of education are overrepresented (e.g. Belgium: Furia, 2020; Austria: Wölfl, 2020). Indeed, women in the health labour force face intensified health risks during the COVID-19 pandemic as a result of stressful and unhealthy working conditions (Borras, 2020). Yet despite women's positions on the frontlines of the pandemic as nurses and other health care workers, they are underrepresented in policy and governing bodies (Buikema, 2020).

11.4 Family structures

Due to these intersections summed up above related to gender, professions and socio-economic status, specific family structures make some people more vulnerable for the indirect effects of the COVID-19 pandemic than others. For instance, in Flanders (Belgium), single-parent families are particularly vulnerable to poverty, and most of them are headed by mothers (Statistiek Vlaanderen, 2016). In Cyprus and Greece, the number of single-parents living in poverty increased during the

pandemic and became very visible due to the growing number of single-parent cases that have their power supply abruptly terminated by the national energy company (AHK) (Alfavita, 2021).

11.5 Ethnicity, race and migration

Ethnic or racial minority and migrant populations are disproportionately affected by the pandemic in a multitude of ways. The impact of the COVID-19 pandemic goes along discriminatory structures which are entrenched in broader structural inequalities and power structures (Bougrea & De Bouw, 2020), both in direct and indirect ways. Direct disadvantage may relate to worse health outcomes when infected with COVID-19, while indirect advantage may be experienced in terms of the broader societal impact of the pandemic. As previously discussed, a disproportionate impact on Black, Asian and Minority Ethnic (BAME) communities has been observed in the UK (Otu et al., 2020). In Belgium, excess mortality rates were also higher during the first COVID-19 wave for older populations with a migration history, especially men, compared to those without migrant background. This shows the importance to include the intersection between age and migrant background (Vanthomme et al., 2021). The risk of dying from COVID-19 as well as the consequences of the COVID-19 measures and pandemic for these groups is related to socio-economic factors, such as limited opportunities for distance work, more dependence on travelling using public transportation, more people in the same household combined with dense housing. Some scholars have highlighted that migrants often work as first-line practitioners (in health care and LTC) and media reports also suggested the spread of the virus in immigrant populations might be explained by immigrants being exposed to the virus in other professions, such as pizza bakers, taxi, tram- and bus drivers, due to the increased human interactions they have at work (see above). Others argue that cultural differences, language barriers and media use are also important to consider in understanding drivers of vulnerability among ethnic/racial minority groups and/or migrant groups (Esaiasson et al., 2020). COVID-19 has also been associated with an increase in discriminatory experiences. In Belgium, for instance, many people with an Asian appearance or physical characteristics faced racist remarks and aggression at the beginning of the COVID-19 pandemic (Slaats, 2020; Struys, 2020). In Austria, an increased occurrence of discrimination based on religious grounds was also noted (SOS Mitmensch, 2021). Many reports of discrimination also relate to the discriminatory enforcement of lockdown rules, e.g. in the context of stop and search and identity checks as police enforced lockdown measures. In the UK, London police registered a 22% increase in stop and searches between March-April 2020, and the proportion of black people searched increased by nearly a third (Amnesty International, 2020). As many of the government measures have been vaguely defined, considerable room for interpretation of the rules remains, which seems to facilitate ethnic profiling in their enforcement (Clementi, 2020; Van Thienen, 2020).

To conclude, there are several ways in which applying an intersectional lens helps to understand the consequences of the COVID-19 pandemic. The most apparent factors that play a crucial role during this pandemic were gender relations, family composition, age, socio-economic status, race/ethnicity, and migrant background. As social factors interact, people may experience multi-layered forms of disadvantage and vulnerability. As became apparent over the course of the pandemic, it is not straightforward to adequately respond to intersectional vulnerability, given the combination of different axes of vulnerabilities and disadvantage that characterise societal structures and are omnipresent in all aspects of our lives. In many European societies, social welfare states aim to reduce social inequalities and tend to compensate for many of these effects. The specific design of such welfare states, ongoing policies and specific compensation measures for COVID-19 seem to also affect

the outcomes of this pandemic. However, the similarities in intersectional vulnerabilities across all countries demonstrates the lack of intersectional policy approaches. Indeed, policy responses typically assume that subjects only face one type of social difficulty or barrier (Crenshaw, 1989). Intersectional responses to the COVID-19 pandemic could include the sharing and coupling of data, available across sectors, policy levels, organizations and communities, to increase collaboration and support.

12 Reflection on risks perceptions, tipping points, feedback loops and adaptation

12.1 Risk perceptions of policy makers and citizens

Past epidemics such as the 2009 swine flu pandemic and the 2013-2016 Western African Ebola virus epidemic have taught us that in order for policies to successfully slow down the transmission of an infectious disease, the public needs to have an accurate understanding of personal and societal risks posed by the disease (Dryhurst et al., 2020). The COVID-19 crisis has been characterized by fundamental uncertainties about how the pandemic evolves, as well as about the effects of possible interventions (Aven & Bouder, 2020). Across partner countries, authorities and policy makers have therefore had to communicate about and respond to the COVID-19 pandemic in the face of considerable uncertainty about the exact risks. Particularly at the beginning of the pandemic, the aetiology and management of COVID-19 was "associated with unbridled uncertainty" (Koffman et al., 2020). As uncontested facts are elusive, decision-making has often had to be based on flawed, incomplete or inaccurate information (Rutter et al., 2020). In this section, we provide a non-comprehensive analysis of how risk perceptions of policy makers and citizens evolved over the course of the pandemic.

12.1.1 Representations of risk

Risks can be viewed as political constructions, and the governance around threats and danger is not solely about risk itself but the representation of risk (Amoore, 2013). Perceptions of COVID-19 risk are inseparable from how the virus is presented in probabilistic and numeric terms (Brown & Galantino, 2020). For instance, in the case of Belgium, the figures on numbers of COVID-19 cases, hospitalizations, deaths and other relevant data communicated in press conferences by a joint team from FPS Health, the NCCN, and Sciensano (News.Belgium, 2021) have undoubtedly played an important role in shaping the Belgian populations' COVID-19 risk perceptions. Additionally, how information about the virus and the COVID-19 pandemic was communicated by public authorities and policy makers had a huge impact. The style and contents of crisis communication by policy makers and scientists differed across countries, and impacted risk perceptions of the general population. For example, in Italy, at the beginning of the pandemic, much of the communication about COVID-19 related to medical risk in terms of the danger of severe symptoms, mortality, and overburdened intensive-care hospital units and to the need of taking protective behaviours, increasing perceived levels of risk (Caserotti et al., 2021). In Sweden, the main communicator was the chief epidemiologist Anders Tegnell (and not the Swedish Prime Minister) who predominantly used ethos-based rhetoric, emphasizing the PHA's own approach to deal with the pandemic. One consequence of this was that, in Sweden, the communication about COVID-19 was framed more clearly by arguments based on medical – epidemiological – data and reasoning (Bjørkedahl et al., 2021) and scientific knowledge. This framing of all recommendations being based on 'solid scientific proof' became more problematic and controversial as the COVID-19 death toll was rising, and the debate became more polarized (Johansson & Vigsø, 2021).

12.1.2 Change and fluctuation

Risk perceptions changed and fluctuated over the course of the pandemic, due to the existing knowledge and proximity of the pandemic, the changing infection rates and the changing fundamental uncertainties associated with COVID-19. Initially, when the virus had been identified by Chinese

scientists, the disease seemed to be far away, resulting in a low level of awareness and a high level of uncertainty. The perceived risk of SARS-CoV-2 changed drastically (within Italy and across other European countries) since the first domestic contagion in Italy on February the 21st, 2020 (Rubaltelli et al., 2020). This affected policy making and crisis management considerably. For instance, in Austria, policy makers reacted to this with a public discussion on different ideas on how to mitigate this risk: closing borders and isolating the country, health checks at the borders and reducing traffic with affected countries were ideas for measures that were thought to be sufficient. In subsequent phases, risk perceptions about COVID-19 have been intricately related to infection rates. For example, as the likelihood of infection seemed to decrease in early summer 2020 in Belgium, people were less worried about the COVID-19 risk (Motivation barometer, 2021). Furthermore, fundamental uncertainties associated with COVID-19 evolved over the course of the pandemic. One issue of particular concern in the Belgian context has been uncertainty about the risk and the contagiousness of COVID-19 among children (Sciensano, 2020), impacting stricter quarantine rules for primary school children (De Standaard, 2021). Another key area of uncertainty relates to the development of new SARS-CoV-2 variants and how they circulated across countries (De Smet, 2021a).

12.1.3 Broadening concerns

As the number of instruments available to fight the pandemic was growing, and societal factors had to be increasingly considered, the complexity of decision making, public negotiation about measures and mitigation strategies became more challenging and resulted in a more diversified society in terms of individual and societal risk perception. Gradually more attention was paid to socio-economic, environmental and economic factors that increased risks of COVID-19 across the population or had disproportionately large impacts on people's lives. For instance, in Greece and Cyprus, risks were related to the lack of frequent public transport to guarantee distancing measures and the crowded mass in public transport particularly in highly populated cities such as Athens and Thessaloniki, the non-abidance of lockdown measures by a high percentage of the population (Naftemporiki, 2021), parties and demonstrations attended by large numbers of people (Gatopoulos, 2021). The pandemic has also had far-reaching effects on the economies of countries. For instance, in Italy, the Bank of Italy identified trade and tourism as the most at-risk sectors (Banca d'Italia, 2020).

12.1.4 Age-disaggregated risks

Some groups face a much lower personal risk of developing severe symptoms as a result of COVID-19, such as younger age groups. Risk communication about COVID-19 often promotes an age-disaggregated picture of risk, in which younger and older population groups are systematically separated. The elderly are often portrayed as a vulnerable group which should be protected through efforts of intergenerational solidarity (Colle, 2020). In some countries, such as Portugal, this led to the development of solidarity campaigns across age groups. For instance, volunteers supported the distribution of food and medicines, spread advice from public support services, and clarified doubts to the community (Government of Portugal, 2020). As in other countries, some tensions have arisen in Belgium related to this expected solidarity in the context of differential risk faced by different age groups. It has been pointed out that younger generations bear a lot of the negative consequences of the pandemic, as they are typically the first to lose their job and often suffer more from social isolation (UCSIA, 2021). According to some commenters, intergenerational solidarity in Belgium seems to be on the brink of collapse (Colle, 2020; UCSIA, 2021).

12.2 Crucial moments and tipping points

COVID-19 has been described as a complex problem in a complex system that is made up of multiple interacting components (Rutter et al., 2020). A systems approach can integrate analysis of the complex relationships between dynamic components that comprise a system to better anticipate and understand their influence (Cegan et al., 2020). Within complex systems theory, a tipping point signifies a critical point at which dramatic shifts occur in a complex system (Scheffer, 2010). In the context of the COVID-19 crisis, tipping points can be understood to be moments of critical change influencing the course of the pandemic and related decision-making.

12.2.1 Health system capacity

One way to consider the relevance of the concept of a 'tipping point' is in the context of the number of COVID-19 cases a healthcare system can handle. Across countries, a key goal of many COVID-19 response policies has been to prevent a surge in cases that would exceed the capacity of its hospitals and the broader health sector. A 'tipping point' representing a number of coronavirus patients surpassing the maximum capacity is considered a situation that has to be avoided at all costs (Beyne, 2020). For instance, in October 2020, the First Minister of Wales Mark Drakeford used the words 'tipping point' to describe the COVID-19 situation in Wales, in particular the fact that COVID-19 cases and hospitalisations had risen steadily over the past weeks (BBC, 2020). Hence, "flattening the curve" became the key rationale behind many key decisions and policy making during the pandemic (Baert, 2020).

12.2.2 Variants

Another type of tipping point which is relevant to consider is the rise of new mutated SARS-CoV-2 variants. Indeed, the new challenges posed by the mutated virus were described by the World Health Organization's regional director for Europe Hans Kluge in January 2021 as representing "a tipping point in the course of the pandemic", which could lead to increased numbers of infections, hospitalisations, and deaths (Chadwick, 2021). By June 2021, the four main 'variants of concern' (VOC) being monitored are the Alpha variant first identified in England, the Beta variant identified in South Africa, the Gamma variant first identified in Brazil, and the Delta variant first identified in India. Over time, different variants have gained the upper hand, introducing significant uncertainty about their impact on the evolution of the pandemic. In Belgium, for example, the Alpha variant was the dominant variant in mid-June 2021, but the Gamma and Delta variants were increasing in relative prevalence (Sciensano, 2021). Similarly, in Italy, the prevalence of the Alpha variant of the Sars-CoV-2 virus reached 88,1% by mid May 2021, with values ranging between the individual regions between 40% and 100%. For the Gamma variant, the prevalence was 7.3% (ISS, 2021).

12.2.3 Testing and vaccination

Advances in new tools against the disease are also crucial tipping points during the pandemic, specifically vaccines, but also COVID-tests and self-tests. For instance, the roll-out of vaccination campaigns can also be seen as a tipping point in the COVID-19 pandemic. In Ireland, the benefits of vaccinations were contrasted against the high case numbers observed during the third wave in January 2021, which impacted how the maximum capacity of the health services were calculated (Carswell & O'Halloran, 2021). Vaccination campaigns served as tipping points because they were often coupled with the relaxation or changes in COVID-19 measures. This applied for instance to the opening of contact professionals and places where people gather (e.g., hairdressers, libraries, dentist practices,

indoor sporting, restaurants, bars, shops, schools and museums), international and national travelling, the wearing of masks in public spaces, etc. In England, the rationale behind the relaxation strategies changed from epidemiological data to the approval of the use of the Oxford-AstraZeneca vaccine. The latter allowed for mass vaccination programmes and for the periodic easing of public health restrictions and re-opening of the economy (MHRA, 2020).

12.2.4 Country-specific tipping points

While most tipping points were considered in terms of health outcomes, there were also some crucial moments related to the risk perceptions, attitudes and protests towards COVID-19 measures, changing strategies and outcomes. These crucial moments were often country-specific, and became visible in distinct ways. In some countries, a tipping point was related to specific news items or pictures shared by media which brought about a strong public reaction (e.g. Austria); or to the emergence of anti-COVID-19 demonstrations (e.g. Greece: Gatopoulos, 2021; Austria: Wiener Zeitung, 2020), or to change brought about by the establishment of a new government (e.g., Belgium in late September 2020, and Italy in February 2021). In Austria, on the 19th of March 2020, photos of military trucks loaded with body-bagged corpses from deceased COVID-19 patients in Bergamo (Italy) were published by the most important media, and symbolised the collapse of healthcare in northern Italy. This message and image became imperative for people in Austria to isolate themselves with their families and households as best as they could (Kurier, 2020).

Figure 8. Photo of Military trucks loaded with corpses from deceased COVID-19 patients in March 2020, Bergamo, Italy

In Portugal, two crucial moments created considerable criticism: the COVID-19 measures on athletes and public attendance of specific sport events, as well as social gathering during holidays. Especially the lack of consistency and random choice of these events and holidays (e.g., Christmas can be celebrated together, New Year's evening not; only public attendance was allowed during Formula 1) were heavily criticised (Donaldson, 2020). Moreover, in both occasions, the safety and distancing measures were not followed, leading to an increase in COVID-19 numbers. In Sweden, a first important tipping point was when the pandemic was declared as being widely spread in the community (March

11 2020) after which the PHA changed its former strategy related to testing and tracing the spread of the virus. A second tipping point was the passing of the pandemic law, which was passed by the parliament in January 2021, that changed the prerequisites for managing the pandemic and gave the authorities far reaching power to county administrative boards and municipalities to decide on local measures, such as closing down businesses, imposing restrictions on premises and areas rented out for private gatherings, etc (Krisisinformation, 2021). In Spain, one of the tipping points related to a key intervention during the COVID-19 pandemic, and involved the closure of all schools for in-person teaching with exclusive reliance on virtual education, widening existing inequalities. Existing inequalities related to childcare and schooling are reinforced and strengthened as it is more difficult for low-income families to support home education. As a consequence, some parents may encounter difficulties to maintain their jobs, or are forced to take leave or even quit their jobs, or ask grandparents who are particularly vulnerable to COVID-19 to help. For example, the increased reliance on grandparents may have explained both higher COVID-19 incidence and mortality in Spain compared to Sweden (Baral et al., 2021).

12.3 Feedback loops

Feedback loops within a system refer to two-way relationships between actions and consequences (Sahin et al., 2020). In the context of the COVID-19 pandemic, the concept of feedback loops can be used to consider how the spread of the virus and the measures to contain it may reinforce other processes. This section will consider feedback loops relating to the economic impact of the COVID-19 crisis, exacerbated social vulnerabilities, and (mis)information.

12.3.1 Economic impact

From an economic point of view, the COVID-19 pandemic generated a global recession in the first half of 2020 (Anderton et al., 2021). Physical distancing and lockdown measures intended to slow the spread of the virus have had drastic economic impacts, including job losses and heavily reduced economic activity during containment measures. For example, Italy, which in Europe is among the most affected countries in terms of infections and human lives lost, has seen a loss of 8.8% of GDP in 2020 (Berardi et al., 2020). Companies – especially the construction sector – have suspended their activities as they foresee a lack of liquidity to meet the expenses that will arise until the end of 2020, leading to a negative spiral and economic deprivation (Istat, 2020). Another example is Spain, where the pandemic has also had a strong impact on the economy, especially in sectors such as tourism and the hotel and catering industry, despite the implementation of palliative measures such as the Employment Regulation expedients. The constant struggle between keeping cumulative incidence low and saving the economy has been an unprecedented challenge, with significant increases in cumulative incidence after the de-escalation and the Christmas campaign (Reuters, 2021). Also in Belgium, the pandemic hit hardest in the retail, leisure, tourism, catering, transport and events sectors (FOD Economie, 2021). Reduced consumer spending results in less income for those employed in these sectors, potentially precipitating further reductions in spending. Such negative feedback loops can be described as ‘economic contagion’ (Longbrake, 2020).

12.3.2 Exacerbated social vulnerabilities

As previously highlighted, people with a precarious position in the labour market – such as employees with temporary contracts or people doing undeclared work (e.g. cleaning) – are more likely to face negative financial consequences as a result of the COVID-19 crisis (Geldof, 2020a). This, in turn, has

the potential to further contribute to the conditions that allow COVID-19 to spread. As more people are forced into poverty, their deteriorating living conditions may facilitate increased viral transmission, hereby creating a reinforcing feedback loop between economic hardship and the spread of the virus (Murray, 2020; Franzini, 2020). Some groups' pre-existing social vulnerabilities may thus be exacerbated through feedback loops. As discussed in section 10, sex workers in Belgium can be considered an example of a vulnerable group, especially sex workers of foreign origin who cannot rely on the Belgian social welfare system. Under the physical distancing measures imposed in Belgium during the COVID-19 pandemic, sex workers have been prohibited from working and many have been unable to generate an income (FPS Social Security, 2020). This heightens their vulnerability as they may run the risk of being unable to meet their basic needs or even of becoming homeless. Some may feel forced to continue working illegally, hereby exposing themselves to the risk of COVID-19 infection.

12.3.3 Communication and misinformation

A final relevant type of feedback loop relates to communication and misinformation during the COVID-19 crisis. It is well-recognized that the spread of information increasingly happens in an 'unbundled form', in which single news items are shared on social media platforms and sorted by algorithms (Martens et al., 2018). Many argue that his creates so-called 'filter bubbles' or 'echo chambers', in which messages are reinforced through communication within a closed system or community of people (Sadagopan, 2019). Furthermore, it has been reported that misinformation and conspiracy theories have grown in prominence during the COVID-19 crisis (Douglas, 2021; Pummerer et al., 2021). Once people engage with pages or articles spreading misinformation, social media platform's algorithms create a type of feedback loop in which similar outputs are suggested to the user. The uncertainty which characterizes the COVID-19 crisis may make people more susceptible to get entangled in these types of feedback loop, if messages are not effectively challenged and underlying anxieties are not addressed. These issues will be explored in further depth in other COVINFORM outputs, notably within WP7.

12.4 Adaptation

Adaptation refers to adjustments made to better fit a specific environment or circumstances (Tzafestas, 2018). In the case of the COVID-19 pandemic, the concept of adaptation can be used to consider how adaptation processes have occurred in terms of policy, interventions, and behaviour. For example, adaptation in governance and policy-making has evolved over time. This is, for instance, visible in the evolution of the governance of the crisis response over the course of the pandemic. This led to the development of new pandemic laws (e.g., in Sweden and Spain), the granting of special powers to authorities (e.g., Belgium: Pattyn et al., 2020) and the relationship between medical advisory groups, other scientists and politicians (e.g., Lefevere, 2020) and has been influenced by changes in the government (e.g., Italy, Belgium).

In response to public health and government communications and restrictive measures, populations have also gone through adaptation processes in terms of their individual behaviours. This includes hygiene behaviours, such as frequent handwashing, sneezing in the elbow, and avoiding touching the face. During the initial stages of the pandemic many of the behavioural changes were considered to only be necessary for a short period of time. However, as the crisis continued, it became necessary to make these behaviours part of a long-term habits (e.g. Belgium: Crisiscentrum, 2020). People's motivation to follow the guidelines and sustain adaptive behaviours has not remained constant over

time. In Belgium, data from the Motivation Barometer presented in the figure on the next page usefully illustrates how the Belgian populations' motivation has fluctuated over the course of the pandemic.

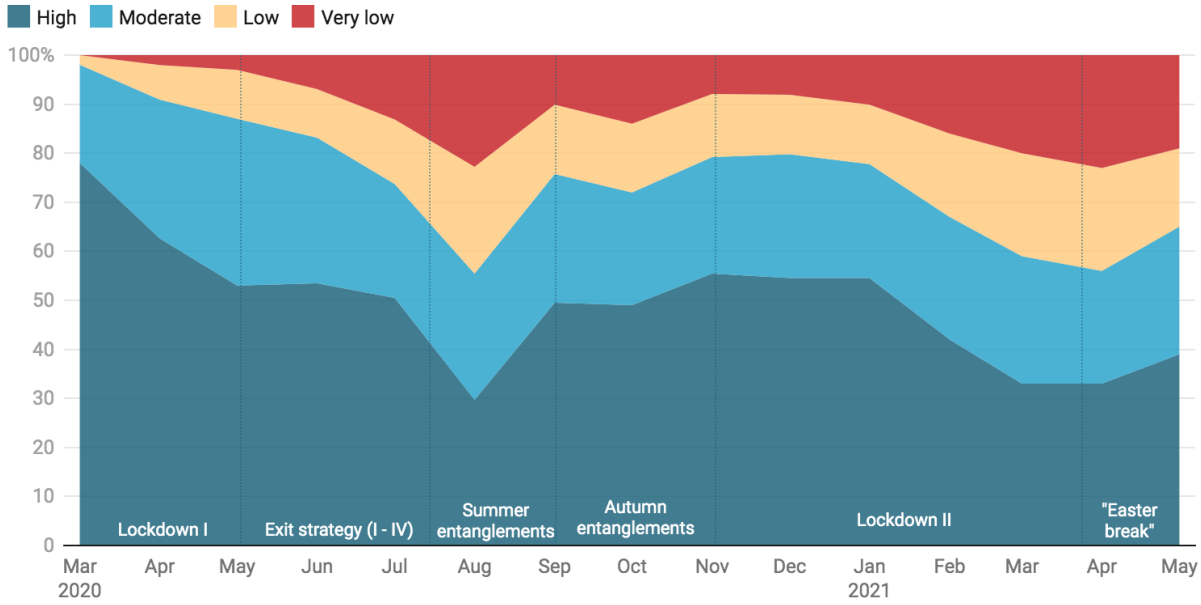

Figure 9. Evolution of respondents' motivation levels, data from the Motivation Barometer Survey. Last update 17-05-2021 (Motivation barometer, 2021)

As shown in other sections, there have been many protests and manifestations against the imposed COVID-19 measures across many countries. The protestors' claims and the incidence of protests have also changed over time. For instance, in Sweden, there have been discussions about "COVID-19 fatigue" from time to time. A final adaptive trend is the accelerated digitisation of societies. This includes teleworking, online education and digital communication with family and friends (De Wulf, 2020).

12.4.1 Communication vulnerability

A final relevant type of vulnerability for the scope of the COVINFORM project relates to groups or individuals who are unable to access, understand and react to communication about the COVID-19 pandemic. Communication-related drivers of vulnerability may relate to individual level-factors (e.g. functional impairments, limited language skills, lack of resources and/or power), social-structural factors (e.g. poor communication infrastructure, norms around information seeking, overly complex information, distrust towards sources of information) as well as situational factors (e.g. exposure to false or contradicting information) (Hansson et al., 2020). 'Top-down' crisis communication strategies employed in the COVID-19 pandemic often failed to sufficiently address these communication-related drivers of vulnerability.

In many countries, organizations working with vulnerable groups in society raised the alarm during the first wave of the pandemic, reporting that information about COVID-19 was often inaccessible to these groups. Reasons for this included people not speaking the national languages, being illiterate, having no access to digital information, or inappropriate style of messaging. In Wales and England, for example, there was a widely circulating critique that government and public health messaging seemed to be catered for a white, healthy, employed, middle class audience that can read and speak English, hereby effectively excluding large groups of people (BPS, 2020). After backlash and as the pandemic unfolded, efforts were made across countries to try to improve the flow of information to all citizens.

In Ireland, for example, local authorities coordinated with representatives from migrant communities to help distribute information about COVID-19 to these groups (IPA, 2020). There are also specific health workers that liaise with both the Traveller and Roma communities in Ireland, and an information phone line was established for these groups (HSE, 2021a). Across partner countries, COVID-19 guidelines were translated and visual representations of public health messages were created in efforts to provide more accessible information (e.g. see Swiss poster with pictograms in Figure 10). Strategies to address communication vulnerabilities also frequently include the development of specific formats for people who have an audiovisual or hearing disability (e.g. see Task Force Kwetsbare Groepen, 2020b).

Figure 10. Swiss COVID-19 poster (English translation) with pictograms, May 2021 (FOPH, 2021)

The spread of misleading or false information is also important to consider in the context of the COVID-19 pandemic. Indeed, as COVID-19 spread across the world in early 2020, the World Health Organization (WHO) noted the parallel outbreak of an 'infodemic': an overwhelming amount of information in both physical and digital environments, among which there may be false or misleading information (Zarocostas, 2020). If people are exposed to false or misleading information in crisis situations, this may put them at increased risk of harm (Hansson et al., 2020). The spread of misinformation has been an issue in the context of the COVID-19 pandemic across partner countries. Social media is typically considered to play a key role in this: for example, an Austrian study has shown that people relying on social media platforms for information were typically less informed about the pandemic and more likely to spread misinformation (CSHI, 2020). A survey on perceptions of disinformation, media coverage and government policy related to COVID-19 in Belgium, Germany, France, Switzerland, UK and US between April-May 2020 found that individual characteristics which make people more likely to engage with disinformation have been reported to include high age, lower

education, male gender, low satisfaction with democracy and right-wing political orientation (Morosoli et al., 2020). Analysis of the ways in which partner countries have responded to the misinformation and attempted to address the needs of the 'infodemically vulnerable' – a small but growing proportion of the population who make limited use of news about the pandemic and do not trust the news media (Nielsen et al., 2020) – will be provided in future outputs of the COVINFORM project.

13 Conclusions

In this report, we have analysed various dimensions of public health responses to the COVID-19 pandemic across COVINFORM partner countries. A brief comparative analysis of countries' national health system highlighted divergent structural trends which influence countries' health system capacity to respond the COVID-19 crisis. An overview of epidemiological outcomes and the temporal evolution of the pandemic demonstrated how both the spread of the virus and the responses to counter it have been uneven and diverse.

Processes of governance, decision-making and consultation in the COVID-19 response differed across countries. Despite some notable similarities, e.g. relating to promoting national-level coordination to fast-track decision-making, there have also been significant differences in the roles and responsibilities of various governmental and non-governmental actors, as well as in the degree of autonomy in decision-making at the regional/local level. To understand the impact of legal factors on the COVID-19 pandemic, we analysed legal issues and considerations underlying the implementation of restrictive measures and disease surveillance responses across partner countries. A focus on contested issues and controversies highlighted how the COVID-19 pandemic has fuelled discussions about the proportionality of limiting citizens' rights in crisis situations. The impact of data collection factors was analysed by considering the necessity for ongoing systematic collection, analysis and interpretation of data to guide the planning and implementation of public health measures and interventions, and an analysis of challenges related to underreporting, temporal delays, and data disaggregation in the COVID-19 pandemic.

Differential impact of the COVID-19 pandemic across and within countries was also considered in relation to demographic and social network factors. Relevant factors shaping epidemiological outcomes and public health responses include the share of a population aged over 65; population density; types of care systems for the elderly; the percentage of people living in multi-generational households; religious attendance, and the proportion of people who have frequent social meetings with friends, relatives or colleagues.

Key similarities and divergences in public health information and communication strategies were analysed in terms of the division of responsibilities in communication strategies; the mix of different communication strategies and channels that have been used; the use of specific communication campaigns; communication about vaccination strategies; and communication strategies to reach vulnerable groups. Although countries have typically used a mix of a range of different communication strategies and channels to maximize coverage, it is clear that many people have been effectively excluded from 'official' communication strategies.

The impact of the COVID-19 pandemic on health care workers was analysed by considering the way their working realities were transformed, their risk of infection, mental health implications, and the public perception of health workers in society. A broader discussion of differential vulnerability highlighted the relevance of diverse drivers of vulnerability in the COVID-19 pandemic. Vulnerability can be linked to physical health status, including people who are considered at higher risk of falling seriously ill or dying from COVID-19, as well as people particularly vulnerable to COVID-19 related disruptions to the health system. Social vulnerability is linked to a wide range of societal inequities, including relating to occupation; material and social deprivation; family situation; legal status; and race/ethnicity. Vulnerability may also result from communication-related factors, as some people

are unable to access, understand and react to communication about the COVID-19 pandemic as a result of numerous intersecting socio-structural, individual-level and situational factors.

Public health impact and response in the context of the COVID-19 pandemic can be usefully examined using different theoretical lenses. Intersectionality theory highlights how the COVID-19 pandemic has reinforced and widened pre-existing vulnerabilities and disadvantage relating to gender, age, socio-economic status and ethnicity/race and migration. Additionally, the introduction of COVID-19 measures such as home schooling, teleworking and social distancing brought new experiences of vulnerability to the fore. A link to complex systems theory highlights how a 'complex problem' like the COVID-19 pandemic can only be understood by holistically considering the complex interlinkages between various system components. As such, insights related to COVID-19 public health impact and response cannot be understood in isolation from issues of governance, crisis communication practices, economic impact, and social inequalities.

13.1 Regional and local decision-making

Most countries are unitary states, whose central governments are ultimately responsible for designing and issuing the main COVID-19 related measures and restrictions. However, regional and local authorities typically have some power to enact (stricter) measures at the regional and local level. In some countries, this regional and/or local autonomy is more significant than in others. In Italy, for example, the public health response to COVID-19 should be considered in light of Italy's highly decentralized health system. As regionally-based health authorities are normally responsible for the organization and delivery of health care services, Italy has been described as having 21 different healthcare systems (De Belvis et al., 2021). During the COVID-19 pandemic, the Italian regions set up crisis management units with regional health authorities, directors of local health agencies and municipalities (Romagnani et al., 2020; Torri et al., 2020). The Ministry of Health and the COVID-19 Scientific Committee (CTS) identified specific guidelines and standards that the regions were expected to respect. However, there have been differences in the way regions implemented the Ministry of Health and CTS recommendations (Meschi et al., 2020; Mugnai & Bilato, 2020; Pecoraro et al., 2021; Romagnani et al., 2020). These differences were due to the incidence of the epidemic clusters, organization of the integrated home assistance and primary care network, and the number of beds in ICU and resources (Berardi et al., 2020; Pecoraro et al., 2021).

Significant levels of self-governance at the regional level can also be observed in the three European Union member states that are federal states: Austria, Belgium and Germany. In Belgium, for example, the Flemish, French and German-speaking communities each have their own community Ministries of Health as well as specific, sometimes overlapping regional responsibilities (Flanders, Brussels-Capital and Wallonia). Education, culture and care for the elderly are also the responsibilities of the federated community entities, which means the communities are in charge of developing protocols to regulate access to schools, theatres and sports activities as well (Reybrouck, 2020). Yet even in unitary states such as Sweden, local administrations have played a key role in managing the COVID-19 crisis. One of the central principles of the Swedish COVID-19 crisis response has been that of proximity: the idea that a crisis should be managed by those who are closest to those affected. In line with this, regional chief epidemiologists and regional "care hygiene" experts supported Swedish health care organizations on regional and local levels (Brorström et al., 2020).

13.2 Collaboration and coordination issues

In some countries, the division of responsibilities in the coordination of the COVID-19 response was not always clear and has been subjected to critique. In Ireland, for example, the NPHET was set up to act in an

advisory role to the government. However, a report published by the Irish Human Rights and Equality Commission (IHREC) in February 2021 suggests that NPHET has played three different roles at different times or in respect of different issues: de facto decisionmaker, collaborator, and advisor (Casey et al., 2021). In several instances, the NPHET and the Irish government disagreed but eventually reached a form of amicable consensus through persuasion or discussion. In other cases, however, the Irish government declined to follow NPHET advice, such as when the Government refrained from placing the country on Level 5 lockdown as recommended by the NPHET in October 2020 (Hosford, 2020). In Belgium, the division of responsibilities at federal, regional and local level has sometimes led to confusion and inefficiency in the COVID-19 response. For example, when (federally financed) home nurses offered to help out their colleagues working in regional Flemish residential care centres during the first wave of the pandemic, their proposal stranded in a bureaucratic discussion about who would have to pay them (Merckx & Delespaul, 2020). Similarly, in March 2020 Flemish home nurses contacted the Flemish government because they desperately needed personal protective equipment (PPE), and it took over 24 hours to figure out that only the federal government could provide this, not the Flemish government (ibid.).

13.3 Elections and minority governments

Governance issues relating to elections or minority governments also impacted the management of the COVID-19 crisis in some national contexts. For example, slow decision making in Belgium during the first few months of the pandemic can be partially attributed to the lack of an established federal government at the time. During the first six months of the COVID-19 crisis, the country was led by an interim 'caretaker' administration. During these months, political parties were thus still discussing potential governmental compositions, which affected decision making. Nearly 16 months after the federal elections had taken place, Belgian political leaders broke the deadlock on forming a new government on the 30th of September 2020 (Brzozowski, 2020). Similarly, in Ireland there had been an inconclusive election three weeks prior to the first confirmed COVID-19 case. An interim government was therefore in power and in charge of handling the pandemic until the new government took up office on the 27th of June 2020 (MerrionStreet.ie, 2020). In Romania, Ludovic Orban returned to office in mid-March with a minority government, which received broad parliamentary support at least in part because of the outbreak of Covid-19 in Romania that month (Gherghina, 2020). Local and parliament elections were held in Romania in September and December 2020, with record low turn-out amid eruptions in COVID-19 cases (Gascón Barberá, 2020; Rosca, 2020).

13.4 Governance style and risk cultures

Cultural characteristics also undoubtedly impact the governance style adopted by authorities across countries in response to the pandemic. For example, Sweden has been described to belong to a "state-oriented risk culture" where responsibility for crisis management is to a large extent ascribed to authorities, instead of to individuals (Cornia et al., 2016). In line with this, Swedes typically have a high level of trust in public authorities, which played an important role for the choice of crisis management strategy. Using "nudges"' rather than prohibition, i.e. behavioural recommendations rather than legal restrictions, was considered a more effective and, most importantly, a more sustainable way to manage the pandemic (Johansson & Vigsø, 2021). In other countries, lockdowns and restrictions on mobility were much more prohibitive, e.g. in Italy, Greece and Spain (BBC, 2021).

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