



## ECDC **CORPORATE**

# Review of ECDC's response to the influenza pandemic 2009/10

**ECDC** CORPORATE REPORT

# **Review of ECDC's response to the influenza pandemic 2009–2010**



#### Panel of experts and authors

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## Abbreviations

BCM	Business continuity management
DG SANCO	Directorate General for Health and Consumer Policy (European Commission)
ECDC	European Centre for Disease Prevention and Control
EOC	Emergency operations centre
OG	Operational group
PHE	Public Health Event
PST	PHE strategic team
PMT	PHE management team
TTT	Threat Tracking Tool
WHO	World Health Organization

# Executive summary

## Findings and recommendations

The 2009 influenza pandemic prompted an unprecedented international response by local, regional, national and international authorities, including the European Centre for Disease Prevention and Control (ECDC). ECDC was established in 2005 to identify, assess and communicate current and emerging threats to human health posed by infectious diseases. As part of its mandate ECDC responded rapidly to the pandemic by identifying the posed threat; setting up European surveillance systems; and providing regular situation updates, risk assessments, and rapid reviews or evaluations of existing information for all Member States, EC and EU agencies – either at its own initiative or on request.

Crisis response at ECDC is managed through a Public Health Event plan (PHE plan). From the end of April 2009 to January 2010, ECDC's response was managed within the PHE plan, with parallel temporary organisational structures complementing the routine ones.

ECDC's response to the pandemic influenza crisis was subject to an early evaluation, conducted during the crisis between May and July 2009 by a team of experts. Internal practices were revised subsequently. However, operations associated with the influenza pandemic went on well beyond that time, lasting one full year.

Therefore, the need for a broader and more comprehensive evaluation of the ECDC response to the 2009 pandemic – the largest response to a single health threat undertaken by ECDC to date – was identified. This evaluation should comply with the highest possible standards in identifying, assessing and communicating current and emerging threats to human health posed by infectious diseases, as mandated by the ECDC founding regulations and its stakeholders.

The following sections summarise the key findings and recommendations of the evaluation panel. Sections correspond to the central themes as described in the terms of reference for this evaluation: crisis management, surveillance, and scientific advice.

Before delving into the three themes, we wish to emphasise our overall conclusion. Based on our own study as well as the clear results of other parallel studies conducted under the auspices of the European Commission (e.g. TOR 1 and 2), it is our conviction that *ECDC provided significant added value to the response to the pandemic in Europe and contributed in a positive fashion to the regional and global response.*

## Findings on the crisis management function

- ECDC has a relatively well developed and dynamic system for crisis (PHE) management and has demonstrated an impressive capacity to learn from real and simulated (exercise-based) experience of public health emergencies.
- The PHE system is generally regarded by our informants as having been appropriately designed and capable of flexible adaptation to unforeseen circumstances. Taking into account the difficulty of the challenges associated with the H1N1 pandemic and the relatively limited previous organisational experience of public health emergencies of this scale and duration, the system performed relatively well under difficult conditions.
- The protracted nature of the H1N1 pandemic did not fit well with the existing PHE arrangements and added to the difficulty of the challenges facing ECDC.
- The planned use of rotating crisis managers (with significant other ongoing duties at ECDC during the event) proved problematic. The shift to a dedicated crisis manager (who was able to forge an efficient and sustained partnership with the influenza coordinator) proved very helpful for this event.
- Many ECDC staffers in critical functions were subjected to heavy stress over prolonged periods. Some were able to cope well with very heavy workloads for extended periods and performed extremely well. Others were pushed to the limit of their coping capacity.
- ECDC's innovative strategy of allowing the observation and review of ongoing efforts (Eriksen et al.) contributed to the capacity of the organisation to rapidly discover and correct problems/dysfunctionalities in the crisis organisation during the event.
- Business continuity management (BCM) was an underdeveloped function at ECDC in the period in question, though efforts are underway to remedy that situation. The need to solve BCM problems in an ad hoc fashion placed an additional burden on participants in ECDC's crisis management effort.
- EOC facilities are likely to be a limiting factor in situations where there are multiple serious (and potentially serious) events occurring in parallel. Facility sharing between the daily roundtable and PHE event management creates a significant vulnerability.

- Heavy media attention and demands for service challenged ECDC's ability to keep up and provide appropriate, coordinated crisis/risk communication. This challenge was exacerbated by event characteristics and a rapidly evolving media (including social media) landscape. ECDC's ability to meet this challenge improved significantly over the course of the event.

## Key recommendations regarding crisis management

- The PHE alert system is a blunt instrument with significant risk of politicisation and should be modified. Escalation from normal (PHE 0) to PHE 1 or PHE 2 is associated with the mandatory requirement to notify the ECDC Advisory Forum, Management Board, the Member States, WHO and the EU Commission, which could discourage proactive alerting and heightened readiness under conditions of uncertainty. ECDC should add an 'internal' alert status (PHE 0.5) without such a reporting requirement in order to facilitate proactive alerting, monitoring and in-house mobilisation in the early phases of a potential public health emergency.
- ECDC should develop a protracted incident response plan to complement existing planning geared towards PHEs of shorter duration.
- ECDC should further develop and implement a BCM programme for disruptions/events of longer and shorter duration. Such a plan should cover financial, contractual, personnel, and critical infrastructure issues, among others.
- Make sure multiple potential occupants of key roles are available. A response capacity predicated upon the availability of uniquely qualified or constituted personnel is highly vulnerable. Avoid role overload.
- Build a dedicated strategic analysis function (cf. the so called 'F Group' which emerged in an ad hoc fashion during the pandemic) into the PHE organisation.
- Develop a general PHE communication strategy and specific contingency-related plans specifying appropriate approaches to organising crisis communication (e.g. single spokesperson vs. decentralised, coordinated communication). Media training should be provided to key participating experts. The crisis communication function should be exercised and evaluated regularly.
- Delimit the Director's role in the crisis organisation. The role of the director is potentially very broad in the crisis management structure with regard to internal and external responsibilities and particularly liable to overload. This role should be specified and priorities set.
- A stress management programme should be established in support of staff engaged in PHE and other forms of crisis management. Stress levels should be closely monitored and steps taken to minimise individual and collective stress and enhance coping capacity. (See the section below on stress management for more specific suggestions.)

## Findings on surveillance and scientific advice

- ECDC surveillance activities were activated in a timely and effective fashion. This was enabled by the existence of a dedicated Preparedness and Response Unit (PRU) with capabilities for epidemiological intelligence.
- Despite surface similarities with the 1918 pandemic (which encouraged alarmist reporting), ECDC did not overestimate the risks associated with the 2009 pandemic in its early threat assessments. ECDC's assessments were sober, prudent, and accurate and were vindicated by the subsequent course of events.
- Syndromic surveillance techniques were applied for the first time in the European setting. Despite various shortcomings, they provided a useful complement to other forms and modes of surveillance.
- Sentinel surveillance reports regarding influenza-like illnesses (ILI) were reported to ECDC drawing upon a network of voluntarily participating family doctors from many EU countries from autumn of 2009.
- ILI reports were consolidated on a weekly basis and reported in a Weekly Influenza Surveillance Overview (WISO) bulletin. Survey results strongly suggest that the WISO was a much appreciated resource.
- Mortality data was used in the surveillance effort despite significant limitations and variations of operationalisation across the Member States. Given the nature of this pandemic, ECDC's decision was justifiable.

## Recommendations on surveillance and scientific advice

- Early assessments of the level and type of threat posed by new viruses should include, whenever possible, socio-demographic characteristics of the involved populations.
- Preliminary information from a new outbreak very often suffers from selection bias, privileging hospitalised severe cases and lacking clear denominators. Those limitations should be made evident in any public communication.
- Overestimation of disease severity occurred in several recent large epidemics and is a recurrent bias of early outbreak communications: special care should be taken in assessing the clinical severity of a disease; a possible solution can be an analysis of the first 100 cases.
- Daily counting of cases or deaths are often demanded by the media and politicians, but may have a counterproductive effect on the monitoring of an emerging epidemic. Daily aggregate counts at the EU level are liable to distortion due to differing case ascertainment and reporting systems among the Member States.



Even when using an agreed case definition, interval-based (e.g. weekly) counts tend to be more reliable and should be adopted in future pandemics.

- The analysis of the risk level that justifies public investment in developing and deploying new vaccines – either for the population as a whole or for specific risk groups – needs to be improved. More sophisticated analyses are needed, taking into account a socio-economic analysis of the costs, benefits and risks of launching such vaccination campaigns, as well as a forecast of compliance targets and vaccine acceptance by the target populations.
- In the case of a pandemic or any other 'emergency', formal vaccine checkpoints where earlier decisions are reviewed in the light of new analyses and information should be built into the decision-making and implementation processes.
- Health personnel should be offered intensive training and access to risk communication tools. Their role is the key to success for any attempt to reduce the impact of a pandemic.
- Risk (and crisis) communication strategies and practices need to adapt to the changing societal and media environments. The communication landscape has evolved, for example with growing use of social media and multiple platforms for self-appointed alternative 'experts' of dubious credentials. More research and practical work determining what messages and what media are most effective in reaching people are badly needed.
- Investment in national public health institutes, their laboratories and the systems that feed into them – is absolutely key. Investment in national laboratories and institutes is needed to ensure data quality. ECDC is highly dependent on good quality data in order to produce high-quality assessments.

## Background

The 2009 influenza pandemic prompted an unprecedented sustained response by local, regional, national and international authorities, including the European Centre for Disease Prevention and Control (ECDC) (Amato Gauci et al., in press). ECDC was established in 2005 to identify, assess and communicate current and emerging threats to human health posed by infectious diseases. As part of its mandate ECDC responded rapidly to the pandemic by identifying the posed threat; setting up European surveillance systems; and providing regular situation updates, risk assessments, and rapid reviews or evaluations of existing information for all Member States, EC and EU agencies – either at its own initiative or on request.

Crisis response at ECDC is managed through a Public Health Event plan (PHE plan). From the end of April 2009 to January 2010, ECDC's response was managed using the PHE plan as a point of departure, with parallel temporary organisational structures complementing the routine ones. It is important to note that significant adaptations to the plan and organisation were made over the course of the protracted event.

ECDC's response to the pandemic influenza crisis was subject to an early evaluation, conducted during the crisis between May and July 2009 by a team of experts. Internal practices were revised subsequently. However, operations associated with the influenza pandemic went on well beyond that time, lasting one full year.

Therefore, the need for a broader and more comprehensive evaluation of the ECDC response to the 2009 pandemic – the largest response to a single health threat undertaken by ECDC to date – was identified. This evaluation should comply with the highest possible standards in identifying, assessing and communicating current and emerging threats to human health posed by infectious diseases, as mandated by the ECDC founding regulations and its stakeholders.

## Terms of inquiry and focus

To perform an evaluation of its response to the 2009 pandemic, ECDC appointed a panel of experts with extensive experience in communicable disease control, crisis management, and influenza programmes. The evaluation team was free to choose appropriate methods according to their professional judgment.

The terms of reference to the evaluation panel were:

### On crisis management

- Evaluate the utility of using the PHE plan to respond to a prolonged Public Health Event.
- Evaluate whether the changes are needed to the PHE plan and to propose necessary changes.
- Identify potential gaps or weaknesses of the ECDC pandemic response within its mandate.

### On surveillance

- Evaluate the content and process of the pandemic influenza surveillance at ECDC and propose changes.
- Evaluate the influenza surveillance outputs (including WISO bulletin).

### On scientific advice and communication

- Evaluate the scientific process, content and utility of ECDC's scientific advice and guidance during the pandemic and propose changes.
- Evaluate the timeliness, utility and impact of ECDC's communication work.

The panel was appointed on July 2010 and held its first meeting on 20 and 21 September 2010. A draft report was submitted to ECDC in May of 2011 with anticipation of finalising the report in June of 2011.

## Methodology and sources

This evaluation has benefitted from the application of several complementary methodologies, in keeping with the terms of reference.

### Qualitative text analysis

In the course of this evaluation, a large number of ECDC documents were processed, as were the protocols from the conducted interviews, as well as the results of the witness symposium (see below for descriptions). ECDC and other relevant documents were subjected to source-critical criteria and scrutinised/weighted for their plausibility (in terms of established criteria for source criticism):

- Centrality: Was the source (or the authors of the source if known) positioned (organisationally, geographically, etc.) in a way to have firsthand knowledge of the events or processes in question?
- Temporal proximity: Were the observations documented in close proximity to the events or at a subsequent point in time?
- Objectivity: To what extent is there a risk of source bias, and if so, in what direction?

### Questionnaire/survey

This evaluation builds upon, and makes use of, the results of three surveys:

- A survey reported in the previous evaluation by Greco and his associates (Eriksen et al.). This survey provides a useful counterpoint to the various qualitative methods employed in this evaluation. The evaluation by Eriksen et al. was performed at the very beginning of the pandemic, in April and May 2009: it was therefore well focused on the start of the event: the activation of the various PHE levels, the roster turnovers, the contingency plans of ECDC units. The survey to Member States was designed to grasp the impact the ECDC action had at the national Member States level.
- The EU TOR 2 report which provided complementary coverage for the latter period of the H1N1 pandemic.
- An online survey among the end users of the Weekly Influenza Surveillance Overview (WISO) by Widgren et al., conducted in May 2010.

### Individual interviewing

Interviews were conducted according to a semi-structured interview procedure. This approach allowed for a degree of comparability among the responses from the informants while providing heightened flexibility. Interviewees were given pre-prepared questions, and a core of common questions was used as a basis for the interviews, in combination with supplemental questions aimed at the subject's particular specialty, organisational vantage point, or participation in the response to the pandemic. Interviewees who preferred to convey their information in narrative form or tell crisis-related anecdotes were given latitude to do so. Most interviews were conducted face-to-face, though several were done by telephone. Interviewees were promised that they would not be cited by name without their consent, in order to facilitate candid responses.

### Witness symposia/group 'debrief'

This method, whereby crisis participants are gathered together to discuss their experiences, is a time- and resource-efficient way of eliciting information from informants. Furthermore, the highly interactive character of the symposium and the diversity among participants allowed for examining issues from multiple vantage points and perspectives. The three-hour witness symposium conducted on 22 September 2010 (see bibliography for list of participants) provided an opportunity for a relatively in-depth and interactive exploration of participant experiences and suggestions regarding further development of ECDC's PHE capacity. While there are some methodological risks associated with this method (e.g. social contamination or homogenisation of accounts and/or various forms of social inhibition), the character of the discussion during the symposium – which reflected broad participation and a healthy diversity of views, as well as substantial portions of self (and other) criticism – was suggestive of a relatively functional and uninhibited group process. Similarly, the substantial number of individual interviews, as well as the survey itself, provide a useful counterpoint and a basis for assessing the results of the symposium. For the most part, the individual accounts converged (rather than diverged) with the accounts and perspectives given during the symposium.

## Process tracing

In addition, some elements of a process-tracing strategy were employed, using the so called Threat Tracking Tool (TTT, see below) and other documentary and oral sources. However, the time and resources available for this evaluation did not permit full-blown process tracing (reconstruction, dissection, thematic analysis, comparative benchmarking etc) procedure (cf. Stern and Sundelius, 2001; George and Bennett, 2004).

The TTT was a valuable resource for the evaluation. It is a computerised system for the real-time recording of most events, grey documents, collective conversations, conferences, meetings, official documents (both internal and external), satisfying a wide range of criteria for arguments concerning possible threats to health, and other documentary and oral sources.

## Content analysis

Published documentation and guidance, press information, and daily reports were examined by the panel. The content and the timelines were assessed in terms of coherence with different sources (ECDC, CDC, WHO) and the time frame was verified.

## Information sources

Most of the analysed documents were downloaded from the content-rich ECDC web pages dedicated to the pandemic influenza. In particular:

- three threat assessments (April to July 2009);
- nine pandemic risk assessment (April to December 2009);
- 228 daily updates or situation reports;
- 30 Weekly Influenza Surveillance Overviews (WISOs);
- 13 ECDC documents;
- four EU-wide evaluations;
- 23 WHO reports;
- one witness symposium transcript (see above).

Attempts were made to adopt methodologies that comply to the evaluation formats of the Directorate General for Health and Consumer Policy (DG SANCO).

## Limitations

The influenza pandemic 2009 was a highly complex and challenging event and a major challenge for ECDC. It stands out not only in terms of intensity (as the first time ECDC chose to activate level 2 of the Public Health Event plan, for example) but also in terms of duration. This was the first time ECDC had to sustain action on an event of this scale and sensitivity for such a prolonged period (more than a year).

This evaluation is based on a wide range of published information and a substantial number of individual and group interviews. Still, we are aware that the evaluation cannot adequately describe the human and professional dedication of so many ECDC employees. It cannot adequately capture the emotional rollercoaster ride experienced by the specialist and lay communities alike in the face of threat, uncertainty, and value conflict during this public health crisis. The focus of the evaluation is not on examining individual performance, but rather on examining organisational preparedness, role enactment, and impact under difficult conditions, with an eye to improving ECDC's future capacity to perform effectively in public health emergencies.

# Organisational structure and key roles

## ECDC mandate

The European Centre for Disease Prevention and Control (ECDC) is an EU agency that was created in 2005, with the aim to strengthen the European Union's defences against infectious diseases.

As indicated in its mandate (Article 3-1 of the Founding Regulation (EC) No 851/2004 of the European Parliament and of the Council of 21 April 2004), ECDC's mission is to 'identify, assess and communicated current and emerging threats to human health posed by infectious diseases'.

In order to fulfil this mandate, ECDC performs a wide range of activities oriented towards the different aspects of threats caused by infectious diseases outbreaks, including:

- the continuous surveillance of 49 mandatory reportable diseases (TESSy database) as well as epidemic intelligence;
- the provision of scientific opinion as well as scientific and technical assistance, including training and risk assessments;
- the provision of timely information to the Commission, the Member States, Community agencies and international organisations within the field of public health;
- the coordination of European networks and bodies operating in areas that fall within the Centres mission, including networks arising from public health activities supported by the Commission and the operation of dedicated surveillance networks; and
- the exchange of information, expertise, best practices and the facilitation of the development and implementation of joint actions.

## ECDC organisation

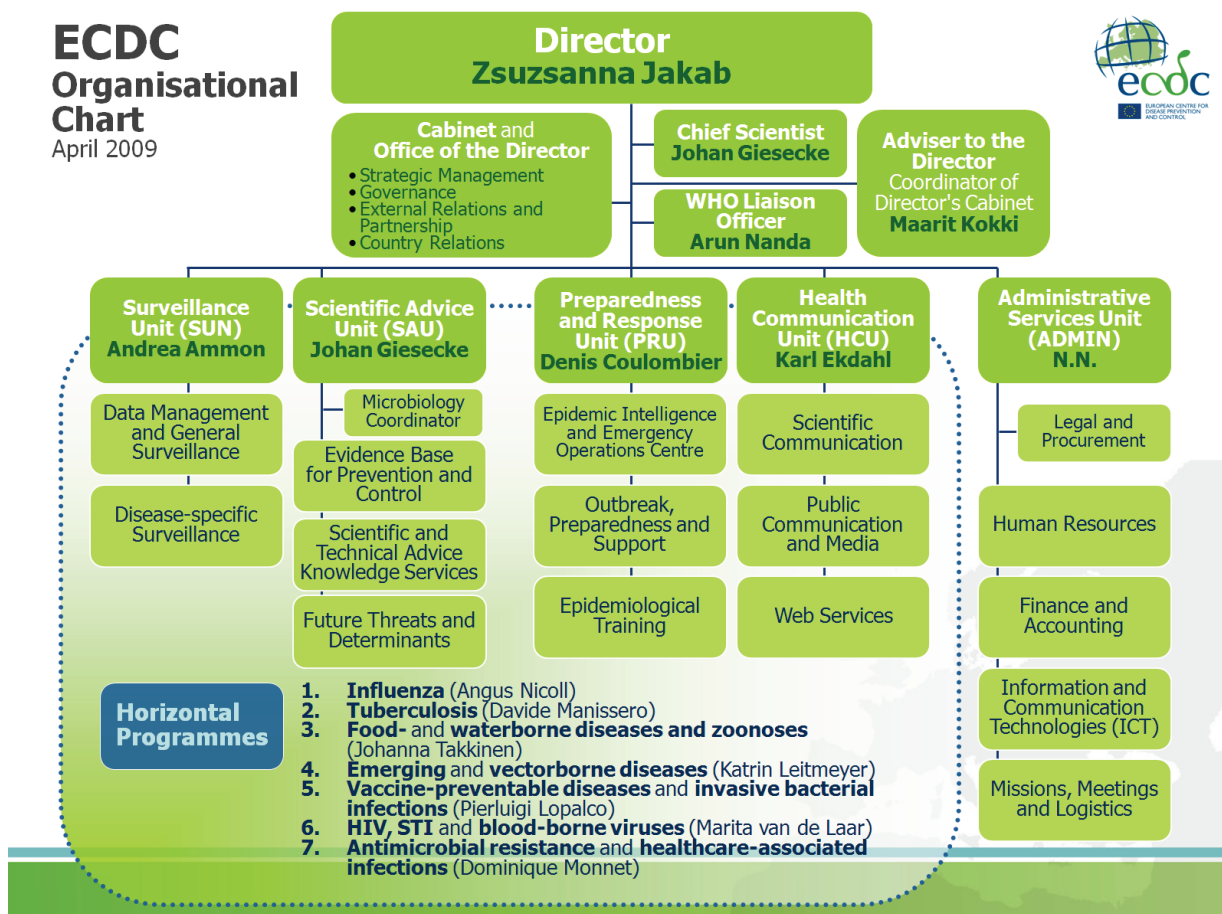
The organisational structure of ECDC reflects the scope of those different activities and is consistent with the necessity to assign roles and responsibilities in accordance with the distribution of expertise.

Two bodies contribute to steering ECDC in collaboration with the Director of ECDC: the Management Board and the Advisory Forum.

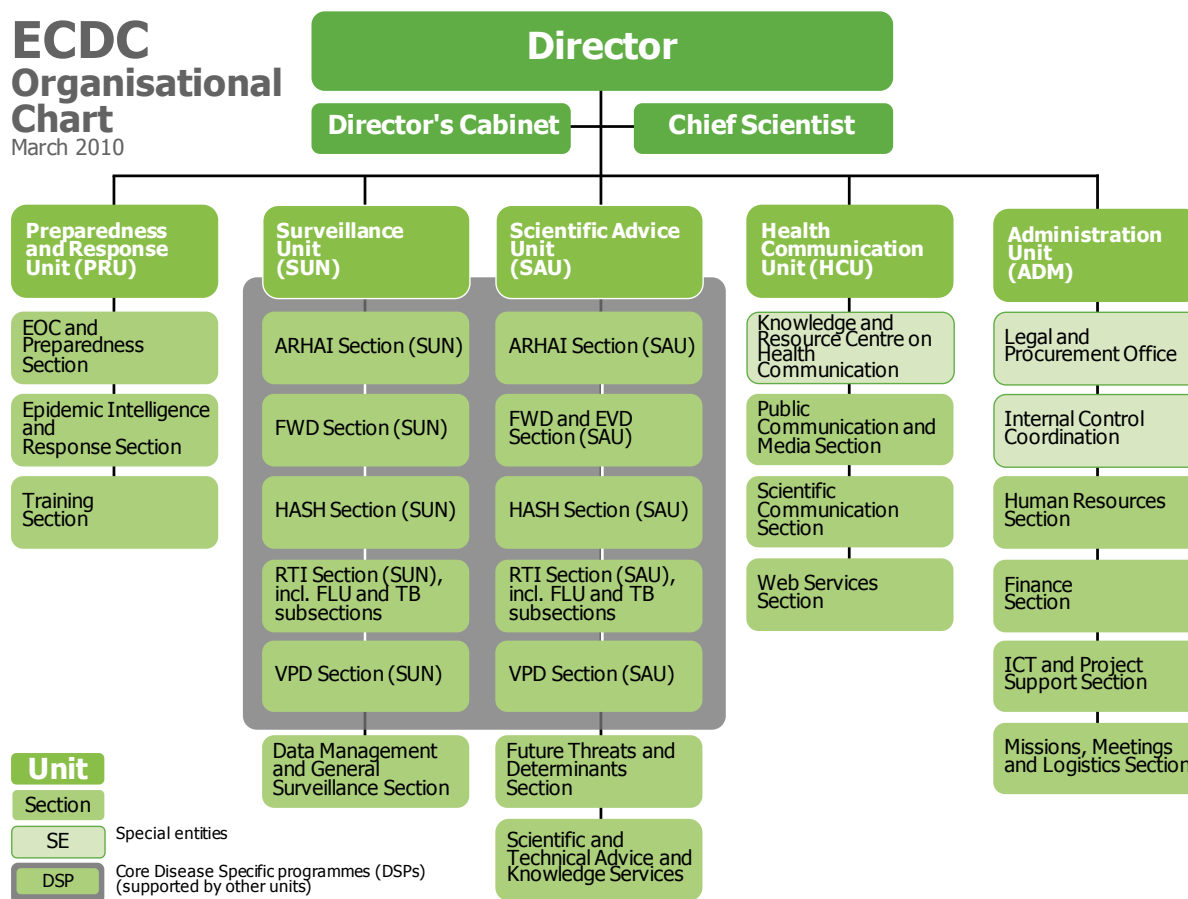
- The Management Board is composed of one member designated by each Member State, two members designated by the European Parliament, and three members representing and appointed by the Commission. The Management Board adopts the Centre's internal rules on the basis of a proposal by the director. These rules shall be made public. The Management Board elects one of its members as its Chair for a two-year period, which is extendable. The Management Board meets at least twice a year at the invitation of the Chair, or at the request of at least a third of its members.
- The Advisory Forum advises the Director of the Centre on the quality of the scientific work undertaken by ECDC. It is composed of senior representatives of national public health institutes and agencies, nominated by the Member States on the basis of their scientific competence, and a public health official from the European Commission. The European scientific associations and civil society groups also send observers to the Advisory Forum.
- The Director is responsible for the overall coordination and leadership of ECDC.

ECDC's activities during the pandemic were based on four technical units and one administrative unit (Figure 1). In April 2011, ECDC was reorganised and the structure below does no longer reflect the current one.

Figure 1a. ECDC organisational chart, April 2009





**Figure 1b. ECDC organisational chart, March 2010**

- The Scientific Advice Unit's (SAU) main responsibility was to provide high-level scientific independent assessments as a basis for EU public health decisions in the area of infectious disease.
- The Surveillance Unit's (SUN) strategic objective was to build a Europe-wide surveillance system that provides high quality, comparable and easy-to-access information on all infectious diseases of interest at EU level.
- The Preparedness and Response Unit (PRU) monitored emerging threats in Europe and internationally; it supported the EU Member States in assessing, investigating and responding to these threats.
- The Health Communication Unit (HCU) was responsible for communicating the scientific and technical outputs of the Centre to European health professionals and to the general European public and for country cooperation.
- The technical units were supported by the Administration Unit, which ensured that ECDC's human and financial resources were properly managed, and that EU staffing and financial control regulations were adhered to.

## Public Health Event (PHE) – operational plan

In times of public health emergencies the organisational framework of ECDC remains the same but an emergency plan is applied to cope with the demand for extra and specific emergency work. The implementation of this plan changes the way activities are performed with regard to the pandemic diseases.

ECDC developed its own approach to the nature of emergency situation. Four conditions need to be met in order for ECDC to declare a Public Health Event:

- a public health threat;
- ECDC action is immediately required;
- a need to change ECDC's routine activities/managerial structure; and
- the public health situation is severely taxing the Centre's capacities (organisational structures, communication links) due to increased demand from public health stakeholders and/or media.

The existence of a public health emergency authorised the use of the Public Health Event (PHE) – operational plan.

The preparedness plan describes operational capabilities and procedures needed to quickly execute tasks in order to prevent, protect against, quickly respond to, and recover from a PHE. It further describes organisational arrangements to cope with a PHE by stating the necessary procedures to raise emergencies levels from 0 to 1 and 2 and the following tasks that need to be performed under each level.

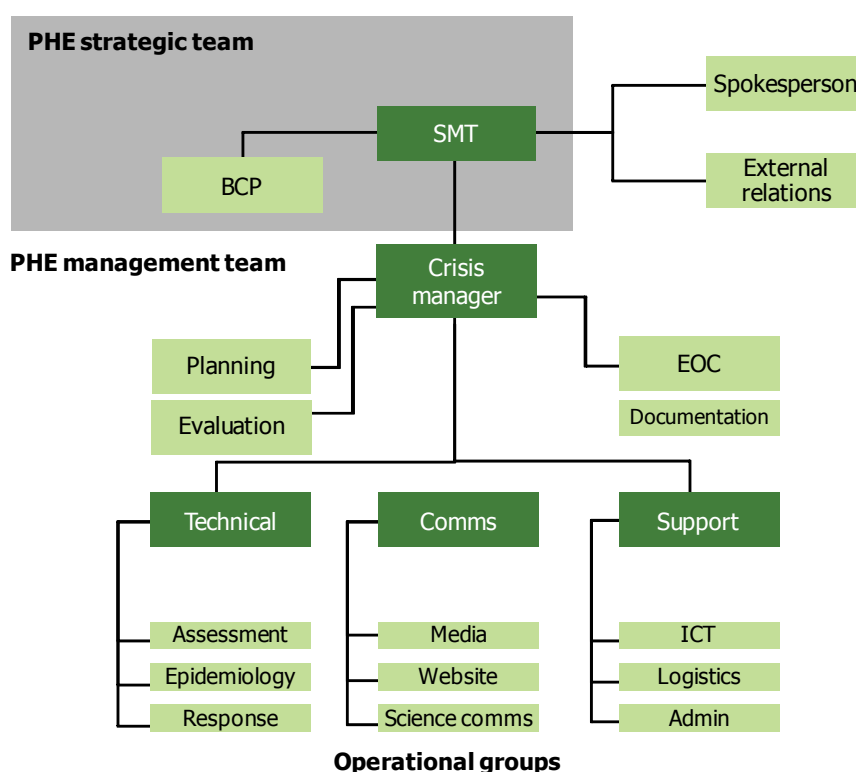
There are three PHE levels (0, 1, 2)

- 0 - PHE not declared. The plan is not invoked.
- 1 - All necessary ECDC resources are pooled.
- 2 - External resources are requested and a rotation of staff is organised to ensure the 24/7 activity of the operational groups (OGs).

The PHE management relies on two teams complementing each other (See Figure 2):

- PHE strategic team (PST)<sup>1</sup> (includes crisis manager, CM)
- PHE management team (PMT)<sup>2,3</sup>, supported by three OGs<sup>4</sup> (includes crisis manager, CM)
  - Technical group: covers epidemiology, assessment and response
  - Communication group: covers media, ECDC website, intranet, and science communication
  - Support group: logistics and administration

**Figure 2: PHE management structure**



During the course of the H1N1 influenza pandemic, ECDC responses comprised an evolving mixture of ongoing and contingency-specific groups, teams, and procedures.

<sup>1</sup> Provides strategic direction for PHE management senior management team + crisis manager + ECDC director. They are supported by a person in charge of relations with media, the external partners (i.e. European Commission, WHO, etc.) and a person in charge of the business continuity plan.

<sup>2</sup> Enacts the strategic direction provided by the PST. Crisis manager + OGs coordinators.

<sup>3</sup> The crisis manager is appointed by ECDC director. He enacts the strategic direction outlined by PST. He also has planning (forecasting of developments with the preparation of scenarios, in order to be prepared for contingencies, thus facilitating appropriate reactions and flexible processes) and evaluation functions (systematic assessment of performance using certain criteria; used to evaluate the actions and decisions made during PHE). He is assisted by three OGs, the EOC (documentation) and by a personal assistant ensuring traceability of all PHE developments and CM activities.

<sup>4</sup> Technical group, communication group, support group. The role of these groups is to facilitate the decision-making of the crisis manager. They are managed by OG coordinators.

- Influenza programme group. The programme on influenza was established in early 2006 and covers seasonal influenza, pandemic preparedness and animal (avian) influenzas. The activities of this group over the period 2005 to 2010 relate to improving the European pandemic preparedness and response: During the pandemic, it worked with others to provide evidence-based analyses and lessons for improving pandemic response to the current pandemic. It now works on improving preparedness and response for preparing for the next pandemic in Europe. The second purpose is to help reduce the burden of seasonal influenza in Europe by implementing the Council of the European Union Recommendation of 22 December 2009 on seasonal influenza vaccination; support is provided to Member States, WHO and the Commission.
- F(uture)-Plan. This was an internal ECDC Plan implemented to prepare for, and cope with, a pandemic affecting Europe and a prolonged crisis management situation due to a pandemic.
- Flu Team (F-Team) = technical team. The team worked towards implementation of the F-Plan. It consisted of the leads for the sub-teams under the influenza programme (communication, science, surveillance and vaccines as well as the influenza coordinator who chaired the team); the team would meet weekly or bi-weekly (formally) in order to agree on a timetable for achieving the set goals, to consider, propose, prioritise or reject additional pieces of work, make suggestions and report to the crisis manager/PST/Executive committee. The aim of the team was to ensure the delivery of the agreed regular influenza outputs as well as the scientific quality of outputs. The most intense period of work was during the summer of 2009, when the team prepared for the anticipated autumn waves of infection and disease in Europe.
- Influenza scientific team. This team was mandated to intensively and continuously monitor the scientific literature (through relevant websites and other sources of scientific information on the influenza virus) during the pandemic. Its most important task was to review and update the ECDC Risk Assessment to provide regular updates on A(H1N1) and convey scientific developments to ECDC technical staff. At the same time, the team described and commented on the most relevant scientific developments, data and guidelines, all of which should be used for the daily influenza updates on the ECDC website. This sub-team was a part of the flu team.
- Vaccine team. This new team was created in the summer of 2009 and reflected the importance of the development of a specific pandemic vaccine. It contributed to a number of vaccine-related publications on the ECDC website and helped with ECDC's input to the EU Pandemic Vaccine Task Force (European Medicines Agency, ECDC, European Commission – Directorate General for Health and Consumer Policy [DG SANCO], European Commission – Directorate General for Research and Innovation [DG Research]).
- Surveillance team. This team organised the surveillance of the emergency meeting in June which gave directions on how to organise surveillance activities and adapt them to the pandemic. It was also in charge of producing the new weekly surveillance overview which was one of the main vehicles to present facts, data and analyses to the public.

## Process and procedures

On the whole, our respondents described the crisis management processes during the pandemic as derived from the pre-pandemic PHE template. However, it is important to note that ECDC's crisis management process evolved over the course of the event in relatively adaptive ways in response to unanticipated and changing conditions, growing experience, and lessons learned. In fact, ECDC exhibited reflexive traits associated with so-called 'learning' organisations, not least by launching an evaluation of the efficacy of the 'first response' while the acute phase of the pandemic was still in progress. This learning process, which encompassed both internal (intra-ECDC) and external partners and 'users' of ECDC products facilitated the identification – and at least partial correction – of a number of problems which emerged early on (cf. Eriksen, 2009).

As we have discussed above, crises (such as influenza pandemics) put a heavy stress on organisations which can have a negative impact (cf. George, 1980) on the quality of internal and external communication, analysis, advice and decision. Crisis-prepared organisations develop processes and procedures which are sufficiently effective and robust to enable effective performance of roles and tasks under these challenging conditions; inadequately prepared organisations tend to do less well, to say the least.

While it was beyond the scope and resources of this evaluation to undertake a comprehensive process and procedural analysis, a number of aspects will be treated below. These are:

- alert status;
- reactivity/proactivity of analysis and staff work;
- coordination and situational awareness (vertical and horizontal); and
- documentation.

### Alert status

Like many organisations and national systems for 'homeland' or societal security, the ECDC PHE system in place during the pandemic was characterised by a multi-level alert system. During the H1N1 pandemic, ECDC operated on all three alert levels:

- PHE level 1, 24 to 26 April 2009
- PHE level 2, 27 April to 8 May 2009
- PHE level 1, 9 May 2009 to 18 January 2010
- PHE level 0, since 19 January 2010

Though the comments of our respondents generally endorsed the notion of multiple alert levels, some potential limitations of the current system were noted.

Maintaining such a system is advantageous as it provides a means of communicating assessments regarding the character of the anticipated workload, thus helping in adapting the organisation and its key staffing and work processes. One should note that there is a serious risk of misunderstanding regarding the frame of reference for this alert system, which is only indirectly linked to the character and severity of the external health threat; instead, it is directly linked to the expected demands on ECDC and its staff. This distinction is very important because ECDC often works with epidemic intelligence and closely monitors leading indicators of various kinds. Periods of peak stress for ECDC may not always coincide with periods of peak stress (and workload) experienced by Member State health systems for example – which was the case during the H1N1 pandemic in which ECDC raised its PHE alert level as early as April 2009 (cf. ECDC 2010 Special Report). A related problem has to do with coping with uncertainty (a key feature not only of many public health emergencies but also a defining feature of many other forms of crisis situations). Detection of a *potentially* acute health threat may necessitate intensified surveillance and analysis within ECDC and require shifts of the internal mode of operation well before the threat has been confirmed. It should be noted that current reporting requirements which mandate notification of the ECDC Advisory Forum, Management Board, Member States, the EU Commission, and WHO when the PHE alert status is changed may provide a disincentive to raising the alert level under conditions of uncertainty and contribute to reactive rather than proactive crisis management. While some senior respondents were confident that 'political' considerations had not affected decisions regarding the public health event alert level – nor would it be likely in the future – others did not share this confidence. Several qualified informants feared that such political 'contamination' effects could arise from the highly politicised European environment in which ECDC is situated and detract from the ECDC response to future PHEs.

Our analysis suggests two conclusions: (1) The multi-level alert system approach should be retained; and (2) the three-level alert system is a blunt instrument with a significant risk of future politicisation of the alert/warning

process; it should be restructured to provide more nuanced categories better adapted to the conditions and constraints noted above.

## Reactivity/proactivity of analysis and staff work

One of the best documented effects of heightened stress on individuals and organisations is a tendency toward reactivity and compressed temporal perspective (Flin, 1996; Stern, 2009; see also the section on stress management below). There are good reasons for this: organisations that have their hands full fighting fires often have little capacity or few short-term incentives to prioritise longer-term perspectives and conduct strategic analysis. The phenomenon is well known to designers of military and 'blue light' response organisations, and well developed crisis staff structures and methods are designed to compensate for this tendency. For example, strategic analysis cells are often added to the staff constellation in order to make sure that at least a few key participants are protected from the stresses of an intense operational tempo and tasked with thinking ahead and making sure that longer-term perspectives and heightened proactivity inform crisis decisions.

According to our respondents, these dynamics were visible within the ECDC PHE organisation during the first months of the pandemic. The crisis organisation was coping with a heavy work (and stress) load. Much of the work was managed day-to-day in a relatively reactive mode – which is understandable given the nature and trajectory of the 2009 H1N1 pandemic. Though the PHE plan (2008:16) envisioned longer-term planning and analysis as part of the 'planning function', in practice the short-term considerations initially tended to crowd out the longer-term perspective.

According to strategically placed informants, the reactivity/proactivity balance shifted significantly as the pandemic wore on. This was partly a function of the prolonged character of the event and partly a function of organisational adaptation which created additional slack and a more differentiated division of labour. During the summer of 2009, a so-called F (for *future* not flu) group was founded. This group worked in parallel with other elements of the PHE organisation and focused on the challenges to come during the fall of 2009 and beyond. According to many accounts, the work done by this group complemented the ongoing PHE management effort and provided useful strategic direction for the challenges to come.

*This experience suggests that the PHE organisation should be reinforced with an enhanced strategic analysis cell which could fulfil functions analogous to those fulfilled by the F group in the 2009 H1N1 pandemic. In order to highlight the importance of this function and provide a degree of separation from the more operational units, this should be broken out from the *planning* function.*

## Coordination and shared situational awareness (vertical and horizontal)

Successful organisational crisis management depends in large measure upon effective mobilisation and coordination of scarce organisational resources. Furthermore, coordinated action of this kind in a dynamic situations and complex institutional environments is thought to be facilitated by heedful interrelating in which each role player (or collective function) enacts his or her role in a manner which is not only parochially competent but also facilitates (or at least does not hinder) the overall effort. Heedful interrelating is highly dependent upon not only good knowledge of the organisational context, but also a high degree of situational awareness.

While enduring myths of crisis management focus attention nearly exclusively on the top leadership of the organisation, empirical research strongly suggests a vertical functional interdependence between that leadership and supporting/enacting functions (including expert assessment) at lower levels of the organisation (Boin et al., 2005). Top leadership is both a provider and key consumer of organisational 'intelligence' (produced elsewhere in the organisation) regarding the situation and the wider context. Top leadership can and should provide normative leadership in terms of formulating or authorising crisis management directives mapping out the course for the organisation, allocating extraordinary resources as necessary, and sanctioning departures from normal rules/practices when situationally appropriate.

In the context of the pandemic, relatively few indications of vertical coordination problems within ECDC have come to light in our individual and collective interviews. The accounts of our informants suggest that a pragmatically effective vertical division of labour emerged among the tiers of the PHE organisation with minimal friction or controversy. This appears to have been the result not only of the formal reporting mechanism and chain of command, but also of relatively strong and personal relationships among a core group of 'pioneers' building a newly founded and rapidly-growing organisation under a widely respected leadership. In expert organisations like ECDC, a common problem is when leaders who are also 'experts' fall prey to the temptation to return to the operational trenches, to the detriment of core internal and external leadership responsibilities. This does not seem to have been a serious problem for ECDC during the pandemic, perhaps in part because the (founding) director in place at the time reportedly conceptualised her role primarily in managerial and 'political' terms. Keep in mind,

however that other directors may face other temptations and that the role of the director in the crisis management organisation is not only vulnerable to overload, but also requires striking a delicate balance between detachment and micro-management.

Some informants noted with dismay that at certain key junctures the organisation functioned in a more hierarchical fashion than is generally the case in a relatively collegial expert organisation like ECDC, feeling that the information flow was restricted and opportunities for input on some matters limited. Other, more senior informants concurred but felt that this reflected an adaptive response to the exigencies of the situation, in which key determinations had to be made under heavy time pressure.

Regarding horizontal coordination, the picture which emerges from our discussions with our informants is suggestive of relatively smooth coordination. The PHE (and ordinary) organisation includes multiple fora for lateral coordination (e.g. strategic team, operational team). Use of the 'roundtable' approach at the operational level had the advantage of building on a well-oiled ongoing communication and coordination processes (and in fact took place in the same facility). It should be noted that while there are obvious advantages and efficiencies involved in using the same facility for PHE management and other forms of ongoing threat monitoring, there are some potential vulnerabilities here as well. For example, crisis management activities may end up competing with regular activities for space/time slots to the detriment of both. Though this does not appear to have been a serious problem during the pandemic, one can easily imagine future situations involving the simultaneous management of one or more PHE events together with the monitoring of other events.

Without dwelling on this issue, which was previously addressed by Eriksen (2009), it is recognised that documentation and display of ongoing efforts is of critical importance. Regarding the former, the PHE plan (e.g. version 25/2/08, p. 16) mandated the creation of a documentation group as part of the PHE organisation, tasked to:

- provide secretarial assistance to the crisis manager;
- ensure all EOC event documentation is captured;
- establish task lists and manage delivery;
- Perform a triage and log incoming information and direct it to the relevant operational group for further treatment;
- circulate outgoing information prepared by the operational groups;
- prepare periodic situation reports;
- documenting and maintain files on all EOC activities;
- keep the crisis manager informed of significant issues affecting the operational team; and
- prepare a final event dossier for approval of EXC (Executive Management Committee) and archiving.

According to Eriksen et al. as well as several of our respondents, this documentation function was underdeveloped in the early phases of the pandemic response and improved significantly over time. Use of the TTT (Threat Tracking Tool) was a key step in the right direction, for example.

A particularly vital documentation/display function is to have an accessible overview of the 'state of the game' at the disposal of the crisis manager. Some staff organisations use a traditional or digital whiteboard in order to provide an up-to-date picture of the key tasks at any point in time. This kind of overview is particularly useful when in crisis mode (PHE 1 and 2) when the baton has to be passed from an outgoing to an incoming crisis manager and shift team. As far as we have been able to determine, ECDC has not yet found an effective and systematic means of fulfilling this function and could benefit from adopting such a practice and adapting its infrastructure.

## Recommendations

- Review approach to staff organisation, methodology, and training:
  - More systematic approach to portraying situation to complement the TTT (e.g. some form of whiteboard or equivalent).
  - Introduce a separate strategic analysis function into the PHE organisation (outside of the 'planning' function).
  - Institutionalise improved documentation routines (take best practice from pandemic response TTT).
- Modify PHE system – add 'level 0.5' (internal alert with preparations for business continuity).
- Note the importance in a sustained crisis of establishing a 'dedicated' crisis manager to work with the relevant disease specialist.

## Training and exercises

The purpose of this section is to examine the training and exercise programmes that contributed to setting the stage for the activities undertaken during the pandemic. The observations made here are based on procedures from training and simulation exercises within ECDC, as well as interviews and the witness symposium.

### Major exercises since founding

Simulation exercises entail confronting individuals or teams with a hypothetical scenario and enabling them to rehearse problem-solving. Since ECDC was founded, a number of simulation exercises took place in order to train the staff, test, and contribute to refining the public health event procedures (See Figure 1).

**Table 1. ECDC exercises**

Year	Exercise	Type	Players	Scenario
June 2007	Brown Lagoon	Command-post exercise	ECDC staff	Norovirus outbreak and diphtheria cluster
September 2007	Red Wing	Tabletop	Belgium, Bulgaria, Czech Republic, France, UK	Ebola virus case in aircraft
June 2008	Green Field	Command-post exercise	ECDC staff	Meningitis outbreak during sport event
November 2008	Blue Triangle	Tabletop exercise	ECDC staff, Denmark, Portugal, Lithuania, Hungary, Greece, EFSA, DG SANCO, WHO	<i>E. coli</i> outbreak linked to food contamination
April 2009	Orange Circle	Tabletop exercise	ECDC staff, Poland, Romania, Slovenia, Denmark, Sweden, EMEA, DG SANCO, WHO	Vaccine-preventable disease and mass vaccination
November 2009	Purple Octagon	Command-post exercise	ECDC staff, UK, Romania, Denmark, Slovakia, Poland, Holland, South Africa, Canada, China, WHO	Mass gathering
July 2010	Wake-Up Call	Tabletop exercise	ECDC staff	Exploring evacuation procedures
September 2010	CCAEX2010	Command-post exercise	ECDC staff and European Commission	Bioterrorism
November 2010	Black Trapezium	Command-post exercise	ECDC staff, FWD EPIS network	FWD outbreak

### Approach to training and exercises

Simulation exercises reproduce real-life scenarios and are used to assess competencies, plans, processes, procedures and SOPs. They are tools to help improve preparedness and aim at assessing the ability of ECDC to respond to emergency events. Preparedness is fostered on two levels:

- At the individual level: exercises present an opportunity to train staff on existing crisis plans and procedures through hands-on practice. The debriefings and final reports clarify and improve the ways of dealing with emergencies through constructive feedbacks.
- At the organisational level: exercises reveal gaps in resources, point out planning weaknesses, and clarify specific roles and responsibilities. They help improving the command procedures and coordination mechanisms.

Simulation exercises are organised under a framework service contract (ECDC/06/013) with the UK Health Protection Agency (HPA) for the development of a number of simulation exercises on outbreak detection, investigation and response (cf. Health Protection Agency, 2011).

An 'Exercise Design Team' – consisting of staff from the Emergency Response Department of the HPA – was established to design and conduct each exercise. At the same time, an Exercise Planning Group (EPG) made up of staff from the Preparedness and Response Unit of the ECDC and Unisys (designers and installers of the ECDC Emergency Operations Centre) was formed to provide the Exercise Design Team with guidance for the planning and approval of the exercise documentation and conduct.

## Review of training and exercises programmes focusing on PHE

Of all the simulation exercises that took place at ECDC, some specifically focused on aspects that were directly relevant and useful during the influenza outbreak. The following are particularly noteworthy:

### The Brown Lagoon exercise

The scenario of the exercise was designed to test the Public Health Event Operations Plan (PHEOP) procedures (including command and control), the Emergency Operations Centre's (EOC) equipment and facilities, and the establishment of an Outbreak Assistance Team.

As a positive result of this exercise players were able to evaluate the plan and associated command and control arrangements in a non-emergency situation before the plan was used extensively in a real-world event.

### The Green Field exercise

The overarching aim of the exercise was to test, evaluate and refine standard operating procedures (SOPs) in order to respond to an emerging and escalating Public Health Event (PHE) involving EU Member States. Specific objectives included the re-evaluation of internal procedures (Public Health Event Operation Plan), the procedures for the levels of operation of the EOC including the scaling up of operations, the allocation of staff, and the assignment of staff functions. Similarly, procedures for internal and external communication were reassessed as well as the tools and equipments of the EOC.

The results of the exercise reflected the significant improvements since the last exercise of this kind, Brown Lagoon, in 2007. Significant improvements were observed in the operationality and practicality of the PHE, in particular in the field of communication and media response. The SOPs were thought to be too long, the crisis manager was overwhelmed by the number of requirements and the implementation of a business continuity plan was recommended.

### The Purple Octagon exercise

The exercise was designed to assess ECDC's capabilities to respond to a public health emergency during an international mass gathering event, while continuing to manage the ongoing pandemic (H1N1) crisis.

Once more, this simulation was designed to test ECDC plans and procedures, with an emphasis on information sharing and communications, as well as on its capacity to allocate resources (e.g. staff planning, rotation, handover and support arrangements) to the management of a PHE-level-2 event, in parallel to the ongoing pandemic.

During the debriefing, comments referred to the complexity of internal information flows that prevented a rapid dissemination of information to all levels of the organisation. This observation was also made at different stages during the witness symposium; it is crucial that all staff and in particular new staff members are familiarised with the process. Similarly, staff resilience should be improved through the development of training of more staff on epidemic intelligence and other critical functions. This would allow for more rotations and reduce the probability of burnouts, as mentioned in the interviews and witness symposium.

All in all, ECDC has demonstrated a relatively high commitment to training and exercise and an impressive ability to address issues identified during exercises, which reportedly have been developed and implemented in a professional manner as part of an integrated, longer-term capability development programme. Many, though not all (a significant exception being the follow-up on business continuity [see below], of the so-called 'lessons learned' in exercises have resulted in revised structures, practices and procedures.

## Recommendations

Considering the observations made during the interviews and witness symposium, future simulation exercises should continue assessing ECDC's procedures for staff rotation and handovers. At the same time, training should continue in order to increase staff awareness of PHE mechanisms and implications.

The management of stress and workload during a long-term public health emergency requires that a substantial number of experts are adequately trained to perform various activities (particularly epidemic intelligence duties). Regular staff training activities also contribute to ensuring that everyone is aware of emergency procedures and can understand what information they need in order to proceed in their respective activities and responsibilities. Such activities would promote the effectiveness of internal communication processes.

This point was already emphasised during the first evaluation of the use of the PHE in July 2009; the results of the questionnaire submitted to ECDC staff showed that a certain number of staff had 'poor knowledge of the PHE



plans<sup>5</sup> (which were fairly long and complex) and that short versions should be prepared to ensure that all staff and external experts brought in (not only PRU experts<sup>6</sup>) are aware of the emergency mechanisms. In this respect the continuous use of the intranet as a means for communication, briefing and training has become an asset and should be further promoted.

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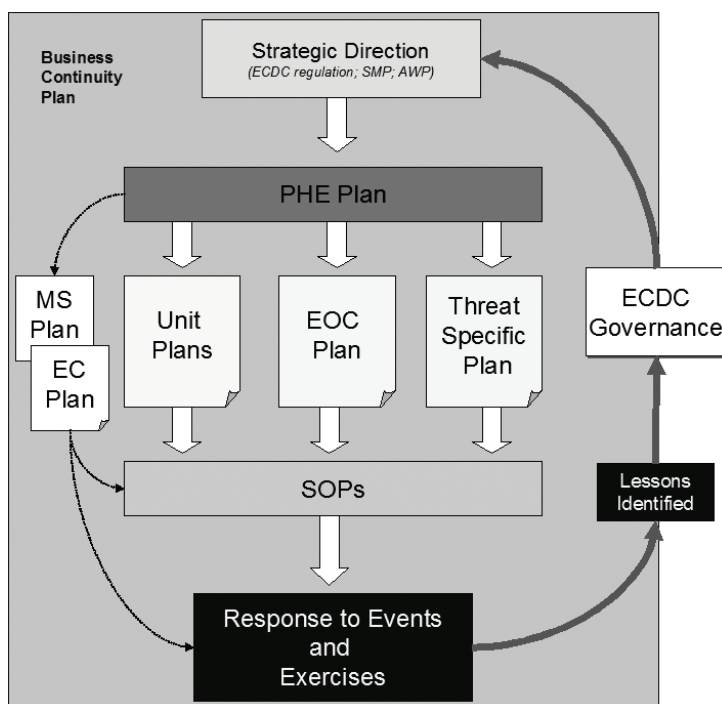
<sup>5</sup> p. 11

<sup>6</sup> p. 12

## Business continuity management and planning

One of the observations from the evaluation performed after the first period of the pandemic was that 'one of the main problems of the crisis response was the forced and sudden interruption of ongoing work activities: especially the non-PRU staff was not adequately prepared to stop their running activity when requested in EOC. Several ECDC units were substantially affected by temporary lack of human resources and found themselves without a prepared contingency plan<sup>7</sup>.'

A business continuity plan (BCP) is part of a larger set of business continuity management (BCM) procedures. It is implemented to ensure that the occurrence of an internal or external adverse event will not have an unduly negative effect on critical organisational functions. As can be seen in the figure below, ECDC's BCP at the time of the pandemic was based on the conjunction/coordination of various documents, mainly on the PHE plan and its Standard Operating Procedures (SOP):



Source: European Centre for Disease Prevention and Control. *ECDC Public Health Event Operation Plan*, p. 8, Figure 1

The PHE plan describes the specific organisational arrangements to cope with an external public health crisis. It was thus used to organise most of the crisis response activities, decision-making procedures, and 24/7 duty rosters. It is updated regularly, and so are the SOPs. In addition to this plan, the simulation exercises that had taken place before the pandemic constituted a reservoir for practical use/adaptation of the plan and lessons learned. No specific business continuity plan for influenza existed however, and ad hoc procedures were implemented to organise staff vaccination and install alco-gel dispensers around the premises (see: ECDC documents on pandemic flu: antivirals, vaccine, masks, missions).

However, these documents did not adequately provide for the management of several key internal issues that are best addressed in a separate contingency plan or BCP. Those issues related to staff sustainability (burnout prevention), work overload and overtime, and personnel and financial resource allocation/prioritisation.

In the process of this second evaluation, the different interviews of key players in the pandemic response as well as the witness symposium revealed how this absence manifested and how it became detrimental to ECDC's quality of work.

<sup>7</sup> p. 15

In the context of ECDC's activities during public health emergencies, a BCP would have to ensure that the crisis does not disrupt the execution of routine activities and legal obligations with regard to internal staff (e.g. compensation) as well as external stakeholders (define what is *force majeure* and *cas fortuit*). The BCP would thus need to contain procedures to decide on operational priorities in order to be able to draw additional budget funding for crisis management from secondary activities. It would also need to contain provisions for the reassignment of tasks among the internal staff and define what would be carried out by external experts if level 2 was activated. These BCP procedures would also help make provisions for training activities aimed at external and internal staff (recruited from other units) to ensure that all personnel had sufficient information to perform their new tasks. In addition to those organisational strategies, technical support would also need to be addressed, in particular the possibility to work remotely (e.g. from home).

Although the BCP was arguably underdeveloped at the time of the pandemic, it is important to note that steps are being taken to rectify this problem. A BCP steering group of 10 experts from all units is currently working on such a plan. In December 2009, a note was presented to the Executive Management Committee (EXC) outlining an approach to develop a business continuity plan. Following this, members of the BCP steering group were appointed by the heads of unit. As indicated in a note (December 2009), the Centre has decided to use the the Commission BCM lifecycle which comprises four elements:

1. Understanding the organisation:  
Identifying the Centre's mission and key objectives and the functions and resources that support them. The main outputs in this phase are a business impact analysis and a risk assessment.
2. Determining the BCM strategy:  
Defining a business continuity strategy on the basis of priorities and possible scenarios, taking into account mitigating measures.
3. Developing and implementing the BC response:  
A detailed plan of procedures and measures to minimise the impact of disruption.
4. Exercising, maintaining and reviewing:  
The plan needs to be tested, staff trained, and the plan should be regularly reviewed for improvement and adaptation to the evolution of the context.

The BCP steering group has carried out the first step: critical and essential functions were identified and analysed in each Unit, and a risk assessment was performed. Critical and essential functions correspond to functions that cannot be interrupted or need to be restored within 48 hours or a week, respectively.

Six criteria for the prioritisation of functions were determined, according to the impact their disruption would have on certain key stakes (external relations, public image, staff, legal and political mandates, and financial viability) and can be found in the note to the Executive Management Committee (EXC) sent on 28 June 2010. Each Unit was then requested to identify its needs in terms on human resources, premises and ICT to ensure continuity of each function and the ways by which business disruption could possibly be mitigated (e.g. back-up staff, back-ups of data and the possibility to work remotely in case of unavailability of premises.)

Risk assessment is the second part in the process of understanding the organisational needs for business continuity planning. It consisted in identifying the threats that could affect ECDC's activities and then evaluating them by considering the impact such events would have on staff resources, premises and IT infrastructure.

The steering group is currently performing the second step whose outcome will be a proposal of business continuity strategy for decision by management. A business continuity plan was scheduled for release in December 2010 according to the timeframe the SMT (Strategic Management Team, successor to the EXC) agreed upon in June 2010 (cf. ECDC internal documents).

In the first quarter of 2011, simulation exercises were scheduled to take place in order to test and further improve the BCP. The scenarios of the exercises will be based on the threats that were identified during the risk assessment phase.

## Recommendation

Business continuity planning, not only for pandemic influenza, but also for a range of other contingencies identified in the risk assessment process (see above) should be completed in a timely fashion during 2011 and then be subject to regular exercise and review.

# Stress management

## Stress management

It is important to begin by noting that many of our informants reported responding positively to the challenges posed by the pandemic of 2009–10. The PHE planning and exercise programmes were cited by many informants as having helped to prepare individuals and teams for the heavy responsibilities (and workloads) associated with public health emergencies and other forms of crisis. Others praised ECDC for stress reduction practices. For example, additional activities were organised within ECDC to ease stress (e.g. services of a physiotherapist, yoga courses).

However, a number of credible informants, speaking individually and collectively, indicated that ECDC stress monitoring management practices were perceived to be underdeveloped during the acute phase of the pandemic (or upon subsequent self-critical reflection). In order to address this issue, one needs to analyse the relationship between crisis and stress, with a focus on ECDC's experience during the pandemic and by pointing out ways to improve future practice.

## Stress and crisis

By definition, crises (such as public health emergencies) are characterised by threats to (and possibly fleeting opportunities to promote) cherished values such as life, health, liberty, justice, power, democracy, welfare, legitimacy, and professional status. An effective response to crisis can protect these values; an inadequate response can be costly to leaders, their organisations, and their constituents. Furthermore, the acute phases of a crisis are distinguished from other situations by the pace of events. In dynamic and volatile situations, windows of opportunity to influence the course of events are often fleeting. Assessments and decisions must be made rapidly or the possibility to influence the course of events may be lost. Furthermore, there are fundamental uncertainties about the nature of the threat, contextual parameters, and/or the efficacy and consequences of alternative responses. These conditions together tend to generate extraordinary stress loads for those individuals responsible for coping with, and seeking to make sense of, crisis situations.

While stress has been conceptualised in a number of ways, one of the most influential views is the one of stress as entailing a relationship between a task load and the coping capacity of an individual, group or network, organisation, or interorganisational response. High stress need not necessarily degrade performance – cognitive and otherwise – if it is balanced by a high degree of coping capacity. Robust research findings suggest that experience is a key factor; seasoned experts tend to be far more effective in maintaining performance under pressure than novices. In fact, the work of organisational psychologist Gary Klein (2001:275) and others (e.g. Schraagen et al., eds., 2008) working in the rapidly growing area of naturalistic decision-making theory have clearly demonstrated the capacity of experienced and well-trained practitioners to cope with extreme situations.

A crude but still useful point of departure for thinking about stress is the conventional wisdom in the field that the relationship between stress and performance tends to take the form of an inverted U. Absence of stress is associated with lower motivation and performance, moderate stress with high performance (due to heightened vigilance and motivation), and excessive stress with declining performance once leaving the optimum zone of the curve. Individuals are thought to have somewhat differently shaped stress curves, in keeping with the notion that some individuals cope better with stress than others. However, the stress curve neglects the possibility that different kinds (as opposed to aggregate quantities) of stress may have rather different psychological consequences for decision-makers. Stress deriving from overload and lack of time may well have different psychological consequences than stress deriving from value trade-offs (such as tragic choices), fear of loss, internal dissent, or external conflict. The latter four are likely to be more emotionally charged – adding to the emotional component of stress dynamics (Janis and Mann, 1977; Lebow and Stein, 1994:331–38).

It has also been suggested that focusing narrowly upon stress linked directly to the crisis problem may be counter-productive. Some researchers argue that stress is likely to be cumulative, in the sense that a decision-maker's ability to cope may be impaired by lingering effects of previous stress loads – a kind of vulnerability-inducing stress hangover. Similarly, stress is thought to be cumulative in the sense that stress associated with other professional tasks or from a decision-maker's personal life may add to the total load borne by a crisis manager or worker. It should be noted that there are indications that some individuals are better than others at compartmentalising stress – isolating stress arising in one domain and preventing it from contaminating others. Clearly, coping with several crises at once (or with the coincidence of a crisis and other demanding organisational tasks) adds to aggregate stress levels.

A wide range of specific effects have been identified by researchers working with experimental, historical, and field studies. For example, under heavy stress, individuals are thought to:

- focus on the short term, to the neglect of longer term considerations;
- to fall back on, and rigidly cling to, long-standing behaviour patterns (often forgetting more recent ones);
- narrow and deepen their span of attention, scrutinising 'central' issues while neglecting 'peripheral' ones; and
- be prone to irritability (Weick, 1995:103–4).

Some researchers argue that the stress literature has systematically misunderstood the relationship between stress and performance errors. For example, Klein (2002:275) has argued that the more important effects of stressors such as extreme time pressure, noise and ambiguity are that:

- stressors interfere with information gathering;
- stressors disrupt the ability to recall necessary information; and
- stressors distract decision-makers' attention from critical tasks.

It should be noted that training and exercises are thought to enable personnel to cope with heavier burdens and potential stressors. ECDC's commitment to training and exercise (see separate section of this report) made a noticeable contribution in terms of preparing the PRU staff.

## The ECDC experience during the pandemic

Respondents reported concerns with both acute and longer-term stress levels associated with peaks of activity that placed heavy demands on staff to perform combined with the prolonged nature of the H1N1 pandemic. Many expressed concern over individual cases of burnout or near-burnout among the staff and felt that the stress management regime in place during the pandemic was underdeveloped and that ECDC had been 'lucky' not to have more cases.

Several accounts suggested that the high levels of stress experienced by staff were exacerbated by the lack of more differentiated business continuity planning (see above), including more systematic mechanisms for prioritisation (and deprioritisation) of PHE-related work in relation to other ongoing commitments. Similarly, staffing practices placed an extremely heavy burden on a number of key individuals and functions.

The specialisation of experts and the low number of possible overlap between competences to execute similar tasks in the context of a public health crisis contributed to the complexity of handovers and staff rotation.

In this context, training of internal staff should remain a priority during normal operation to ensure that a broader staff cadre can be mobilised for future crisis events. In addition, supplementary ('quick') training should be made available during the public health event, to guarantee that external experts and other reinforcements are quickly brought up to speed on PHE organisation and procedures. A key purpose of PHE level 2 is to add external expertise to alleviate internal work and to ensure that the crisis is managed in the best possible way; if, however, the external experts are not pre-trained or rapidly briefed on the basics, their integration into the PHE work will be slowed down.

On another level, stress can be generated by the complexity of internal communication processes in an emergency situation, the uncertainty of responsibilities, and the lack of information. As mentioned in the interviews and in the previous evaluation in July 2009, this factor could be reduced through a clear awareness of each contributor's role in the management of the event; the awareness of procedures and plans would be a means to reduce stress.

Finally, as observed in the interviews, the lack of a clear compensation scheme for extended overtime hours was also contributing to stress. The system allowed for vacation compensations, which, if a majority of eligible staff had claimed comp-time, would have made the management of the crisis impossible.

Many respondents reported experiencing high levels of work-related stress during the H1N1 pandemic and especially during certain key periods such as the PHE 1 and especially the PHE 2 period. The PHE 2 period was described by one centrally placed respondent as 'ten days of frenzy'. Several staff members described a very heavy burden on those working with the media, for example. Ad hoc, reactive and semi-coordinated scheduling of PHE work added to staff stress levels during the initial period but improved subsequently (Eriksen et al., 2009: 12).

In summary, most emphasised what might be called *eu-stress* – experiencing a potentially stressful situation in positive terms as a professional challenge and opportunity to make a contribution to ECDC and its various constituencies including European public health (Eriksen et al., 2009:9). Many influenza specialists had been gearing up for a long-expected serious pandemic. Some individuals obviously worked at peak levels for prolonged periods of time and in multiple capacities. Such sustained high performances are likely to be the result of an unusual combination of personality and conducive situational factors and can set performance standards which are not realistic for others to aspire and may in fact be dangerous.

However, other staff members reported how individuals experienced PHE-related stress in a negative way. In one case mentioned by several respondents, an ECDC senior official reportedly became over-stressed to the point that he was unable to fulfil his duties and was hospitalised. Others were described as having experienced milder forms of 'burnout' with less dire consequences. Centrally placed informants felt that it may have been sheer luck that not more were pushed (or pushed themselves) too far. Others emphasised that unacceptable risks were taken with staff and that their anxieties were not adequately addressed.

## Recommendations

- Improved consciousness of managers (and staff) regarding stress monitoring and management of colleagues (superiors, subordinates, peers). Specific training in this area may be needed.
- Short-term considerations (i.e. need for an individual's skill set) have to be balanced against the need for individual and collective sustainability.
- Access to multiple, qualified players of key PHE roles will reduce the temptation to over-use key players.
- Avoid role overload.
- Encourage staff to maintain physical 'readiness' via adequate provision of food, water, rest/sleep etc. Performance can decline quickly when these factors are neglected. In some cases, supplies should have been actively promoted to heavily engaged personnel rather than counting on them to seek sustenance themselves.
- Physical exercise (and massage) helps some people to cope more effectively with work related stress, generally as well as in more acute situations. ECDC's provision of yoga and massage services free of charge during the acute period was appreciated and functional. Such activities should be in place in advance for future events as part of PHE/BCM planning.
- Reinforce key functions proactively (do not wait until individuals or teams are overwhelmed) and prepare for shifts as envisioned in the PHE plan.
- Clear priorities and, if necessary, explicit deferral of other duties/commitments helps to reduce stress and anxiety.
- Other types of stress reduction: see Eriksen et al. (taxis, late night personnel security, etc.)
- Consider including psychologists/psychiatrists in the crisis management teams with responsibilities for stress monitoring.

## Surveillance

Surveillance is a vital and prioritised function at ECDC. All technical units of the agency devote a substantial portion of their efforts to this work. A central means is through systematic collection of data from EU Member State notification systems on communicable diseases, but many other types of information sources are also utilised, such as laboratory information or hospital admission records.

Influenza has been in focus for some time and a dedicated specialist team exists at ECDC, working as a central node in a long-standing influenza-specific surveillance system throughout the EU, which can be described as a combination of notifications, general practitioner-based sentinel surveillance, and influenza laboratory information in all Member States. These sources have been coordinated by ECDC via an integrated surveillance system since the inception of the agency.

Our discussion of the surveillance function will take the form of a discussion of several key questions:

- Was the ECDC response activated in time?
- Did the first risk assessment released by ECDC overestimate the risk?
- Were the surveillance indicators used appropriately and timely?
- Was the format used in communicating surveillance data appropriate?
- Is the daily counting of cases or fatalities helpful?

### Was the ECDC response activated in time?

The first information about the pandemic was captured by ECDC's preparedness and Response Unit (PRU) on 21 April 2009, through the discovery of a short publication of two cases of 'influenza by a novel virus' in a CDC USA publication entitled 'Mortality and Morbidity Weekly Report' (MMWR). On the same day, PRU activated an internal influenza working group, including senior influenza experts who were already on the ECDC staff.

An active information search, contacts with WHO and CDC, and contacts with Member States experts led ECDC to activate level 1 of the Public Health Event (PHE) plan on 24 April 2009. As described previously in this report, the pre-existing Public Health Event plan includes two emergency levels: level 1 implies 12 hours/6 days activity with rotating teams from a roster of ECDC expert staff. The first ECDC threat assessment was published on the same day. Also on 24 April, WHO posted an International Health Regulation (IHR) message confirming that the outbreak of severe respiratory diseases in Mexico was caused by a novel influenza virus.

One day later, on 25 April, a report confirmed the outbreak, with 18 confirmed cases in Mexico, including six deaths, thus linking the appearance of the 'new' influenza virus to an apparently very high lethality. ECDC published its first situation report on the same day. On that day, WHO also reported the outbreak in Mexico and USA. Two days later, on 27 April, ECDC, for the first time ever, raised the PHE level to the highest available level (2), so internal and external staff could participate in around-the clock shift work, 24 hours a day, seven days a week.

It is evident that the ECDC response was very timely; within a few hours of the first news of the epidemic, the entire PRU was mobilised, and in less than a week after the original event ECDC had mobilised its staff more actively than ever before.

Key elements for such a prompt, expert response were:

- The presence of a dedicated unit on preparedness and response (PRU), with a dedicated team working on epidemic intelligence, actively scanning for potential global health threats, using formal and informal sources of information.
- The existence of a carefully formulated Public Health Event (PHE) plan that was widely shared with the ECDC staff.
- The systematic use of simulation exercises to practice emergency response procedures within PRU and for all ECDC staff.
- The presence of high-quality expertise at ECDC, specifically influenza experts who were not only competent, but also had access to a personal network of contacts that included many international experts in the field of influenza.

## Did the first released ECDC risk assessment overestimate the risk?

The first information from the outbreak in Mexico was largely incomplete: The virus was not yet isolated, a diagnostic test was not available. What was evident was a growing number of adults, many of them young, admitted to hospitals with a sudden onset of pneumonia.

On 25 April, news from Mexico described about 200 cases, with a case-fatality ratio of 17%, which is extremely high when compared to seasonal influenza.

On 27 April, WHO described the outbreak with about 1 000 cases, with 71 deaths (7% case-fatality ratio) in Mexico.

In summary, the information available during the first week from the first reports of the outbreak suggested the following:

- A novel influenza virus, closely related to the 1918 one.
- High incidence in young, previously healthy adults.
- Case-fatality ratios from 17 to 7%.

These three pieces of information were not unlike the evidence of the 1918 'Spanish flu' pandemic and conjured up images of a devastating influenza pandemic: the media could not have been offered a better opportunity to come up with terrifying scenarios of a devastating pandemic.

On 24 April, ECDC released its first threat assessment: this document was quite prudent and did not overstate the facts. The main message was to wait for further information.

A week later, on 30 April, ECDC defined the epidemic as 'clinically mild and with a lethality rate not different from the seasonal influenza'.

This clear message, which was also confirmed during daily teleconferences with most of Member States, was insufficient to avoid extreme positions that had become quite frequent in many Member States governments and media.

The lack of a clear severity matrix that could have helped Member States to try to evaluate the severity of the pandemic, contributed to a gap between ECDC's scientific advice and the perceptions and actions of some Member State authorities. ECDC has since that developed such a matrix. Still, the series of risk assessments produced by ECDC demonstrated the Centre's significant ability to incorporate new data, provide updates on the evolving picture of the event, and identify key areas of uncertainty.

## Were the surveillance indicators used appropriate and timely?

A dedicated surveillance system was rapidly established and daily reports were published on the web and distributed to interested parties. From the beginning, mortality and morbidity data as well as virological information was included in the surveillance (Devaux, et al., 2009). Starting in October 2009, when many Member States activated their routine sentinel surveillance systems, this information was included in ECDC's surveillance activities and reports.

### Virological data and seroepidemiology

Results of virological tests were collected both by the existing influenza laboratory network (Community Network of Reference Laboratories; CNRL), but also by all Member States and periodically published online. Laboratories in the EU/EEA experienced an unprecedented amount of diagnostic work related to 2009 pandemic influenza (H1N1). Tens of thousands of tests were performed and thousands of viral isolates were typed. This constituted an extraordinary amount of work carried out by a few skilled influenza laboratories. Due to a certain excess in requests for diagnostic services, this event proved to be a major test of the capacity of the virological labs in the EU/EEA.

From the very beginning, seroepidemiology was a technology in high demand, as it offered valuable insights into pre-existing and evolving immunity in the population, was instrumental in understanding the clinical disease, and could be used to evaluate the impact of vaccination programmes. A test was quickly made available by the WHO influenza laboratory network, but it took a long time to build a network for the surveillance of seroepidemiology in the EU. In fact, seroepidemiology related to seasonal influenza epidemics was not common practice in Europe. It was perceived as expensive, time-consuming, and lacking a standard reference, and was thus very often limited to research projects. (Note: ECDC in collaboration with Member States and other countries such as Canada, is currently engaged in improving seroepidemiology.)



## Surveillance of severe acute respiratory infections

The 2009 pandemic provided an opportunity to include a syndromic approach into a surveillance system – the first time this was done in the EU. For purposes of monitoring the severity of illness and impact of public health measures, a surveillance system for cases of hospitalised severe acute respiratory infections (SARI) infected with the 2009 pandemic H1N1 virus was established. A case definition for the syndrome was made available on 30 April 2009. The system was based on sentinel hospitals; national coverage varied considerably in the Member States.

Inevitably, this new system suffered from many limitations: the concept of severity was not fully understood so that both mild and severe hospitalised cases were reported; reporting was not homogenous and often required active persuasion of reporting countries by ECDC. Another limitation of SARI surveillance was the lack of information on risk factors, a trait it shared with ILI surveillance. The most significant limitation however was that SARI, although a reportable disease in some less developed countries, is not a recognised diagnosis in most EU hospitals. Only 40% of the EU population was covered. In most countries where no uniform nationwide hospital network for SARI existed, only a few sentinel hospitals joined the system. As is the case often for hospital-based data, the population denominator was unknown for many hospitals or did not necessarily reflect the population from which cases arose. For some countries, the level of care was also unknown (some countries only reported ICU patients, others all hospitalised cases) and the date used for statistics varied: hospitalisation/notification/onset.

More than 95% of the reported SARI cases were infected with the 2009 pandemic 2009 H1N1 virus, which reflects the case definition recommended by ECDC. Following this case definition increased specificity, but decreased sensitivity. This is in contrast with the objectives of the main SARI system, which aimed to monitor the impact of the pandemic influenza on hospital care services.

Despite the shortcomings of this new and rapidly implemented system, the trend analysis of reported SARI cases provided a very good fit with other morbidity indicators such as ILI and mortality, proving the relevant added value of SARI surveillance. It offered crucial hospital data on the health system response to the pandemic, but also contributed greatly to the understanding of the clinical picture of this new disease and helped evaluate the severity of the pandemic.

## Surveillance of influenza-like illness

In early autumn 2009 many countries implemented a routine sentinel surveillance system for influenza, drawing on a network of voluntarily participating family doctors that reported to the Centre all cases of influenza-like illness (ILI) on a weekly basis. This network has been operating in Europe since 1987.

The results of the ILI sentinel surveillance system were published in the Weekly Influenza Surveillance Overview (WISO) bulletin (see below).

This surveillance system provided systematic and quite reliable information on a weekly basis. Despite the low specificity of the ILI diagnosis for influenza diseases, the more than ten years of experience has proved in many countries that ILI surveillance is a very good proxy of morbidity during a seasonal influenza epidemic. The system worked also very well also during the pandemic, despite the different seasonal period.

## Mortality surveillance

While it needs to be recognised that the number of deaths is not a good indicator to evaluate the full impact of influenza, it also needs to be understood that these numbers were a crucial indicator during the pandemic, and ECDC was correct in using them.

The number of deaths due to the pandemic virus (laboratory confirmed) were actively collected from Member States from the very first indications of a pandemic. This indicator was not commonly used in the seasonal national influenza surveillance systems, but during the pandemic this was definitively the indicator most frequently requested by EU/EEA Member States, WHO and the media.

A large proportion of the pandemic influenza-related deaths occurred in young people (which is very uncommon for seasonal flu) and deaths occurred also in individuals without any known underlying diseases or risk factors. One reason to monitor the number of deaths was to estimate the frequency of these events, thereby describing the clinical picture and severity of this disease. It was also an indicator which was comparable, albeit in a limited way, between countries worldwide.

One serious limitation of counting fatal cases was the attribution of cause of death to the pandemic influenza: there were diagnostic difficulties, there was as the fact that most deaths occurred in patients already suffering from severe disease, and there was a large variance among the reporting Member States on the interpretation of this relationship. Due to pandemic influenza, most Member States collected the number of deaths by a dedicated *ad hoc* active surveillance system, which was often hospital-based. Data collection was not based on routine mortality registers, which in most countries are not timely enough to support decision-making. In fact, many

countries established a double reporting system during the pandemic: the routine mortality surveillance system was complemented by the surveillance of pandemic deaths.

## Recommendations

A more careful use of virological testing capacity could have had beneficial effects on timing and availability.

Better use of sero-epidemiological studies should be developed for future pandemics: in fact, important scientific and public health-related information was obtained from the 2009 pandemic, but due to the delayed activation of the system, most of this was provided too late to be of practical use.

The implementation of severe-disease surveillance was a very relevant innovation and contributed to the surveillance of the pandemic. However, SARI surveillance is not appropriate for most EU hospital systems. Severe-disease surveillance systems also have important relevance for other epidemic situations and should be maintained as a routine system. Further attempts should be made to improve the number of countries participating and the quality of data provided by these systems, with a stronger focus on intensive care units.

## Was the format for communicating surveillance data appropriate?

As a preliminary step in this evaluation, an evaluation of the Weekly Influenza Surveillance Overview bulletin was carried out through an online survey during May and June 2010. The response rate to the online survey was 40% (44 out of 110). Half of the 40 people who filled out the questionnaire before the EISN meeting on the 1 June 2010 worked at public health institutes in the Member States, and 80% were involved in the process of uploading influenza surveillance data to TESSy. Two thirds named the WISO as their main source of international surveillance data. More than 90% named 'to document the current status and the progression of influenza activity' as one of the most important functions of the WISO.

In general, the feedback on the WISO bulletin in the survey was positive; the overall rating of the usefulness of the WISO, its accessibility and the accessibility of information within the WISO were all above 3.5 on a five-graded scale, where five was the highest score. Each of the five sections in the WISO; the summary, the epidemiological section, the virological section, the section on influenza deaths, and the SARI cases section were given average ratings between 3.5 and 4.2. These ratings did not differ significantly between epidemiologists and virologists on a 95% statistical confidence level. Though the ratings from the people who responded after the EISN meeting (where the preliminary results were presented) were slightly higher than the ratings of those who responded prior to the meeting, the difference between them was not statistically significant.

Although the timing of the WISO (it was published every Friday afternoon), was given an average rating of 3.5 out of 5, several comments were made that it would have been helpful if it had been published earlier in order to be read before the weekend. The majority of people were content with the size and format (PDF) of the WISO.

Eight of thirty non-ECDC-employed respondents said they included the WISO summary in their national influenza bulletins, and ten of them forwarded the WISO link to interested audiences.

There were many comments made in the survey; if possible, these will be taken into account in the design of future WISOs. Comments included advice on how to improve the layout of the maps and tables in the epidemiological section. The links in this section were often slow to open. Some other comments expressed wishes for more interpretation of the collated data. Feedback was given on which tables and graphs were of particular interest to the readers, e.g. the 'weekly and cumulative influenza virus detection' graph in the virological section and the 'number of SARI cases by week of onset' in the SARI cases section. Several respondents expressed concern about the heterogeneity in the case definition and data collection for SARI cases, something that was further discussed during the EISN annual meeting in June 2010.

Seventy-six percent of respondents thought that the WISO bulletin should contain links to national influenza bulletins, and many expressed that it would be useful to have links to surveillance information from the southern hemisphere. The majority of respondents thought the reporting process to the TESSy database worked well; however, it was considered time-consuming. Most people had not found any errors in the WISO.

## Is daily counting of cases or deaths helpful?

Decision-makers and the media displayed great interest in daily reports of numbers of deaths. The media love to report on daily numbers, and often politicians are very sensitive to this kind of media reporting.

However, the daily counting of cases and deaths does not contribute to the monitoring of an epidemic. In fact, at EU level, these daily counts of fatal cases inevitably become affected by several biases such as national differences in case ascertainment and reporting systems. This happened despite an agreed case definition: some countries reported only deaths after hospitalisation, others only laboratory-confirmed deaths. Some countries provided rapid online reporting, while others relied on e-mail. Furthermore, some countries reported the cases by date of onset, others by date of diagnosis.

On the other hand, daily counts were reported on the front pages of newspapers, potentially contributing to the growing nervousness of the population, who were unaware of concepts like 'incidence' or 'lethality rates'. For seasonal or pandemic influenza, daily counts are of limited scientific value, therefore interval (e.g. weekly) reporting should be emphasised in the early stages of an epidemic as well.

In general, exact numbers of cases and deaths can be misleading for the reasons mentioned above. Trends and analyses are more useful than exact numbers. In addition, production of numbers, especially on a daily basis is immensely draining and resource-intensive for staff at public health organisations.

## Scientific advice and information on vaccines

Providing scientific advice was the main activity of ECDC during the pandemic year (April 2009 to April 2010). Different forms of scientific advice were offered to EU/EEA Member States, public health institutions, medical and public health professionals, and the general public:

- Daily reports, and later weekly reports, on the evolution of the pandemic: these reports included epidemiological data together with laboratory and clinical data that were reported in a standardised format with clear graphical representations and scientific interpretation.
- Technical documents: since the first days of the pandemic, a long series of documents were published on the ECDC web portal: a total of at least 18 documents, including guidelines (4), technical reports (7), technical meetings reports (4), a special report (1), followed by weekly and monthly surveillance reports. The scientific reports benefitted greatly from the fact that they were based on documents produced earlier as part of ECDC's pandemic preparedness work.
- Audio and teleconferences: for the first 60 days, ECDC organised or participated in daily teleconferences with the Member States and the EC; this was later reduced to twice weekly.
- Participation of ECDC experts in international scientific meetings organised by WHO, EMA, CDC, and many other relevant technical bodies.
- Responses to a large number of bilateral telephone requests to advise the Member States or EC.

According to the 'Assessment report on the EU-wide response to pandemic (H1N1) 2009' (ToR 1) all participating Member States expected ECDC to provide risk assessments and situation reports about EU and global events. Several Member States noted the willingness of ECDC to provide scientific support and information on the pandemic. Comments by Member States in the report included 'all provided – excellent and reliable' and 'they were the entity that provided the most information and in a timely manner'.

According to the 'Assessment report on EU-wide pandemic vaccine strategies' (ToR 2), ECDC planning assumptions were considered the second most important element influencing national planning processes, second only to 'epidemiologic evidence' (based opinions voiced by responding Member States).

## Was the ECDC planning and response adequate?

### Containment and mitigation

The first few pandemic influenza cases that occurred in the EU were clearly imported by travellers from Mexico and the US. This led to the belief of decision-makers in many Member States that containment was feasible. Isolation of infected persons and prophylaxis of close contacts with antiviral medicines were the most commonly considered public health measures. Many EU/EEA Member States took similar steps. However, on 26 April 2009, the special advisor on pandemic influenza to the director general of WHO, Dr. Fukuda, declared containment impossible. On 27 April, WHO declared pandemic phase 4, and three days later phase 5 was declared. This 'containment phase' could not be found in any EU Member State health plan. Its origins may lie in the concept of early containment developed for use in the transition period from Phase 3 to 4 (cf. WHO pandemic influenza draft protocol for rapid response and containment).

ECDC published a guidance document on containment and mitigation on 6 June which clearly described the scientific evidence against the use of containment measures outside of confined settings. However, once more, Member States reacted without taking this advice into account. Most Member States insisted on containment action for the following months; only the UK declared the transition from containment to mitigation on 1 July, and this was reinforced by an event organised early during the EU Presidency of Sweden, which was followed by a statement by EU health ministers at the informal EPSCO Council. This allowed Member States to quietly abandon their containment policies.

### Modelling

Many countries implemented different strategies to build mathematical models to characterise possible scenarios for the approaching pandemic. A number of governments made significant use of the information provided by those models. It was possibly the first time in the EU that epidemic modellers had their results considered by national politicians and the media.

However, several limitations were encountered by the modellers:

- Pre-existing influenza models were not tailored to cope with a pandemic, but to interpret seasonal trends and recurrent scenarios of the disease.
- The results of the models were required early in the beginning of the pandemic, when information available were quite limited and not very accurate, this led to a large range of possible scenarios, not easy to interpret for public health decisions.
- Mortality indicators played a major role in many models. However, this was very much due to incomplete information at the early stages of the pandemic, which led to an overestimation of mortality.
- Modellers offered a range of possible scenarios. Despite a variety of scenarios, decision-makers and politicians had a tendency to focus on the worst-case scenarios, assuming that by alerting the public to the worst case, unpleasant measures would look more acceptable.
- The phrase 'reasonable worst case scenario' caused confusion because 'reasonable' was interpreted as 'likely' when in fact it meant 'still very unlikely'.
- Validation of the models was complicated by the lack of surveillance data and inadequate seroepidemiology.

It needs to be underlined that most models used at national level were systematically updated with the basic data from newly emerging information, thus successively refining the efficiency and precision of the models.

Unfortunately, as is obvious now, many decision-makers did not wait for better information to emerge before taking consequential decisions on vaccine strategy on the basis of a worst-case scenario.

ECDC coordination of modellers was very timely. As early as 29 April (five days after the start of the pandemic), a teleconference with modellers was held to collate experiences in six Member States. Starting from this meeting, practically all meetings or conferences arranged by ECDC on surveillance issues included a session on modelling.

## Was ECDC's advice on pandemic vaccines timely and adequate?

A few days after the first announcement of the pandemic (29 April 2009), the European Medicines Agency (EMA; later known as EMA<sup>8</sup>) held a meeting with vaccine manufacturers. Four weeks after the alert (19 May), the WHO strategic advisory group of experts on immunisation (SAGE) issued a first document on pandemic vaccination. EMA followed on 11 June with recommendations on pandemic vaccine composition, and ECDC published an interim guidance document on pandemic vaccinations on 13 August.

Vaccine manufacturing companies were also very fast in the production of pandemic vaccines: The first two pandemic vaccines were authorised for use in EU Member States by the European Commission, based on a positive recommendation by EMA on 29 September.

ECDC's role was to give guidance on the possible risk groups to be targeted for countermeasures such as vaccines (and also early use of antivirals). According to the 'Assessment report on EU-wide pandemic vaccine strategies' (ToR 2), 15 out of the 27 surveyed Member States considered ECDC advice as the primary or secondary source of advice for deciding on national target and priority groups for vaccination programmes. These results were comparable to ratings on advice given by WHO or national experts. In the same survey, ECDC was considered the third most important source of information on the safety and efficacy of centrally authorised H1N1 vaccines, after the European Medicines Agency and national medicines agencies or authorities.

The advice on vaccinations provided by ECDC, including advice on priority groups and target groups, was rapid, competent and comprehensive, taken into account the state of knowledge available at the time. This advice resulted in a statement on 25 August 2009 by the Health Security Council on target and risk groups for vaccinations. Unfortunately, the subsequent vaccination campaigns varied greatly across the EU, and many campaigns met with limited success in reaching target groups. The overall coverage for the pandemic vaccines in most EU Member States was far from even the most pessimistic forecasts. In most countries, no more than a quarter of the target population was vaccinated, though there were notable exceptions such as Finland, the Netherlands, Norway and Sweden.

Several factors contributed to this mixed performance, including the late arrival of vaccines (despite a much accelerated process for production and registration), a diffuse sensation of a very mild pandemic rather than the forecasted tragedy, and the clear opposition to, or lack of, cooperation by a large part of the medical profession.

It is sobering to observe that ECDC action, despite being timely and technically correct, did not result in an efficient and consistent vaccine campaign across the EU. In all fairness, it is important to note that this outcome was to a large degree a function of the uneven and partial integration of public health policy in the EU at the time, as well as a result of differences in situation, culture, national expertise, and policymaking institutions across the Member States.

<sup>8</sup> Set up by EC Regulation No. 2309/93 as the European Agency for the Evaluation of Medicinal Products, and renamed by EC Regulation No. 726/2004 to the European Medicines Agency, it had the acronym EMA until December 2009.

## Recommendations

Possibly a more in-depth consideration of the several factors influencing vaccination campaign compliance should have been taken: such as the inclusion of a socioeconomic analysis, a benefit-risk analysis of the vaccinations, and a review of the available early information on efficacy and safety (available in an EMEA dossier on 29 September).

## Positive points

- When the pandemic was announced, some of the leading European experts on influenza and surveillance served on the ECDC staff. This was extremely relevant, not only because of the available expertise, but also because of personal contacts which facilitated access to the global influenza expert network, which made it possible to candidly share information and data for the benefit of European advice and decision-making processes.
- The ECDC Scientific Advice Unit was very efficient in rapidly producing high-quality technical documents to be published on the web portal. The authorisation process of documentation was quite efficient and did not jeopardise the need for rapid advice.

The scientific response to the pandemic was a clear demonstration for the need to maintain an excellent scientific competency within the Centre. This is the only way to cope with such emergencies: competence combined with capacity in order to rapidly adopt public health measures based on the latest available scientific evidence.

## Problems

Our examination of the record of the pandemic suggests that there was a significant gap between the scientific advice offered by ECDC to Member States and the strategic decisions taken by many of them. It is, of course, absolutely common that there is a certain distance between European-level advice and national policy decisions. This is especially true in the field of public health with its gap between scientific advisors and decision-makers. In the case of the pandemic, a general overview led to the conclusion that Member States were more closely listening to scientific advice than in the past, but there was also an evident distance, especially in sensitive areas such as procurement of medicines or vaccines, and in communication to the public. This happened despite the fact that most of the ECDC scientific positions were the result of a process of evidence gathering in which many of the Member States experts had directly participated.

This decision support gap represents a long-lasting dilemma for which there is no simple solution. However, it does indicate the need to produce scientific advice that becomes more consequential and is accompanied by surveillance systems, evaluations, and operations that allow the Member States to evaluate and implement required and relevant scientific advice and supportive actions.

## Crisis communication

Leaders (and participants) in crisis management groups attend to the challenge of optimising information flows from the top team to various constituencies within and outside the organisation. Such crisis communication has both 'operational' and 'political symbolic' dimensions (Boin et al., 2005). Operationally, crisis teams must ensure that actors and stakeholders within and outside the organisation get the information necessary to play their respective parts in protecting the values at stake in the crisis or emergency. This may seem simple, but in practice it is a highly challenging task. Crisis conditions carry a risk of miscommunication. Given the fast pace of crisis events, there may not be sufficient time to identify and remedy miscommunications before they result in tragic consequences. It is also critical for leaders to realise that in crisis situations – which are often associated with high levels of stress, emotionality, anxiety, disorientation, outrage, and fatigue – communication must be formulated in a fashion which recognises and addresses these aspects. Failure to do so can be catastrophic in terms of internal morale and support, as well as external confidence in, and legitimacy of, the organisation and its leadership.

While it is beyond the scope of this document to do a full-scale crisis communication analysis, it is possible to provide some reflections on the way this task was managed by ECDC during the pandemic and provide some thoughts about ways of strengthening ECDC's crisis communication capacity in the future. Let us note at the outset that other credible studies have found that ECDC established itself as a key and trusted source of information for the Member States and the EU Commission during the pandemic (Eriksen et al., 2009, ToR 1 and 2 reports). Our analysis here will focus on the topics of internal communication and organising communication via news and mass media.

## Internal communication

The responses of our informants as well as previous surveys (Eriksen et al., 2009) indicate a somewhat uneven performance of ECDC with regard to internal crisis communication during the pandemic. Some informants expressed dissatisfaction with the information provided, especially during the most acute periods. This is a relatively common problem in crisis situations when an organisation is scrambling to deal with a rapidly developing and complex situation. The bulk of the available evidence suggests, however, that internal communication improved significantly across the (protracted) event and particularly after the initial fever peaks.

Several respondents noted that vertical and horizontal communication within ECDC should be improved during the acute phase and ways to do this should be identified. With regard to the former, a contributing factor seems to have been 'contraction of authority' (cf. Hermann, 1963) – a common crisis-related phenomenon in which organisational 'democracy' gives way to a perceived action imperative and top-down 'command' type mode. Under the pressure of the acute situation, information flows became more constricted and decisions were made with more limited internal deliberation and consultation and by individuals or smaller groups, in contrast to the more democratic conditions that usually characterise collegial expert organisations like ECDC. Comments by several participants in the witness symposium as well as other informants suggest that this was the case. Informants differed (with substantial correlation to their role in the organisation) on whether this was desirable. It is important to recognise that as the pressure on the organisation eased (at least slightly), more familiar modes of operation reportedly resurfaced.

Regarding horizontal communication, survey responses focusing on the early stages (Eriksen et al., 2009) indicated dissatisfaction with the degree of communication (and coordination) between ECDC units. Consequently, staff requested an improved information flow and better coordination (for example with regard to staff rosters), which was subsequently forthcoming.

As the event wore on, various supplementary internal information practices such as enhanced use of the intranet were introduced, which staff members appreciated.

## Organising communication via mass and new social media

It is beyond the scope of this inquiry to carry out an analysis of the interaction between ECDC and the mass media or the ways in which 'output' from ECDC (and the organisation itself) were portrayed in the mass media, though these are worthy topics for follow-up studies. Our focus is rather on the organisation of ECDC's response to the media. Our findings indicate the following main conclusions on the basis of our discussions with ECDC staff:

- ECDC experienced heavy pressure from the mass media early during the acute phase of the pandemic and had difficulty in coping with the heavy demand for 'service'.

- The ECDC revamped and restaffed its media affairs function which worked increasingly smoothly over the course of the protracted event. This was partly a reflection of ECDC's capacity for learning and adaptation and partly a function of the cycle of media attention.
- ECDC shifted from a more centralised (single spokesman model) and aggressive media strategy to a more decentralised model, which was largely appreciated (though not unanimously). Technical experts played an important role in this process.
- More decentralised crisis communication requires compensating mechanisms for the coordination of messaging. The lines-to-take arrangement helped to provide such message coordination.
- Several respondents found the procedures for clearance of documents cumbersome.
- The mild nature of the pandemic (combined with occasional fatalities outside known risk groups) posed 'exceptionally difficult communication dilemmas' (ECDC wiki on lessons learned, 22 April 2010:5).
- ECDC had difficulties in coping with rumours and self-appointed experts of dubious qualification, which posed another dilemma. Engaging them in debate would confer status, while ignoring them allowed rumours and misinformation to flourish online (ECDC wiki on lessons learned, 22 April 2010:6).
- Persistent ambiguity regarding 'target' groups for communication needs to be better clarified. The default setting is: 'everyone' (which is suboptimal).
- Need for a more comprehensive communication strategy for dealing with public health emergencies/pandemics including objectives, target groups, messages, and (having established all of that) the appropriate communication tools, channels, etc. (witness symposium).
- Healthcare professionals need particular attention as they are key in winning the trust of the populations (ECDC wiki on lessons learned, ToR 2).
- Technical experts were not always trained, equipped, or suited to communicating with media and other laymen (Eriksen et al., 2009).
- New social media are increasingly important and pose a challenge to agencies like ECDC (cf. TOR 2 report).



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## List of individual/group interviewees at ECDC

Ciancio, Bruno  
Coulombier, Denis  
Harant, Philippe  
Hrabcik, Hubert  
Jakab, Zsuzsanna  
Johansen, Kari  
Lopez, Vicente  
Penttinen, Pasi  
Phillips, Damian  
Plata, Flaviu  
Nicoll, Angus  
Robino, Elisabeth  
Salminen, Mika  
Sprenger, Marc  
Vasconcelos, Paula  
Weber, Todd