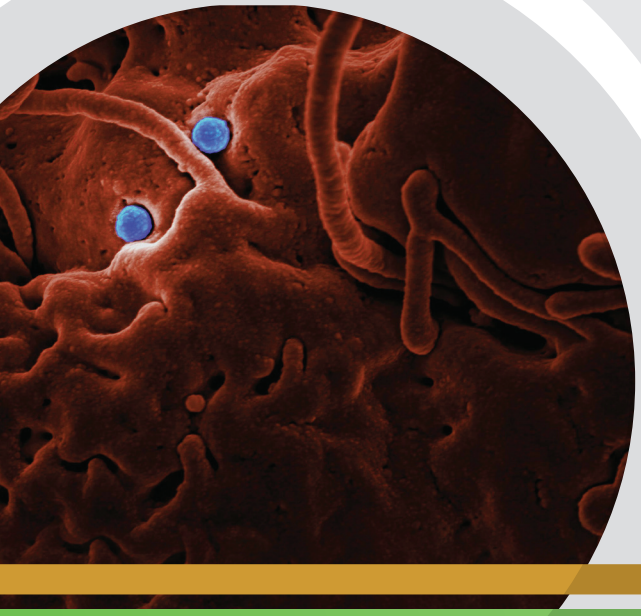

TECHNICAL REPORT

# Preparedness planning for respiratory viruses in EU Member States

Three case studies on MERS preparedness in the EU

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**ECDC** TECHNICAL REPORT

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This report was commissioned by the European Centre for Disease Prevention and Control (ECDC), coordinated by Svetla Tsolova, and produced by John Kinsman (Umeå University).

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*Author*
John Kinsman (Umeå University)

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Umeå University: Maria Furberg, Paola Mosquera, Laura Otero, John Angrén

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# Abbreviations

| | |
|---|---|
| MERS | Middle East respiratory syndrome |
| MERS-CoV | Middle East respiratory syndrome coronavirus |
| SARS | Severe acute respiratory syndrome |
| MH | Ministry of Health |
| EU | European Union |
| WHO | World Health Organization |
| IHR | International Health Regulations |
| GP | General practitioner |
| SOP | Standard operating procedure |

# Introduction

Decision No 1082/2013/EU of the European Parliament and of the Council of 22 October 2013 on serious cross-border threats to health highlights the critical links that exist between different sectors of society, as well as between countries, and that need to function properly in the event of a public health emergency. For example, transport, communication and civil protection all rely, in a crisis situation, on a well-prepared public health system, which in turn is dependent on the good functioning of those other sectors. Likewise, the capacity of different countries to work effectively together is an essential component of a well-coordinated international public health response. This multi-sectorial and cross-border approach to pandemic preparedness is a relatively new policy area, however, and some uncertainties remain about what precisely it involves. While people in the health sector are very familiar with pandemic planning, the intersectoral and cross-border planning issues are not widely understood.

As part of the process of increasing intersectoral and cross-border preparedness for serious cross-border public health threats, the European Centre for Disease Prevention and Control (ECDC) has initiated a case study project to investigate the emergency preparedness status of the health and other sectors in EU Member States, with a particular focus on the determinants of cross-border and intersectoral interoperability[1].

The work has focused on preparedness[2] for a respiratory viral pandemic, with the Middle East respiratory syndrome (MERS) given as the specific disease of concern. Middle East respiratory syndrome coronavirus (MERS-CoV) was first identified in Saudi Arabia in 2012. As of 13 January 2015, 972 laboratory-confirmed cases and 394 deaths have been reported to the public health authorities worldwide [1].

Three EU Member States participated in this case study – the United Kingdom (with a primary focus on England)[3], Greece, and Spain. Greece and England have both had imported cases of MERS-CoV, with one case and four cases, respectively.

This summary report describes the methodological approach applied in the case study, as well as a series of cross-cutting findings that may also be of relevance to other EU Member States. Finally, some steps forward are suggested that could assist in implementation of EU Decision 1082/2013/EU. Chapter 5 presents an analysis of the strengths, risks, and vulnerabilities in preparedness capacities that were identified during interviews with expert key informants in each of the three countries.

[1] We define interoperability as the ability to make systems work together, including with regard to the exchange and use of information. In the context of respiratory virus pandemics, we are concerned with the capacity of all sectors that provide essential services in affected countries to work together effectively to prepare for, and counter, public health threats. Interoperability therefore has an inherent inter-sectorial and cross-border component.

[2] EU action in the field of preparedness planning for serious cross-border health threats aims at strengthening capacities to respond rapidly to any kind of emergency affecting or likely to affect public health [http://ec.europa.eu/health/preparedness_response/preparedness/index_en.htm]. These range from pandemic influenza, SARS, other events caused by biological or unknown agents, accidents caused by chemical agents, natural events of environmental origin such as climate change, or deliberate acts. The term 'preparedness' in this document refers specifically and only to pandemic preparedness.

[3] In this report, we only refer to 'England'.

# 1 Methodological approach

This study used a qualitative case study methodology [2], which included (i) a documentary review, and (ii) a series of standardised, open-ended, semi-structured interviews in each of the three countries. The work was performed by a team from the PrEPArE consortium (Public Health Emergency Preparedness Activities for Europe)[4] at Umeå University in Sweden, which has been contracted by ECDC for this case study project.

The documentary review was based on materials provided by ECDC's National Focal Point (NFP) for preparedness in each participating country, and was conducted prior to the country visits at which the interviews were held. The documents included: (i) policies that may be related to EU Decision 1082/2013 on serious cross-border public health threats; (ii) standard operating procedures, existing contingency plans and structures, and/or guidelines in the event of a pandemic respiratory disease threat; (iii) risk assessment protocols; and (iv) documented lessons learned from events connected to actual cases of MERS-CoV or other zoonotic disease outbreaks, or from any simulation or training exercises on these diseases that may have been held.

Visits were made to the three countries to conduct field work on the following dates: England: 15–19 September 2014; Greece: 22–26 September 2014; Spain: 29 September–3 October 2014.

Senior experts representing 13 different categories of professionals involved in public health emergency planning, from both the health and non-health sectors, were identified and contacted for interviews in each of the three countries. The categories of informants were:

- Health sector: ambulance services; department/ministry of health; national infectious disease centre; infectious disease doctor with experience of zoonotic diseases; medical association; ministry of health/health communicator
- Non-health sector: ministry of agriculture/veterinary/animal health; health journalist; government cabinet office/civil protection; border control; ministry of foreign affairs; ministry of transport; aviation company

A standardised approach was taken in each of the three countries, including preparatory work, country visits, and analysis of obtained information. Altogether, we conducted 33 interviews in the three countries (Table 1). The interview questions were discussed and agreed with the ECDC National Focal Points for Preparedness, and sent to the informants before we met with them.

**Table 1. The numbers of interviews planned and conducted in each country**

| | Interviews planned | Interviews conducted |
|---|---|---|
| England | 12 | 10 |
| Greece | 13 | 11 |
| Spain | 13 | 12 |

Data collected during the interviews were analysed within four broad topic areas, two of which were concerned with health sector preparedness (pre-hospital and hospital stages), with the other two focusing on intersectoral and cross-border preparedness measures. We also sought to identify issues that were specific to the four WHO-defined pandemic phases: the inter-pandemic phase; the alert phase; the pandemic phase; and the transition phase [3]. Draft country reports were sent for review to the ECDC National Focal Points for Preparedness in the three countries.

One important limitation in the case study field work was time. With just one week spent in each country, we cannot claim to have produced an objective representation that provides complete empirical coverage. Instead, we have produced a broad-brush picture of what we consider to be some of the main strengths and vulnerabilities in the three countries' preparedness capabilities. We believe that the broad consistency of the findings across the three countries indicates that the findings and conclusions are reliable, and that they can be acted upon with confidence.

It is also important to note that our focus in the data collection was primarily on the national perspective, and as such as we did not conduct interviews with international institutions such as the European Commission, WHO, or ECDC. This may have implications for the interpretation of the data.

Although this was a case study about respiratory viruses, and MERS-CoV in particular, there was inevitably a discussion in all three countries about the major public health issue of the moment: Ebola. While Ebola is of course

[4] The PrEPArE consortium includes the Epidemiology and Global Health Unit; the European CBRNE Center; the Department of Clinical Microbiology; and the Centre for Research and Development in Disaster Medicine.

a completely different sort of disease – in terms of transmission, clinical manifestation, and epidemiology – we were pleased to take the opportunity to discuss it in the depth that some of our informants wanted to, as it allowed us to examine pandemic preparedness from a broader perspective, and to gain insights on that basis. We also found that our informants wanted to talk about previous influenza outbreaks (such as A(H5N1) in 2005; and A(H1N1) in 2009), and SARS (2003), as these provided a concrete frame of reference for the discussions. Thus, discussion of these other diseases complements our analysis of the main focus of this report, MERS-CoV.

# 2 MERS-CoV epidemiology and impact

With 394 deaths among the 972 laboratory-confirmed cases to date, MERS-CoV has a high case fatality rate: 40%. Most of the cases have occurred in the Middle East (primarily Saudi Arabia and the United Arab Emirates), but there have also been 14 imported cases into Europe, and seven deaths, with eight European countries affected (see Table 2).

**Table 2. Countries in Europe affected by MERS-CoV, as of 13 January 2015**

| Reporting country | Cases | Deaths | Date of onset/reporting for most recent cases |
|---|---|---|---|
| Turkey | 1 | 1 | 25 September 2014 |
| Austria | 1 | 0 | 24 September 2014 |
| United Kingdom | 4 | 3 | 6 February 2013 |
| Germany | 2 | 1 | 8 March 2013 |
| France | 2 | 1 | 8 May 2013 |
| Italy | 1 | 0 | 27 May 2013 |
| Greece | 1 | 1 | 18 April 2014 |
| The Netherlands | 2 | 0 | 5 May 2014 |

*Source: European Centre for Disease Prevention and Control [1]*

Camels appear to play a key role in transmitting the virus to human beings, and there are also indications that bats may serve as a reservoir. Human-to-human transmission can take place occasionally, most probably via respiratory droplets, although sustained chains of human-to-human infection have not yet occurred [4]. Contact and fomite transmission also might be possible routes of transmission. Importation of MERS-CoV cases into the European Union continues to be a possibility, but the risk of sustained human-to-human transmission remains very low in Europe [1]. However, as MERS-CoV is occurring in a region with major global transport hubs, it is imperative to better understand and assess the risks for other countries [5].

One ongoing area of concern is the Muslim Hajj and Umrah pilgrimages to Mecca in Saudi Arabia, since they offer the possibility for people from all over the world to become infected during their pilgrimage and then return home where they may fall sick, with the disease possibly remaining unrecognised, thereby potentially facilitating its further spread. In 2013, intensive surveillance during the Hajj did not detect any cases of MERS-CoV among pilgrims; but in 2014, several MERS-CoV cases in returning Umrah pilgrims were identified in countries outside of Saudi Arabia. There were no reported cases of MERS-CoV among returning pilgrimages from the 2014 Hajj, which took place in October [6].

Within Saudi Arabia, MERS-CoV had political implications, e.g. the dismissal of the Health Minister in April 2014, while the country's healthcare system has had to pay a 'significant cost… in terms of personnel and time required for contact tracing and means of implementing infection control and prevention measures in health care settings' [7].

Where there is a recognised health threat, key stake holders need to ensure that the health and other relevant public sectors are prepared to respond. The WHO IHR Emergency Committee stated in October 2014 that countries should 'continue to strengthen infection prevention control practices and build capacity of health-care workers; improve awareness about MERS-CoV among pilgrims going for Hajj, and conduct surveillance for MERS-CoV among pilgrims during and after Hajj'. Collaboration between laboratories and reinforced epidemiological surveillance was also identified as an important activity that must be maintained [8].

# 3 Findings on preparedness capacity for a respiratory virus pandemic in three EU Member States

This section provides a brief synthesis and summary of the main findings from the three countries that participated in this case study. As indicated above, MERS-CoV was taken as the point of departure for our investigations, but discussions often covered other pandemic situations, such as influenza. Thus the summary points can also be seen as relevant for generic pandemic preparedness.

The points presented here relate, in one way or another, to different aspects of EU Decision 1082/2013, and they are categorised into five broad groups, as follows:

## 3.1. Pandemic preparedness planning

- Key stakeholders perceive the level of pandemic preparedness to be adequate to cope with a viral respiratory health threat, such as MERS-CoV.
- Knowledge and experience on health threats has accumulated over the last 10 years or so, due to public health events such as SARS, the A(H1N1) pandemic, MERS-CoV, and Ebola.
- Pandemic preparedness plans exist, although in some of the countries these have not been updated for over five years.
- The WHO pandemic phases are embedded in the preparedness plans. The emphasis on different phases differs from country to country, and some phases may not be equally covered in the planning documentation.
- Systems for enhancing healthcare capacities in the event of a pandemic are foreseen in the plans or in strategic documents (e.g. approaching the private healthcare sector to use its capacity).

## 3.2. Organisational structures

- Public health structures are complemented by crisis management systems to act in the event of a serious threat to public health.
- Trusted expert organisations are in place, and these create confidence in the system (e.g. KEELPNO in Greece, PHE in England, SICAS in Spain).
- Networks of laboratories, surveillance units, and health facilities exist, and these collaborate nationally and cross-border.

## 3.3. Resources and capacities

- All three countries have a cadre of highly motivated experts. Even in settings where salaries have been severely cut (as a result of the financial crisis and subsequent austerity measures), people continue to perform at a very high level.
- Personal networks and contacts were widely considered as beneficial for promoting a timely and effective response to public health threats. These networks (including, in many cases, outside the health sector), are seen as key to the effectiveness of process and practice in pandemic preparedness.
- The financial crisis that has affected many European countries since 2009 has had a serious, adverse effect on pandemic preparedness measures in some countries. Nevertheless, emergency funding for public health crises is invariably provided due to increased political and social pressure.
- Even though they are time-consuming and resource intensive, simulation exercises are recognised as an important element of the planning process for preparedness, and as a means of strengthening knowledge and building capabilities. Financial constraints have reduced the number of exercises in recent years.
- The operationalisation of national preparedness plans is an important discussion point, with challenges identified in the implementation of national policy at local level. These challenges could arise as a result of a relative lack of resources, or because of particular political structures that are in place.

- Functioning of laboratory and surveillance networks has been maintained and upgraded to include new developments, and to incorporate lessons learned from previous public health events.
- Consistent health communication messages delivered by a trusted authority are recognised as a critical component of any pandemic response. Extra efforts to communicate with migrant, hard-to-reach, and non-native-speaking populations could reap substantial benefits.
- Ambulance services have a critical function as first responders in a pandemic situation. Among the challenges they could face would be ensuring the continuation of full services, and the effective implementation of safety protocols.
- Comprehensive evaluations of countries' responses to recent public health emergencies are seen as an essential element of pandemic preparedness planning, by feeding back into protocols, but such evaluations are not always conducted.
- Tracing the contacts of travellers who fall sick with a serious infectious disease is a complex activity and remains a public health challenge due to information availability, data protection legal issues, timing, and aspects of international travel regulations and rules.
- Innovations that promote efficiency and save time have been introduced in countries' pandemic preparedness and response strategies, some of which have been applied in simulation exercises or actual public health events.

## 3.4. Intersectoral connections and interoperability

- Collaboration between the human and animal health sectors has a long tradition, with well-established protocols, memoranda of understanding, and mutual participation of common working groups and committees. One specific area of proven systems interoperability is work related to avian influenza preparedness, reporting and response.
- Preparedness plans for non-health sectors such as civil protection and border control are operational, but they may not currently be interoperable with health sector preparedness plans.
- Sectors that have a significant financial stake in controlling infectious diseases – such as tourism, agriculture, and air travel – are more likely to invest in strong protocols for pandemic preparedness and response than other sectors.

## 3.5. Cross-border collaboration

- Collaboration for pandemic preparedness with neighbouring states is ongoing in different ways and to different extents for all countries in this case study. One of the major factors influencing the nature of the collaborations is whether or not the neighbours are EU Member States.
- Participation in European and other international disease surveillance networks and associated research projects is recognised as playing an important role in maintaining high levels of preparedness.
- Simulation exercises involving other EU Member States and non-EU neighbouring countries are crucial for identifying weaknesses in preparedness systems, and for creating the basis for strong, cross-border professional networks that could prove invaluable in tackling a pandemic situation. Financial constraints have reduced the number of such exercises in recent years.

# 4 Looking ahead: five suggested steps

The suggestions given in this section arose in one form or another during our interviews, and as such they represent the thoughts of in-country experts. They are presented here as a possible basis for steps that could be taken, in various arenas, as a means of strengthening the implementation of EU Decision 1082/2013.

## 4.1. Sustaining public health preparedness capacity

- Staff capacities and institutional memories, including lessons learned from recent public health emergencies, as well as exemplary preparedness legacies (Olympic Games preparations or simulation exercises) need to be retained.
- Resources, both human and financial, are vital for the proper functioning of the public health system, especially during crises. Most of the major challenges in pandemic preparedness were the result of financial pressures on public budgets, which reduce the opportunities for conducting preparedness exercises and training, for recruiting and retaining high-quality staff, and for ensuring that lessons learned are incorporated into protocols. Securing sustainable funding for preparedness, based on risk assessment and risk ranking, should be considered as an important driver for a well-functioning public health system.
- Simulation exercises (local, national, or at EU or international level) have been of great importance for capacity building. In countries affected by the financial crisis, the national authorities cannot easily afford to organise such exercises alone. Executing table-top public health preparedness exercises could support efforts to ensure sustainability of capacities, and could be organised by national authorities, complemented by input from international organisations.
- Evaluations of exercises and responses to recent public health events need to be conducted as a core component of the planning cycle, with lessons learned from all relevant sectors being systematically recorded to allow policies and practice to be amended as appropriate.

## 4.2. Assessing implementation challenges at the local level

The relationship between the national and local levels is critical for ensuring continuity between policy and implementation. Local level preparedness may be affected by specific contexts, such as historical and legal background, the organisational structure of the public health system, availability of resources, governance issues, and community participation. It would be important to understand local level actors' perceptions of the challenges that they face in pandemic preparedness, whether to allay any possible concerns of the national authorities, or in order to identify means by which they could be supported in their planning and implementation efforts.

## 4.3. Strengthening intersectoral collaboration in public health emergency preparedness

Written plans may be in place in all relevant sectors; however, interoperability of these plans needs to be ensured. While coordination between the health and animal health sectors is excellent, with reciprocal exchanges on technical working groups and reportedly good personal relations between the personnel involved, similar relations may not be so prominent between health and some other non-health sectors. Within the context of EU Decision 1082/2013, the development of good intersectoral coordination and collaboration in pandemic preparedness is a priority. Preparedness in other sectors, such as border control, could be addressed, for example by engaging with relevant senior officials, and seeking to enhance their recognition of pandemic preparedness as a project of vital national interest. Intersectoral simulation exercises at national and EU level may help enhance the interoperability of preparedness plans of the different sectors, such as civil protection, transport, etc.

## 4.4. Strengthening health communication

Health-promoting information about infectious diseases, translated into languages used by migrants and other hard-to-reach minority populations, could increase these groups' understanding of important public health measures. Consistent messages disseminated by a trusted authority are needed during a pandemic. It is therefore important to coordinate and standardise the core messages given out by the different authorities. The recipients' perceptions and the impact of the messages could also be evaluated to facilitate effective fine-tuning and maximise impact. This point specifically aims to support paragraph 22 of EU Decision 1082/2013, which is concerned with strengthening health communication.

## 4.5. Cross-border collaboration

Simulation exercises involving other EU Member States and non-EU neighbouring countries are crucial for identifying weaknesses in preparedness systems, and for creating the basis for strong, cross-border professional networks that could prove invaluable in tackling a pandemic situation. Such exercises are expensive, however, and are currently beyond the reach of some countries that have been badly affected by the financial crisis. EU support for multi-country simulation exercises, possibly also including non-EU countries, could prove to be a good investment.

A legal basis for enhanced collaboration and for exchanging and gaining experiences via exercises could be found in Article 4 of the EU Decision 1082/2013 on cross-border threats to health.

# 5 Pandemic preparedness capacity in England, Greece, and Spain

This section presents the public health institutional contexts of the three countries which participated in this case study, with a focus on how these institutional contexts are designed to address a respiratory virus pandemic such as MERS-CoV. An analysis of good practices and vulnerabilities is also provided. Please note that the preparedness plans we discussed with our informants were, for the most part, strategic, or generic. Operational or 'tactical' plans do exist, but for security reasons these tend to remain confidential, and we did not have access to them.

EU Decision 1082/2013 focuses on intersectoral and cross-border issues for pandemic preparedness, but in order to provide the broader context, the discussion also includes the health sector. Similarly, while the primary focus of this case study has been MERS-CoV, many informants naturally included other diseases with pandemic potential in their responses to our questions, such as influenza, SARS, and Ebola. These other diseases and the issues surrounding them are therefore also included here.

## 5.1 England

### Public health institutional context

England is governed through a centralised parliamentary system[5]. Central government raises taxes and is responsible for the main functions of the state, but many elements of the administration of these functions are decentralised.

The Department of Health (DoH) is the central government body responsible for policy regarding the National Health Service (NHS), public health, and adult social care. The healthcare system has undergone major changes in the last few years. Public Health England (PHE) is the new national public health agency whose primary role is to protect and improve health and wellbeing and to reduce health inequalities. One key function of PHE is to protect the public from infectious diseases and other public health hazards. The threat from pandemic influenza remains a top national risk, and PHE has a critical role in this area, working with its local and national partners to prepare and respond to a possible pandemic.

The English system for crisis management is centralised, but it has been designed for the command authority to move rapidly between local responders and central government. Emergency response is based on the principle of subsidiarity (i.e. local response). In a national disaster or when emergency powers are invoked, the Prime Minister can step in and take charge. Response organisations are divided into two categories as outlined in the Civil Contingencies Act: they include the first responders (police, fire brigade, ambulance service, and others such as Public Health England); and a second category which provides support to the response. First responders conduct a rapid assessment and report to a central control room, which alerts other emergency services as necessary, which then activate their own emergency plans. The local authority emergency/crisis management centre coordinates local authority activities. In emergencies with a relatively slow onset such as pandemic influenza, the response will most likely be led from the top, from national to local level.

In each disaster there should be one lead government department, which is responsible for an initial situation analysis, ensures that relevant ministers are briefed, and carries out media relations. The Department of Health is the responsible lead government department for infectious diseases, mass casualty events and health services. If the crisis/emergency is bigger than a single department can handle, then the Prime Minister or a Secretary of State will lead the response in cooperation with COBRA (the Cabinet Office Briefing Room) and the Civil Contingencies Committee.

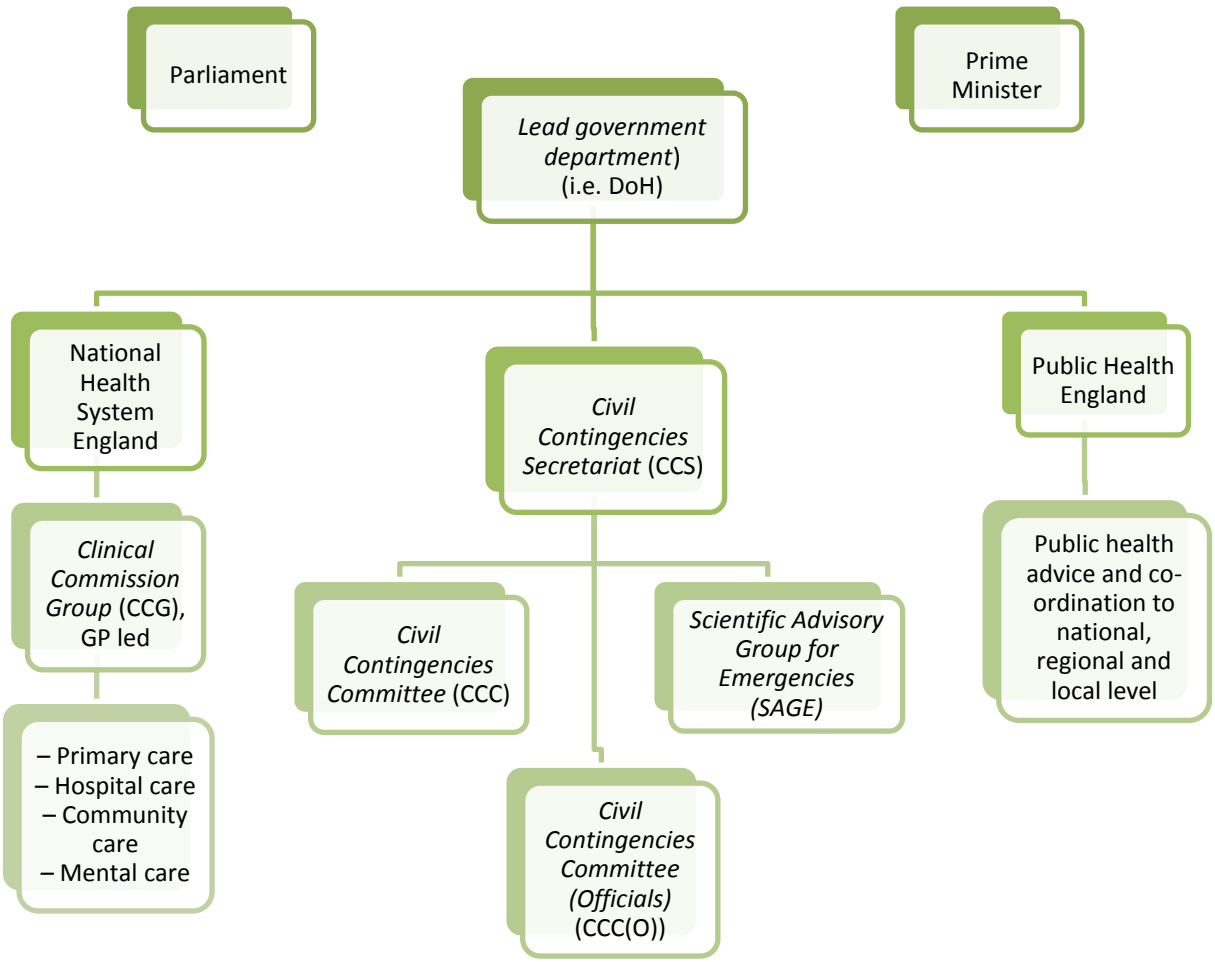
An influenza pandemic would require significant central government coordination over an extended period, and the DoH has overall responsibility for preparing for a pandemic and leading the response. The same would apply in the event of a MERS-CoV pandemic. During a pandemic, PHE will be responsible for providing public health leadership as well as scientific and technical advice at all levels, and for coordinating its activities closely with the NHS and directors of public health who are embedded in local government. PHE is also responsible for ensuring that its own systems are fit for purpose to respond to a pandemic. A ministerial committee will meet during a pandemic situation to provide cross-government coordination and strategic leadership between departments. The lead

[5] This section focuses specifically on England, one of the four countries that constitute the United Kingdom. The other three countries are Wales, Scotland, and Northern Ireland. While much of what is presented here may also apply to these other three countries, we have not investigated them (except, with some issues, in the context of the UK as a whole), so assumptions should not be made about their pandemic preparedness based on this material.

government department will receive support and guidance from the Civil Contingencies Committee (CCC), which is part of the Cabinet Office and which has responsibility for civil emergency planning for the UK. The Scientific Advisory Group for Emergencies provides the CCC with scientific advice. Other departments involved will hold responsibility for issues that fall within their respective policy areas (Figure 1).

England's plans for pandemic preparedness are generic, but they are intended to be adaptable to specific scenarios, for example SARS or MERS-CoV. The plans acknowledge and address the different pandemic phases, as defined by WHO. The overall objective of the plans is to minimise the impact of a pandemic on health and on society, and to maintain trust and confidence through good communications. Precaution, proportionality and flexibility[6] are repeatedly emphasised in the country's pandemic influenza plans.

**Figure 1. Simplified health system, and pandemic preparedness and response structure in England**




*Source: John Angrén, Umeå University*

PHE has a large role to play in the event of a pandemic. The UK Pandemic Influenza Strategic Framework [10] describes the key tasks for PHE, the institution with primary responsibility for England, as the following: to develop diagnostic tests, to perform early and rapid collection and analyses of data, to assess the impacts of the pandemic, and to ensure that plans are in place and functioning. PHE provides support in all key aspects of the UK pandemic

[6] The initial response to a pandemic situation will need to reflect the levels of risk based on inevitably limited evidence. The principle at this stage, therefore, is seen as precautionary. As reliable information becomes available, the appropriate response to the pandemic can then be determined, and this should at all times be proportional to the population's risk. And as the pandemic evolves, different geographical areas are likely to be affected to different extents, and the response should be flexible enough to take this into account [9].

influenza strategy: preparedness; detection, assessment and control; international travel; public health measures, including communication.

In the UK Influenza Pandemic Preparedness Strategy [9], the lessons learned from the 2009 A(H1N1) pandemic, as identified in the Hine Report [11] have been taken into account. These lessons included the importance of developing or improving plans to reduce uncertainty, and working towards a proportionate response as opposed to assuming a worst-case scenario. The report also noted the importance of taking into account people's behaviour when designing health communications during a pandemic, as well as the need for improved planning for the end of the pandemic and the recovery phase.

The National Pandemic Flu Service was an innovation used during the 2009 A(H1N1) pandemic, aimed at reducing the burden on health workers by providing a separate route to access and collect antivirals. A self-assessment service on the phone or online determines whether people are eligible for anti-viral medications, and if they are, their friends or relatives are then given the right to collect their medications, allowing them to stay at home. During the 2009 pandemic, this facilitated the maintenance of business continuity within the health sector, and also covered issues not related to the pandemic. The service could be reactivated in the event of a future pandemic, but this would only happen if the pressures on primary care services were deemed to warrant additional support.

## Good practices

Confidence in England's pandemic preparedness plans is high, according to all our informants. Detailed, easily accessible and updated plans on influenza pandemic preparedness in England are in place in almost every sector with which we had contact. The plans are tested and evaluated regularly. In many cases, plans are generic, and as such they can easily be adapted to other diseases (such as MERS-CoV); this reflects a pragmatic approach to planning and preparedness that seems to cut across all sectors. Moreover, personal, non-formalised networks of key actors were perceived as being of critical importance in all aspects of pandemic preparedness. Personal contacts can have great advantages in terms of readiness and willingness to cooperate, and in terms of flexibility, accessibility and opening up the possibility for open conversations.

Hospitals in England would be able to increase their critical care capacity by a minimum of 50%, by stopping non-urgent planned operations. The UK government has also held discussions with private healthcare services about the possibility of accessing their beds if needed in the event of a pandemic, thereby taking advantage of the additional capacity.

A major lesson learned from the 2009 A(H1N1) pandemic was how quickly GP practices became overwhelmed by the sheer number of patients. The National Pandemic Flu Service (NPFS) was therefore developed as a pragmatic means of reducing pressure on the health system by providing an alternative route for assessment and delivery of antivirals for patients with flu-like symptoms. An evaluation of the service after the pandemic reported that 'the early impression is that the NPFS succeeded in absorbing excess clinical and administrative workload experienced in general practice in England' [12, p. 7]. The NPFS is now incorporated into the plans for a future respiratory virus pandemic situation.

Current communication plans are in large part the product of previous experience, gained during, for example, the 2009 A(H1N1) pandemic. Initial communications during a future pandemic will be managed by PHE, but as the situation intensifies, responsibility for communication will pass to DoH. A lot of pre-prepared materials and hidden webpages with specific information have already been created, and these can be made public instantly. All communication to the public will be done in close collaboration between PHE, the NHS, and the Department of Health, so as to give a united response: all content will be agreed upon by all three partners. The importance of a united response was strongly emphasised by our informants, and this constitutes another lesson learned from A(H1N1). The importance of PHE acting as an independent scientific voice was equally emphasised, since this gives it credibility in the eyes of the public and the media.

Exercises were perceived as being very important by informants from several sectors, as a means of keeping people informed and updated. Plans for sector-specific pandemic response frameworks are in place in most key sectors, and these plans are regularly reviewed by the various responsible agencies, such as the Department for Transport, the Civil Aviation Authority, PHE, and the Animal Health and Veterinary Laboratories Agency.

Protocols and plans are in place for post-pandemic evaluations of the response in most of the sectors included in our case study, and protocols also exist for incorporating the lessons learned from the evaluations into the existing plans. This appears to be a real strength in the UK system for pandemic preparedness. Standardised procedures, called 'wash-ups', are in place to capture lessons learned from public health events such as SARS, A(H1N1), MERS-CoV, and to ensure that these are fed back into the existing plans and protocols. One lesson learned from the 2009 A(H1N1) pandemic, for example, was that the characteristics of this disease did not fit the existing preparedness plans, which focused on rapid-onset diseases. Actions were therefore taken at the wrong time for this slower-onset event, so the plans have now been adapted also to fit slow-onset diseases.

The 2012 Olympic Games were held in London, and were seen as an important opportunity for England to enhance surveillance and public health. Money for new and improved surveillance was allocated, scenarios were enacted, and insights gained as to where there were gaps in planning. While not specific to pandemic preparedness, these activities provided an invaluable upgrading of the generic, all-hazard plans.

Active surveillance of all infectious diseases is performed on an ongoing, routine basis by staff at PHE and DoH, and our informants were confident about their ability to identify and respond to an emerging epidemic early on. The UK also has in place a system called the First Few 100 (FF100) that would be activated in the event of an emerging epidemic to collect epidemiological data. FF100 was developed during A(H1N1) and adapted for MERS-CoV, as a generic protocol for conducting a thorough epidemiological investigation of the first 100 or so cases of an epidemic. It is based on an electronic system whereby GPs and other health personnel report on various aspects of their patients' clinical status. The overall aim is to gain an early understanding of some of the key clinical, epidemiological, and virological characteristics of the first cases of the new infection, and thereby to inform the development and updating of public health guidance to manage cases and reduce the potential spread and impact of the disease in the country.

With regard to laboratory capacity, the relevant collaborations and standard operating procedures are well developed, and England reportedly has strong surge capacity for diagnostics. In addition, a cross-government group exists to ensure that there is a pool of laboratory scientists who are trained to work as a shared resource for emergencies in animal as well as human health.

During the A(H1N1) pandemic, ambulance staff did not have facemasks, but today all ambulances in the country carry masks as standard equipment.

Cross-border collaboration for pandemic preparedness planning is, in most areas, extensive. The Civil Aviation Authority cooperates and conducts exercises with, for example, Schiphol airport in Amsterdam; the ambulance services conduct cross-border training with Ireland, Netherlands, Israel and Norway; and England also hosts one of a group of five laboratories in five European countries that are developing a formal agreement to assist each other in an outbreak or pandemic situation, whereby each will provide laboratory facilities and perhaps staff to help respond to an outbreak in the other countries.

Different sectors appear to have different levels of coordination with respect to pandemic preparedness. Cooperation with the animal health sector, for example, appears to represent a pocket of excellence in intersectoral infectious disease preparedness, perhaps because of the potentially high financial stakes in the event of a zoonotic pandemic. The preparations include lists of contacts, arrangements for diagnostics, and investigative work to be conducted at the Animal Health and Veterinary Laboratories Agency; and there is dedicated funding that would be upgraded during a pandemic. Legislation regarding the slaughter of animals in the event of a known disease is also in place.

The Border Control agency would cooperate with PHE and NHS England in the event of a specific threat, such as Ebola, and they would be able to have their response plan operationalised within 48 hours. This would include holding daily meetings between border control and PHE.

The Civil Aviation Authority works to ensure that the guidelines for aircraft crews are in line with the International Health Regulations. Business continuity plans for air transport are well developed, and each incident that occurs is analysed, with lessons learned being incorporated into the SOPs. Several informants spoke of an important lesson learned from the SARS epidemic, concerning the need for consistency in the advice given by and between WHO, CAA, and the transport association. For purposes of clarity, there was a need to ensure that the terminology used is consistent and comparable.

The role of the Department for Transport during a pandemic would be to ensure that the roads are kept open. According to the Civil Contingencies Act, the government could take possession of private lorries should there be a shortage of vehicles to transport essential medical equipment or other goods necessary for the country, for example, but the decision to adopt such measures would not be taken lightly, and it would inevitably involve dialogue with the haulage companies.

## Vulnerabilities

Reliance on personal networks could be problematic if critical people within them become unavailable for any reason. Furthermore, institutional reorganisations, or the rotation of individual professionals between positions and departments, can compromise networks' collective memories of specific events – which is one of their main strengths.

Because of international hub airports, such as Heathrow and Gatwick, the UK is likely to have patients arriving in the country by air during the early stages of a pandemic. As such, the country will have important contact tracing responsibilities, and these can be burdensome. Availability of data for passengers may become an issue, as most disease cases that require contact tracing are diagnosed post-arrival, and therefore the key information from travel services may have been lost.

The recent restructuring of the English health system has created challenges in terms of preparedness. As a general principle, stability in the system was emphasised by several informants as being essential for maintaining good levels of preparedness. Frequent organisational changes in a health system, which are usually politically induced, could lead to weakened preparedness structures and mechanisms, at least in the short term.

Although cross-border relationships were mostly described in positive terms, our informants reported some difficulties in relation to receiving required information from the Saudi authorities during the early stages of the MERS-CoV epidemic.

One of the concerns raised by our informants was about the need for high-ranking and trusted public health scientists supporting the communications strategy; but since these same people are also required for handling the pandemic, it may be hard for them to operate in both domains for an extended period, especially if there is intensive media interest in the topic.

Although there was a consensus that the national level of preparedness was adequate, concerns were raised about the situation at the local level, specifically during the alert phase of the pandemic, and in the pre-hospital response stage (i.e. possibly involving such issues as epidemiological investigation and diagnostics). We were not able to investigate these concerns directly, as our informants worked at national level, but this is a potentially important area for future studies.

There are concerns about ambulance staff safety in a pandemic situation. Cleaning the ambulances would also be difficult in a situation where the service faces very high pressure. There is often no time to ventilate ambulances properly, in accordance with the SOPs, even under normal conditions, and there would be even less time during a pandemic. With regard to working capacity, our informant described the organisation as already very stretched. It would be difficult to run an effective service with a high rate of absenteeism, as staff themselves would likely fall ill, yet this is what would be expected during a pandemic. We also learned that many ambulance staff do not have enough time for all their on-the-job training, although such training may be a contractual obligation.

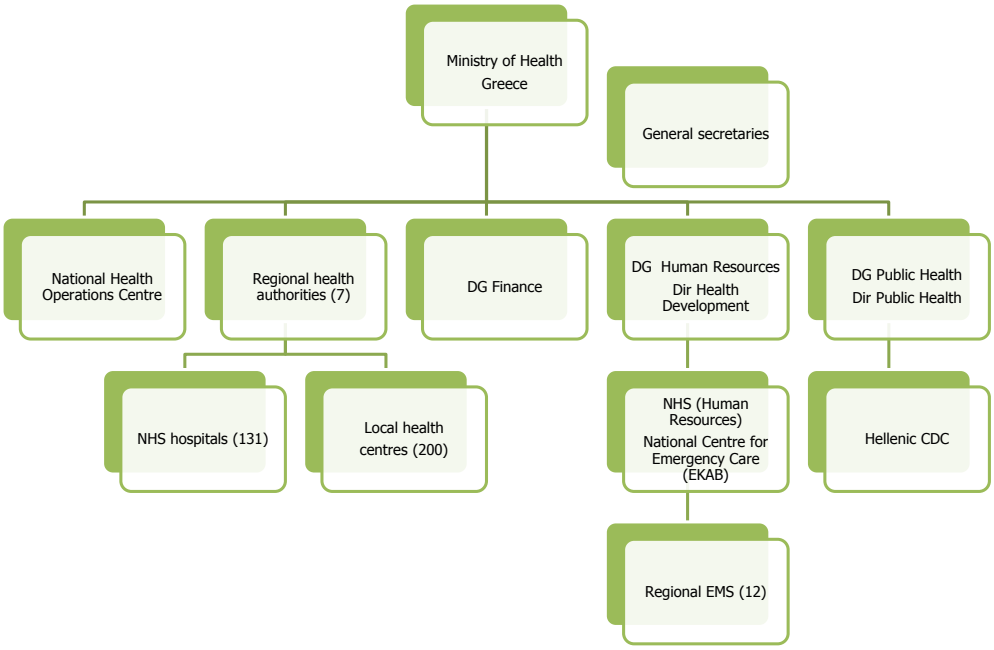
## 5.2 Greece

### Public health institutional context

The Greek health system comprises elements from both the public and private sectors, with private providers located in particular at the primary care, or local, level [13]. Access to services is based on citizenship as well as on occupational status. The system is financed by the state budget, social insurance contributions, and private payments.

The Ministry of Health (MH) is the main national health authority. One of its divisions, the Department of Public Health and Social Welfare (DPHSW), is responsible for epidemiological monitoring, control of sexually transmitted diseases, sourcing and quality control of vaccines, public health risk management, and other related issues within the public health and welfare sector [13]. The Hellenic Centre for Disease Control and Prevention (known by its Greek acronym, KEELPNO) is supervised and funded directly by the MH. Established to coordinate the country's response to the HIV epidemic, KEELPNO's stature grew during the preparations for the Athens 2004 Olympic Games, and its core tasks now include the protection and promotion of public health (surveillance, prevention and control of infectious and chronic diseases), and implementation of measures in the event of public health crises or epidemics [14]. The National Health Operations Centre (NaHOC) was established in preparation for the 2004 Olympic Games in Athens and comprises several teams with different responsibilities. NaHOC has an updated set of operational and tactical plans for intersectoral and inter-agency response in the event of a public health emergency, including a viral pandemic. These are checked and updated every six months as necessary [15]. Figure 2 gives an illustration of the institutional structures that are responsible for pandemic preparedness and response, though it is important to note that the Ministry of Health is responsible for more organisations than are presented here.

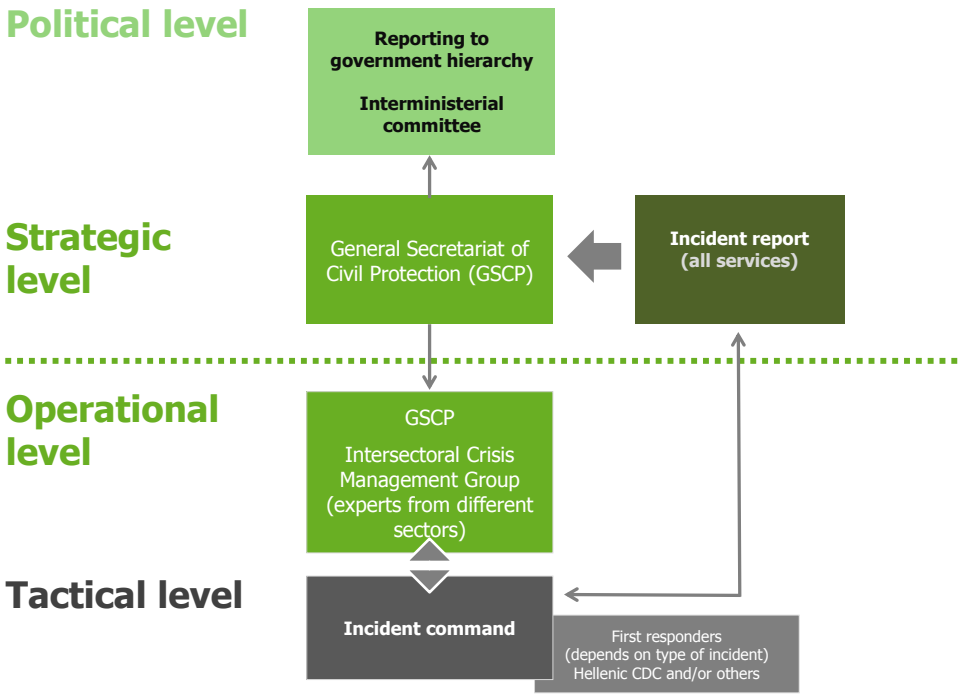
**Figure 2. Organisational structure of the Greek national health system**




*Source: Ministerial decision, August 2014*

The Greek crisis management system runs on a decentralised basis: primary responsibility lies at the national level, but the constitution allows for far-reaching local and regional autonomy . The General Secretariat for Civil Protection is the responsible national authority for disaster planning, from the prevention phase through to the recovery phase (Figure 3). All governmental authorities, public institutions and services have their own emergency plans for different kinds of emergencies. These plans can take either a generic form, or a more detailed specialised plan for a particular type of emergency. Government ministries are responsible to act as the lead agency if an emergency takes place under their area of responsibility. Thereby the MH will act as lead agency, with overall responsibility for emergency response, in the event of a public health emergency such as a pandemic [15].

**Figure 3. Crisis response mechanisms in Greece**




A National Plan for influenza pandemic preparedness (including avian influenza) was produced in 2005, and updated in 2009, in view of the A(H1N1)2009 pandemic. The plan provides a generic strategy for what is to be

done in the event of an influenza pandemic, and as such it would also be broadly applicable to a MERS-CoV or other respiratory virus pandemic situation. The plan also prescribes the responsibilities of ten different types of organisations (e.g. ministries, KEELPNO, laboratories, National Drug Association, etc.). Aspects of the work are given in relation to the WHO pandemic phases (inter-pandemic phase; alert phase; pandemic phase; and transition phase [3]), with different activities running according to the pandemic phase. Following the Greek case of MERS-CoV in April 2014, updated generic protocols were developed regarding contact tracing, procurement procedures, and preparing special ICUs.

KEELPNO and the NaHOC conduct tests when a threat such as avian influenza or Ebola arises in order to establish how well hospitals are prepared for emergencies (including for a respiratory virus epidemic), but there is no obligation to adapt the national plans to the specific settings of individual healthcare institutions. Most hospitals have their own all-hazard preparedness plan, which includes a response scenario to a local outbreak and/or pandemic. Preparedness planning is done according to KEELPNO instructions and adjusted to the local needs.

It appears that while epidemic planning is seen as important by hospitals, it is not urgent. Given the persistently high demands on clinical and administrative staff, it is therefore rarely prioritised.

## Good practices

Preparedness levels have been kept at a good level through the various health scares that have appeared over the last 10 years or so: SARS, pandemic A(H1N1) influenza, MERS-CoV, and Ebola. Therefore, it is expected that Greece will effectively manage a respiratory virus pandemic situation. The response to the April 2014 MERS-CoV case, in particular, was praised by several MH informants. They spoke of a strong capacity to adapt, to think and act fast, and praised the political framework, in particular with regard to KEELPNO and NaHOC, which allowed for rapid, pragmatic decisions to be made at the top levels of government in order to ensure that money and resources were made available when and where they are really needed.

The NaHOC has a regularly updated and apparently comprehensive set of operational plans for responding to a public health emergency; there also exists a National Plan for influenza; and, further, Athens airport appeared to be a pocket of excellence in terms of plans, procedures and implementation of lessons learned.

Several informants spoke of the central importance of the key actors' personal networks in responding to the MERS-CoV case.

It was universally clear from our interviews that KEELPNO is a trusted organisation because it has excellent capacity, and is well connected to other key institutions in the country.

The legacy of the Athens 2004 Olympic Games has been vital for the development of the broader public health preparedness infrastructure and expertise in Greece.

The financial crisis that engulfed Greece in 2009 has had a huge effect on the country's health system, including its capacity to prepare for a serious public health threat. Nevertheless, while cuts in funding have been made for general preparedness and training activities, resources are invariably made available for responding to emergencies.

In some cases, public health activities not only secure and promote public health but also help prevent significant economic losses from other sectors (e.g. tourism and agriculture). Examples included work to tackle an emerging malaria threat in one part of the country, as malaria was considered to be a threat to tourism; and the development of a policy for the surveillance of avian flu, as a means of reducing the risk to the financially important poultry industry. Another recent example is rabies surveillance and a vaccine bait air-drop programme for the prevention of rabies in wild animals, which could also have significant public health benefits.

Local level structures may suffer from limited resources, especially in rural areas, which may reduce their capacity to implement public health policies. However, they may also have the potential for better intersectoral collaboration and coordination than many major urban centres, simply because people in the different sectors often know each other personally.

Greece's geographical position on the edge of the EU means that most of its neighbours are not EU Member States, and this affects the types of relationships that the country has throughout the region. With regard to preparedness against cross-border public health threats, all the neighbouring countries are signatories to WHO's International Health Regulations, so clear protocols about sharing information do exist; but the EU's Early Warning and Response System is shared only with Bulgaria (Greece's only EU Member State neighbour). We also heard how shared crises can bring together neighbouring countries with historical grievances against each other, as in the case of Turkey and Greece, when both suffered serious earthquakes in 1999. Cross-border pandemic preparedness activities could therefore perhaps also offer the potential for bringing about warmer relations where diplomatic and political challenges continue to prevail.

The all-hazard, strategic approach to preparedness in Greece, which does not necessarily include a lot of details, allows for the production of plans that can be adapted to different public health emergencies as necessary. Through this, preparations in response to the importation of one serious infectious disease would appear to have

generic and positive implications for the preparation against many other infectious diseases. The response to the country's MERS-CoV case benefited from this, as did the work preparing Greece for possible cases of Ebola.

### Vulnerabilities

The reliance on personal networks to facilitate the response to a public health emergency was seen as a potential weakness, since, in the event of an emergency, the individuals with responsibility may themselves fall ill, or otherwise be unavailable.

Concerns were raised regarding the need to sustain high levels of awareness about maintaining pandemic preparedness once a given crisis situation has passed.

Undocumented migrants and their care is seen as a public health challenge. They represent a hard-to-reach population for whom there is no overall policy to provide for their health needs. They often avoid seeking healthcare, due to their illegal status in the country and their fear of deportation.

Since Greece has, to date, only had a single case of MERS-CoV, and the country has not been faced with a serious pandemic situation for decades, there is inevitably some uncertainty about how events would evolve in the event of a more widespread public health emergency.

No scientific evaluation is conducted on the impact of the health information published by KEELPNO or MH. This applies to information about respiratory virus infections, including MERS-CoV, as well as other diseases.

Some operational challenges were discussed in relation to working with a shared language in cross-border operations.

There appears to be relatively little focus on preparedness planning within the framework of the WHO pandemic phases. No specific mention was made during our interviews of the transition (post-pandemic) phase.

Regional disparities were said to exist, in particular between the centre of the country – effectively meaning Athens and environs – and the more peripheral areas, which include the islands as well as the more remote northern and eastern parts of the country. Examples of disparities included the ambulances serving rural health centres, which are not obliged to follow the national ambulance service's safety and communication protocols, and the gap between national policy concerning surveillance of avian flu in wild birds and poultry, and local level implementation, which is often hampered by shortages of vehicles, staff and equipment.

National public health training exercises have been cancelled due to a lack of funding – the effect of the financial crisis and subsequent austerity measures – which reduces the opportunities to enhance preparedness and response measures against a serious threat to the country.

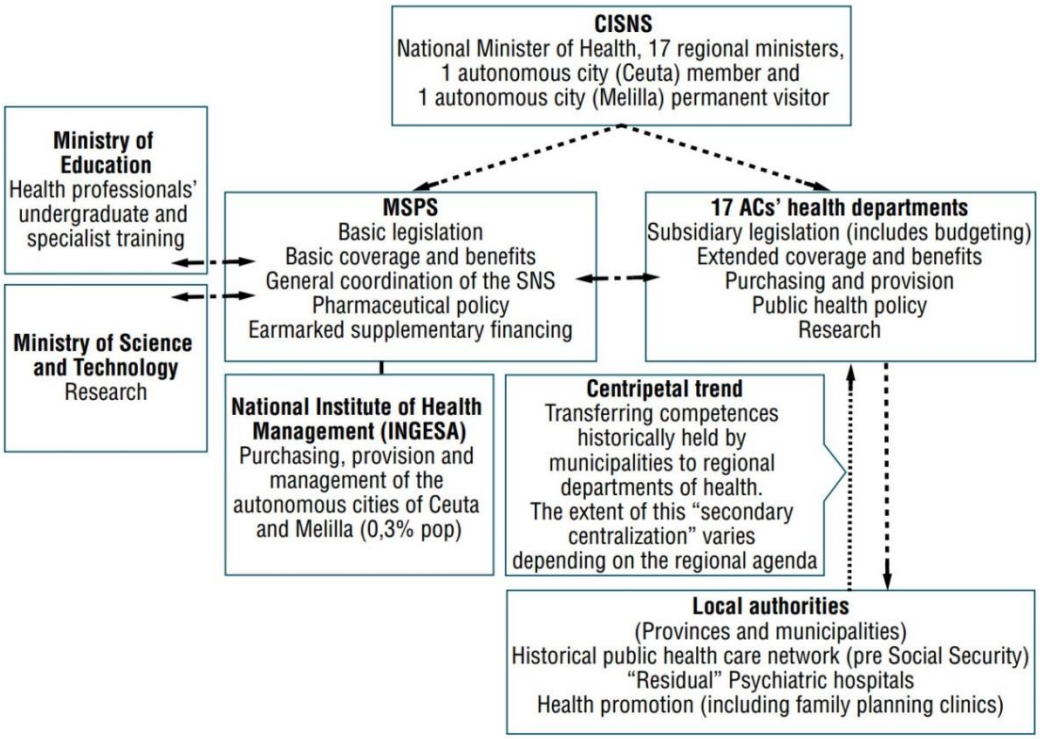
Substantial budget cuts have increased the workloads of people working in Greece's key public health institutions: much now depends on relatively few people. These cuts also present the risk of the country losing irreplaceable institutional memories of how recent serious public health threats, such as SARS, A(H1N1), MERS-CoV, and Ebola, have been addressed. Since financial constraints have prevented these experiences and their lessons learned from being systematically documented, the potential loss of institutional memory is ever greater, which means in turn that mistakes may be repeated in future crises, and lives lost.

## 5.3 Spain

### Public health institutional context

As required by the constitution, the Spanish National Health System provides universal coverage. It is funded almost completely from taxes and provided predominantly by the public sector. Since 2002, the system has been decentralised, with responsibility for healthcare transferred to the Autonomous Communities (AC) at regional level [16]. Provision of healthcare is free of charge at the point of delivery, with the exception of people without a health insurance card. People who are not covered are still able to use public facilities, but only to receive emergency care after serious illness or injury [17], or in the case of a public health threat. Due to the level of decentralisation in the country, the national Ministry of Health, Social Services and Equality has only limited power, and its roles are mainly to coordinate and monitor the functioning of the health services across the country [16]. The Ministry of Health acts as a coordinator at supra-regional level in several areas, e.g. health policy, health planning and guidelines, international and border-related health issues, legislation on pharmaceutical products, and surveillance and health information systems (Figure 4).

**Figure 4. Organisational structure of the Spanish national health system**

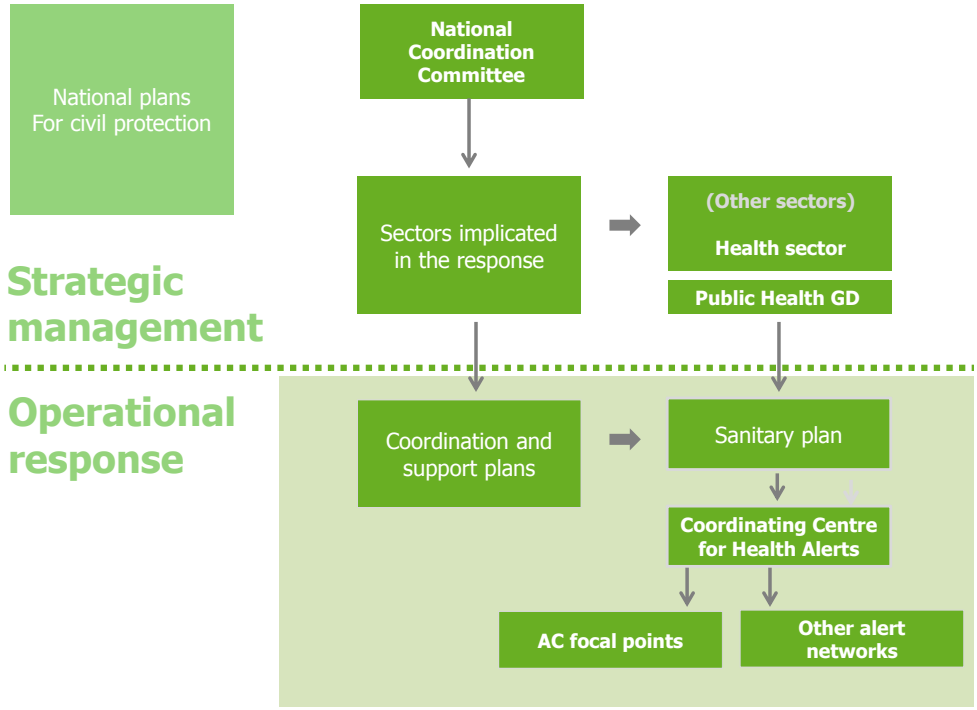



*Source: WHO Regional Office for Europe [16], page 30*

*CISNS = Interterritorial Council of the National Health System; MSPS = Ministry of Health and Social Policy; SNS = Spanish national health system*

For public health emergencies, the Coordination System for Health Alerts and Emergencies (SICAS, in its Spanish acronym) is a management/operational structure created to coordinate interventions, to lead decision-making processes and provide logistical support in emergency situations, as well as to serve as a liaison between regional, national and international levels. Its strategic direction is executed by a Steering Committee of Crisis and Emergency, which is chaired by the health minister and is comprised of a group of internal (and external when necessary) high level officials, who are responsible for managing and coordinating emergency response, as well as providing logistical support to the Autonomous Communities. The operational unit of this system is the Coordinating Centre of Alerts and Emergencies [18]. In 2012, an Early Warning and Rapid Response System was developed for the purpose of establishing a network of focal points that allows continuous and rapid communication of risk situations or events of public health importance in order to improve the timeliness and coordination if there is a risk of involvement at national or international level (Figure 5). Each autonomous community has appointed an Autonomous Focal Point that will coordinate with the National Focal point (Coordination Centre for Health Alerts and Emergencies). Funding for crisis situations is secured, and provided as necessary by the Prime Minister's office.

**Figure 5. Management and response algorithm for chemical, nuclear, and environmental threats; Spain**[7]




*Source: Based on an original slide by the* Ministerio de Sanidad, Servicios Sociales e Igualdad, *Spain*

Preparedness plans are used as a generic framework for action that may be adapted to the specific situation. We were informed during our interviews that the 2013 surveillance protocol for haemorrhagic fevers was adapted for the Ebola cases in the country in 2014. At this moment, the country is working on a national guideline on countering biological threats. For seven other identified risks (e.g. earthquakes, fires, etc.), multi-sectorial plans have been produced in collaboration with the Civil Protection Department, and a plan in response to bioterrorism is currently under discussion.

The 2005 National Influenza Pandemic Preparedness Plan was updated in December 2006, and different annexes were added in 2009. These define the objectives and actions to be taken during the different phases of a pandemic. The plan addresses each of the five key response elements recommended by WHO: a) an organisational and coordination structure; b) epidemiological and virological surveillance; c) prevention and control measures (vaccines, antiviral agents and non-pharmaceutical interventions); d) response of the health service; and e) communication strategy [19]. Both the initial and the updated version of the national pandemic preparedness plan focused on avian influenza virus. However, most of the activities are generic enough to be applied to any respiratory pandemic virus, including MERS-CoV. Plans can also be easily adapted if needed. There is an approved control and surveillance protocol for SARS and a procedure for the detection of suspected cases of MERS-CoV.[8]

Execution of a pandemic plan will be coordinated by the National Executive Committee for the Prevention, Control and Monitoring of the Epidemiological Evolution of the Influenza Virus (NIPPC). The Executive Committee has the Technical Coordination Group (permanent) and the Working Group of the Executive Committee (ad hoc, established in the event of a pandemic) as its operational cores. The Executive Committee, the Working Group of the Executive Committee, and the Technical Coordination Group are all supported by a Scientific Committee and four Subcommittees[9] created to address the technical development of each of the key areas to be included in the National Plan.

[7] A similar algorithm exists for biological threats.

[8] The country has not experienced any MERS-CoV case as of yet, although on November 2013 two cases were detected in Spain with a positive screening PCR for MERS-CoV. Neither case met the WHO case definition for confirmed cases of MERS-CoV infection, which led to a classification as probable cases.

[9] The four subcommittees include: 1) Surveillance Subcommittee; 2) Vaccines and Antiviral Agents Subcommittee; 3) Emergency Response Subcommittee; and 4) Communications Subcommittee.

At the level of the Autonomous Communities (AC), national plans for preparedness and response are adapted and developed by the Regional Public Health Boards (RPHB). These meet every month and on an ad hoc basis when needed. The National Planning Committee coordinates plans developed by AC through the RPHBs with the aim of harmonising response plans between the autonomous communities and the recommendations of the EU and the WHO, as well as to ensure that the same minimum level of capacities exists in all AC. The RPHB guarantees that the general control measures established for each phase in the National Plan are adopted throughout the organisational structures of each AC[10].

The Executive Committee is chaired by the Minister for Health, and was created to develop, coordinate and monitor actions related to the National Plan, and, when relevant, to propose actions to be taken by the state departments (and other public entities) in case of an influenza pandemic. As such, it plays a critical role in ensuring an intersectoral pandemic response. The functions of the Working Group of the Executive Committee are to plan, initiate and coordinate the response of institutions involved in the development and implementation of the National Plan, to support the health services at all levels to prepare their own plans, to guarantee continuous updating of the Plan in accordance with the evidence provided by WHO and the Health Security Committee of the EU in each phase of the pandemic, and to propose control strategies to the National Influenza Pandemic Planning Committee. One of the members of the NIPPC would serve as a member of the Health Security Committee, linking the national and international level.

For its part, the Technical Coordination Group functions to support the Working Group of the Executive Committee and to coordinate the activities of the subcommittees. The Technical Coordination Group is responsible for being in contact with WHO experts and other international agencies, and for providing updated information about the influenza situation worldwide in order to ensure that the National Plan is continually updated. It is also responsible for coordinating virological, clinical and epidemiological data to support strategic decisions on the use of antivirals and vaccines. During the pandemic alert phase, the Technical Coordination Group is required to have a mobile team of specialists in the field assessing the risk of infection spread, as well as to collaborate with the Communications Subcommittee in order to identify the most appropriate way to inform the population.

The Scientific Committee was created to support and advise the Executive Committee on scientific issues related to the National Plan and the policy decisions required in an influenza pandemic. The president of this Committee is the secretary of state for health, Members include representatives from a variety of Spanish scientific societies (Family and Community Medicine, Infectious Diseases and Clinical Microbiology, Epidemiology, Public Health and Health Administration, and so on).

In 2006 the Interministerial Avian Influenza Monitoring and Information Commission was established to coordinate the Government's communication policy in relation to avian influenza. This commission is headed by the Cabinet Office Ministry and the Secretariat of State for Communication. Representatives from various governmental departments (Health and Consumer Affairs, Agriculture, Fisheries and Food, Economy and Finance, Public Administration, Industry, Tourism and Trade and Environment) are also involved in this commission. It was activated during the 2009 pandemic.

## Good practices

Motivation and commitment of the relevant professionals in the different sectors is considered as the country's main strength in terms of pandemic preparedness. We were told that the engagement of professionals has helped to sustain, and make viable, the implementation of the preparedness and response plans in times of crises, even when there were very few people available.

In-country capacity to respond to a respiratory virus pandemic is perceived as adequate in Spain. Previous experiences with SARS, the 2009 A(H1N1) pandemic, and the recent cases of Ebola in the country, have helped to develop strategies and protocols that have proved to be effective in practice.

In Spain, most operational capacities and powers are decentralised, with responsibility belonging to the country's Autonomous Communities and two Autonomous Cities. General guidelines are issued at the national level, and these serve as a common framework which Autonomous Communities use to develop their own guides, thereby providing some consistency and consensus within the country. Thus pandemic preparedness plans[11] and strategies are drawn up at regional level. In this model, the bottom-up decision-making process facilitates a willingness to implement measures that are approved as part of the plan.

[10] The pandemic situation may be different in different Autonomous Communities (AC), which can it make it difficult to obtain an agreement on the appropriate level of alert and response. In ACs where tourism is a major economic factor, the local authorities can also play a significant role in supporting public health actions and strengthening the system.

[11] In the area of vector-borne diseases, e.g. West Nile fever, the Autonomous Regions and the Ministry of Agriculture cooperate closely.

The ambulance systems were reported to be adequately prepared in terms of personal protective equipment and other equipment, and the personnel are well trained in the protocols to deal with MERS CoV patients, or patients with any other severe infection[12]. In the event of a pandemic situation, there is a plan in place to ensure the continuation of services. There are also regular evaluations of practice; any perceived shortfalls can be addressed immediately. As service provision is the task of the Autonomous Communities, it is possible that the level of preparedness and response varies at the regional levels.

The surveillance system for respiratory viruses, and in particular for influenza, has been strengthened through the implementation of a Sentinel Physician Network (SPN), which works together with a national Laboratory Network. The Sentinel Network was developed for seasonal influenza. There is a National Surveillance System and an Early Warning and Response System for the detection of other respiratory or infectious diseases, such as MERS-CoV. This is the network that would be activated in the event of a suspected case of MERS-CoV. The coordination between these two Networks greatly facilitates the disease surveillance process. The SPN is a volunteer network of physicians working in primary healthcare, who collect specific health information from outpatient cases who present with symptoms of acute respiratory disease. The SPN and the Laboratory Network of each Autonomous Community are together responsible for activating surveillance alarms at regional levels. Thus, the monitoring of events is performed by the Autonomous Regions, but overall coordination takes place at national level. The work done by the SPN was greatly valued and was identified as an important factor for improving the connections between the regional and national levels.

Our informants were confident about the capacity of the network of laboratories across the country to effectively monitor respiratory viruses during different phases of a pandemic. Laboratory capacity in the ACs is tested by the national reference laboratory through a quality assurance scheme. The national reference laboratory has launched a rapid response unit, which can deliver the results of any microbiological analysis from the list of diseases under special surveillance within 24 hours. The national reference laboratory also has funds designated to procure rapid diagnostic kits for respiratory viruses, including for MERS-CoV, in case of a pandemic situation.

The movement of undocumented African migrants either through the land borders of Ceuta and Melilla, or by sea, has increased since the year 2000. There are several different Spanish authorities and agencies engaged, including Border Control, the Ministry of Employment, the Ministry of Internal Affairs, the Ministry of Health, the Autonomous Communities, and the Spanish Red Cross. Collaboration is good.

Coordination between sectors, and in particular between the health and animal health sectors, was said by our informants to be very good. For example, in the event of an alert with implications for both sectors, a representative of the Ministry of Health is invited to the regular meetings of the National Committee for Veterinary Health Alerts, while representatives of the Ministry of Agriculture are invited to participate in a number of working groups from the health sector. A protocol has also been developed to ensure urgent notification of the detection of cases of highly pathogenic avian influenza from the animal health sector to the Ministry of Health.

Cross-border collaboration exists mostly between Spain and the two countries with which the country shares a land border: Portugal and France. An especially close relationship exists with Portugal, and there has been strong political willingness to support the relationship, for example, during the 2005 A(H5N1) avian influenza pandemic, when work was undertaken with the health authorities there. The outcome of this work included joint strategies and protocols. Although there is no official agreement to develop joint plans, the relationship between Spain and Portugal has remained strong due to the good personal relations between the professionals working in both countries, and through some cross-border meetings, networks and other initiatives.

Within the animal health sector, there is a wide range of activities for communications and joint work with neighbouring, EU, and other countries regarding surveillance and control of zoonotic diseases [20, 21]. In 2006, Spain initiated a network involving Mediterranean and African countries to work on avian flu (REMESA, in Spanish) [22], and later other diseases were added to their agenda. The cross-border collaborations in this sector have apparently not been severely affected by the economic crisis: when Spain was no longer able to provide funds, France stepped in to cover the gap. However, this did also mean that Spain lost the lead in the initiative.

For all actors it was clear that communication between the relevant sectors in a pandemic must be initiated and led by the Ministry of Health. It was also understood that, depending on the severity of the problem, the Prime Minister could assume a leadership role in any health emergency.

[12] Note that our field work was conducted the week before the in-country Ebola case was identified. This experience indicated that some of the ambulance service's protocols required review.

## Vulnerabilities

The economic crisis and the subsequent austerity policies have acted as important constraints that could threaten the health system's potential to respond to a pandemic situation. In addition to their impact on the health system itself, there have also been serious adverse effects on intersectoral collaborations, as well as participation in international networks. Budgetary cuts have forced fewer resources to be made available for public health planning, and they have also brought about a considerable reduction of the number of people working at public institutions, causing delays in activities and actions. They were further identified as threats to the Sentinel Physician Network, disturbing the organisational climate of these network structures, and having the potential to reverse important improvements which had made the surveillance processes more sensitive. Healthcare professionals are also overloaded with tasks, which may have serious implications in the event of a pandemic. In addition, strategic planning and development has been inhibited, and especially so at the regional level, where the budgetary constraints were even more significant.

Communication to the general public was identified as an area where improvements could be made. We were informed that when the coordination between the public health authorities and the media is not well articulated, the public can become unnecessarily alarmed, which can result in overcrowding of health services, or, as in the case of A(H5N1) avian influenza, a drop in chicken consumption. Health communicators highlighted the importance of the leadership role that public health institutions need to take. When public institutions deliver a unified and transparent message, the media can act as an ally in the communication processes. But in the absence of a unified message from the lead public institution, the media may end up disseminating what they learn from different actors, who may possibly also have different agendas, and this can result in conflicting information.

Although some simulation exercises have been performed both at EU level and at local level (for example, with civil protection and in many hospitals), these are not conducted on a regular basis in most of the institutions we visited. On the contrary, they are perceived as 'extra' and time-consuming activities. Even in settings where exercises are held, procedures for acting upon lessons learned are not always documented or formalised in protocols, and similarly, the lessons learned are not always fed back into the plans. Budgetary cuts and shortages of qualified personnel, both consequences of the economic crisis and the austerity policies, are seen as major barriers to the implementation of better evaluation and testing routines.

A decentralised system could potentially create some variations between Autonomous Communities. Even though ACs are obliged to meet the minimum standards developed and proposed by the national authorities, service delivery and policy implementation may take place in different ways and to different extents in the ACs. Although this does mean that service delivery can be tailored to local needs, it may not always produce optimal results. For example, regions with more tourist activity have shown more interest in allocating resources to public health measures and implementing control measures. Further, the nature of the decision-making processes may cause delays in finalising and implementing policies because it is not always easy to reach consensus, especially when decisions involve the allocation of financial resources.

Coordination activities with the Autonomous Cities of Ceuta and Melilla, which are geographically enveloped by Morocco, are somewhat limited with regard to pandemic preparedness.

For most of the non-health sectors, there are neither official plans for communicating with the health authorities, nor are there formal, comprehensive lists of contacts across institutions to initiate a collaborative process in case of a pandemic.

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