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Effective Communication
in Outbreak Management for Europe

WP1 – D1.1 Report

Dealing with the A/H1N1 pandemic: Time dependent influences of epidemiology and risk communication on human behavior

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SEVENTH FRAMEWORK PROGRAMME

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Executive summary

In March/April 2009, a new influenza A virus emerged, causing the first pandemic of the 21st century. The first influenza A/H1N1 infections were reported in Mexico and shortly after, occurred in the US, before spreading globally eventually affecting all European countries in 2009. As with all new rapidly emerging outbreaks, information on the transmission dynamics, incubation period, virulence and other characteristics of the influenza A/H1N1 virus were initially missing. It however, became clear at an early stage that the outbreak met the criteria to become a pandemic and the countries started to take response measures. Some severe influenza A/H1N1 infections, partially with fatal outcome, had been reported in previously healthy young persons from Mexico City, which increased apprehension in an already uncertain situation.

During the pandemic, the media reported on official statements, but also on various aspects such as severe disease courses, fatal outcomes as well as vaccine safety in the context of the changing dynamics of the pandemic. These dynamics of the influenza A/H1N1 transmission in combination with the enormous amounts of varying media messages and official national and international recommendations influenced the perceptions, beliefs and finally peoples' behavior during the pandemic.

In order to increase the acceptance of large-scale response measures such as vaccination among at-risk groups and the general public, communication messages have to take into account factors that influence human behavior. Therefore, one of the aims of the Ecom@EU project is to explore the time-dependent interplay between the changing influenza A/H1N1 epidemiology, initiated pandemic management measures, media attention, risk perception and public health behaviour throughout the pandemic. A time series analysis explores the interaction of what actually happened (epidemic curves), how the countries responded (public health measures), what was recommended (official recommendations), media attention (number of media messages released) and finally how people perceived the risk and reacted (vaccination uptake) along the timeline of the pandemic. The results of this analysis give valuable insight into the time-dependent influence of these factors and what

should be taken into consideration when formulating risk communication messages in uncertain situations.

To obtain pandemic influenza A/H1N1 surveillance data and information on the national pandemic control measures initiated in five selected European countries, namely Germany, the United Kingdom, Spain, the Czech Republic and Denmark, a comprehensive literature search of scientific as well as grey literature was carried out and websites of national health authorities and international health agencies were searched. In addition, national health authorities were contacted for information that could not be retrieved through the search. The data collected were used to draw epidemic and media curves for each of the countries.
The media attention was analysed for the time period of April 1st 2009 to March 31st 2010 (March 2009 to February 2010 for UK). Media attention data for Germany, Spain and the Czech Republic were obtained from the Switzerland-based media research institute Media Tenor. Data on media attention in the UK was retrieved from the data of Hilton and Hunt's (2011) article on UK news coverage, and for Denmark from a search in LexisNexis. To assess the risk perception of the different populations and their potentially protective behaviour (e.g. vaccination uptake), several national and European surveys were considered. The Robert Koch-Institute and the States Serum Institute were contacted for further information on vaccination uptake in Germany and Denmark.
The public health measures and recommendations from the literature search, the number of influenza A/H1N1 associated media stories from the media analysis and information on risk perception and vaccination coverage were plotted using the epidemic curves as a timeline.

Germany, the UK, Spain, the Czech Republic and Denmark were considerably affected by influenza A/H1N1 and showed different pandemic profiles during the 2009 pandemic. Due to differences in the surveillance systems, the number of influenza A/H1N1 cases and deaths cannot be compared between the countries. However, this was not the aim of the present report, but rather, to assess similarities and differences in the trends.
In general, all included countries experienced two waves of the influenza A/H1N1 virus during the pandemic in 2009/2010. The first wave occurred around week 30, 2009 and the

number of cases remained at a lower level over summer. In autumn/winter 2009, Germany, Spain, the Czech Republic and Denmark experienced a major wave of influenza A/H1N1 cases, whereas the UK saw its major wave already in spring 2009 and a smaller wave in autumn/winter.

Compared to the other countries, the UK and Spain were affected early by the influenza A/H1N1 virus in terms of reported cases and deaths.

Throughout the pandemic, the highest infection rates were observed in children and young people. Generally, the virus caused a mild illness and a more severe disease was especially experienced by persons with underlying health conditions.

The initial control strategies focused on limiting transmission of the virus or delaying the spread. In order to inform the general public on the pandemic virus and personal protective measures, Germany, the UK, Spain, the Czech Republic and Denmark developed extensive information material at an early stage of the pandemic. The campaigns provided basic knowledge of hygiene and personal protective measures against infection. Further, the national authorities of all included countries published tailored information for healthcare professionals on the treatment of cases and preventive measures. In late October, Germany and the UK started their vaccination program. Denmark started vaccination in the beginning of November, Spain in mid-November and the Czech Republic in the end of November 2009.

The countries responded to and changed recommendations in response to available evidence on the characteristics of the virus and the pandemic vaccines. The vaccination campaigns that went alongside the vaccination programs in Germany, the UK and Spain informed the general public on the aspects of the programs. In addition, the UK and Germany issued tailored information for at-risk groups. Furthermore, information for healthcare professionals was published in all five countries to inform them on the specific pandemic vaccines and on aspects for vaccine administration.

Despite the different data collection methods (see above), the media attention defined as the number of influenza A/H1N1 associated media stories was highest in week 18 in all of the included countries, when the WHO declared pandemic phase four and five. Apart from the

UK and Spain, this was considerably before influenza A/H1N1 began to spread within the countries. Thereafter, the media attention curve only showed smaller peaks, which may be related to the first death in the country as well as to the discussion of vaccination priority groups. For Spain and Germany, data derived from Google Flu Trends was included in the analysis. The frequency of influenza-related web search queries well reflected the epidemic curve in both countries.

The risk of personally contracting an influenza A/H1N1 infection was perceived as rather low by participants in the Eurobarometer survey from all of the included countries. The intention to get vaccinated against influenza A/H1N1 and the actual vaccine uptake was also rather low. When asked for a trusted source of information, most of the respondents from the included countries named health professionals.

Although a lot of information on the pandemic influenza A/H1N1 virus, personal protective measures and the pandemic vaccine has been published, vaccination goals were mostly not met (especially among risk-groups such as pregnant women, healthcare workers and persons with underlying diseases) and the uptake of recommended behavior during the pandemic was low.

The analysis shows that the main vaccination uptake in all the study countries occurred within a short period of around four weeks after the start of vaccination. This short time-span could be regarded as the window of opportunity during which concerted efforts of the state ministries, of public health institutes and especially of health professionals, who are regarded as the most trusted source of information according to the Eurobarometer survey, should be undertaken.

Further, the high media attention very early in the pandemic should be used to inform the population about the disease, the importance of adopting protective behavior such as getting vaccinated and very important - reliable sources of information during the pandemic. As the analysis of Google Flu Trends data shows, the information seeking of the people increased with the increasing number of influenza A/H1N1 cases in the country. Therefore, communication channels such as Google or Twitter may be useful for addressing specific target-groups in order to provide reliable and up-to-date information.

Several improvements have been identified regarding the vaccination and information campaigns, but still, more work is needed to see how recommendations can be effectively translated into higher vaccination coverage and behavior change. This should also take into account the influence of varying media messages, but also the news reporting in and from other countries about potentially spreading diseases.

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Abbreviations

AEMPS	Agencia Española de Medicamentos y Productos Sanitarios (Spanish Medicines and Healthcare Products Agency)
BZgA	Bundeszentrale für gesundheitliche Aufklärung (Federal Centre for Health Education)
CCAES	Centro de Coordinación de Alertas y Emergencias Sanitarias (Coordinating Centre for Health Alerts and Emergencies at the Spanish Ministry of Health and Social Policy)
CDC	US Centers for Disease Control and Prevention
CSP	Comisión de Salud Pública (Public Health Commission)
DH	Department of Health (UK)
EC	European Commission
ECDC	European Centre for Disease Prevention and Control
EMA	European Medicines Agency
EU	European Union
GP	General Practitioner
GSK	GlaxoSmithKline
HPA	Health Protection Agency
IfSG	Infektionsschutzgesetz (German Protection Against Infection Act)
IHR	International Health Regulations
JCVI	Joint Committee on Vaccination and Immunization (UK)
MHRA	Medicines and Healthcare products Regulatory Agency (UK)
MHSP	Ministry of Health and Social Policy (Spain)
NHS	National Health Service (UK)
NPFS	National Pandemic Flu Service
PEI	Paul-Ehrlich-Institute
PHEIC	Public Health Emergency of International Concern
PIKS	Pandemische Influenza A(H1N1) Krankenhaus Surveillance (Pandemic Influenza A(H1N1) Surveillance in hospitals)
RKI	Robert Koch-Institute
SAGE	Scientific Advisory Group for Emergencies (UK)
SISS	Spanish Influenza Surveillance System
STIKO	Ständige Impfkommission (German Committee on Vaccination)

SVA	Subcomité de Vacunas y Antivirales (Spanish Subcommittee on Vaccines and Antivirals)
WHO	World Health Organization

1 Introduction

Emergence and evolution of the pandemic A/H1N1 virus

In March/April 2009, a new influenza A/H1N1 virus emerged causing the first pandemic of the 21st century. The pandemic started in Veracruz, Mexico where an outbreak of influenza-like illness was recorded in early April (European Centre for Disease Prevention and Control, 2010a). A few days later, other outbreaks of influenza-like illness were reported in several parts of Mexico. Analysis of samples detected an Influenza A virus, but it was not possible to identify the subtype (World Health Organization, 2011). By 23 April, 120 confirmed cases of respiratory illness due to influenza and 20 deaths had been reported in Mexico (Dacey et al., 2010). The situation was of concern because especially young people and previously healthy people experienced severe disease (World Health Organization, 2011). In mid-April, the US Centers for Disease Control and Prevention (CDC) identified the swine influenza A/H1N1 virus from a sample of two children with respiratory illness in southern California in the USA. CDC stated that the virus contained a gene segment that had not yet been found in humans or swine and raised concern that this new strain of swine influenza A/H1N1 virus differs from human influenza A/H1N1 viruses. This would imply that a large proportion of people might not be immune to this new strain of swine influenza A/H1N1 and that the seasonal influenza vaccine would not protect from contracting the virus (Centers for Disease Control and Prevention, 2009).

Further virological analyses confirmed that the virus isolates from Mexican patients were genetically identical to the new strain of swine influenza A/H1N1 virus discovered in California (World Health Organization, 2009b). Molecular analyses revealed that the virus was a product of reassortment. In this process, genetic material of various virus subtypes admixes and results in a new virus. This biological process occurs when one organism is infected with two different influenza viruses at the same time. Swine are an ideal species for this process as they are susceptible to infection by both bird and human influenza viruses. The new swine influenza A/H1N1 virus was most likely derived from the US triple

reassortment swine influenza virus and a Eurasian H1N1 swine influenza lineage (Schaberg & Burger, 2010). The swine triple reassortment was first discovered in 1998. It was derived from a swine influenza virus lineage, an avian influenza virus and a human Influenza A/H3N2 lineage. It is not clear when exactly the reassortment took place that produced the new swine influenza A/H1N1 (Bush, 2011). Figure 1 illustrates the described evolution of the new swine influenza A/H1N1 virus.

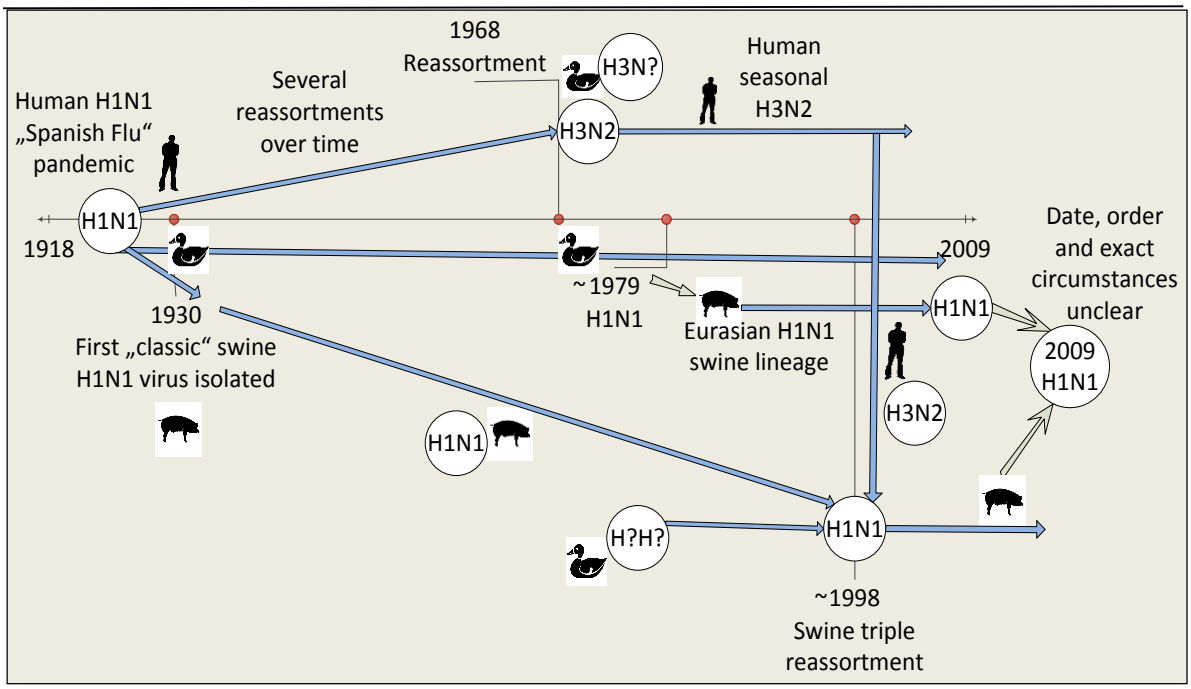


Figure 1: Evolution of the new swine influenza A/H1N1 virus
(Bush, 2011; modified by author)

Global situation

The virus started to spread globally and by 28 April seven countries (Mexico, USA, Canada, Israel, New Zealand, Spain and the UK) reported confirmed cases of swine influenza A/H1N1 (World Health Organization, 2011). On 29 April, WHO raised the level of influenza pandemic alert to phase 5 and advised all countries to activate their pandemic preparedness and response plans (World Health Organization, 2009e). Although only a few countries were affected at this stage, Phase 5 was a signal that a pandemic was coming up and human to

human spread of the virus into at least two countries of one WHO region was evident (World Health Organization, 2012). The number of affected countries increased steadily and by 9 June, 73 countries worldwide had reported 26.563 laboratory confirmed cases to WHO (World Health Organization, 2011). On 11 June, the WHO raised the level of influenza pandemic alert to phase 6, declaring a pandemic (World Health Organization, 2009h). This phase is defined by a high and sustained transmission in the population, in at least one other country in a different WHO region in addition to the characteristics of Phase 5 (World Health Organization, 2012). The severity of the pandemic was considered to be moderate by the WHO (World Health Organization, 2009i).

In order to find a scientifically acceptable name for the virus, the WHO organized a teleconference with the Food and Agriculture Organization of the United Nations (FAO) and the World Organization for Animal Health (OIE) on 15 June. The participants agreed to name the virus “pandemic influenza A/H1N1 2009 virus” (World Health Organization, 2011).

The pandemic influenza A/H1N1 2009 virus (hereafter referred to as pandemic A/H1N1 virus) continued to spread globally and became the predominant circulating influenza virus (World Health Organization, 2009m). By October, the overall number of cases started to decline, but some regions of the world still experienced sustained transmission (Sekkides, 2010). An assessment of the global situation in August 2010 indicated that the levels and patterns of pandemic A/H1N1 transmission showed seasonal patterns of transmission. Therefore, on 10 August 2010 the WHO announced that the pandemic was over (World Health Organization, 2010c). By then, more than 214 countries and overseas territories have reported confirmed pandemic A/H1N1 cases and nearly 18.500 pandemic influenza A/H1N1 related deaths have been recorded (World Health Organization, 2010b). It is possible, that the number of deaths from pandemic A/H1N1 infection is underestimated because the WHO´s number considers only deaths of patients in whom pandemic A/H1N1 infection was

laboratory confirmed. Thus, many deaths may have been either not recognized or not reported.

Differences between pandemic A/H1N1 and seasonal influenza

The clinical presentation of a pandemic A/H1N1 infection was similar to a seasonal influenza infection. Common symptoms were fever, cough, sore throat, body aches and headache. Additionally, patients with pandemic A/H1N1 infection reported vomiting and diarrhea (Robert Koch-Institute, 2009a). Most cases experienced mild illness. Patients experiencing severe disease had similar risk factors as for seasonal influenza complications (Louie et al., 2009; Nicoll & Coulombier, 2009).

A significant difference between pandemic A/H1N1 and seasonal influenza was that mostly younger age groups were affected. Several studies observed that many people aged ≥ 65 years were immune most likely due to exposure to a similar influenza virus that had been circulating before the mid-1950s (Donaldson et al., 2009; Hardelid et al., 2010). The case fatality ratio was highest in persons aged 65 years or over, although the lowest incidence rate was observed in this age group. This means that individuals aged 65 years or over were less likely to contract a pandemic A/H1N1 infection than younger age groups, but if they contracted the virus, they were more likely to have a severe or fatal outcome. A study on the epidemiology of 308 fatal cases in England by Pebody et al. (2010) reported a case fatality ratio of nine per 1.000 clinical cases for the ≥ 65 years age group compared to a case fatality ratio of 0.4 per 1.000 clinical cases for those aged six months to 64 years. Underlying risk factors for severe disease were observed in 77% of the 308 fatal cases. The overall case fatality rate was estimated to be 0.4 per 1.000 clinical cases. A similar finding has been reported earlier by Donaldson et al. (2009). This study also showed that the mortality in this pandemic was lower than observed in previous pandemics.

A considerable proportion of fatal outcomes occurred in younger age groups (Department of Health, 2010d; Larrauri Cámara, Jiménez-Jorge, Méndez, & de Mateo Ontañón, 2010;

Schaberg & Burger, 2010). Nearly 80% of fatal cases reported to the European Center for Disease Prevention and Control (ECDC) occurred in those under 65 years of age (Amato-Gauci et al., 2010). The minority of fatal cases occurred in previously healthy people. The relative risk for fatal outcome was especially high for those with underlying chronic conditions. Donaldson et al. (2009) observed a nine times greater risk of dying from pandemic A/H1N1 for people in one of the risk groups eligible for vaccination in the UK. Members of an at-risk group were people with chronic respiratory disease, chronic heart disease, chronic renal disease, chronic liver disease, chronic neurological disease, immunosuppression, diabetes mellitus and pregnant women (Department of Health, 2009g; Hine, 2010). The findings from Pedbody et al. (2010) showed that pandemic A/H1N1 patients with chronic neurological disease, chronic respiratory disease, chronic liver disease and immunosuppression were the most vulnerable group for fatal outcome. This may explain the high case fatality rate in the older age groups among whom the prevalence of underlying risk conditions is likely to be high. In addition, pregnancy has also been revealed to be a risk factor. Similar findings on risk factors for severe disease or death were published in reports from other countries (Louie et al., 2009; Santa-Olalla Peralta, Cortes García, Vicente-Herrero, et al., 2010).

Although characteristics of the pandemic A/H1N1 virus having an impact on the size, speed and seriousness of a pandemic (like spectrum of disease, reproduction rate, immunity, case fatality rate, age distribution, etc.) were still missing when the virus emerged (European Centre for Disease Prevention and Control, 2009g), it became clear at an early stage that it met the criteria for a pandemic strain[1] (Amato-Gauci et al., 2010) and countries started to take response measures.

[1] These criteria are: a new influenza A virus subtype genetically different from circulating human influenza A viruses, able to cause disease in humans and able to spread easily from one person to another (World Health Organization, 2005)

1.1 The Ecom@EU project

Effective measures to counter the impact of such major epidemic outbreaks include large-scale vaccination and distribution of antiviral therapy. Although scientific knowledge and technical ability to take effective response measures exist, there may still be potential for improvement in the governments' and health authorities' communication regarding the need for such large-scale measures in a reliable way in order to increase the acceptance of these measures among the general public and at-risk groups. In order to bridge this gap, the project "Effective Communication in Outbreak Management: Development of an evidence-based tool for Europe (Ecom@EU)" has been launched in March 2012. It combines state-of-the-art knowledge in epidemiology, media analysis, social marketing, risk perception, and discrete choice experiments in order to develop an evidence-based behavioral and communication package that can be applied by health professionals and health agencies throughout Europe in case of major epidemic outbreaks (Ecom@EU Study Group, 2011).

The different characteristics of the 2009 A/H1N1 pandemic influenza influenced people's perception on the risk of contracting the virus and the fear of the virus. In addition, the enormous amounts of varying media messages and official recommendations along with conflicting media messages on vaccine safety influenced people's perceptions, beliefs and finally people's behavior during the pandemic (Feufel, Antes, & Gigerenzer, 2010). In order to increase the acceptance of large-scale response measures among the general public and at-risk groups, communication messages have to take into account these factors that influence human behavior. Therefore, one of the aims of the Ecom@EU project is to assess the influence of the A/H1N1 epidemiology, the varying pattern of risk communication, and the changing official recommendations on human protective behavior during the 2009 A/H1N1 pandemic. The dynamics and interactions of these factors are explored in a time series analysis. For this analysis, epidemic curves of the 2009 A/H1N1 pandemic in selected EU countries are drawn. These epidemic curves provide information on the pattern of disease spread and serve as a timeline along which data on official (national and international) public health and health behavior recommendations, the A/H1N1 associated media stories as well

as data on public behavior during the pandemic are plotted. The results of this analysis will provide valuable information about the time dependent influences of the described factors and what should be considered when formulating uncertain risk communication messages (Ecom@EU Study Group, 2011).

1.2 Purpose of this report

This report contributes to the Ecom@EU project by exploring the dynamics of the 2009 A/H1N1 pandemic in, Germany, the UK, Spain, Czech Republic and Denmark. These countries were chosen to assess the pandemic in different regions of Europe, including at least one country from Southern Europe, Northern Europe and Eastern Europe. Initially, the UK and Spain were countries most affected by the pandemic in Europe but as the pandemic started to spread across Europe, Germany also reported significant numbers of cases (Nicoll & Coulombier, 2009) Therefore, the UK was also included in the analysis.

This report presents the progress of the pandemic in the five countries and gives a systematically documented chronological overview of public health measures taken and official recommendations released during the pandemic in order to reduce the impact of the pandemic. A time series analysis explores the interaction of what actually happened (epidemic curves), how the countries responded (public health measures), what the people were recommended (official recommendations) and how people perceived the risk and reacted accordingly (vaccination uptake) along the timeline of the pandemic.

2 Methods

2.1 Systematic literature search

In order to obtain pandemic A/H1N1 surveillance data for the UK, Germany, Spain, Denmark and Czech Republic a systematic literature search was accomplished using Medline and Google Scholar. Medline was the main source. The search terms used in Medline were H1N1, epidemiology, population surveillance, incidence, prevalence and Europe. Two searches were conducted. The first search used the combination H1N1 AND (epidemiology OR population surveillance) AND Europe. The second search had the search query H1N1 AND (prevalence OR incidence) AND Europe. The limits used were articles published from 2009 to 2013, articles in English and German. A text words search for H1N1 was employed to retrieve recent papers that are included in Medline, but are not yet indexed and therefore have no assigned MeSH terms. Table 1shows the search strategy in Medline.

Table 1: Search strategy in Medline

Search Term	Combination OR	Combination AND	
		Search 1	Search 2
H1N1 [TW][1]		**X**	**X**
Epidemiology [MeSH][2]	**X**	**X**	
Population surveillance [MeSH]			
Prevalence [MeSH]	**X**		**X**
Incidence [MeSH]			
Europe [MeSH]		**X**	**X**

[1] [tw]: Search in title, abstract, other abstract, MeSH terms, MeSH Subheadings, Publication Types, Substance Names, Personal Name as Subject, Corporate Author, Secondary Source, and Other Terms.
[2] [MeSh]: Medical Subject Heading

In Google Scholar, a brief search was conducted; therefore the “allintitle”-operator was employed for each search. Except for Europe, the same search terms as for the Medline

search were used. Two search terms were combined per search using the Boolean function "AND". Same as in Medline, only articles published from 2009 to 2013 were considered.

Table 2 illustrates the search strategy in Google Scholar.

Table 2: Search strategy in Google Scholar

Search Term	**Combination AND**			
	Search 1	**Search 2**	**Search 3**	**Search 4**
H1N1	**X**	**X**	**X**	**X**
Epidemiology	**X**			
Population surveillance		**X**		
Prevalence			**X**	
Incidence				**X**

Note: For each search the „allintitle:"- operator was used. It only returns results that include your search term in the document's title.

For literature extraction the following inclusion and exclusion criteria were developed.

Inclusion criteria:

- Articles with relation to the 2009 A/H1N1 pandemic.
- Articles on epidemiological characteristics of the 2009 A/H1N1 pandemic.
- Articles with relation to the general population.
- Articles that deal with the UK, Germany, Spain, Denmark or Czech Republic.

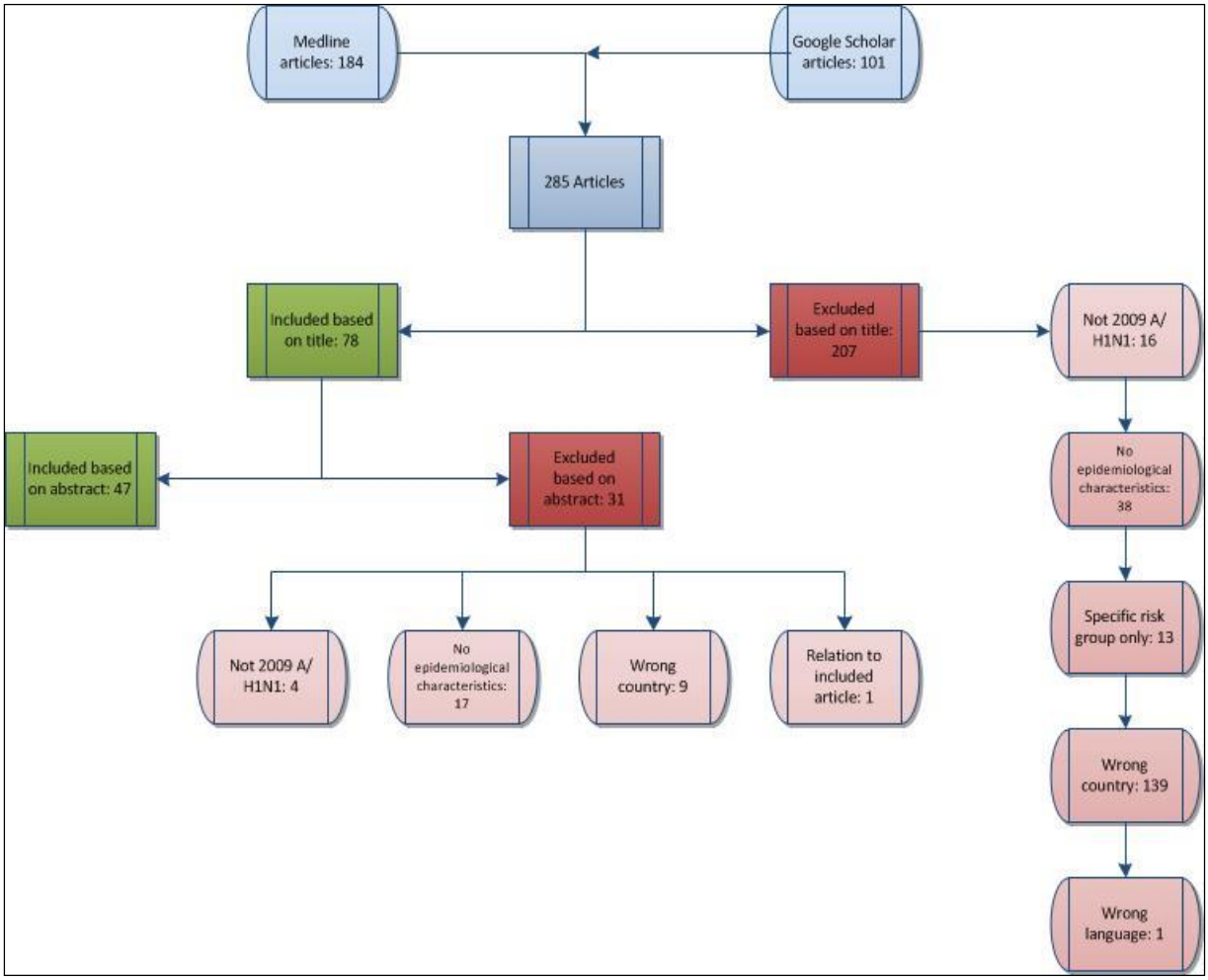
Exclusion criteria:

- Articles that did not deal with the 2009 A/H1N1 pandemic.
- Articles that did not report epidemiological characteristics of the pandemic.
- Articles on vaccination or antiviral drugs.
- Articles on microbiological characteristics of the pandemic A/H1N1 virus.
- Articles with relation to specific risk groups only (e.g. young children, pregnant women)

- Articles in other languages (other than English or German).

Altogether, the conducted search in Medline and Google Scholar resulted in 285 articles. First, a selection was made based on the title whereby 207 articles were excluded. The second selection was based on the abstract. After the abstract screening another 31 articles were excluded. Finally, 47 articles on pandemic A/H1N1 surveillance data were found. Figure 2 shows this selection process.

Figure 2: Selection process



In addition to the systematic literature search grey literature and websites of national health authorities (Robert Koch-Institute, Health Protection Agency, Spanish Ministry of Health and Social Policy, Statens Serum Institute and the Czech Ministry of Health) and international health agencies (European Centre for Disease Prevention and Control, World Health Organization) were searched to retrieve pandemic A/H1N1 surveillance data.

To obtain further epidemiological data on the number of new A/H1N1 cases per week, the reported number of deaths and vaccine uptake in Spain, Germany and Denmark, the Ministerio de Sanidad, Servicios Sociales e Igualdad, the Robert Koch-Institute and the States Serum Institute were contacted.

2.2 Literature search on official recommendations

A literature search on public health measures taken and official health behavior recommendations released during the 2009 A/H1N1 pandemic was conducted considering the official websites of national health authorities, but also grey literature. Additionally, recommendations released by the European Centre for Disease Prevention and Control (ECDC), the World Health Organization (WHO) and the European Medicines Agency (EMA) were included.

2.3 A/H1N1 related communication in the media

The media and social media content analysis of the A/H1N1 pandemic is part of WP2 of the Ecom@EU project, in which the Department of Communication Science at VU University Amsterdam is involved. Their cooperating company, the Switzerland-based media research institute Media Tenor, conducted a retrospective content media analysis of the 2009/2010 A/H1N1 pandemic from 1 April 2009 to 31 March 2010 in Germany, Czech Republic and Spain. Opinions and risk perception were the main aspects in order to analyze how the A/H1N1 pandemic was portrayed in the media.

For the analysis of news reporting, the search terms “H1N1”, “Swine flu” and “new virus” were used in the respective languages. In the analysis, the main evening news show (assessed by human coders) as well as the mainstream newspapers (assessed through automated content analysis) of the respective country were considered. Table 3 shows the newspapers and main news show included in the analysis for Czech Republic, Germany and Spain.

All news items were retrieved, scanned for relevance and included if they referred primarily to H1N1, swine flu or swine flu vaccination. News stories were defined as primarily referring to H1N1 if the topic took up either (a) the greatest part, or (b) at least half of the news item (more than any other issue), or (c) was mentioned in the headline or (d) depicted in an illustration.

Table 3: TV news shows and newspapers included in media analysis by country

	TV	Print	Weeklies
Czech Republic	CTV Udalosti	Lidove Noviny	Respekt
		Blesk	
Germany	ARD Tagesschau	FAZ	Spiegel
		Bild	
Spain	TVE Telediario	El Pais	Tiempo (Internet)
		20 minutos	

Due to quality issues in the coding process, only the quantitative results of Media Tenor’s analysis are used for this report. The number of A/H1N1 associated media stories per calendar week were combined for the three media forms (daily and weekly newspaper, TV news show) and plotted along the timeline of the epidemic curve for Germany, Czech Republic and Spain.

The content media analysis could not be performed by Media Tenor for Denmark. Hence, an alternative search was conducted in LexisNexis. The database was searched for all articles in the Danish newspapers "Politiken" and "Politiken weekly" published from 1 April 2009 to 31 March 2010 using the search terms "H1N1" and "svineinfluenza". It was assessed, whether the article mainly dealt with A/H1N1. The number of articles primarily focusing on A/H1N1 per calendar week was calculated and plotted along the timeline of the epidemic curve. Each article was included in this analysis only once, independently of how often this article has been published[2].

For the UK, the number of A/H1N1 associated media stories was derived from the article "UK newspapers' representations of the 2009/10 outbreak of swine flu: one health scare not over-hyped by the media?" by Hilton, 2011. This article describes an analysis of UK newsprint coverage of A/H1N1 pandemic from 1 March 2009 to 28 February 2010 considering eight newspapers with high circulation figures and various readership profiles. The articles during the time period were identified through a search in LexisNexis with the search terms "swine flu" or "H1N1" in "All text". All articles mainly related to A/H1N1 (defined as the primary focus and more than 50% of the article) and published in the News, Comment, Feature, Business, City, Sport, Travel or Home, were included. This resulted in 2374 articles.

The data set with these 2374 articles could be used for our analysis thanks to the authors' (Hilton&Hunt) permission and contribution. For the analysis, a subsample of Hiltons and Hunts sample was taken considering the newspapers' circulation number as well as the political spectrum covered. Further, a similar approach to Media Tenor was chosen using two serious newspapers, one middle-market tabloid and one tabloid. Therefore, The Daily

[2] "Politiken weekly" is a newspaper which consists of the main articles collected over one week out of "Politiken". Therefore, the main articles may be published twice, once in "Politiken" and again in "Politiken weekly".

Telegraph (serious, conservative/supportive of Tories), The Guardian (serious, liberal, left-wing/supportive of Labour), The Daily Mail & Mail on Sunday (middle-market tabloid) and The Sun (tabloid) were included. The same as for Denmark, the number of articles per calendar week was calculated and plotted along the timeline of the epidemic curve.

For Spain as well as for Germany, further information derived from Google Flu Trends were included in the analysis. Google Flu Trends uses influenza-related online web search queries in order to monitor health-seeking behavior and to estimate the frequency of influenza-like disease in a particular area or country. In previous research, this method showed to be useful for accurately estimating the influenza-like illness prevalence in various regions in the United States since the relative frequency of influenza-related search terms is highly correlated with the percentage of physician visits of patients with influenza-like illness (Ginsberg et al 2008). Google Flu Tends categorizes the frequency of influenza-related web searches into minimal, low, moderate, frequent and very frequent on a weekly scale and plots them over a one-year time period (July to June). These graphs always include one reference curve, so the graph used in this report compares the season 2013/2014 to the time period of the A/H1N1 pandemic in 2009/2010.

2.4 Epidemic curves and time series analysis

The information from the articles derived from the systematic literature search, the aspects from the additional search on official websites of national and international health authorities as well as the data received from national health authorities were used to draw epidemic curves for the UK, Germany, Spain, Denmark and Czech Republic (see annex "Comprehensive information on epidemic curves and key events per country" for the epidemic curves only). National data sources, if available, were preferred over data from European or international health authorities such as ECDC or WHO because of potentially incomplete or delayed reporting to these authorities (see for example http://ecdc.europa.eu/en/healthtopics/H1N1/epidemiological_data/Pages/number_confirmed_fatal_2009_pandemic_influenza_cases.aspx).

The public health measures taken and official recommendations released during the 2009 A/H1N1 pandemic are illustrated in a time series analysis using the epidemic curves as a timeline along which key data of the events and recommendations are plotted. The same approach is used for the combined number of A/H1N1 associated media stories from daily and weekly newspapers as well as TV news shows. Further data on human behavior such as vaccination uptake rates, if available, were also assessed over time and considered in the analysis.

For the Figures 3,5,6,8 and 9 the scales for the reported number of confirmed A/H1N1 cases (on the vertical left side of each figure) and the number of confirmed A/H1N1 related deaths and A/H1N1 related media messages (on the vertical right side of each figure) were individually chosen to optimally display the progress of the A/H1N1 pandemic along with key events in each study country.

For each of the included countries, epidemiology and progress of the pandemic, surveillance, pandemic management strategy, vaccination strategy and communication as well as communication in the media is described in detail in the following section (3 Results).

Further, in order to give an in-depth description of the public health measures taken und official recommendations released during the 2009 A/H1N1 pandemic, the pandemic has been split up into five time periods, separately for each of the included countries. This was similarly done in an analysis of the response measures in the Netherlands (Stein, van Vliet, & Timen, 2011). Each time period represents different stages in the progress of the pandemic and different response activities of Germany, the UK, Spain, Czech Republic and Denmark:

- Time period 1 (01/04/2009 to 21/06/2009). This time period is characterized by the emergence of the pandemic A/H1N1 virus in Mexico and the spread of the virus to the UK, Spain, Germany, Denmark and the Czech Republic. It also describes early response strategies to contain the spread of the virus.

- Time period 2 (22/06/2009 to 02/08/2009). Numbers of confirmed cases increased constantly and therefore, a change in prevention and control policy from containment to mitigation took place in this time period.
- Time period 3 (03/08/2009 to 04/10/2009). Numbers of confirmed cases decreased during the summer. In this time period, countries started to prepare the vaccination program.
- Time period 4 (05/10/2009 to week 30/11/2009). This time period is characterized by the autumn winter wave with high numbers of confirmed cases. In this time period the UK, Germany, Spain, Denmark and the Czech Republic started their vaccination programs and campaigns.
- Time period 5 (01/12/2009 to 15/04/2010). This is the post peak period. During this time period the numbers of confirmed pandemic cases started to decline constantly.

Again, each time period serves as a timeline along which data on all public health measures taken and official (national and international) health behavior recommendations released during the different time periods are plotted. To structure the information of each time period, the events were allocated to the following themes: situation, surveillance, control strategy and treatment of cases, vaccination strategy and communication. For a better overview each country is presented separately. The results for the in-depth analysis are presented in annex “In-depth description of events and recommendations“.

3 Results

The pandemic started in Veracruz, Mexico where an outbreak of influenza-like illness was recorded in early April 2009 (European Centre for Disease Prevention and Control, 2010a). A few days later several parts of Mexico reported further outbreaks of influenza-like illness. Analysis of samples detected an Influenza A virus but it was not possible to identify the subtype (World Health Organization, 2011). In mid-April, the US Centers for Disease Control and Prevention (CDC) analyzed a sample from two children with respiratory illness

in southern California, USA and identified the virus as a swine influenza A/H1N1 virus (Centers for Disease Control and Prevention, 2009). On 24 April WHO reported that virus isolated from Mexican patients were genetically identical to the new strain of swine influenza A/H1N1 virus discovered in California (World Health Organization, 2009b). On the same day ECDC published its first Threat Assessment stating that although the public health situation was still limited to Mexico and the US further vigilance was required in Europe to ensure the identification of the new virus (European Centre for Disease Prevention and Control, 2009d).

One day later, on 25 April 2009, the first WHO Emergency Committee meeting was held. International experts came together to assess the situation in Mexico and the US and to advice the WHO Director-General, Dr. Margaret Chan, on response measures. The Committee reported more information on the clinical presentation, epidemiology and virology of cases was needed, but concluded, that the situation was of international concern. Thus, Dr. Margret Chan declared the outbreak in Mexico and the US as a public health emergency of international concern (PHEIC) under International Health Regulations (2005) and advised all countries to intensify surveillance for influenza-like illness and respiratory disease (World Health Organization, 2009c).

On the same day, the ECDC started to publish daily situation reports in which the current epidemiological situation was summarized. So far, eight cases of pandemic A/H1N1 had been confirmed in the United States of America. In Mexico City, 854 cases of pneumonia have been reported, including 59 deaths (European Centre for Disease Prevention and Control, 2009e).

Two days later, on 27 April, the first laboratory confirmed pandemic A/H1N1 cases have been reported in Europe, one in Spain and two in the UK (European Centre for Disease Prevention and Control, 2009f). Based on available data on confirmed pandemic A/H1N1 cases in Mexico, the USA, Canada, and reports on suspected cases in other countries, the

WHO Director-General raised the level of influenza pandemic alert to phase 4 (World Health Organization, 2009d). While phase 3 is characterized by sporadic cases and limited human-to-human transmission of an influenza reassortant virus, phase 4 is defined by confirmed human-to-human transmission of an influenza reassortant virus capable to cause sustained outbreaks in a community (World Health Organization, 2012). The WHO Director-General, Dr. Margaret Chan, did not recommend any trade or travel restrictions and advised to center on mitigation measures as the containment of the outbreak was not considered to be feasible (World Health Organization, 2009d).

Two days later, on 29 April, the influenza pandemic alert was raised to phase 5 (World Health Organization, 2009e). This was a signal that a pandemic was coming up and human to human spread of the virus into at least two countries of one WHO region was evident, namely Mexico and USA (European Centre for Disease Prevention and Control, 2009h; World Health Organization, 2012).

In its first risk assessment, published on 30 April, the ECDC reported missing information and data to define the seriousness of the potential pandemic. So far, the majority of pandemic A/H1N1 cases experienced a mild disease and the case fatality rate was judged not to be different from seasonal influenza (European Centre for Disease Prevention and Control, 2009g). On 30 April, the European Commission agreed on a common case definition for the European Union in order to detect cases of influenza caused by the new virus. This case definition is presented in Table 4.

Table 4: EU case definition for pandemic A/H1N1 infection

(European Commission, 2009a)

Clinical criteria: Any person with one of the following three: • fever > 38 °C AND signs and symptoms of acute respiratory infection, • pneumonia (severe respiratory illness), • death from an unexplained acute respiratory illness.
Laboratory criteria: At least one of the following tests: • RT-PCR, • viral culture (requiring BSL 3 facilities), • four-fold rise in novel influenza virus A/H1N1 specific neutralizing antibodies (implies the need for paired sera, from acute phase illness and then at convalescent stage 10-14 days later minimum).
Epidemiological criteria: At least one of the following three in the seven days before disease onset: • a person who was a close contact to a confirmed case of novel influenza A/H1N1 virus infection while the case was ill, • a person who has travelled to an area where sustained human-to-human transmission of novel influenza A/H1N1 is documented, • a person working in a laboratory where samples of the novel influenza A/H1N1 virus are tested.
Case classification: A. *Case under investigation:* Any person meeting the clinical and epidemiological criteria. B. *Probable case:* Any person meeting the clinical AND epidemiological criteria AND with a laboratory result showing positive influenza A infection of an unsubtypable type. C. *Confirmed case:* Any person meeting the laboratory criteria for confirmation.

In its risk assessment update on 20 May, the ECDC again reported a continuing lack of data on parameters needed for right risk assessment. The ECDC considered available data and stated that the pandemic A/H1N1 infections have been generally mild in Europe. Now there was more evidence that the virus was able to spread easily from one person to another and that it preferentially infected younger age groups. ECDC concluded that the spread of the

pandemic A/H1N1 virus will continue (European Centre for Disease Prevention and Control, 2009p).

On 11 June, the WHO raised the level of influenza pandemic alert to phase 6, declaring a pandemic (World Health Organization, 2009h). The severity of the pandemic was considered to be moderate by the WHO (World Health Organization, 2009i).

The UK, Germany, Spain, Denmark and Czech Republic had different pandemic profiles during the 2009 A/H1N1 pandemic. Therefore, in the following, the aspects epidemiology and progress of A/H1N1 pandemic, surveillance, pandemic management strategy, vaccination strategy, communication as well as risk perception and human behavior are presented separately for each of the countries included.

3.1 Germany

3.1.1 Epidemiology and progress of the A/H1N1 pandemic

The blue bars in Figure 3 show the number of A/H1N1 cases per week as derived from influenza notification data collected by the local health authorities according to the German Protection Against Infection Act (Infektionsschutzgesetz; IfSG).

The first laboratory confirmed cases in Germany were reported on 29 April 2009 (Robert Koch-Institute, 2009h). As of 30 April, three confirmed cases have been reported in Germany. Shortly after, secondary transmission of the virus was notified in Germany (European Centre for Disease Prevention and Control, 2009i). The numbers of confirmed pandemic A/H1N1 cases increased constantly. By the end of June, Germany has reported 429 confirmed cases.

Initially, pandemic A/H1N1 infections occurred among travelers returning from North America. Until week 28/2009 limited spread of the diseases was observed in Germany. With the beginning of the summer holidays, the number of travelers returning from affected countries, like Spain, increased and the numbers of confirmed cases began to rise until early August (Buda et al., 2010).

In its Threat Assessment, published on 1 July, the ECDC announced the first isolation of an oseltamivir (also known as Tamiflu®) resistant mutant A/H1N1 virus in Denmark. The virus was not a reassortant virus and was still susceptible to zanamivir (also known as Relenza®). There was no evidence that the virus has been transmitted to other persons. ECDC stated that this phenomenon is well-known in influenza viruses and emphasized the need for continued surveillance of this problem (European Centre for Disease Prevention and Control, 2009u).

According to an ECDC risk assessment published on 20 July, 20-30% of the population was expected to be affected over the first major wave of the pandemic. Clinical attack rates were expected to be highest in children and young adults. The estimate for hospitalization rates in Europe was 1-2% and the case fatality rate was estimated to be 0.1-0.2% of all clinical cases. ECDC stated that most cases experienced a mild and self-limiting illness, but people with chronic underlying medical conditions, pregnant women and young children were at higher risk of experiencing severe disease and deaths (European Centre for Disease Prevention and Control, 2009w).

As of 4 August, Germany has reported 7177 confirmed cases to the ECDC (European Centre for Disease Prevention and Control, 2009aa). The virus continued to spread in the country, but at a low level over the summer (see Figure 3). On 25 September, Germany reported the first fatal case from pandemic A/H1N1 infection (Robert Koch-Institute, 2009j). The red curve in Figure 3 illustrates the reported number of confirmed A/H1N1 deaths during the pandemic.

On 21 August, the ECDC published its planning assumptions for the first major wave of infection, which was expected to take place in the autumn and winter of 2009/2010. However, these planning assumptions did not differ from those published on 20 July (European Centre for Disease Prevention and Control, 2009ab).

In late September, the ECDC has reduced its planning assumption. This decision was based on experience from Southern Hemisphere countries. It became more apparent that most pandemic A/H1N1 cases experienced a mild disease; therefore hospitalization and case fatality rates were revised downwards (European Centre for Disease Prevention and Control, 2009ad).

In early autumn, the numbers of pandemic A/H1N1 infections in Germany have started to increase again, indicating the beginning of the expected autumn/winter wave. The second wave reached its peak in week 47/2009 (Buda et al., 2010). On 16 November, Germany has reported 16 deaths due to pandemic A/H1N1 (European Centre for Disease Prevention and Control, 2009ah).

Thereafter influenza A/H1N1 activity decreased steadily. As more information on the pandemic A/H1N1 virus became available showing that it remains relatively mild for most people and suggesting that the second peak may not be as high as actually thought, ECDC has revised its planning assumptions. In its 7th risk assessment issued on 6 November the following EU reasonable worst case planning assumptions for the first year up to mid-May 2010 were published: clinical attack rate: up to 20% of population, hospitalization rate: up to 100 per 100.000 population and case fatality rate: up to 3 per 100.000 population (European Centre for Disease Prevention and Control, 2009ag).

The pandemic influenza wave ended in week 2/2010 and afterwards only sporadic cases have been reported (Buda et al., 2010). The last virus detection within the sentinel system

by the influenza working group (Arbeitsgemeinschaft Influenza) for the occurrence of acute respiratory diseases in primary health care practices, in which 879 primary care physicians across Germany participated in the season 2009/2010, was in week 12/2010.The number of reported deaths, however, increased from 176 in mid-January to 235 in mid-February (European Centre for Disease Prevention and Control, 2010c,d).

By April 2010, 225.729 cases and 250 deaths of pandemic A/H1N1 virus have been reported to the Robert Koch-Institute according to IfSG (Buda et al., 2010). The infection caused a mild illness in most cases. Infection rates were highest in children and young adults. A subset of cases experienced severe disease, especially in those with underlying risk factors. 86% of the 250 deaths attributable to pandemic A/H1N1 virus had an underlying risk factor (chronic condition or pregnancy) (Schaberg & Burger, 2010).

In February 2010, evidence showed decreasing or low pandemic A/H1N1 activity in many countries, but the WHO Emergency Committee agreed that it was too early to conclude that the pandemic A/H1N1 virus has run its course. Thus, the pandemic influenza alert phase was not changed (World Health Organization, 2010a). On 10 August 2010, the WHO Emergency Committee assessed the global situation again. This time the Committee concluded that the world was entering the post-pandemic period (World Health Organization, 2010c).

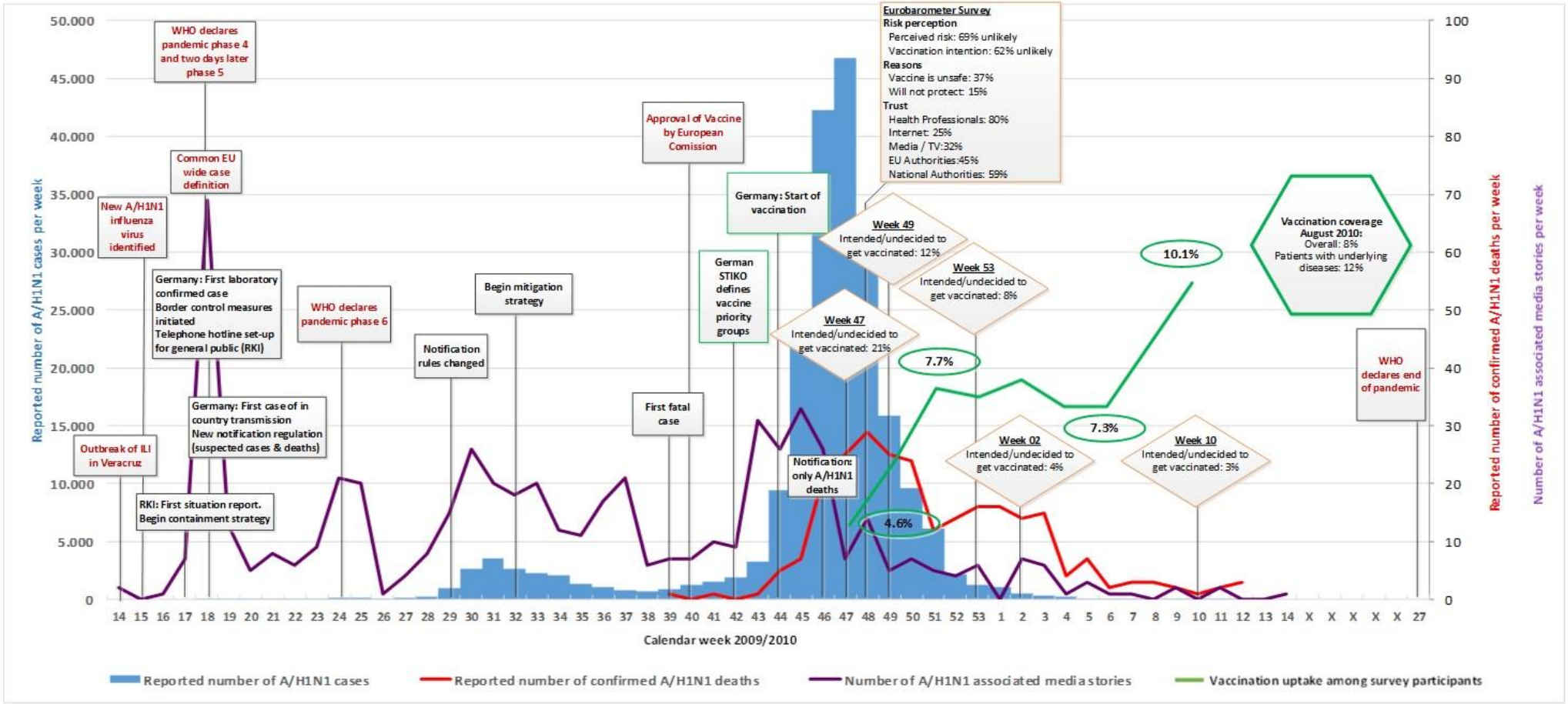
3.1.2 Surveillance

Influenza is a notifiable disease in Germany. According to § 7 IfSG laboratories have to report direct evidence of influenza to local health authorities and the local health authorities forward the notifications to the Robert Koch-Institute (RKI). As national reference laboratory for influenza (NRZ), the RKI performed the virological surveillance together with cooperating laboratories of four national states. To receive information on pandemic A/H1N1 infections at an early stage, a new notification regulation for physicians under § 6 IfSG came into force on 3 May 2009 stating that all suspected cases, confirmed cases and deaths from pandemic A/H1N1 virus have to be reported by name to the local health

authorities (Bundesministerium der Justiz, 2009). On 13 July, the surveillance strategy in Germany was modified. From week 29/2009 onwards regional health authorities were no longer required to submit reports on suspected cases to the state health authorities or to the Robert Koch-Institute (Robert Koch-Institute, 2010a).

On 16 July, the WHO announced that countries with community-wide transmission are no longer required to forward regular reports of individual confirmed cases to the WHO, as the detection, laboratory-confirmation and investigation of all cases is extremely resource-intensive and not sustainable for these countries (World Health Organization, 2009k). In view of increasing numbers of A/H1N1 infections, the German surveillance strategy was again modified. From week 46/2009 onwards only laboratory confirmed cases and deaths relating to a pandemic A/H1N1 infection had to be reported to the RKI (Buda et al., 2010). For reducing the reporting effort for local health authorities, it was possible to only forward weekly aggregated case numbers to state health authorities and the RKI. In addition, laboratory testing was only recommended and reimbursed for cases with a high risk of developing severe disease, in order to ensure laboratory capacity and to reduce costs (Robert Koch-Institute, 2010a). In order to gather information on hospitalizations and deaths due to pandemic A/H1N1 infections, the RKI set up the Pandemic Influenza A/H1N1 Hospital Surveillance System (Pandemische Influenza A(H1N1) Krankenhaus Surveillance; PIKS). From week 49/2009 onwards, all hospitals were able to forward weekly aggregated numbers of hospital admission and deaths relating to a pandemic A/H1N1 infection to the RKI on a voluntary basis (Buda et al., 2010).

Figure 3: Epidemiology, key events and media attention during the A/H1N1 pandemic in Germany



Sources: Number of new A/H1N1 cases per week: Robert Koch-Institute. Arbeitsgemeinschaft Influenza. (2009/2010). Wochenberichte der AGI. http://influenza.rki.de/Wochenberichte.aspx. Reported number of confirmed A/H1N1 deaths: Robert Koch-Institute. Arbeitsgemeinschaft Influenza. (2010). Influenza Wochenberichte 15. KW. http://influenza.rki.de/Wochenberichte.aspx. Number of A/H1N1 associated media stories: Media Tenor. Risk perception and vaccination uptake: personal communication with Division Immunization, Robert Koch-Institute based on Walter et al. (2011). Vaccination coverage: Mereckiene et al. (2012): Influenza A(H1N1)pdm09 vaccination policies and coverage in Europe. *Euro Surveillance*, *17*(4).

3.1.3 Pandemic management strategy

Initially, Germany employed a containment strategy. Measures focused on limiting transmission of the virus or delaying the spread in order to gain time to apply effective response measures. This strategy included the following public health measures: those who met the clinical and epidemiological case definition were assessed through swabbing and laboratory testing; cases were treated with antivirals within 48 hours after onset of symptoms and requested to isolate at home or in hospital (depending on their clinical condition) for at least seven days. Contacts were additionally asked to self-isolate at home for seven days with restrictions on visits (Robert Koch-Institute, 2010a).

In order to avoid the introduction of the pandemic A/H1N1 virus through international air traffic, health authorities agreed that instead of meeting all flights from Mexico, suspected cases had to be notified by the pilot of the plane and were examined at the airport of destination by medical teams. Contact details of passengers were collected and information leaflets about pandemic influenza were distributed (Marcic et al., 2010). The infection control measures at German airports were kept up until week 35/2009 (Robert Koch-Institute, 2010a). School closures were not recommended as a means of reducing the spread of the virus (Robert Koch-Institute 2010a).

In early August 2009, Germany has changed its response strategy and moved to a mitigation strategy. The new strategy focused on risk groups and included the following changes: Contact-tracing was ceased, isolation was recommended for cases with contact to vulnerable persons only, antivirals were only given to cases in at-risk groups with signs of developing severe illness, case-based reporting requirements were relaxed and in late August infection control measures at airports were reduced (Robert Koch-Institute, 2010a).
In week 35/2009 infection control measures at German airports were reduced (Robert Koch-Institute, 2010a).

3.1.4 Vaccination strategy

As the new virus first emerged in April 2009, it was not possible to adjust the 2009/2010 seasonal influenza vaccine to this new influenza A/H1N1 strain (Robert Koch-Institute, 2009c). The production of a pandemic-specific vaccine takes four to six months and can only be started when the new strain has been isolated (Hine, 2010).

At the time Germany started to develop its vaccination strategy, the severity and infectivity of the pandemic A/H1N1 virus was still uncertain. Thus, it was difficult to decide on the quantity of required vaccine (Marcic et al., 2010). Germany had advance-purchase agreement contracts with vaccine manufacturers in order to secure sufficient vaccine supply in the event of a pandemic. These contracts were a result of Germany's pre-pandemic planning and were activated with the announcement of pandemic influenza alert phase 6 (Marcic et al., 2010). The advance-purchase agreements in place included the assumption that enough vaccine for 100% of the population to have two doses would be needed (Marcic et al., 2010). Later, this assumption was revised downwards and only 50 million doses of pandemic vaccine were ordered (Feufel et al., 2010).

As initial supplies of pandemic vaccine were limited, the WHO Strategic Advisory Group of Experts (SAGE) on Immunization recommended that the following groups should be prioritized for vaccination: health-care workers, pregnant women, individuals aged above six months with a chronic medical condition, healthy individuals aged between 15 years and up to 49 years, healthy children, healthy individuals aged between 50 years and up to 64 years, and healthy individuals aged 65 years or above. The order of priority should be based on country-specific conditions (World Health Organization, 2009j).

On 29 September, the European Commission authorized the first two pandemic vaccines Focetria® (Novartis) and Pandemrix® (GlaxoSmithKline) for use in all Member States of the European Union and in Iceland, Liechtenstein and Norway (European Commission, 2009b).

On 6 October, the European Commission authorized a third pandemic vaccine, Celvapan®, for use in all EU Member States, Iceland, Lichtenstein and Norway (European Commission, 2009c).

On 12 October, the Robert Koch-Institute published the priority groups for vaccination recommended by the German Committee on Vaccination (Ständige Impfkommission; STIKO). According to the STIKO, three groups were identified to be prioritized for vaccination in the following order: front-line health and social care workers, individuals aged six months and above in a clinical at-risk group and pregnant women. Clinical at-risk groups were considered to be the same as in the UK (see 3.2.). The Robert Koch-Institute and Paul-Ehrlich-Institute recommended a one-dose schedule for Pandemrix® for those aged 10 and up to 60 years. Individuals above 60 years of age should receive two doses and children aged below ten and over six months two half adult doses of Pandemrix® (Robert Koch-Institute, 2009c).

While the Robert Koch-Institute and the Paul-Ehrlich-Institute considered a one dose schedule for Pandemrix® to be sufficient for those aged 10 years and above, the European Medicines Agency (EMA) recommended a two dose schedule for all three authorized vaccines (European Medicines Agency, 2009b).

The German vaccination program started on 26 October (Bundesministerium für Gesundheit, 2009). Based on new data suggesting that young children and adolescents have an increased risk of contracting the pandemic A/H1N1 virus and of developing severe disease from the virus, the German Committee on Vaccination extended its recommendations on priority groups for vaccination. This update was published on 14 December and included the following changes: After vaccination of the three identified priority groups, vaccine should also be offered to household contacts of people in at-risk groups, all children and adolescents aged between 6 months and 24 years, all adults aged between 25 and 59 years, and all individuals aged 60 years and over (Robert Koch-Institute, 2009f). In addition to the updated recommendations on priority groups for vaccination by

the German Committee on Vaccination, the Robert Koch-Institute (RKI) and Paul-Ehrlich-Institute (PEI) updated their recommendations on vaccine dosage. Now, the RKI and PEI recommended a one-dose schedule for those aged 10 and above and one half adult dose schedule for children aged between 6 months and 9 years (Robert Koch-Institute, 2009g).

3.1.5 Communication

In order to give a better overview, the information published during the pandemic is grouped around the themes: Communication related to personal protective measures, communication related to A/H1N1 treatment, communication related to pandemic management strategy, communication related to A/H1N1 vaccination and communication in the media.

Communication related to personal protective measures

In Germany, the Robert Koch-Institute (RKI) and the Federal Centre for Health Education (BZgA) had already launched the information campaign "Wir gegen Viren" in March 2009, before pandemic A/H1N1 infections occurred in Germany. This campaign aimed to convey basic knowledge on hygiene and personal protective measures to the public in order to prevent viral infections. For the dissemination of the information, the RKI and BZgA developed posters, leaflets, stickers and a TV spot on hand washing (Robert Koch-Institute & Bundeszentrale für gesundheitliche Aufklärung, 2009). During the pandemic, these media were then refined and adjusted to the pandemic A/H1N1 influenza (Martin, 2010).

On 27 April, German health authority staff at airports started to distribute information leaflets in four different languages to travelers from affected countries. The leaflets informed about pandemic A/H1N1 symptoms and advised travelers to seek medical care in case of onset of symptoms. On the same day, the RKI set up an information hotline to provide a response to inquiries from citizens (Robert Koch-Institute, 2010a).

In addition to the public information and advice on national level, the ECDC provided information on European level. On 27 April, the ECDC published the first general questions and answers on pandemic A/H1N1 virus (European Centre for Disease Prevention and Control, 2010a). In May, the ECDC published two documents on personal protective

measures and information for travelers. The documents described personal protective measures to reduce the risk of acquiring influenza, i.e. regular hand washing, respiratory hygiene, avoidance of close contacts and mass gatherings (European Centre for Disease Prevention and Control, 2009k, 2009m, 2009n).

On 15 July, Germany started its A/H1N1 pandemic information campaign by publishing an information leaflet on personal protective measures in eleven languages (Die Beauftragte der Bundesregierung für Migration, Flüchtlinge und Integration, 2009). In addition, the Federal Centre for Health Education (BZgA) provided information to the public on modes of transmission, symptoms of an A/H1N1 infection and on general hygiene measures to prevent the spread of the virus (Bundeszentrale für gesundheitliche Aufklärung, 2009a). Further, the Robert Koch-Institute developed a document that aimed to inform the public about the influenza viruses and a pandemic in general, about modes of transmission of influenza viruses and about personal protective measures to prevent an influenza infection (Robert Koch-Institute, 2009i).

During the summer holiday season, Germany observed importations of the pandemic A/H1N1 virus from affected countries, especially from Spain. Thus, in early August the Federal Centre for Health Education (BZgA) in Germany issued a press release on personal protective measures on vacation to remind holiday-makers of performing the recommended hygiene measures even on holiday (i.e. avoidance of close contacts with sick people, frequently hand washing, good respiratory hygiene, self-isolation of sick people) (Bundeszentrale für gesundheitliche Aufklärung, 2009b).

Before the start of the vaccination program, the Federal Ministry of Health in Germany has revised its offer of information. In order to provide solid information for the general public and for health professionals, the Federal Ministry of Health, together with the Robert Koch-Institute, the Federal Centre for Health Education and the Paul-Ehrlich-Institute, launched the central information website www.neuegrippe.bund.de (Bundesministerium für

Gesundheit, 2009). This website provided information on the pandemic A/H1N1 virus, personal protective measures and the pandemic vaccine.

In late October, the Federal Centre for Health Education developed a media package on hygiene practices for schools and kindergartens, called "schütz ich mich-schütz ich dich". Posters, stickers and leaflets aimed to inform children and adolescents on proper hand and respiratory hygiene. The materials were produced in two different designs to ensure age-appropriate speech of children and adolescents (Bundeszentrale für gesundheitliche Aufklärung, 2009c).

Communication related to A/H1N1 treatment

The use of antivirals in some groups involves particularities health professionals should know. Thus, on 8 May, the European Medicines Agency (EMA) published a guidance document on the use of the antiviral medicine Tamiflu in children under one year of age and the antivirals Tamiflu and Relenza in pregnant and breastfeeding women in the case of an influenza A/H1N1 pandemic. The EMA stated that in the event of a pandemic Tamiflu can be used to treat children under the age of one and both antivirals can be used to treat pregnant women, as the benefits of their use outweigh their risks (European Medicines Agency, 2009a).

On 18 August, the ECDC published general guidance on the use of antivirals during influenza pandemics. The document aimed to inform those deciding on antiviral use strategies about the effectiveness of antivirals, side effects of antivirals, priority groups for antiviral use and about necessary arrangements for antiviral delivery and administration (European Centre for Disease Prevention and Control, 2009y).

In late October, the RKI published a guidance document for physicians. This document contained information on the epidemiological and clinical characteristics of the pandemic A/H1N1 virus, the antiviral treatment, the vaccination, the notification regulations, and preventive and control measures (Robert Koch-Institute, 2009a)

Communication related to pandemic control measures

On 19 May, the ECDC published a guidance document on case and contact management. The recommended measures did not differ from the measures already applied in Germany, Spain and the UK (European Centre for Disease Prevention and Control, 2009o).

On 6 June, the ECDC published a guidance document on mitigation and containment strategies for national health authorities. ECDC stated that many public health measures are common in both strategies and the implementation of a mitigation strategy would mainly mean to move away from vigorous case finding and contact tracing. Further, the ECDC acknowledged that a containment strategy is very resource-intensive and therefore not a recommended infection control strategy for human influenza beyond pandemic alert phase 4 (European Centre for Disease Prevention and Control, 2009r).

On 26 June, the WHO published a guidance document on public health measures to help countries manage the A/H1N1 pandemic. Besides giving general advice on response measures, the WHO provided additional advice for countries with widespread community-level transmission, for countries with no reported cases and for countries in transition. The WHO advised all countries to concentrate on mitigation measures, to prepare the health-care system for a high volume of patients and to ensure antiviral medicine and vaccine supply. In addition, countries with widespread community-level transmission were advised to cease laboratory-testing of all cases, to reduce the pressure on the health-care system, to primarily focus on the treatment of ill patients, and to consider school closures or the cancellation of mass gathering on a case-by-case basis. Countries with no reported cases were advised that they may consider entry screening at airports and contact tracing, but that these measures are resource intensive and of limited benefit to prevent the spread of the disease. Countries in transition were advised to start the same control measures as countries with widespread community-level transmission (World Health Organization, 2009a).

On 20 July, the ECDC gave scientific advice on reactive and proactive school closures in Europe. ECDC highlighted that there is no consensus on the benefits from proactive school

closures (school closure before transmission between the children occurs), but countries and schools were advised to at least have plans for reactive school closures (school closure when many children and/or staff are experiencing illness). These plans should consider the following issues: recommended length of time of closure, the triggers for re-opening, how to sustain teaching and learning and potential problems that may arise for parents, if they have to take time off work (European Centre for Disease Prevention and Control, 2009x).

In mid-September, the ECDC published a document on public health measures for policy and decision-makers (European Centre for Disease Prevention and Control, 2010a). It provided scientific information on measures that may be applied to reduce the impact of influenza pandemics (i.e. border closures, entry restrictions, personal protective measures, social distancing measures, use of antivirals and vaccines) and aimed to help EU countries to decide on appropriate response measures (European Centre for Disease Prevention and Control, 2009a).

On 23 September, the WHO Emergency Committee held its 5th meeting and agreed on continuing the following recommendations proposed by the WHO Director-General:

- borders should not be closed and travel and trade should not be restricted,
- countries should intensify surveillance of unusual events and
- people who are ill should postpone international travel (World Health Organization, 2009n).

Due to increasing numbers of pandemic A/H1N1 cases, the Robert Koch-Institute received many queries regarding the effectiveness of school closures as a means to contain the spread of the virus. Thus, on 16 November, the RKI published a brief overview on aspects of reactive and proactive school closures and stated that with respect to the current epidemiological situation proactive school closures were not recommended. Further, the RKI stated that decisions on reactive school closures should depend on the epidemiological situation but an effect on the progress of the pandemic wave cannot be expected from reactive school closures (Robert Koch-Institute, 2009e).

On 26 November, the WHO Emergency Committee held its 6th meeting and agreed that delaying international travel was no longer recommended for ill persons, because pandemic A/H1N1 infections were already widespread (World Health Organization, 2009p).

Communication related to A/H1N1 vaccination

Referring to media reports that have displayed concern about the safety of pandemic vaccines, the WHO has issued a note on pandemic vaccine safety on 6 August. In this statement the WHO outlined the procedures for approval and licensing of vaccines and confirmed that these procedures are strict and do include safety and quality controls. The WHO also stated that the data on influenza vaccine safety collected during the last 60 years do not show a special safety issue. Nonetheless, the WHO advised countries to closely monitor the safety and efficacy of the pandemic vaccine, as rare adverse events may only occur when large numbers of people got vaccinated (World Health Organization, 2009l).

On 13 August, the ECDC published a document on the use of influenza pandemic vaccines during the 2009 A/H1N1 pandemic. The document aimed to inform those deciding on vaccination policies in the European countries on vaccine use and options for prioritization in order to maximize the benefit of available vaccine (European Centre for Disease Prevention and Control, 2009z).

On 4 September, the German Paul-Ehrlich-Institute issued information for physicians and pharmacists on the safety of pandemic vaccines during pregnancy. The Paul-Ehrlich-Institute considered existing scientific evidence and concluded that the pandemic A/H1N1 vaccines do not pose a risk to pregnant women. However, the Paul-Ehrlich-Institute stated that this conclusion did not involve the recommendation of vaccinating all pregnant women at this point and recommended to only vaccinate pregnant women if the potential benefits of the vaccine outweigh its potential risks (Paul-Ehrlich-Institute, 2009).

Together with the start of the vaccination program, the public information campaign was launched in Germany. Information and advice was accessible on government websites and made available to the general public through leaflets (Bundesministerium für Gesundheit et

al.., 2009e). In addition to the mainstream public information, the Federal Ministry of Health in Germany published tailored information for specific target groups (i.e. people with chronic underlying conditions, health professionals, pregnant women; and fire fighters and policemen) (Bundesministerium für Gesundheit et al., 2009a, 2009b, 2009c, 2009d). Furthermore, clinical professional brief information on pandemic vaccination were published (Robert Koch-Institute & Paul-Ehrlich-Institute, 2009).

On European level, information on vaccination was provided by the ECDC. In November the ECDC published questions and answers on vaccines for health professionals and for the general public on its website (European Centre for Disease Prevention and Control, 2009b, 2009c, 2010a).

On 19 November, the WHO issued a briefing note on pandemic vaccines in which the safety of the vaccines was reaffirmed (World Health Organization, 2009o). The European Medicines Agency (EMA) did hold the same opinion. In a press release published on 20 November, the EMA reasserted the efficacy and safety of pandemic vaccines. Further, the EMA revised its advice on vaccine schedules and published the following recommendations: Pandemrix® and Focetria® may be used as a single dose in adults (18-60 years) and in children and adolescents (Focetria®: from the age of 9 years; Pandemrix®: from the age of 10 years). Individuals aged over 60 years may also receive one dose of Pandemrix®, but younger children and immunocompromised people should receive two doses (European Medicines Agency, 2009c).

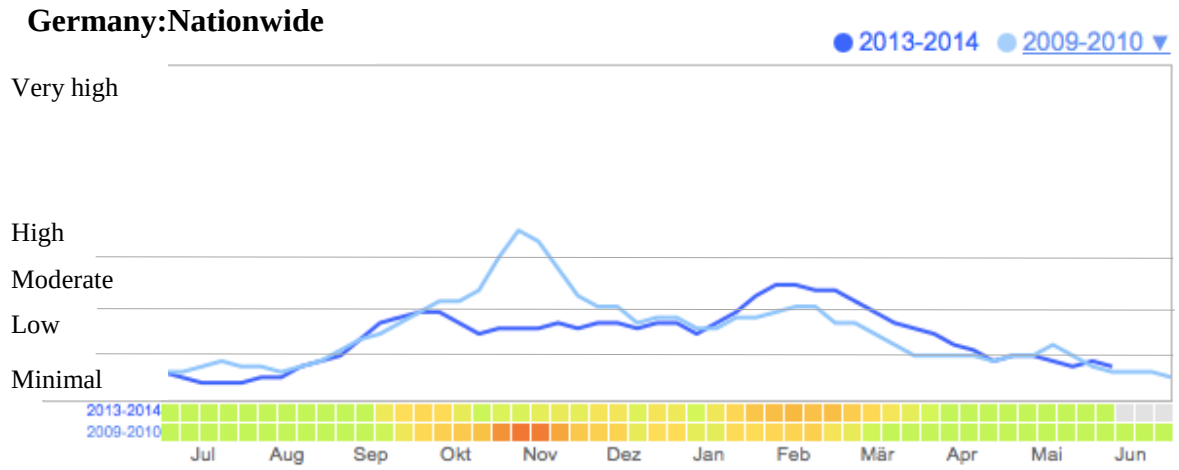
Between December 2009 and August 2010, the European Medicines Agency (EMA) published regular updates on safety monitoring of vaccines and medicines used during the pandemic (European Medicines Agency, 2010). In its update on pandemic medicines of 18 December, the EMA reaffirmed that the available data on the three pandemic vaccines and Tamiflu® showed no unexpected serious safety issues (European Medicines Agency, 2010).

Communication in the media

The number of A/H1N1 associated media stories published in the main news TV show (ARD Tagesschau), two important daily newspapers (FAZ, Bild) and one of the main weekly newspapers (Spiegel) is illustrated in the purple curve in Figure 3. This curve shows two major peaks over the time of the pandemic (week 14/2009 – week 14/2010). It reached the first peak in week 18 (69 A/H1N1 associated media stories), when the WHO declared the pandemic phase 4 and shortly after, the pandemic phase 5. The media attention was significantly lower (13 A/H1N1 associated media stories) in week 19, when the first laboratory-confirmed case occurred in Germany. The WHO declared the pandemic phase six in week 24, when 21 A/H1N1 associated media stories were published. The attention rose again from week 29 onwards. At this time, the number of new A/H1N1 cases per week also stared to rise. Shortly after the definition of the vaccine priority groups by the German Committee on Vaccination (week 42) and the start of the vaccination program (week 44), the media attention rose again and reached the second peak in week 45 (33 A/H1N1 associated media stories). Thereafter, the number of A/H1N1 associated media stories declined steadily and remained at a low level until week 14/2010.

Figure 4 shows the results from the Google Flu Trends analysis for Germany from July to June for the 2009/2010 A/H1N1 as well as for the 2013/2014 season. In mid-September 2009, when the number of new A/H1N1 cases started to rise (see Figure 3), the number of influenza-associated web searches also rose from low to moderate. In November 2009, the influenza-associated web searches reached a high level, which is also the time of the peak in new A/H1N1 cases from week 45 to week 49 (see Figure 3). Thereafter, the frequency of influenza-associated web searches declined steadily.

Figure 4: Search activity in Google for influenza like illness in Germany



3.1.6 Risk perception and human behavior

To monitor pandemic influenza A/H1N1 vaccine uptake during the vaccination campaign in Germany, 13 telephone-surveys were performed between November 2009 and April 2010. The vaccination uptake among the survey participants is illustrated in the green curve in Figure 3. According to the surveys, the vaccination coverage in persons ≥ 14 years of age was 4.6% (N=1000) in week 47 and 6% in week 49. After this rather sharp increase in vaccination coverage, the curve remains at a plateau at approximately 8%, before reaching roughly 10% in week 10, 2010 (Walter et al., 2011).

The aforementioned 13 surveys were also monitoring knowledge, attitude and behavior concerning pandemic influenza infection and vaccination against pandemic influenza. During the peak of the pandemic in week 47, only 18% (N=1000) of participants perceived the risk due to swine flu as great or partially great and 34% stated their perception of risk was low (Walter et al.., 2011, 2012).

In late November 2009, the Gallup Organization conducted a survey called the Eurobarometer in the 27 EU Member States, as well as in Norway, Switzerland and Iceland to examine public opinion about influenza and pandemic A/H1N1. 69% (N=1001) believed it was unlikely or rather unlikely that they would personally catch the A/H1N1influenza.

Furthermore, 62% stated that is was not likely or not likely at all that they would get vaccinated against the pandemic A/H1N1 virus. Health professionals were the most trusted source to inform about pandemic A/H1N1. 80% mentioned that they trust health professionals mostly or completely (The Gallup Organization, 2010).

In week 51/2009, the vaccination coverage in persons ≥ 14 years of age was 8% (N=1000) according to the survey monitoring vaccine uptake during the vaccination campaign in Germany (Walter et al.., 2011). Furthermore, only 10% (N=1000) of participants perceived risk due to swine flu as great or partially great. Accordingly, the proportion of participants perceiving a low risk increased from 34% (week 47) to 65% in March 2010 (week 10) (Walter et al.., 2011, 2012).

In August 2010, the VENICE (Vaccine European New Integrated Collaboration Effort) consortium conducted a web-based survey covering 27 European member states in addition to Norway and Iceland in order to estimate A/H1N1 vaccination coverage rates in different target groups and entire populations during the pandemic. For 22 countries, estimates on the vaccination coverage were provided. Table 5 shows the survey results for Germany.

Table 5: A/H1N1 vaccination coverage in different target groups and the entire population in Germany

(Mereckiene et al, 2012)

Vaccination coverage (%)					
Country	Overall (n=22)**a**	≥ 6 months of age with chronic diseases and underlying conditions (n=9)	Pregnant women (n=12)**b**	Children (n=12)**c**	Healthcare workers (n=13)**d**
Germany (data for age groups ≥ 14 years)	**8**	**12**	**9**	**NA**	**16**

a Some countries recommended pandemic vaccine for some population groups but calculated overall vaccination coverage.
b Pregnant women: all countries that provided vaccination coverage recommended vaccination to all pregnant women (with or without risk indication).
c Groups for which vaccination coverage were measured: France, Iceland, Italy, Norway and Slovenia (n=5), ≥6months–<18years of age; England, ≥6 months–<5 years of age; Finland, ≤15 years of age; Ireland, >6months–<15years or age; Luxembourg, at risk; Netherlands, ≥6 months–4years of age; Portugal, ≥6 months–12 years of age.
d Healthcare workers: Czech Republic, England, Malta, Netherlands, Portugal (n=5) recommended pandemic vaccine to only healthcare workers with close contact with patients; Estonia recommended for healthcare workers with close contact with patient and with no contact with patients, but contact with potentially contaminated material; Hungary, Malta, Romania, Spain, Sweden and Slovakia (n=6) recommended pandemic vaccine to all healthcare workers.

In the 13 surveys on vaccination and risk perception mentioned above, respondents who were not vaccinated or did not intend to be vaccinated were asked for their reason to object to vaccination. Approximately 20% of the participants named fear of adverse events and 15% perceived the vaccines as not sufficiently tested. Further, 14% decided against being vaccinated because of 'public panicking and overhyping' and for 10%, the being vaccinated was perceived as simply not necessary. Only 2% of the respondents reported a lack of information about the vaccine and potential side effects as a reason (Walter, 2012).

3.2 The United Kingdom

3.2.1 Epidemiology and progress of A/H1N1 pandemic

The blue bars in Figure 5 represent the number of A/H1N1 cases per week in the UK. The first two laboratory confirmed pandemic A/H1N1 cases have been reported in the UK on 27 April (European Centre for Disease Prevention and Control, 2009f). Shortly after, secondary transmission of the virus was also notified in the UK (European Centre for Disease Prevention and Control, 2009i). At the start of the Sixty-second World Health Assembly on 18 May, members shared their experiences with the current outbreak of pandemic influenza A/H1N1. Altogether, 40 countries have reported 8829 confirmed cases of pandemic A/H1N1. 97, 9% of the total number of cases was reported by six countries: the USA (4714

cases), Mexico (3103 cases), Canada (496 cases), Japan (125 cases), Spain (103 cases)[3] and the UK (101) (World Health Organization, 2009f).

As of 15 June, the UK has reported 1320 confirmed pandemic A/H1N1 to the ECDC. Additionally, the first fatal case in Europe was reported in Scotland (European Centre for Disease Prevention and Control, 2009t). The reported number of confirmed A/H1N1 deaths is illustrated in the red curve in Figure 5.

As Figure 5 shows, the UK experienced two waves of pandemic A/H1N1 activity. Initially, the UK observed sporadic importations of the pandemic A/H1N1 virus from Mexico and the US. As sustained community transmission developed in June, the number of pandemic A/H1N1 cases increased sharply until the peak of the first wave in week 27/2009. The West Midlands, London and central Scotland were most affected at the beginning of the A/H1N1 outbreak in the UK. By the end of June almost 7000 confirmed cases were reported (Health Protection Agency, 2010b). On 1 July, the UK has reported three fatal cases (European Centre for Disease Prevention and Control, 2009v).

In its Threat Assessment, published on 1 July, the ECDC announced the first isolation of an oseltamivir (also known as Tamiflu®) resistant mutant A/H1N1 virus in Denmark. The virus was not a reassortant virus and was still susceptible to zanamivir (also known as Relenza®). There was no evidence that the virus has been transmitted to other persons. ECDC stated that this phenomenon is well-known in influenza viruses and emphasized the need for continued surveillance of this problem (European Centre for Disease Prevention and Control, 2009u).

[3] Please note that the number of cases shown in Figure 13 differs from this number of cases. Figure 13 only shows data on confirmed cases from the SISS as the Spanish Ministry of Health and Social Policy (MHSP) stopped reporting total numbers of cases on 28 July 2009. Hereafter, the MHSP only reported incidence rates which were calculated from the SISS data (Ministerio de Sanidad y Politica Social, 2009c).

On 16 July, the Department of Health in the UK made its first planning assumptions public. The figures represented a “reasonable worst case”, not a prediction on how the pandemic will evolve. The following key planning assumptions for the first major pandemic wave were published: 18.69 million cases, 370.000 people hospitalized, 2.8 million people with complications and up to 65.000 deaths. These figures referred to the total UK population of about 62.3 million (Department of Health, 2009e).

According to an ECDC risk assessment published on 20 July, 20-30% of the population was expected to be affected over the first major wave of the pandemic. Clinical attack rates were expected to be highest in children and young adults. The estimate for hospitalization rates in Europe was 1-2% and the case fatality rate was estimated to be 0.1-0.2% of all clinical cases. ECDC stated that most cases experienced a mild and self-limiting illness, but people with chronic underlying medical conditions, pregnant women and young children were at higher risk of experiencing severe disease and deaths (European Centre for Disease Prevention and Control, 2009w).

As of 4 August, the UK the UK has reported 11912 cases to the ECDC. The UK has stopped laboratory testing of all suspected cases; therefore, the reported numbers severely underestimate the true figure in the country. So far, the UK has recorded 30 deaths from pandemic A/H1N1 infection (European Centre for Disease Prevention and Control, 2009aa). The virus continued to spread in the country, but at a low level over the summer (see Figure 5). The closure of schools was supposed to be responsible for this decline of infections as transmission accelerated again in late September with the return to school.

On 21 August, the ECDC published its planning assumptions for the first major wave of infection, which was expected to take place in the autumn and winter of 2009/2010. However, these planning assumptions did not differ from those published on 20 July (European Centre for Disease Prevention and Control, 2009ab).

In contrast to the ECDC, the Department of Health in the UK has modified its planning assumptions in early September. Based on the latest evidence on the severity of the pandemic A/H1N1 virus, the following values have been revised downwards: hospitalization rate from 2% to 1% and upper case fatality rate from 0, 35% to 0, 1% (Department of Health, 2009i).

In late September, the ECDC has reduced its planning assumption as well. This decision was based on experience from Southern Hemisphere countries. It became more apparent that most pandemic A/H1N1 cases experienced a mild disease; therefore hospitalization and case fatality rates were revised downwards and were now in line with the figures published in the UK in early September (European Centre for Disease Prevention and Control, 2009ad).

In early autumn, the numbers of pandemic A/H1N1 infections in the UK have started to increase again, indicating the beginning of the expected autumn/winter wave. In the UK the second wave peaked in week 45/2009 (Department of Health, 2010a). Thereafter the numbers of infections declined constantly until the end of the second wave in early January 2010. Throughout the pandemic, the highest infection rates were observed in children and young people. Generally, the virus caused a mild illness. More severe disease was especially experienced by those cases with underlying conditions (Department of Health, 2010a).

On 15 October, the number of reported deaths in the UK reached 95 (European Centre for Disease Prevention and Control, 2009ae). On months later, this number had increased up to 185 (European Centre for Disease Prevention and Control, 2009ah). As more information on the pandemic A/H1N1 virus became available showing that it remains relatively mild for most people and suggesting that the second peak may not be as high as actually thought, the worst-case planning assumptions for the UK were revised downwards once more. In the new planning assumptions, published on 22 October, the reasonable worst case for the clinical attack rate was reduced from 30% to 12% and the reasonable worst case for further deaths was reduced from 19.000 to 1.000 (Department of Health, 2009m).
In its 7th risk assessment issued on 6 November, the ECDC has revised its planning assumptions as well. The following EU reasonable worst case planning assumptions for the

first year up to mid-May 2010 were published: clinical attack rate: up to 20% of population, hospitalization rate: up to 100 per 100.000 population and case fatality rate: up to 3 per 100.000 population (European Centre for Disease Prevention and Control, 2009ag).

On 30 November, the UK`s Scientific Advisory Groups for Emergencies held a meeting in which modelers announced that the pandemic had now peaked and that the recently published worst case assumptions will not be reached (Department of Health. Scientific Advisory Group for Emergencies (SAGE), 2009d).

The number of pandemic A/H1N1 infections decreased constantly in the UK. On 11 December, the UK has reported 283 deaths due to pandemic A/H1N1 (European Centre for Disease Prevention and Control, 2009aj). The end of the autumn wave was in early January 2010. Afterwards only sporadic cases have been reported (Department of Health, 2010a).

In February 2010, evidence showed decreasing or low pandemic A/H1N1 activity in many countries, but the WHO Emergency Committee agreed that it was too early to conclude that the pandemic A/H1N1 virus has run its course. Thus, the pandemic influenza alert phase was not changed (World Health Organization, 2010a). On 10 August 2010, the WHO Emergency Committee assessed the global situation again. This time the Committee concluded that the world was entering the post-pandemic period (World Health Organization, 2010c). Altogether, the UK has reported 474 pandemic A/H1N1 influenza related deaths. Of these, 83% were in younger age groups (0-64 years) and 18% had no underlying condition (Department of Health, 2010d).

During the first wave of transmission the UK employed a containment strategy until 2 July 2009. The aim of this strategy was to delay the spread of infection and thereby get more time to develop specific countermeasures, like pandemic vaccine. Those who met the clinical and epidemiological case definition were assessed through swabbing and laboratory testing. Cases were requested to isolate at home or in hospital (depending on their clinical condition) for at least seven days. Close contacts were traced and offered antiviral prophylaxis.

Additionally, information on the virus was gathered to get a better understanding of the disease course. During this initial containment phase specimens were taken from all suspected cases for laboratory testing (Health Protection Agency, 2010c). From 2 July onwards cases were diagnosed on the basis of clinical symptoms and laboratory confirmation was not required for every patient anymore (Health Protection Agency, 2010b).

Given this information, the numbers of confirmed cases from week 27/2009 onwards in Figure 5 do not reflect the actual number of cases in the UK and the sharp decline in after week 27/2009 is, besides the school closure for summer holidays, probably due to this different testing strategy. In order to still monitor the magnitude of the pandemic in the population, the Health Protection Agency (HPA) in England started to calculate estimates the number of new clinical A/H1N1 cases in England from week 30 onwards. The were generated each week using a statistical model. The data were obtained from two surveillance systems: the primary care based QSurveillance scheme and the Royal College of General Practitioners (RCGP) and HPA Regional Microbiology Network sentinel surveillance scheme. In late July data from the National Pandemic Flu Service (NPFS) added (Health Protection Agency, 2009c). To calculate the estimates GP (General Practitioner) and NPFS age-specific consultations rates, age specific positivity rates and estimated proportions of people who contacted their GP or the NPFS were used. To take uncertainty of proportions consulting health care into account, a range of estimates was calculated surrounding the central estimate (Health Protection Agency, 2010b).

Figure 12 shows the weekly number of confirmed A/H1N1 cases and the weekly estimates in England. The figure illustrates the aforementioned under-reporting of pandemic A/H1N1 cases from 2 July onwards, as the actual number of cases was estimated to be up to a hundred times higher than the number of confirmed cases in England. However, the pandemic profile as described above is still visible in both curves.

3.2.2 Surveillance

On 30 April, the European Commission agreed on a common case definition for the European Union in order to detect cases of influenza caused by the new virus. This case definition is presented in Table 4.

For monitoring and assessing the situation, the UK used the following existing influenza surveillance systems:
For clinical surveillance through primary care the QSurveillance and Royal College of General Practitioner (RCGP) networks of sentinel General Practitioners (GP), as well as the telephone helpline NHS direct in England and Wales, and NHS 24 in Scotland were used. These systems provided estimates of influenza incidence to detect an increase in influenza infections as early as possible (Hine, 2010).
The WHO National Influenza Reference Centre for the United Kingdom is the Respiratory Virus Unit (RVU) of the Virus Reference Department at the Health Protection Agency. It collated virological data from its reference laboratories, from a nationwide laboratory reporting system and from general practitioners (Health Protection Agency, 2012).

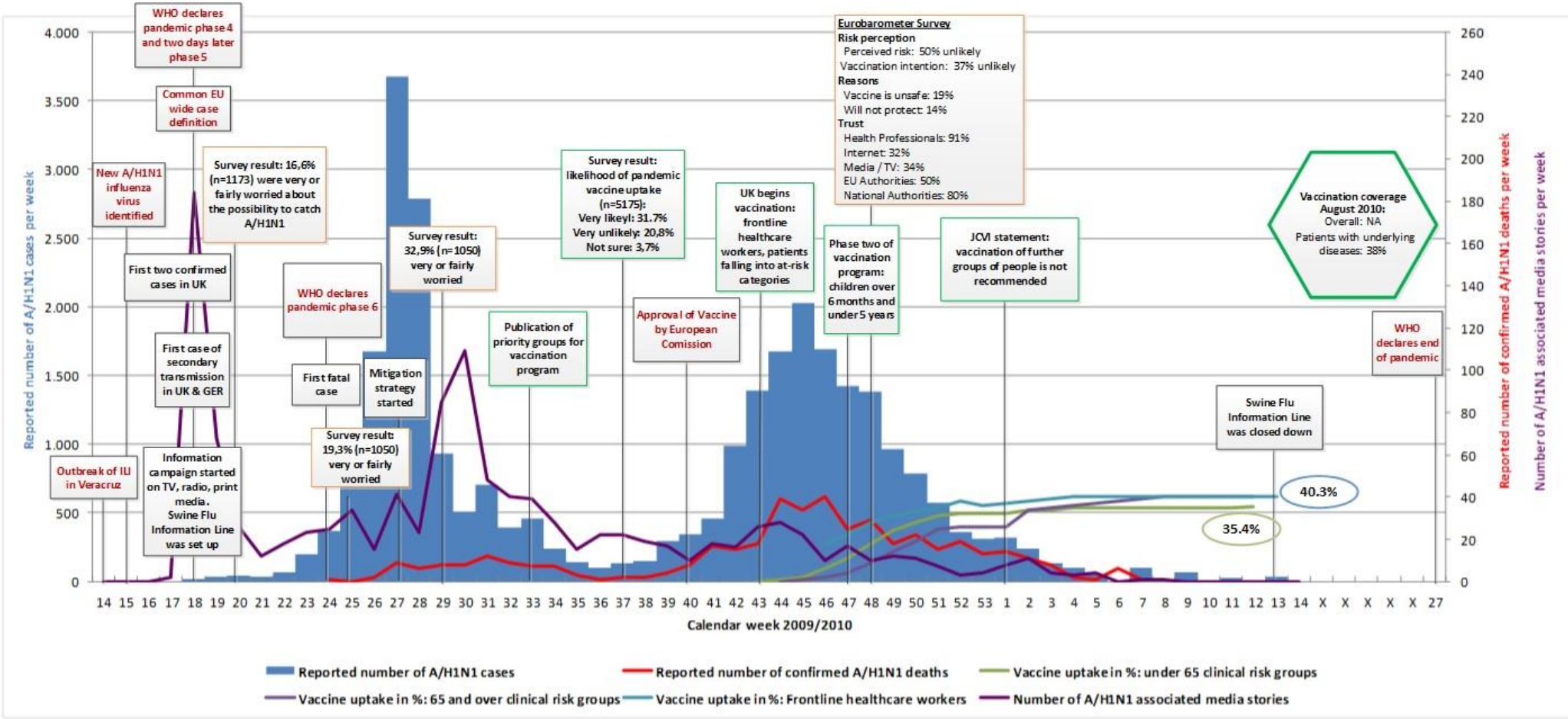
On 2 July, the surveillance strategy in the UK was modified. This change implied that laboratory testing of all cases and case-tracing was ceased (Health Protection Agency, 2009d). To monitor the safety of the medicines and vaccines that are on the market, the Medicines and Healthcare products Regulatory Agency (MHRA) of the UK has a an on-line reporting system in place, called the Yellow Card Scheme. This system is open to members of the public as well as healthcare professionals wanting to report suspected adverse drug reactions. On 6 July, a special web-based system for reporting suspected adverse drug reactions to Tamiflu, Relenza and to future pandemic vaccine was put into operation for the duration of the pandemic (Medicines and Healthcare products Regulatory Agency, 2009a).

On 16 July, the WHO announced that countries with community-wide transmission are no longer required to forward regular reports of individual confirmed cases to the WHO, as the

detection, laboratory-confirmation and investigation of all cases is extremely resource-intensive and not sustainable for these countries (World Health Organization, 2009k).

In October, the Health Protection Agency set up a web based reporting system for NHS Trusts across England to gather information on hospitalized pandemic A/H1N1 cases. With this system the Health Protection Agency aimed to collect clinical, epidemiological and demographic data on all hospitalized cases with a confirmed pandemic A/H1N1 infection (Health Protection Agency, 2010b).

Figure 5: Epidemiology, key events and media attention during the A/H1N1 pandemic in UK



Sources: Number of new A/H1N1 cases per week: Health Protection Agency (2010): Weekly epidemiological updates archive. http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/PandemicInfluenza/H1N1PandemicArchive/SIEpidemiologicalData/SIEpidemiologicalReportsArchive/influswarchiveweek-lyepireports Reported number of confirmed A/H1N1 deaths: Pebody et al. (2010): Pandemic Influenza A (H1N1) 2009 and mortality in the United Kingdom: risk factors for death, April 2009 to March 2010 http://www.eurosurveillance.org/images/dynamic/EE/V15N20/art19571.pdf (The numbers used were taken from Figure 1)
Vaccine uptake in **England**: Sethi & Pebody (2010a): Pandemic H1N1 (Swine Flu) and Seasonal Influenza Vaccine Uptake amongst Frontline Healthcare Workers in **England** 2009/10. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/215976/dh_121015.pdf (The numbers used were taken from Graph 1, p. 36), Sethi & Pebody (2010b): Pandemic

H1N1 (Swine) Influenza Vaccine Uptake amongst Patient Groups in Primary Care in **England** 2009/2010. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/215977/dh_121014.pdf
Vaccination coverage: Mereckiene et al. (2012): Influenza A(H1N1)pdm09 vaccination policies and coverage in Europe. *Euro Surveillance*, *17*(4)
Risk perception: Rubin et al (2010): The impact of communication about swine flu (influenza A H1N1v) on public responses to the outbreak: results from 36 national telephone surveys in the UK. Health Technology Assessment, 14(34), 165 – 248, Media attention: Hilton &Hunt (2011). UK newspapers' representations of the 2009–10 outbreak of swine flu: one health scare not over-hyped by the media?. *Journal of epidemiology and community Health*, 65(10), 941-946.

3.2.3 Pandemic management strategy

Initially, the UK employed a containment strategy. Measures focused on limiting transmission of the virus or delaying the spread in order to gain time to apply effective response measures. This strategy included the following public health measures: those who met the clinical and epidemiological case definition were assessed through swabbing and laboratory testing; cases were treated with antivirals within 48 hours after onset of symptoms and requested to isolate at home or in hospital (depending on their clinical condition) for at least seven days; close contacts were traced and offered antiviral prophylaxis. Contacts were asked to self-isolate only if they developed symptoms (Health Protection Agency, 2010b).

In order to avoid the introduction of the pandemic A/H1N1 virus through international air traffic, the UK started to meet all direct flights from Mexico at an early stage. Medical teams checked passengers and crew members on clinical symptoms and distributed information leaflets about pandemic influenza. In addition, contact details of passengers were collected to be able to inform them if it turned out that a person with confirmed pandemic A/H1N1 infection was aboard the same flight (Hine, 2010).

Health protection authorities in the UK advised schools to close for one week in the event of a confirmed pandemic A/H1N1 case at school and antiviral prophylaxis was given to all close contacts. The first school closure in the UK was on 29 April. On the same day, Gordon Brown announced that in order to provide antivirals for 80% of the population, the antiviral stockpile was to be increased from 33, 5 million to 50 million doses (Hine, 2010). To implement the control strategy at regional level in England, the HPA put in place Flu Response Centers staffed by HPA and NHS staff (Health Protection Agency, 2010c).

On 20 May, the HPA in the UK proposed to change the actions regarding the contact management at schools. Instead of offering antiviral prophylaxis to all contacts, only the closest contacts should be given antivirals to reduce the risk of viral resistance due to non-compliance with the specified course of treatment (Department of Health. Scientific

Advisory Group for Emergencies (SAGE), 2009a). However, the UK maintained its initial containment actions until 22 May, at which point the first adjustment was made. Based on information on reduced prevalence of pandemic A/H1N1 in Mexico, the HPA stopped meeting all flight from Mexico (Health Protection Agency, 2009a).

As the numbers of cases increased steadily, the containment actions became more and more resource-intensive. Especially in the most affected areas in the UK, such as London and the West Midlands, the measures became unsustainable. Therefore, on 10 June, the initial containment approach in the UK was relaxed for "hot spot" areas. As proposed by the HPA, antiviral prophylaxis was only offered to the closest contacts. Additionally, laboratory testing was not necessary anymore if the clinical diagnosis indicated a high probability that the case was positive (Health Protection Agency, 2010c; Hine, 2010).

Acknowledging that the containment of the pandemic A/H1N1 virus was no longer possible, the ministers in the UK changed the response strategy on 2 July. Due to the widespread of the virus within the UK, ministers decided to move from containment into the treatment phase. As already described in the previous chapter this change meant that laboratory testing was no longer required for all cases and case-tracing was ceased. Further, antiviral treatment was only offered to clinical cases (Health Protection Agency, 2009d). Additionally, to relieve some of the pressures on the health system, the National Pandemic Flu Service was launched in England on 23 July. This was an online and telephone self-care service that allowed people to be assessed for pandemic flu and, if required, to get access to antivirals. If symptoms were causing concern or if cases were in an at-risk group, they were advised to contact their GP. Those who were authorized to receive antivirals were able to pick up the drugs from one of the 2.000 antiviral collection points that were established across England. In Scotland, Wales and Northern Ireland A/H1N1 cases accessed antivirals through the normal primary care route, by taking a GP prescription to a pharmacy. In England, all clinical cases received antivirals, whereas GPs in the devolved administrations were advised to prescribe antivirals to cases in at-risk groups and any other cases based on clinical discretion (Department of Health, 2009f; Hine, 2010).

The National Pandemic Flu Service (NPFS) was launched in England in order to reduce the pressure on primary care. With decreasing numbers of pandemic A/H1N1 cases this service was not required anymore and was closed down on 11 February. During its operation, the NPFS distributed antivirals to 1.1 million people.

Two months later, on 1st April, antiviral collection points in England closed and the Swine Flu Information Line was stood down. Further, antivirals could no longer be collected from national stockpiles (Hine, 2010).

3.2.4 Vaccination strategy

As the new virus first emerged in April 2009, it was not possible to adjust the 2009/2010 seasonal influenza vaccine to this new influenza A/H1N1 strain (Robert Koch-Institute, 2009c). The production of a pandemic-specific vaccine takes four to six months and can only be started when the new strain has been isolated (Hine, 2010).

At the time the UK started to develop its vaccination strategy, the severity and infectivity of the pandemic A/H1N1 virus was still uncertain. Thus, it was difficult to decide on the quantity of required vaccine (Hine, 2010; Marcic et al., 2010). The ministers in the UK decided to procure 90 million doses of pre-pandemic vaccine, enough for 45% of the population to have two doses. Pre-pandemic vaccines contain the virus strain most likely to be similar to the pandemic strain. The ministers in the UK started to negotiate with the vaccine manufactures GlaxoSmithKline and Baxter Healthcare on the supply of the pre-pandemic vaccine. In the end, no pre-pandemic vaccines were purchased, as the negotiations were still ongoing when the influenza pandemic alert phase 6 was declared by the WHO, which triggered the advance-purchase agreements (Hine, 2010). The UK had advance-purchase agreement contracts with vaccine manufacturers in order to secure sufficient vaccine supply in the event of a pandemic. These contracts were a result of the UK's pre-pandemic planning and were activated with the announcement of pandemic influenza alert phase 6. On 17 June, the ministers in the UK decided to purchase pandemic vaccine for 100% of the population (Hine, 2010).

The UK`s initial vaccination strategy was to provide pandemic vaccine for 100% of the population. Thus, on 26 June, contracts were signed with GlaxoSmithKline and Baxter Healthcare to make available 132 million doses of pandemic vaccine, enough for the whole population to have two doses of vaccine (Hine, 2010).
As initial supplies of pandemic vaccine were limited, the WHO Strategic Advisory Group of Experts (SAGE) on Immunization recommended that the following groups should be prioritized for vaccination: health-care workers; pregnant women; individuals aged above six months with a chronic medical condition; healthy individuals aged between 15 years and up to 49 years; healthy children; healthy individuals aged between 50 years and up to 64 years; and healthy individuals aged 65 years or above. The order of priority should be based on country-specific conditions (World Health Organization, 2009j).

Three days later, on 16 July, UK ministers agreed on the following priority groups for vaccination advised by DH´s Joint Committee on Vaccination and Immunization (JCVI) and previously endorsed by DH`s Scientific Advisory Group for Emergencies (SAGE): individuals aged between six months and 65 years in the current seasonal flu at-risk group; pregnant women; children aged between 3 years and up to 16 years; and frontline health and social care workers (Department of Health. Joint Committee on Vaccination and Immunisation, 2009a; Department of Health. Scientific Advisory Group for Emergencies (SAGE), 2009b; Hine, 2010).

At the beginning of the vaccine production, vaccine manufacturers had problems with low vaccine output. GlaxoSmithKline and Baxter Healthcare reacted to this problem by modifying their production process and thereby increased their vaccine output. Thus, on 29 July, the ministers in the UK decided to buy 30 million doses of additional pandemic vaccine from GlaxoSmithKline to ensure pandemic vaccine supply (Hine, 2010).

On 13 August, the priority groups for the pandemic A/H1N1 vaccination program were announced in the UK. Based on advice from the Joint Committee for Vaccination and Immunization (JCVI) and the Scientific Advisory Group for Emergencies (SAGE) four

groups have been identified to be at highest risk of developing severe disease from a pandemic A/H1N1 infection. These groups should be prioritized for vaccination in the following order:

- people aged between six months and up to 65 years in the present seasonal flu vaccine clinical at-risk groups,
- all pregnant women,
- household contacts of immunocompromised people, and
- individuals aged ≥ 65 in the present seasonal flu vaccine clinical at-risk groups.

In addition, front-line health and social care workers should be vaccinated together with the first clinical at-risk group (Department of Health, 2009g). Members of the clinical at-risk group were individuals with one of the following underlying clinical condition: chronic respiratory disease, chronic heart disease, chronic renal disease, chronic liver disease, chronic neurological disease, immunosuppression or diabetes mellitus (Department of Health, 2009h).

On 29 September, the European Commission authorized the first two pandemic vaccines Focetria® (Novartis) and Pandemrix® (GlaxoSmithKline) for use in all Member States of the European Union and in Iceland, Liechtenstein and Norway (European Commission, 2009b).

On 6 October, the European Commission authorized a third pandemic vaccine, Celvapan®, for use in all EU Member States, Iceland, Lichtenstein and Norway (European Commission, 2009c). As the European Commission has now authorized both vaccines procured by the UK (Pandemrix® and Celvapan®), the DH`s Joint Committee on Vaccination and Immunization gave the following advice on vaccine dosage: one dose of Pandemrix® for those aged 10 years and above, two doses for immunocompromised individuals, two half adult doses for children aged below ten years and over six months and two doses of Celvapan® for all age groups (Department of Health. Joint Committee on Vaccination and Immunisation, 2009c). Four days later, on 12 October, this advice was endorsed by DH`s

Scientific Advisory Group for Emergencies (SAGE) (Department of Health. Scientific Advisory Group for Emergencies (SAGE), 2009c).

While the DH`s Joint Committee on Vaccination and Immunization considered a one dose schedule for Pandemrix® to be sufficient for those aged 10 years and above, the European Medicines Agency (EMA) recommended a two dose schedule for all three authorized vaccines (European Medicines Agency, 2009b).

On 21 October, the UK started its vaccination program (Department of Health, 2009k).

On 19 November, phase two of the UK`s vaccination program was announced by the Department of Health. Chief Medical Officer Liam Donaldson stated that the vaccination program will be extended and vaccine will also be offered to all children over six months of age and under five years old. This decision was based on evidence showing that this age group is at higher risk of developing severe disease from an A/H1N1 infection than other healthy age groups (Department of Health, 2009u).

In December, the UK extended its vaccination program. As already announced in mid-November, the UK started to offer pandemic vaccine to children over 6 months and under 5 years of age. The recommendation on the vaccine dosage was updated and one half adult dose of Pandemrix® was now considered to be sufficient for children over six months (Department of Health, 2009v). The DH`s Joint Committee on Vaccination and Immunization in the UK did not recommend to extend the vaccination program to other groups of the population. This recommendation was based on the latest epidemiological evidence and modeling predictions, which showed that pandemic A/H1N1 activity has decreased and a third wave was unlikely (Department of Health. Joint Committee on Vaccination and Immunisation, 2010). On 4 February, ministers approved this advice, but decided to set up a strategic reserve of 15 million doses of pandemic vaccine (Hine, 2010). The Department of Health has already contacted Baxter Healthcare in late December 2009 to stop supply of Celvapan® from 28 February 2010. This was possible, because a break

clause was agreed with Baxter Healthcare at the time the UK ordered the vaccine in 2009 (Hine, 2010). On 14 January 2010, ministers agreed to stop deliveries of Pandemrix® as well. As this contract did not include a break clause, the Department of Health commenced negotiations with GlaxoSmithKline over terminating vaccine deliveries. On 6 April, the Department of Health achieved agreement to only take deliveries of just under 35 million doses of Pandemrix® (The Secretary of State for Health, 2010).

3.2.5 Communication

In order to give a better overview, the information published during the pandemic is grouped around the themes: Communication related to personal protective measures, communication related to A/H1N1 treatment, communication related to pandemic control measures, communication related to A/H1N1 vaccination and communication in the media.

Communication related to personal protective measures

On 30 April, the information campaign started in the UK. The campaign ran on TV, on the radio and in print media. Additionally, posters and leaflets were used and an information line was set up to provide up-to-date advice to the public. Further, advice and information was accessible on the government website. Same as in Spain and Germany, following good hygiene practices, i.e. using and disposing tissues and washing hands, was recommended as the best way to protect oneself from contracting the virus. To remember this, the UK campaign used the following slogan: “Catch it, bin it, kill it” (Department of Health, 2009a; Hine, 2010).

In addition to the public information and advice on national level, the ECDC provided information on European level. On 27 April, the ECDC published the first general questions and answers on pandemic A/H1N1 virus (European Centre for Disease Prevention and Control, 2010a). In May, the ECDC published two documents on personal protective measures and information for travelers. The documents described personal protective measures to reduce the risk of acquiring influenza, i.e. regular hand washing, respiratory hygiene, avoidance of close contacts and mass gatherings (European Centre for Disease Prevention and Control, 2009k, 2009m, 2009n).

In early January, the Department of Health in the UK published information leaflets in 32 languages to provide information on the pandemic A/H1N1 virus, personal protective measures, and the vaccination program for people who cannot speak or read English and who may not have access to a regular flow of news, i.e., an asylum seeker or refugee or a member of an established migrant group (Department of Health, 2010b).

Communication related to A/H1N1 treatment

The use of antivirals in some groups involves particularities health professionals should know. Thus, on 8 May, the European Medicines Agency (EMA) published a guidance document on the use of the antiviral medicine Tamiflu in children under one year of age and the antivirals Tamiflu and Relenza in pregnant and breastfeeding women in the case of an influenza A/H1N1 pandemic. The EMA stated that in the event of a pandemic Tamiflu can be used to treat children under the age of one and both antivirals can be used to treat pregnant women, as the benefits of their use outweigh their risks (European Medicines Agency, 2009a).

In the UK, the following recommendations on the use of antivirals in children, pregnant women and women who are breastfeeding were published:

- zanamivir (Relenza®) or oseltamivir (Tamiflu®) can be used in pregnant women, but zanamivir was recommended as first choice for treatment and prophylaxis,
- the preferred antiviral medicine for breastfeeding women is oseltamivir,
- children under the age of one year should only be treated with oseltamivir,
- post exposure prophylaxis for children under the age of one should only be offered after a thorough benefit-risk assessment (Department of Health, 2009j)

On 18 August, the ECDC published general guidance on the use of antivirals during influenza pandemics. The document aimed to inform those deciding on antiviral use strategies about the effectiveness of antivirals, side effects of antivirals, priority groups for antiviral use and about necessary arrangements for antiviral delivery and administration (European Centre for Disease Prevention and Control, 2009y).

The Department of Health in the UK published clinical management guidelines for adults, children and pregnant women (Department of Health & Royal College of Obstetricians and Gynaecologists, 2009; Department of Health, 2009q). A third document aimed to provide guidance for health professionals on the use of antiviral prophylaxis during the A/H1N1 pandemic. It informed on situations when the use of antiviral prophylaxis in pregnant women and people with underlying medical conditions was considered to be appropriate (Department of Health, 2009l). In addition, information for health and social care workers who are pregnant or in other at-risk groups was published (Department of Health, 2009o).

Communication related to pandemic control measures

On 19 May, the ECDC published a guidance document on case and contact management. The recommended measures did not differ from the measures already applied in Germany, Spain and the UK (European Centre for Disease Prevention and Control, 2009o).

On 6 June, the ECDC published a guidance document on mitigation and containment strategies for national health authorities. ECDC stated that many public health measures are common in both strategies and the implementation of a mitigation strategy would mainly mean to move away from vigorous case finding and contact tracing. Further, the ECDC acknowledged that a containment strategy is very resource-intensive and therefore not a recommended infection control strategy for human influenza beyond pandemic alert phase 4 (European Centre for Disease Prevention and Control, 2009r).

On 26 June, the WHO published a guidance document on public health measures to help countries manage the A/H1N1 pandemic. Besides giving general advice on response measures, the WHO provided additional advice for countries with widespread community-level transmission, for countries with no reported cases and for countries in transition. The WHO advised all countries to concentrate on mitigation measures, to prepare the health-care system for a high volume of patients and to ensure antiviral medicine and vaccine supply. In addition, countries with widespread community-level transmission were advised to cease laboratory-testing of all cases, to reduce the pressure on the health-care system, to primarily focus on the treatment of ill patients, and to consider school closures or the cancellation of

mass gathering on a case-by-case basis. Countries with no reported cases were advised that they may consider entry screening at airports and contact tracing, but that these measures are resource intensive and of limited benefit to prevent the spread of the disease. Countries in transition were advised to start the same control measures as countries with widespread community-level transmission (World Health Organization, 2009a).

On 2 July, the Department of Health in the UK published three documents on the new response strategy. The first document was intended for the NHS which outlined the rationale of the movement from containment to treatment and set responsibilities for the NHS during the treatment phase (Department of Health, 2009b). The second document provided clear information to the public explaining why the UK has chosen to move to a treatment phase, and the third document summarized scientific issues relevant to the new response strategy (Department of Health, 2009c, 2009d).

On 20 July, the ECDC gave scientific advice on reactive and proactive school closures in Europe. ECDC highlighted that there is no consensus on the benefits from proactive school closures (school closure before transmission between the children occurs), but countries and schools were advised to at least have plans for reactive school closures (school closure when many children and/or staff are experiencing illness). These plans should consider the following issues: recommended length of time of closure; the triggers for re-opening; how to sustain teaching and learning; and potential problems that may arise for parents, if they have to take time off work (European Centre for Disease Prevention and Control, 2009x).

In mid-September, the ECDC published a document on public health measures for policy and decision-makers (European Centre for Disease Prevention and Control, 2010a). It provided scientific information on measures that may be applied to reduce the impact of influenza pandemics (i.e. border closures, entry restrictions, personal protective measures, social distancing measures, use of antivirals and vaccines) and aimed to help EU countries to decide on appropriate response measures (European Centre for Disease Prevention and Control, 2009a).

On 23 September, the WHO Emergency Committee held its 5th meeting and agreed on continuing the following recommendations proposed by the WHO Director-General:

- borders should not be closed and travel and trade should not be restricted,
- countries should intensify surveillance of unusual events and
- people who are ill should postpone international travel (World Health Organization, 2009n).

On 26 November, the WHO Emergency Committee held its 6th meeting and agreed that delaying international travel was no longer recommended for ill persons, because pandemic A/H1N1 infections were already widespread (World Health Organization, 2009p).

Communication related to A/H1N1 vaccination

Referring to media reports that have displayed concern about the safety of pandemic vaccine, the WHO has issued a note on pandemic vaccine safety on 6 August. In this statement the WHO outlined the procedures for approval and licensing of vaccines and confirmed that these procedures are strict and do include safety and quality controls. The WHO also stated that the data on influenza vaccine safety collected during the last 60 years do not show a special safety issue. Nonetheless, the WHO advised countries to closely monitor the safety and efficacy of the pandemic vaccine, as rare adverse events may only occur when large numbers of people got vaccinated (World Health Organization, 2009l).

On 13 August, the ECDC published a document on the use of influenza pandemic vaccines during the 2009 A/H1N1 pandemic. The document aimed to inform those deciding on vaccination policies in the European countries on vaccine use and options for prioritization in order to maximize the benefit of available vaccine (European Centre for Disease Prevention and Control, 2009z).

Together with the start of the vaccination program, the public information campaign was launched in the UK. Information and advice was accessible on government websites and made available to the general public through leaflets (Department of Health, 2009n). In addition to the mainstream public information, the Department of Health in the UK produced

tailored information for health professionals and pregnant women (Department of Health, 2009r, 2009s). Furthermore, clinical professional briefs on pandemic vaccination were published (Department of Health, 2009p, 2009t).

On 5 November, the Medicines and Healthcare products Regulatory Agency (MHRA) in the UK published its first adverse reaction analysis on pandemic vaccines. In this report, the MHRA stated that there have been no new safety issues identified and that the benefits for Celvapan® and Pandemrix® still outweigh their risks (Medicines and Healthcare products Regulatory Agency, 2009b).

On European level, information on vaccination was provided by the ECDC. In November, the ECDC published questions and answers on vaccines for health professionals and for the general public on its website (European Centre for Disease Prevention and Control, 2009b, 2009c, 2010a).

On 19 November, the WHO issued a briefing note on pandemic vaccines in which the safety of the vaccines was reaffirmed (World Health Organization, 2009o). The European Medicines Agency (EMA) did hold the same opinion. In a press release published on 20 November, the EMA reasserted the efficacy and safety of pandemic vaccines. Further, the EMA revised its advice on vaccine schedules and published the following recommendations: Pandemrix® and Focetria® may be used as a single dose in adults (18-60 years) and in children and adolescents (Focetria®: from the age of 9 years; Pandemrix®: from the age of 10 years). Individuals aged over 60 years may also receive one dose of Pandemrix®, but younger children and immunocompromised people should receive two doses (European Medicines Agency, 2009c).

In December 2009, the UK started to offer pandemic vaccine to children over 6 months and under 5 years of age. The Department of Health developed a leaflet for parents that contained tailored information about the second phase of the vaccination program (Department of Health, 2009w).

Between December 2009 and August 2010, the European Medicines Agency (EMA) published regular updates on safety monitoring of vaccines and medicines used during the pandemic (European Medicines Agency, 2010). In its update on pandemic medicines of 18 December, the EMA reaffirmed that the available data on the three pandemic vaccines and Tamiflu® showed no unexpected serious safety issues (European Medicines Agency, 2010).

Communication in the media

In the analysis of Hiltons & Hunts data set including 2374 articles mainly focusing on A/H1N1 published in the UK between 1 March 2009 and 28 February 2010, all articles from The Daily Telegraph & Sunday Telegraph, The Guardian, The Daily Mail & Mail on Sunday and The Sun were considered. This analysis resulted in 1142 articles in total (The Sun: 553, The Guardian: 236, The Daily Telegraph & Sunday Telegraph: 201, The Daily Mail & Mail on Sunday: 152).

The purple curve in Figure 5 shows the number of A/H1N1 associated media stories per week from week 14/2009 until week 14/2010. Compared to the number of A/H1N1 associated media stories published in Germany, Spain and Czech Republic, the curve has a similar shape, but at a higher level. This may be due to the inclusion of four newspapers in contrast to three newspapers and the main TV news show in Germany, Spain and Czech Republic and potentially different in- and exclusion criteria. The curve in Figure 5 also shows one major peak in week 18 and one smaller peek thereafter.

In week 18, the WHO declared pandemic phase 4 and two days later, pandemic phase 5. In the same week, the first two laboratory-confirmed A/H1N1 cases were reported in the UK, but also the first case of secondary transmission. After week 18, the number of A/H1N1 associated media stories declined sharply and remained at a low to moderate level until week 28 (12 A/H1N1 associated media stories in week 21, 34 in week 25 and 41 in week 27). Then, the number of media stories increased steadily and reached a minor peak in week 30 (109 A/H1N1 associated media stories). This was shortly after the first major wave had peaked in week 27. According to a survey conducted in week 29, 32.9 % of the participants (n=1050) were very or fairly worried about personally contracting the A/H1N1 virus.

Thereafter, the media attention decreased steadily to 15 A/H1N1 associated media stories in week 35, but increased slightly again and reached 28 media stories in week 44, when the first peak in the number of A/H1N1 deaths occurred (39 deaths). The curve then levelled out until week 8/2010, when the last A/H1N1 media story was published, despite the second large wave of A/H1N1 cases and deaths.

3.2.6 Risk perception and human behavior

In order to monitor public risk perception in relation to the pandemic A/H1N1 outbreak, 36 telephone surveys were conducted in weekly intervals across the UK between 1 May 2009 and 10 January 2010. In mid-May, only 16.6% (N=1173) of interviewees stated to be very or fairly worried about the possibility of catching pandemic A/H1N1. Along with the growing number of reported pandemic A/H1N1 cases, the percentage of worried persons increased as well. By mid-June, 19.3% (N=1050) of interviewees stated to be very or fairly worried about the possibility of catching pandemic A/H1N1 (Rubin et al., 2010).

In mid-July, the percentage of worried persons had increased again. This time, 32.9% (N=1050) of interviewees stated to be very or fairly worried about the possibility of catching pandemic A/H1N1 (Rubin et al., 2010).
According to a survey observing people´s attitude towards the pandemic vaccine conducted between 14 August and 13 September 2009, 31.7% (N=5175) of respondents ranked the likelihood of getting vaccinated as very likely and 24.4% as fairly likely (Rubin et al.., 2010)

In late November 2009, the Gallup Organization conducted a survey called the Eurobarometer in the 27 EU Member States, as well as in Norway, Switzerland and Iceland to examine public opinion about influenza and pandemic A/H1N1. In the UK, 49% (N=1000) believed it was unlikely or rather unlikely that they would personally catch the A/H1N1influenza. Furthermore, 37% stated that is was not likely or not likely at all that they would get vaccinated against the pandemic A/H1N1 virus. Health professionals were the most trusted source to inform about pandemic A/H1N1. 91% mentioned that they trust health professionals mostly or completely (The Gallup Organization, 2010).

From 8 November 2009 to 4 April 2010, a survey was conducted in all 389 NHS Trusts (Acute, Mental Health, Ambulance, Primary Care, Care and Foundation Trusts) in England on a weekly basis in order to assess the uptake of the vaccines among healthcare workers. The proportion of frontline healthcare workers vaccinated is illustrated in the turquoise curve in Figure 5. Same as for the number of vaccines administered in Denmark, the vaccine uptake increased sharply within the first weeks after the vaccine was available and leveled out later on at approximately 40 % from week 4/2010 on (Sethi &Pebody 2010a).

The A/H1N1 vaccination program in England initially targeted persons, who are most at risk for serious illness or death. These are persons, who belong to the seasonal influenza clinical risk groups (all ages), all pregnant women and household contacts of the immunocompromised, but also healthy children aged 6 months to under five years from December 2009 onwards (Sethi & Pebody 2010b). In order to assess the vaccine uptake among the target groups, a survey was conducted using data collected from a sentinel group of GP practices (around 40 %). The vaccination uptake in under 65 clinical risk groups is reflected in the green curve in Figure 5 and the vaccination uptake in 65 and over clinical risk groups in the light purple curve. In both groups, the vaccine uptake increases steadily until week 4/2010 and then remains at a rather constant level. Overall, the national vaccine uptake in patients aged under 65 years in clinical risk groups was 35.4% including pregnant women. In those aged 65 years an over in clinical risk groups, the national vaccine uptake was 40.4% (Sethi & Pebody 2010b).

In August 2010, the VENICE consortium conducted a web-based survey covering 27 European member states in addition to Norway and Iceland in order to estimate A/H1N1 vaccination coverage rates in different target groups and entire populations during the pandemic. For 22 countries, estimates on the vaccination coverage were provided.
Table 6 shows the survey results for England.

Table 6: A/H1N1 vaccination coverage in different target groups and the entire population in England

(Mereckiene et al., 2012)

Vaccination coverage (%)					
Country	Overall (n=22)**a**	≥ 6 months of age with chronic diseases and underlying conditions (n=9)	Pregnant women (n=12)**b**	Children (n=12)**c**	Healthcare workers (n=13)**d**
England	**NA**	**38**	**15**	**24**	**40**

a Some countries recommended pandemic vaccine for some population groups but calculated overall vaccination coverage.
b Pregnant women: all countries that provided vaccination coverage recommended vaccination to all pregnant women (with or without risk indication).
c Groups for which vaccination coverage were measured: France, Iceland, Italy, Norway and Slovenia (n=5), ≥6months–<18years of age; England, ≥6 months–<5 years of age; Finland, ≤15 years of age; Ireland, >6months–<15years or age; Luxembourg, at risk; Netherlands, ≥6 months–4years of age; Portugal, ≥6 months–12 years of age.
d Healthcare workers: Czech Republic, England, Malta, Netherlands, Portugal (n=5) recommended pandemic vaccine to only healthcare workers with close contact with patients; Estonia recommended for healthcare workers with close contact with patient and with no contact with patients, but contact with potentially contaminated material; Hungary, Malta, Romania, Spain, Sweden and Slovakia (n=6) recommended pandemic vaccine to all healthcare workers.

3.3 Spain

3.3.1 Epidemiology and progress of the A/H1N1 pandemic

The blue bars in Figure 6 illustrate the total number of A/H1N1 detections (sentinel and non-sentinel) during the A/H1N1 pandemic. In Spain, the first confirmed case was reported on 27 April 2009. By 11 May, the number of confirmed cases rose to 98 cases. Of these, 76 cases had a history of travel to Mexico (Surveillance Group for New Influenza A(H1N1) Virus Investigation and Control in Spain, 2009). In late May, the first outbreak without travel

history was observed at the Military Academy of Engineering in Hoyo de Manzanares indicating the start of community transmission of the pandemic A/H1N1 virus.

The numbers of confirmed pandemic A/H1N1 cases increased constantly. By the end of June, Spain has reported 717 confirmed cases (Ministerio de Sanidad y Politica Social, 2009b). On 1 July, Spain confirmed its first fatal case (European Centre for Disease Prevention and Control, 2010a), which raised the cumulative number of deaths in the EU to four (UK three cases, Spain one case) (European Centre for Disease Prevention and Control, 2009v). The reported number of deaths from A/H1N1 per week is reflected in the red curve in Figure 6.

In its Threat Assessment, published on 1 July, the ECDC announced the first isolation of an oseltamivir (also known as Tamiflu®) resistant mutant A/H1N1 virus in Denmark. The virus was not a reassortant virus and was still susceptible to zanamivir (also known as Relenza®). There was no evidence that the virus has been transmitted to other persons. ECDC stated that this phenomenon is well-known in influenza viruses and emphasized the need for continued surveillance of this problem (European Centre for Disease Prevention and Control, 2009u).

In July, numerous outbreaks occurred, especially in summer camps, and the numbers of infections began to increase until week 29/2009 (Sierra Moros et al., 2010). As observed in Germany and the UK, transmission decreased as the summer progressed. In early autumn transmission accelerated again and numbers of detections rose constantly.

According to an ECDC risk assessment published on 20 July, 20-30% of the population was expected to be affected over the first major wave of the pandemic. Clinical attack rates were expected to be highest in children and young adults. The estimate for hospitalization rates in Europe was 1-2% and the case fatality rate was estimated to be 0.1-0.2% of all clinical cases. ECDC stated that most cases experienced a mild and self-limiting illness, but people with chronic underlying medical conditions, pregnant women and young children were at higher

risk of experiencing severe disease and deaths (European Centre for Disease Prevention and Control, 2009w).

As of 4 August, Spain has reported 1538 confirmed cases to the ECDC. Spain has stopped laboratory testing of all suspected cases; therefore, the reported numbers severely underestimate the true figure in the two countries. So far, Spain has recorded 7 deaths from pandemic A/H1N1 infection (European Centre for Disease Prevention and Control, 2009aa). The virus continued to spread in the country, but at a low level over the summer (see Figure 6).

On 21 August, the ECDC published its planning assumptions for the first major wave of infection, which was expected to take place in the autumn and winter of 2009/2010. However, these planning assumptions did not differ from those published on 20 July (European Centre for Disease Prevention and Control, 2009ab).

In late September, the ECDC has reduced its planning assumption. This decision was based on experience from Southern Hemisphere countries. It became more apparent that most pandemic A/H1N1 cases experienced a mild disease; therefore hospitalization and case fatality rates were revised downwards (European Centre for Disease Prevention and Control, 2009ad).

In early autumn, the numbers of pandemic A/H1N1 infections in Spain have started to increase again, indicating the beginning of the expected autumn/winter wave (see Figure 6). In Spain the autumn wave peaked in week 46/2009 reaching the weekly incidence rate of nearly 372 cases/ 100.000 population (Larrauri Cámara et al., 2010). In mid-November, the number of reported deaths due to pandemic A/H1N1 in Spain reached 88 (European Centre for Disease Prevention and Control, 2009ah).

In its 7th risk assessment issued on 6 November, the ECDC has revised its planning assumptions. The following EU reasonable worst case planning assumptions for the first

year up to mid-May 2010 were published: clinical attack rate: up to 20% of population, hospitalization rate: up to 100 per 100.000 population and case fatality rate: up to 3 per 100.000 population (European Centre for Disease Prevention and Control, 2009ag).

The number of pandemic A/H1N1 infections decreased constantly in Spain. The end of the autumn wave was in early January 2010. Afterwards only sporadic cases have been reported (Larrauri Cámara et al., 2010). In mid-January, the number of reported deaths due to pandemic A/H1N1 in Spain reached 271 (European Centre for Disease Prevention and Control, 2010b).

In Spain, the incidence rate was highest in the under 15 years of age group. The severity of the pandemic regarding lethality and mortality was characterized as mild with an estimated overall mortality rate of 0.43 deaths per 1000 pandemic cases. The 45- 64 years age group showed the highest mortality rate, with 9.35 deaths per 1.000.000 population (Larrauri Cámara et al., 2010).

In February 2010, evidence showed decreasing or low pandemic A/H1N1 activity in many countries, but the WHO Emergency Committee agreed that it was too early to conclude that the pandemic A/H1N1 virus has run its course. Thus, the pandemic influenza alert phase was not changed (World Health Organization, 2010a). On 10 August 2010, the WHO Emergency Committee assessed the global situation again. This time the Committee concluded that the world was entering the post-pandemic period (World Health Organization, 2010c). Altogether, the total number of reported deaths due to pandemic A/H1N1 influenza across Spain was 348 (Ministerio de Sanidad, Politica Social e Igualdad, 2010a).

3.3.2 Surveillance

The Spanish influenza surveillance system (SISS) consists of sixteen Spanish regional sentinel networks and regional laboratories, including the National Center of Microbiology at the Instituto de Salud Carlos III (WHO National Influenza Centre). In the 2008/2009 season, the system comprised over 500 general practitioners and 173 pediatricians and

covered nearly 2.1% of the population of the 16 autonomous communities (ACs) in Spain. Each regional sentinel network entered data on influenza detections in a web-based application on a weekly basis and the National Centre of Epidemiology at the Instituto de Salud Carlos III in Madrid analyzed the data at central level. Pandemic A/H1N1 virus detections from non-sentinel sources (i.e. hospitals, cooperating laboratories) were also reported to the system (Larrauri et al., 2011). The data reported to the SISS were used to calculate weekly influenza incidence rates. For this calculation, the population in each sentinel network was used as the denominator (Larrauri Cámara et al., 2010). Since 1904, Influenza is a notifiable disease in Spain, but the specificity of this system is lower than the specificity of the SISS (Centro Nacional de Epidemiología. Instituto de Salud Carlos III, 2009). Therefore, only available data of the SISS have been used to show the progress of the 2009/2010 A/H1N1 pandemic in Spain.

Based on the situation in Mexico and the US, the Coordinating Centre for Health Alerts and Emergencies (CCAES) at the Spanish Ministry of Health and Social Policy issued a national epidemiologic alert on 24 April. National and regional public health authorities were asked to enhance surveillance and to report urgently any case of influenza-like illness and severe respiratory disease among people who traveled to Mexico or who had contact with a confirmed case of pandemic A/H1N1 infection (Surveillance Group for New Influenza A(H1N1) Virus Investigation and Control in Spain, 2009).

Following the declaration of a public health emergency of international concern (PHEIC), the Ministry of Health and Social Policy launched the National Plan for Preparedness and Response to an influenza pandemic, including the activation of the Surveillance Subcommittee, which held its first meeting on 27 April. This committee was responsible for defining and agreeing the strategy of surveillance, although all decisions had to be presented to the Public Health Commission for approval (Sierra Moros et al., 2010).

Spain`s initial case definition was amended and finally adopted on 7 May, 2009, to accommodate to the EU case definition. The modification included the following changes:

the temperature defining fever was increased from 37,5º C to 38º C and the incubation period was reduced from 10 to 7 days (Santa-Olalla Peralta, Cortes García, Martínez Sánchez, et al., 2010). To gather epidemiological data of pandemic A/H1N1 infections, a case-based surveillance was implemented which differed from the usual flu surveillance maintained by the Spanish Influenza Surveillance System (Sierra Moros et al., 2010)

On 26 June, Spain modified its surveillance strategy. The Public Health Commission approved a strategy based on 5 points, saying that:

- a case-based surveillance of severe cases should start,
- the influenza surveillance through the SISS should be maintained,
- monitoring of clusters of acute respiratory illness should be maintained, but a case-based notification was not required anymore and only the first cases had to be swabbed for laboratory confirmation,
- monitoring of influenza or acute respiratory disease from the primary care computerized database, as well as
- case-based monitoring of flu cases in the community should be maintained.

In addition, the identification and monitoring of contacts and administration of prophylaxis to contacts was ceased. (Santa-Olalla Peralta, Cortes García, Martínez Sánchez, et al., 2010).

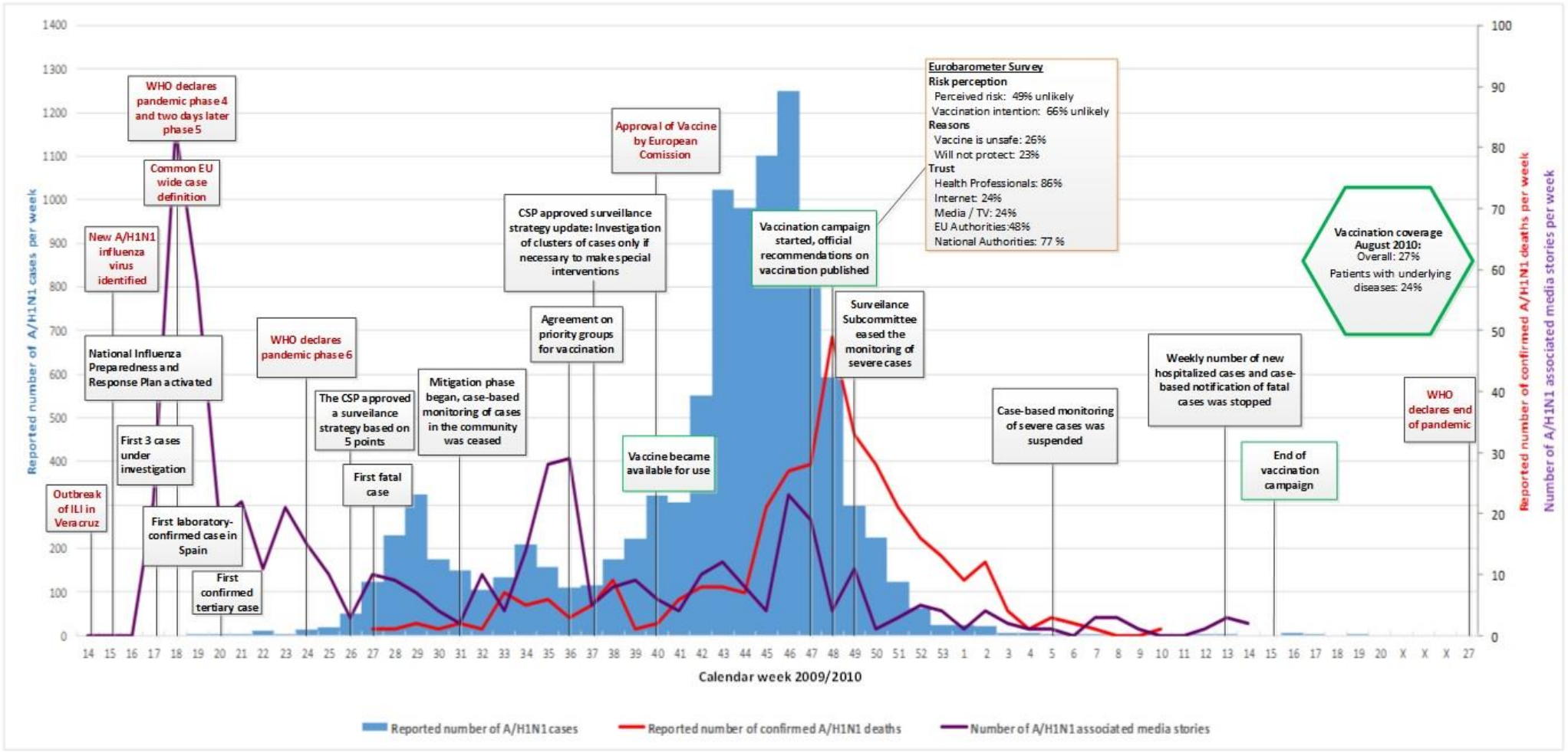
On 16 July, the WHO announced that countries with community-wide transmission are no longer required to forward regular reports of individual confirmed cases to the WHO, as the detection, laboratory-confirmation and investigation of all cases is extremely resource-intensive and not sustainable for these countries (World Health Organization, 2009k).

On 27 July, the Spanish Surveillance Subcommittee agreed on a surveillance strategy update that suppressed the case-based surveillance of cases in the community. One day later, this new strategy was approved by the Spanish Public Health Commission (Ministerio de Sanidad, Politica Social e Igualdad, 2010a; Sierra Moros et al., 2010).

On 9 September, the Spanish Public Health Commission revised the surveillance strategy once again. According to the new strategy, the investigation of clusters of cases was only recommended in those cases deemed necessary to make a special intervention (Ministerio de Sanidad, Politica Social e Igualdad, 2010a).

On 4 December, the Spanish Surveillance Subcommittee eased the reporting requirements for severe cases. Two month later, on 1st February, the case-based monitoring of severe cases was stopped in favor of weekly aggregated reports of severe pandemic A/H1N1 cases. On 1st April, this new reporting requirement was ceased as well. Additionally, the notification of pandemic influenza A/H1N1 related deaths was stopped (Ministerio de Sanidad, Politica Social e Igualdad, 2010a).

Figure 6: Epidemiology, key events and media attention during the A/H1N1 pandemic in Spain



Sources: Reported number of A/H1N1 cases per week: Centro Nacional de Epidemiología. Instituto de Salud Carlos III. (n.y.). Vigilancia de la gripe en Espana. Evolución de la gripe pandémica or AnH1N1. (Desde la semana 20/2009 hasta la semana 20/2010). http://www.isciii.es/ISCIII/es/contenidos/fd-servicios-cientifico-tecnicos/fd-vigilancias-alertas/fd enfermedades/Vigilancia_de_la_gripe_en_Espana_Evolucion_de_la_pandemia_por_AnH1N1_Temporada_2009-2010.pdf, personal communication National Centre for Epidemiology, Instituto de Salud Carlos III, Reported number of confirmed A/H1N1 deaths: personal communication Centro de Coordinación de Alertas y Emergencias Sanitarias (CCAES), Ministerio de Sanidad, Servicios Sociales e Igualdad, Vaccination coverage: Mereckiene et al. (2012): Influenza A(H1N1)pdm09 vaccination policies and coverage in Europe. *Euro Surveillance*, *17*(4). Number of A/H1N1 associated media stories: Media Tenor

3.3.3 Pandemic management strategy

Initially, Spain employed a containment strategy. Measures focused on limiting transmission of the virus or delaying the spread in order to gain time to apply effective response measures. This strategy included the following public health measures: those who met the clinical and epidemiological case definition were assessed through swabbing and laboratory testing; cases were treated with antivirals within 48 hours after onset of symptoms and requested to isolate at home or in hospital (depending on their clinical condition) for at least seven days. Contacts were additionally asked to self-isolate at home for ten days with restrictions on visits (Santa-Olalla Peralta, Cortes García, Martínez Sánchez, et al., 2010).

In order to avoid the introduction of the pandemic A/H1N1 virus through international air traffic, Spain started to meet all direct flights from Mexico at an early stage. Medical teams checked passengers and crew members on clinical symptoms and distributed information leaflets about pandemic influenza. In addition, contact details of passengers were collected to be able to inform them if it turned out that a person with confirmed pandemic A/H1N1 infection was aboard the same flight. Spain maintained this measure until 16 June. In Germany, the infection control measures at the airports were kept up until week 35/2009 (Dávila Cornejo et al., 2010). School closures were not recommended as a means of reducing the spread of the virus (Ministerio de Sanidad, Servicios Sociales e Igualdad, 2009).

On May 20, the Surveillance Subcommittee in Spain changed the case and contact management strategy. It was agreed that antivirals would be given only to cases with severe disease, those with risk factors and contacts with risk factors. Whereas the isolation of cases should be maintained, the isolation of contacts was not considered to be necessary anymore (Santa-Olalla Peralta, Cortes García, Martínez Sánchez, et al., 2010).

On 27 July, Spain moved from containment to mitigation, although response measures have already been changed towards a mitigation strategy in late June, i.e. contact tracing was ceased. Case-based reporting of cases in the community was stopped and antivirals were

only given to cases requiring hospitalization and to those at risk of complications (Ministerio de Sanidad, Politica Social e Igualdad, 2010b; Sierra Moros et al., 2010)

3.3.4 Vaccination strategy

As the new virus first emerged in April 2009, it was not possible to adjust the 2009/2010 seasonal influenza vaccine to this new influenza A/H1N1 strain (Robert Koch-Institute, 2009c). The production of a pandemic-specific vaccine takes four to six months and can only be started when the new strain has been isolated (Hine, 2010). At the time Spain started to develop their vaccination strategy, the severity and infectivity of the pandemic A/H1N1 virus was still uncertain. Thus, it was difficult to decide on the quantity of required vaccine (Hine, 2010; Marcic et al., 2010). On 13 May, the Public Health Commission in Spain adopted an estimate saying that vaccine for 40% of the population would be needed. On the basis that two doses of vaccine per person were needed to achieve a sufficient immune response, the Public Health Commission planned to procure 36.6 million doses of pandemic vaccine (Ministerio de Sanidad, Politica Social e Igualdad, 2010b).

As initial supplies of pandemic vaccine were limited, the WHO Strategic Advisory Group of Experts (SAGE) on Immunization recommended that the following groups should be prioritized for vaccination: health-care workers, pregnant women, individuals aged above six months with a chronic medical condition, healthy individuals aged between 15 years and up to 49 years, healthy children, healthy individuals aged between 50 years and up to 64 years and healthy individuals aged 65 years or above. The order of priority should be based on country-specific conditions (World Health Organization, 2009j).

In Spain, an agreement on priority groups for vaccination against pandemic A/H1N1 has been achieved on 31 August. The following population groups were considered to be priority groups for vaccination, but should not be prioritized in any order:

- health and social care workers,
- pregnant women,

- people working in essential public services (e.g. firefighters, policemen, workers at prisons, etc.), and
- individuals aged over six months in a clinical at-risk group.

Clinical at-risk groups were considered to be the same as in the UK (Ministerio de Sanidad y Politica Social, 2009l; Ministerio de Sanidad, Politica Social e Igualdad, 2010b).
On 29 September, the European Commission authorized the first two pandemic vaccines Focetria® (Novartis) and Pandemrix® (GlaxoSmithKline) for use in all Member States of the European Union and in Iceland, Liechtenstein and Norway (European Commission, 2009b).

On 6 October, the European Commission authorized a third pandemic vaccine, Celvapan®, for use in all EU Member States, Iceland, Lichtenstein and Norway (European Commission, 2009c).

On 16 November the Spanish vaccination program commenced (Ministerio de Sanidad y Politica Social, 2009l). Just in time for the start of the vaccination program the new pandemic vaccine Panenza® was authorized in Spain. It has been authorized by a decentralized procedure in which national agencies of Spain, France, Germany, Italy, Belgium and Luxembourg have participated. Panenza® is a vaccine without an adjuvant and was administered to pregnant women (Agencia Española de Medicamentos y Productos Sanitarios, 2009c). Pandemrix® was recommended to be administered to adults aged between 18 and 60 years only. The first choice for the other age groups was Focetria®. The Spanish Medicines and Healthcare Products Agency (Agencia Española de Medicamentos y Productos Sanitarios; AEMPS) recommended a one dose schedule for Pandemrix® and Focetria® for individuals aged over six months (Agencia Española de Medicamentos y Productos Sanitarios, 2009d).

3.3.5 Communication

In order to give a better overview, the information published during the pandemic is grouped around the themes: Communication related to personal protective measures, communication related to A/H1N1 treatment, communication related to pandemic management strategy, communication related to A/H1N1 vaccination and communication in the media.

Communication related to personal protective measures

On 24 April, the Spanish Ministry of Health and Social Policy published information on personal protective measures for the public and for travelers on its website. The information aimed to raise early awareness of the pandemic A/H1N1 virus among the public and informed on personal protective measures, i.e. regular hand washing, respiratory hygiene and avoidance of close contacts with sick people (Surveillance Group for New Influenza A(H1N1) Virus Investigation and Control in Spain, 2009).

In addition to the public information and advice on national level, the ECDC provided information on European level. On 27 April, the ECDC published the first general questions and answers on pandemic A/H1N1 virus (European Centre for Disease Prevention and Control, 2010a). In May, the ECDC published two documents on personal protective measures and information for travelers. The documents described personal protective measures to reduce the risk of acquiring influenza, i.e. regular hand washing, respiratory hygiene, avoidance of close contacts and mass gatherings (European Centre for Disease Prevention and Control, 2009k, 2009m, 2009n).

In mid-August, the pandemic A/H1N1 information campaign “Gripe A. La prevención es la major medida” started in Spain (Ministerio de Sanidad y Politica Social, 2009a). Therefore, the Ministry of Health and Social Policy has launched the information website “informaciongripea.es”. This website provided information about the disease and advice on personal protective measures for the general public. In addition, information and advice was made available to the public through posters, information leaflets, social networks and over the radio (Ministerio de Sanidad y Politica Social, 2009a, 2012). Besides the mainstream public information campaign, the Ministry of Health and Social Policy published tailored

information and guidance on preventive measures for families, schools and kindergartens (Ministerio de Sanidad y Politica Social, 2009e, 2009f, 2009g).

Communication related to A/H1N1 treatment

The use of antivirals in some groups involves particularities health professionals should know. Thus, on 8 May, the European Medicines Agency (EMA) published a guidance document on the use of the antiviral medicine Tamiflu in children under one year of age and the antivirals Tamiflu and Relenza in pregnant and breastfeeding women in the case of an influenza A/H1N1 pandemic. The EMA stated that in the event of a pandemic Tamiflu can be used to treat children under the age of one and both antivirals can be used to treat pregnant women, as the benefits of their use outweigh their risks (European Medicines Agency, 2009a).

In Spain, the following recommendations on the use of antivirals in children, pregnant women and women who are breastfeeding were published:

- zanamivir (Relenza®) or oseltamivir (Tamiflu®) can be used in pregnant women, but zanamivir was recommended as first choice for treatment and prophylaxis,
- the preferred antiviral medicine for breastfeeding women is oseltamivir,
- children under the age of one year should only be treated with oseltamivir,
- post exposure prophylaxis for children under the age of one should only be offered after a thorough benefit-risk assessment (Agencia Española de Medicamentos y Productos Sanitarios, 2009a)

Besides the guidance on the use of antivirals, the Spanish Ministry of Health published recommendations on the treatment of cases with severe acute respiratory failure, recommendations on the clinical management of adults with pneumonia and recommendations on the treatment of pregnant women. The three documents aimed to inform health professionals on diagnostic tests, general and severe symptoms, antiviral treatment or the treatment of complications, and personal protective measures (Ministerio de Sanidad y Politica Social, 2009d, 2009h, 2009i).

On 18 August, the ECDC published general guidance on the use of antivirals during influenza pandemics. The document aimed to inform those deciding on antiviral use strategies about the effectiveness of antivirals, side effects of antivirals, priority groups for antiviral use and about necessary arrangements for antiviral delivery and administration (European Centre for Disease Prevention and Control, 2009y).

In October, the Spanish Ministry of Health and Social Policy published two documents for health professionals. The first document aimed to inform health professionals on diagnostic procedures and the treatment of pandemic A/H1N1 infections. It contained recommendations regarding the criteria for hospitalization, the organization of care, the treatment with antivirals and personal protective measures (Ministerio de Sanidad y Politica Social, 2009j). The second document included recommendations on prevention and control measures in retirement homes. It informed on general hygiene measures, the management of cases and on available pandemic vaccines (Ministerio de Sanidad y Politica Social, 2009k).

Communication related to pandemic control measures

On 19 May, the ECDC published a guidance document on case and contact management. The recommended measures did not differ from the measures already applied in Germany, Spain and the UK (European Centre for Disease Prevention and Control, 2009o).

On 6 June, the ECDC published a guidance document on mitigation and containment strategies for national health authorities. ECDC stated that many public health measures are common in both strategies and the implementation of a mitigation strategy would mainly mean to move away from vigorous case finding and contact tracing. Further, the ECDC acknowledged that a containment strategy is very resource-intensive and therefore not a recommended infection control strategy for human influenza beyond pandemic alert phase 4 (European Centre for Disease Prevention and Control, 2009r).

On 26 June, the WHO published a guidance document on public health measures to help countries manage the A/H1N1 pandemic. Besides giving general advice on response measures, the WHO provided additional advice for countries with widespread community-

level transmission, for countries with no reported cases and for countries in transition. The WHO advised all countries to concentrate on mitigation measures, to prepare the health-care system for a high volume of patients and to ensure antiviral medicine and vaccine supply. In addition, countries with widespread community-level transmission were advised to cease laboratory-testing of all cases, to reduce the pressure on the health-care system, to primarily focus on the treatment of ill patients, and to consider school closures or the cancellation of mass gathering on a case-by-case basis. Countries with no reported cases were advised that they may consider entry screening at airports and contact tracing, but that these measures are resource intensive and of limited benefit to prevent the spread of the disease. Countries in transition were advised to start the same control measures as countries with widespread community-level transmission (World Health Organization, 2009a).

On 20 July, the ECDC gave scientific advice on reactive and proactive school closures in Europe. ECDC highlighted that there is no consensus on the benefits from proactive school closures (school closure before transmission between the children occurs), but countries and schools were advised to at least have plans for reactive school closures (school closure when many children and/or staff are experiencing illness). These plans should consider the following issues: recommended length of time of closure; the triggers for re-opening; how to sustain teaching and learning; and potential problems that may arise for parents, if they have to take time off work (European Centre for Disease Prevention and Control, 2009x).

In mid-September, the ECDC published a document on public health measures for policy and decision-makers (European Centre for Disease Prevention and Control, 2010a). It provided scientific information on measures that may be applied to reduce the impact of influenza pandemics (i.e. border closures, entry restrictions, personal protective measures, social distancing measures, use of antivirals and vaccines) and aimed to help EU countries to decide on appropriate response measures (European Centre for Disease Prevention and Control, 2009a).

On 23 September, the WHO Emergency Committee held its 5th meeting and agreed on continuing the following recommendations proposed by the WHO Director-General:

- borders should not be closed and travel and trade should not be restricted,
- countries should intensify surveillance of unusual events and
- people who are ill should postpone international travel (World Health Organization, 2009n).

On 26 November, the WHO Emergency Committee held its 6th meeting and agreed that delaying international travel was no longer recommended for ill persons, because pandemic A/H1N1 infections were already widespread (World Health Organization, 2009p).

Communication related to A/H1N1vaccination

Referring to media reports that have displayed concern about the safety of pandemic vaccine, the WHO has issued a note on pandemic vaccine safety on 6 August. In this statement the WHO outlined the procedures for approval and licensing of vaccines and confirmed that these procedures are strict and do include safety and quality controls. The WHO also stated that the data on influenza vaccine safety collected during the last 60 years do not show a special safety issue. Nonetheless, the WHO advised countries to closely monitor the safety and efficacy of the pandemic vaccine, as rare adverse events may only occur when large numbers of people got vaccinated (World Health Organization, 2009l).
On 13 August, the ECDC published a document on the use of influenza pandemic vaccines during the 2009 A/H1N1 pandemic. The document aimed to inform those deciding on vaccination policies in the European countries on vaccine use and options for prioritization in order to maximize the benefit of available vaccine (European Centre for Disease Prevention and Control, 2009z)

Together with the start of the vaccination program, the public information campaign was launched in Spain. Information and advice was accessible on government websites and made available to the general public through leaflets (Bundesministerium für Gesundheit et al., 2009e; Department of Health, 2009n; Ministerio de Sanidad y Politica Social, 2009l).

On 5 November, the Medicines and Healthcare products Regulatory Agency (MHRA) in the UK published its first adverse reaction analysis on pandemic vaccines. In this report, the MHRA stated that there have been no new safety issues identified and that the benefits for Celvapan® and Pandemrix® still outweigh their risks (Medicines and Healthcare products Regulatory Agency, 2009b).

On European level, information on vaccination was provided by the ECDC. In November the ECDC published questions and answers on vaccines for health professionals and for the general public on its website (European Centre for Disease Prevention and Control, 2009b, 2009c, 2010a).

On 19 November, the WHO issued a briefing note on pandemic vaccines in which the safety of the vaccines was reaffirmed (World Health Organization, 2009o). The European Medicines Agency (EMA) did hold the same opinion. In a press release published on 20 November, the EMA reasserted the efficacy and safety of pandemic vaccines. Further, the EMA revised its advice on vaccine schedules and published the following recommendations: Pandemrix® and Focetria® may be used as a single dose in adults (18-60 years) and in children and adolescents (Focetria®: from the age of 9 years; Pandemrix®: from the age of 10 years). Individuals aged over 60 years may also receive one dose of Pandemrix®, but younger children and immunocompromised people should receive two doses (European Medicines Agency, 2009c).

Between December 2009 and August 2010, the European Medicines Agency (EMA) published regular updates on safety monitoring of vaccines and medicines used during the pandemic (European Medicines Agency, 2010). In its update on pandemic medicines of 18 December, the EMA reaffirmed that the available data on the three pandemic vaccines and Tamiflu® showed no unexpected serious safety issues (European Medicines Agency, 2010).

On 21 December, the Spanish Medicines and Healthcare Products Agency (Agencia Española de Medicamentos y Productos Sanitarios; AEMPS) issued official

recommendations on the vaccination program. This document informed health professionals on the priority groups for vaccination, the specific pandemic vaccines and on aspects for vaccine administration (Agencia Española de Medicamentos y Productos Sanitarios, 2009d).

Communication in the media

The number of A/H1N1 related media stories published in the main news TV show (TVE Telediario), two important daily newspapers (El Pais, 20 minutos) and one of the main weekly newspapers (Tiempo, internet version) is illustrated in Figure 6 (purple curve). This curve is rather similar to the curve in Germany and in Czech Republic. However, it shows one major peak and two rather small ones over the time of the pandemic (week 14/2009 – week 14/2010). The first peak was also reached in week 18 (83 A/H1N1 associated media stories), when the WHO declared the pandemic phase 4 and shortly after, the pandemic phase 5. In this week, Spain also reported its first laboratory-confirmed A/H1N1 case. After this peak, the media attention decreased sharply, although not as sharply as in Germany and Czech Republic, to 19 A/H1N1 associated media stories in week 20. In this week, the first confirmed tertiary case was registered in Spain. In week 24, when the WHO declared the pandemic phase 6, 15 A/H1N1 associated media stories were published.

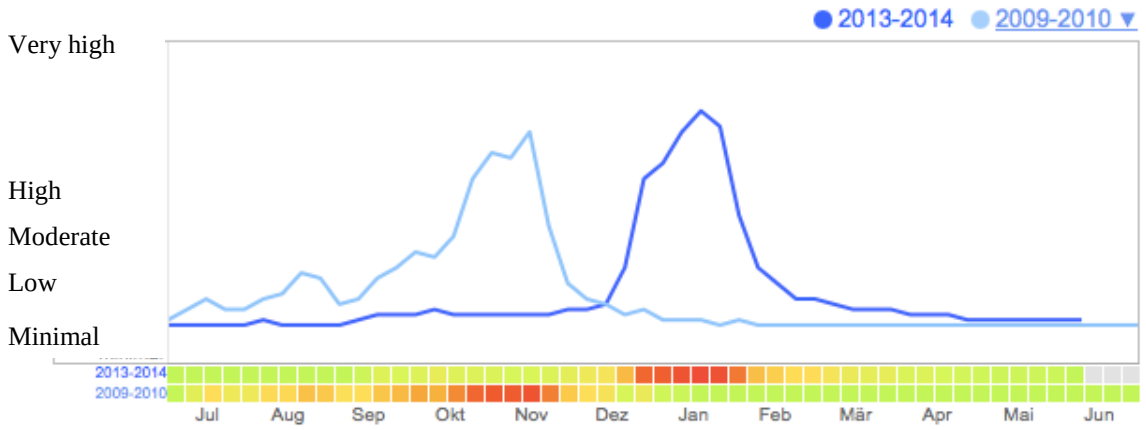
The media attention remained rather low until week 31. From week 25 to week 29, the number of A/H1N1 cases increased in Spain. The number of A/H1N1 related articles started to rise again and reached the first smaller peak in week 36 (29 A/H1N1 associated media stories). In the same week, the priority groups for vaccination have been agreed on. The second minor peak was reached in week 46 (23 A/H1N1 related media stories). This was the time, when the number of new A/H1N1 cases was highest during the pandemic. Thereafter, the media attention remained at a rather low level until week 14 in 2010.

Figure 7 shows the results from the Google Flu Trends analysis for Spain from July to June for the 2009/2010 A/H1N1 as well as for the 2013/2014 season. Compared to other European countries, Spain was affected early by the A/H1N1 pandemic. The first smaller A/H1N1 wave already started in mid-June. The number of influenza-associated web-searches also started to increase from minimal to low from mid-June on. Thereafter, the number of influenza-associated search queries started to rise again and reached a close to moderate

level in September. In Spain, the major A/H1N1 wave began in mid-September. In November, the frequency of influenza-associated web searches peaked and was in between high and very high. This was also the time, when the highest number of new A/H1N1 cases was registered (week 46, see Figure 6). Thereafter, number of influenza-associated web searches decreased and remained at minimal to low level from January 2010 on. The same holds true for the number of A/H1N1 cases.

Figure 7: Search activity in Google for influenza like illness (Spain)

Spain:Nationwide



3.3.6 Risk perception and human behavior

In Spain, a study with two waves of anonymous cross-sectional computer-assisted telephone interviews was conducted in order to assess the perception of A/H1N1 pandemic and potential preventive measures adopted by the general population. The first wave of the study took place during the pandemic peak (week 43-46/2009) and the second covered the pandemic declining phase (week 47/2009 – 4/2010). In the first survey, 79.5% of the respondents reported to have adopted at least one of the preventive measures recommended by the Spanish Ministry of Health (respiratory hygiene and/or hand washing more frequently). This proportion was significantly lower in the declining phase of the pandemic (74.6%). Several factors were associated with the adoption of preventive measures recommended by the Spanish Ministry of Health, especially a high concern to personally be infected with A/H1N1 as well as a high perception of the effectiveness of the preventive

measures and the usefulness of the information provided by the government (Agüero et al. 2011).

In late November 2009, the Gallup Organization conducted a survey called the Eurobarometer in the 27 EU Member States, as well as in Norway, Switzerland and Iceland to examine public opinion about influenza and pandemic A/H1N1. 49% (N=1003) of Spanish interviewees believed it was unlikely or rather unlikely that they would personally catch the A/H1N1influenza. Furthermore, 66% stated that is was not likely or not likely at all that they would get vaccinated against the pandemic A/H1N1 virus. Health professionals were the most trusted source to inform about pandemic A/H1N1. 86% mentioned that they trust health professionals mostly or completely (The Gallup Organization, 2010).

In August 2010, the VENICE consortium conducted a web-based survey covering 27 European member states in addition to Norway and Iceland in order to estimate A/H1N1 vaccination coverage rates in different target groups and entire populations during the pandemic. For 22 countries, estimates on the vaccination coverage were provided. Table 7 shows the survey results for Spain.

Table 7: A/H1N1 vaccination coverage in different target groups and the entire population in Spain

(Mereckiene et al., 2012)

	Vaccination coverage (%)				
Country	Overall (n=22)**a**	≥ 6 months of age with chronic diseases and underlying conditions (n=9)	Pregnant women (n=12)**b**	Children (n=12)**c**	Healthcare workers (n=13)**d**
Spain	**27**	**24**	**9**	**NA**	**12**

a Some countries recommended pandemic vaccine for some population groups but calculated overall vaccination coverage.

b Pregnant women: all countries that provided vaccination coverage recommended vaccination to all pregnant women (with or without risk indication).
c Groups for which vaccination coverage were measured: France, Iceland, Italy, Norway and Slovenia (n=5), ≥6months–<18years of age; England, ≥6 months–<5 years of age; Finland, ≤15 years of age; Ireland, >6months–<15years or age; Luxembourg, at risk; Netherlands, ≥6 months–4years of age; Portugal, ≥6 months–12 years of age.
d Healthcare workers: Czech Republic, England, Malta, Netherlands, Portugal (n=5) recommended pandemic vaccine to only healthcare workers with close contact with patients; Estonia recommended for healthcare workers with close contact with patient and with no contact with patients, but contact with potentially contaminated material; Hungary, Malta, Romania, Spain, Sweden and Slovakia (n=6) recommended pandemic vaccine to all healthcare workers.

3.4 Czech Republic

3.4.1 Epidemiology and progress of the A/H1N1 pandemic

The blue bars in Figure 8 represent the number of new A/H1N1 cases per week in Czech Republic. On 25 May, the Czech Republic reported its first laboratory-confirmed case of pandemic A/H1N1 (European Centre for Disease Prevention and Control, 2009q). In its risk assessment update on 20 May, the ECDC again reported a continuing lack of data on parameters needed for right risk assessment. The ECDC considered available data and stated that the pandemic A/H1N1 infections have been generally mild in Europe. Now there was more evidence that the virus was able to spread easily from one person to another and that it preferentially infected younger age groups. ECDC concluded that the spread of the pandemic A/H1N1 virus will continue (European Centre for Disease Prevention and Control, 2009p). Similar to the other countries, Czech Republic saw two waves of the influenza A /H1N1 pandemic in 2009. The first wave occurred in the summer, surrounding week 32/2009. In the second wave commencing in week 44/2009, the infection spread effectively. This autumn wave peaked around week 51/2009 lasted until week 4/2010 (see Figure 8). In Czech Republic, the number of pandemic A/H1N1 cases has increased sharply until the peak of the first wave in week 32/2009 (see Figure 8).

In its Threat Assessment, published on 1 July, the ECDC announced the first isolation of an oseltamivir (also known as Tamiflu®) resistant mutant A/H1N1 virus in Denmark. The virus was not a reassortant virus and was still susceptible to zanamivir (also known as Relenza®).

There was no evidence that the virus has been transmitted to other persons. ECDC stated that this phenomenon is well-known in influenza viruses and emphasized the need for continued surveillance of this problem (European Centre for Disease Prevention and Control, 2009u).

According to an ECDC risk assessment published on 20 July, 20-30% of the population was expected to be affected over the first major wave of the pandemic. Clinical attack rates were expected to be highest in children and young adults. The estimate for hospitalization rates in Europe was 1-2% and the case fatality rate was estimated to be 0.1-0.2% of all clinical cases. ECDC stated that most cases experienced a mild and self-limiting illness, but people with chronic underlying medical conditions, pregnant women and young children were at higher risk of experiencing severe disease and deaths (European Centre for Disease Prevention and Control, 2009w). Similar to other countries, the virus continued to spread in Czech Republic, but at a low level over the summer (see Figure 8).

On 21 August, the ECDC published its planning assumptions for the first major wave of infection, which was expected to take place in the autumn and winter of 2009/2010. However, these planning assumptions did not differ from those published on 20 July (European Centre for Disease Prevention and Control, 2009ab).

In late September, the ECDC has reduced its planning assumptions. This decision was based on experience from Southern Hemisphere countries. It became more apparent that most pandemic A/H1N1 cases experienced a mild disease; therefore hospitalization and case fatality rates were revised downwards (European Centre for Disease Prevention and Control, 2009ad).

In early autumn, the numbers of pandemic A/H1N1 infections have started to increase again, indicating the beginning of the expected autumn/winter wave. In the Czech Republic, the second wave peaked around week 51/2009. On 26 October, the Czech Republic reported the first fatal case due to pandemic A/H1N1(European Centre for Disease Prevention and

Control, 2009af). The reported number of confirmed deaths from A/H1N1 is shown as red curve in Figure 8.

In its 7th risk assessment issued on 6 November, the ECDC has revised its planning assumptions. The following EU reasonable worst case planning assumptions for the first year up to mid-May 2010 were published: clinical attack rate: up to 20% of population, hospitalization rate: up to 100 per 100.000 population and case fatality rate: up to 3 per 100.000 population (European Centre for Disease Prevention and Control, 2009ag).

The number of pandemic A/H1N1 infections decreased constantly in the Czech Republic. The end of the autumn wave was in end of January 2010. Afterwards only sporadic cases have been reported (see Figure 8). In mid-January 2010 the number of deaths had climbed up to 83 people in the Czech Republic (European Centre for Disease Prevention and Control, 2010c) and reached a total of 98 by the end of March 2010 (European Centre for Disease Prevention and Control, 2010e).

In February 2010, evidence showed decreasing or low pandemic A/H1N1 activity in many countries, but the WHO Emergency Committee agreed that it was too early to conclude that the pandemic A/H1N1 virus has run its course. Thus, the pandemic influenza alert phase was not changed (World Health Organization, 2010a). On 10 August 2010, the WHO Emergency Committee assessed the global situation again. This time the Committee concluded that the world was entering the post-pandemic period (World Health Organization, 2010c).

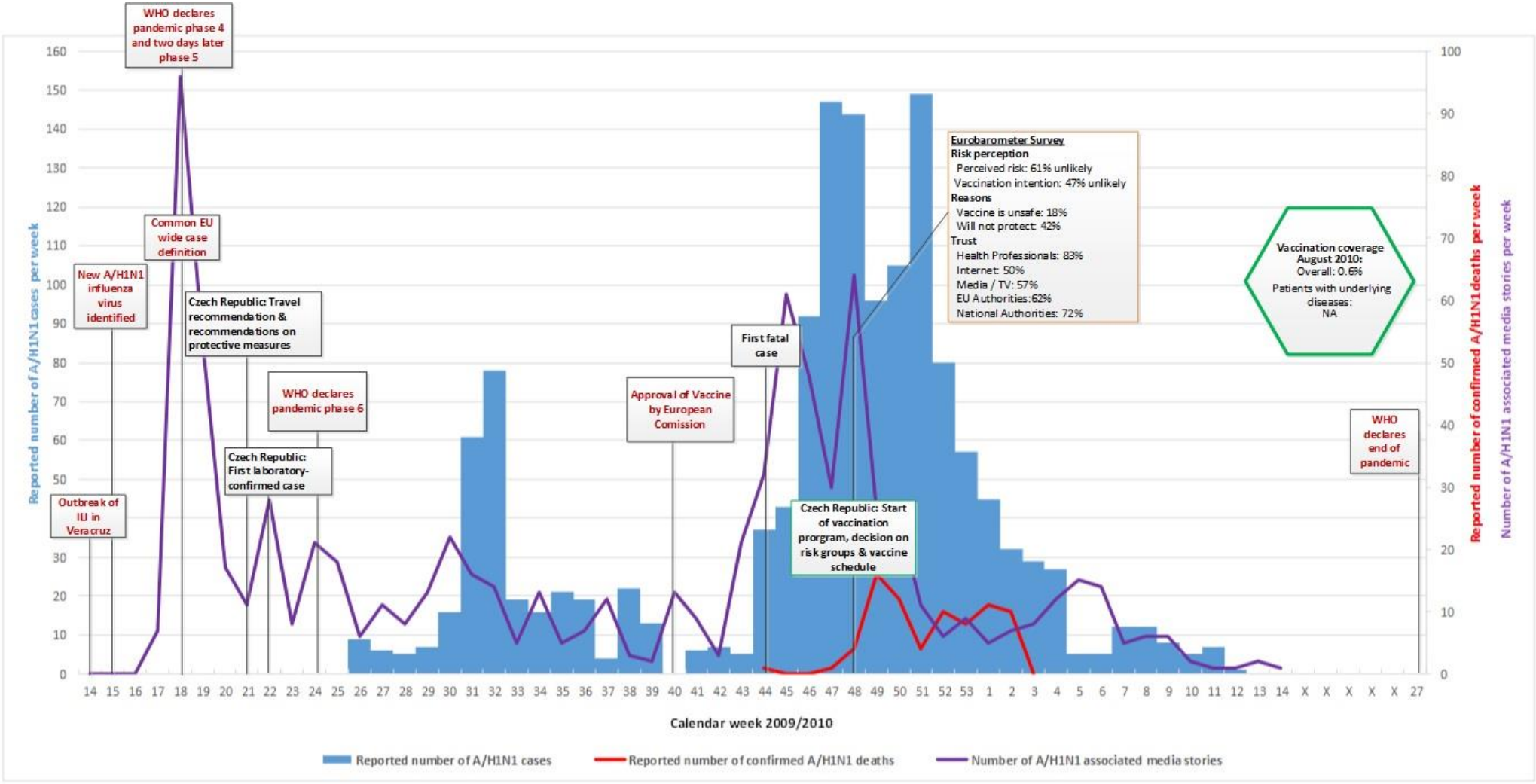
3.4.2 Surveillance

In the Czech Republic, the surveillance system to monitor influenza and other viral acute respiratory infections was active throughout the year and used the European Union case definition for influenza. Data were collected on a weekly basis and analyzed at national level. The information was provided to the European Centre for Disease Prevention and Control (ECDC) and the World Health Organization (WHO). Due to the occurrence of increased numbers of severe influenza cases during the pandemic in 2009, the Regional Public Health

Authorities started, on request of the Ministry of Health of the Czech Republic, to introduce a surveillance system for influenza-related hospitalizations. This system collected case-based information about hospitalized patients with influenza infections (Kyncl, Havlickova, Nagy, Jirincova, & Piskova, 2013).

On 16 July, the WHO announced that countries with community-wide transmission are no longer required to forward regular reports of individual confirmed cases to the WHO, as the detection, laboratory-confirmation and investigation of all cases is extremely resource-intensive and not sustainable for these countries (World Health Organization, 2009k).

Figure 8: Epidemiology, key events and media attention during the A/H1N1 pandemic in Czech Republic



Sources: Number of new A/H1N1 cases per week: Ministerstvo zdravotnictví ČR. (2010). Údaje k výskytu podezření na onemocnění Pandemic (H1N1). http://pandemie.mzcr.cz/Categories/134-udaje-k-vyskytu-podezreni-na-onemocneni-pandemic-h1n1.html. Reported number of confirmed A/H1N1 deaths: the number of confirmed A/H1N1 deaths was calculated based on the daily reports of ECDC. Vaccination coverage: Mereckiene et al. (2012): Influenza A(H1N1)pdm09 vaccination policies and coverage in Europe. *Euro Surveillance*, *17*(4). Number of A/H1N1 associated media stories: Media Tenor.

3.4.3 Pandemic management strategy

For containing the spread of the A/H1N1 virus, the Czech Ministry of Health asked persons experiencing any of the typical flu symptoms to isolate at home for at least seven days after the onset of symptoms, if no underlying chronic illness was present. Contact with other persons was supposed to be avoided. Immediate medical attention was recommended for persons from at-risk groups for a complicated disease course, who experience basic symptoms of suspected flu-like illness. Risk groups included pregnant women in the higher state of pregnancy, children under the age of 24 months, adults aged 65 and older, people with certain chronic medical conditions (e.g. affecting lung, heart or kidney, diabetes, and cancer) and people with severe obesity (Ministerstvo zdravotnictví ČR, 2009a, Ministerstvo zdravotnictví ČR, 2009e). Treatment with antivirals such as Tamiflu was recommended within 48 hours after the onset of symptoms (Ministerstvo zdravotnictví ČR, 2009f). About a potential preventive use of Tamiflu or Relenza the treating physicians was in charge of deciding according to the individual risk (Ministerstvo zdravotnictví ČR, 2009a).

For an uncomplicated disease course, it was recommended to stay in bed and control symptoms with over-the-counter medication. In case of more severe symptoms such as significant headaches, breathing difficulties and increased shortness of breath, it was recommended to contact a physician. Persons with underlying major diseases such as diabetes or cardiovascular diseases were asked to contact their doctor before travelling and to avoid close contact with sick people during their travels. In case of fever and flu-like symptoms after returning from travels, persons were ask to immediately contact the doctor who was supposed to follow national health recommendations accordingly (Ministerstvo zdravotnictví ČR, 2009a).

3.4.4 Vaccination strategy

As initial supplies of pandemic vaccine were limited, the WHO Strategic Advisory Group of Experts (SAGE) on Immunization recommended that the following groups should be prioritized for vaccination: health-care workers, pregnant women, individuals aged above

six months with a chronic medical condition, healthy individuals aged between 15 years and up to 49 years, healthy children, healthy individuals aged between 50 years and up to 64 years and healthy individuals aged 65 years or above. The order of priority should be based on country-specific conditions (World Health Organization, 2009j).

On 21 August, the Czech Republic decided to buy 1 million doses of Pandemrix from GlaxoSmithKline. First deliveries were expected in week 48/2009 (Ministerstvo zdravotnictví ČR, 2009c).

On 29 September, the European Commission authorized the first two pandemic vaccines Focetria® (Novartis) and Pandemrix® (GlaxoSmithKline) for use in all Member States of the European Union and in Iceland, Liechtenstein and Norway (European Commission, 2009b).

On 6 October, the European Commission authorized a third pandemic vaccine, Celvapan®, for use in all EU Member States, Iceland, Lichtenstein and Norway (European Commission, 2009c). The European Medicines Agency (EMA) recommended a two dose schedule for all three authorized vaccines (European Medicines Agency, 2009b).

On 23 November the Czech Republic started its vaccination program (O'Flanagan et al.., 2011). Three days later the decision on risk groups and vaccine schedules were published. The pandemic vaccine was recommended for the following groups:

- Individuals with chronic conditions (e.g chronic heart disease, chronic pulmonary disease, chronic kidney disease, immunocompromised person),
- Individuals performing essential public services and
- Healthcare workers.

For these groups listed above a single-dose vaccine schedule was recommended, except for immunocompromised individuals where the vaccine was administered in a two-dose schedule (Ministerstvo zdravotnictví ČR, 2009c, 2009j).

3.4.5 Communication

In order to give a better overview, the information published during the pandemic is grouped around the themes: communication related to personal protective measures, communication related to A/H1N1 treatment, communication related to pandemic control measures, communication related to A/H1N1 vaccination and communication in the media.

Communication related to personal protective measures

The ECDC provided information on European level. On 27 April, the ECDC published the first general questions and answers on pandemic A/H1N1 virus (European Centre for Disease Prevention and Control, 2010a). In May, the ECDC published two documents on personal protective measures and information for travelers. The documents described personal protective measures to reduce the risk of acquiring influenza, i.e. regular hand washing, respiratory hygiene, avoidance of close contacts and mass gatherings (European Centre for Disease Prevention and Control, 2009k, 2009m, 2009n).

On 21 May travel recommendations and recommendations on protective measures were published by the Czech Ministry of Health. This leaflet was based on information given by the ECDC. It informed about the symptoms of pandemic A/H1N1 infection and provided instructions on general hygiene measures to avoid pandemic A/H1N1 infection (Ministerstvo zdravotnictví ČR, 2009a).

On 27 August, the Ministry of Health published a document on personal protective measures based on ECDC material. This document aimed to answer frequently asked questions on pandemic A/H1N1. It informed about symptoms of pandemic influenza A/H1N1, ways of transmission, general hygiene measures, risk groups, and control measures (Ministerstvo zdravotnictví ČR, 2009d). About three weeks later, on 16 September, a poster on preventive measures was published (Ministerstvo zdravotnictví ČR, 2009e).

Communication related to A/H1N1 treatment

The use of antivirals in some groups involves particularities health professionals should know. Thus, on 8 May, the European Medicines Agency (EMA) published a guidance document on the use of the antiviral medicine Tamiflu in children under one year of age and the antivirals Tamiflu and Relenza in pregnant and breastfeeding women in the case of an influenza A/H1N1 pandemic. The EMA stated that in the event of a pandemic Tamiflu can be used to treat children under the age of one and both antivirals can be used to treat pregnant women, as the benefits of their use outweigh their risks (European Medicines Agency, 2009a).

On 31 July, the Ministry of Health published information on Relenza for health professionals. This information was based on advice from the European Medicines Agency and contained the following recommendations: Relenza in the current situation was indicated for the treatment of diseases of proven influenza virus A (H1N1) in adults, adolescents and children over 5 years of age. It was not intended for prophylactic use. Treatment should have been initiated as soon as possible after the outbreak of flu symptoms and within 48 hours of onset of symptoms in adults and within 36 hours of onset of symptoms in children (Ministerstvo zdravotnictví ČR, 2009b).

On 18 August, the ECDC published general guidance on the use of antivirals during influenza pandemics. The document aimed to inform those deciding on antiviral use strategies about the effectiveness of antivirals, side effects of antivirals, priority groups for antiviral use and about necessary arrangements for antiviral delivery and administration (European Centre for Disease Prevention and Control, 2009y).

On 23 September, a document providing information on antivirals for health professionals was published. This document contained information on the use and dosage of antivirals, contraindications and side effects. According to this document, the prophylactic use of antivirals was not recommended (Ministerstvo zdravotnictví ČR, 2009f).

On 16 November an information letter was sent to GP that informed about the start of the vaccination program and the Tamiflu distribution process. Tamiflu was not recommended for the prophylactic treatment, but as antiviral treatment for (hospitalized) patients with severe disease course (Ministerstvo zdravotnictví ČR, 2009g).

On 20 November the Ministry of Health published information on the amount of antivirals distributed to hospitals and recommended dosage of antivirals for children and adults (Ministerstvo zdravotnictví ČR, 2009h).

Communication related to pandemic control measures

On 19 May, the ECDC published a guidance document on case and contact management. The recommended measures did not differ from the measures already applied in Germany, Spain and the UK (European Centre for Disease Prevention and Control, 2009o).

On 6 June, the ECDC published a guidance document on mitigation and containment strategies for national health authorities. ECDC stated that many public health measures are common in both strategies and the implementation of a mitigation strategy would mainly mean to move away from vigorous case finding and contact tracing. Further, the ECDC acknowledged that a containment strategy is very resource-intensive and therefore not a recommended infection control strategy for human influenza beyond pandemic alert phase 4 (European Centre for Disease Prevention and Control, 2009r).

On 26 June, the WHO published a guidance document on public health measures to help countries manage the A/H1N1 pandemic. Besides giving general advice on response measures, the WHO provided additional advice for countries with widespread community-level transmission, for countries with no reported cases and for countries in transition. The WHO advised all countries to concentrate on mitigation measures, to prepare the health-care system for a high volume of patients and to ensure antiviral medicine and vaccine supply. In addition, countries with widespread community-level transmission were advised to cease laboratory-testing of all cases, to reduce the pressure on the health-care system, to primarily

focus on the treatment of ill patients, and to consider school closures or the cancellation of mass gathering on a case-by-case basis. Countries with no reported cases were advised that they may consider entry screening at airports and contact tracing, but that these measures are resource intensive and of limited benefit to prevent the spread of the disease. Countries in transition were advised to start the same control measures as countries with widespread community-level transmission (World Health Organization, 2009a).

On 20 July, the ECDC gave scientific advice on reactive and proactive school closures in Europe. ECDC highlighted that there is no consensus on the benefits from proactive school closures (school closure before transmission between the children occurs), but countries and schools were advised to at least have plans for reactive school closures (school closure when many children and/or staff are experiencing illness). These plans should consider the following issues: recommended length of time of closure; the triggers for re-opening; how to sustain teaching and learning; and potential problems that may arise for parents, if they have to take time off work (European Centre for Disease Prevention and Control, 2009x).

In mid-September, the ECDC published a document on public health measures for policy and decision-makers (European Centre for Disease Prevention and Control, 2010a). It provided scientific information on measures that may be applied to reduce the impact of influenza pandemics (i.e. border closures, entry restrictions, personal protective measures, social distancing measures, use of antivirals and vaccines) and aimed to help EU countries to decide on appropriate response measures (European Centre for Disease Prevention and Control, 2009a).

On 23 September, the WHO Emergency Committee held its 5th meeting and agreed on continuing the following recommendations proposed by the WHO Director-General:

- borders should not be closed and travel and trade should not be restricted,
- countries should intensify surveillance of unusual events and

- people who are ill should postpone international travel (World Health Organization, 2009n).

On 26 November, the WHO Emergency Committee held its 6th meeting and agreed that delaying international travel was no longer recommended for ill persons, because pandemic A/H1N1 infections were already widespread (World Health Organization, 2009p).

Communication related to A/H1N1 vaccination

Referring to media reports that have displayed concern about the safety of pandemic vaccine, the WHO has issued a note on pandemic vaccine safety on 6 August. In this statement the WHO outlined the procedures for approval and licensing of vaccines and confirmed that these procedures are strict and do include safety and quality controls. The WHO also stated that the data on influenza vaccine safety collected during the last 60 years do not show a special safety issue. Nonetheless, the WHO advised countries to closely monitor the safety and efficacy of the pandemic vaccine, as rare adverse events may only occur when large numbers of people got vaccinated (World Health Organization, 2009l).

On 13 August, the ECDC published a document on the use of influenza pandemic vaccines during the 2009 A/H1N1 pandemic. The document aimed to inform those deciding on vaccination policies in the European countries on vaccine use and options for prioritization in order to maximize the benefit of available vaccine (European Centre for Disease Prevention and Control, 2009z).

On European level, information on vaccination was provided by the ECDC. In November, the ECDC published questions and answers on vaccines for health professionals and for the general public on its website (European Centre for Disease Prevention and Control, 2009b, 2009c, 2010a).

On 19 November, the WHO issued a briefing note on pandemic vaccines in which the safety of the vaccines was reaffirmed (World Health Organization, 2009o). The European

Medicines Agency (EMA) did hold the same opinion. In a press release published on 20 November, the EMA reasserted the efficacy and safety of pandemic vaccines. Further, the EMA revised its advice on vaccine schedules and published the following recommendations: Pandemrix® and Focetria® may be used as a single dose in adults (18-60 years) and in children and adolescents (Focetria®: from the age of 9 years; Pandemrix®: from the age of 10 years). Individuals aged over 60 years may also receive one dose of Pandemrix®, but younger children and immunocompromised people should receive two doses (European Medicines Agency, 2009c).

On 20 November, information on the vaccination strategy, general conditions for the distribution and storage of vaccine, and the risk groups was published on the website of the Czech Ministry of Health (Ministerstvo zdravotnictví ČR, 2009i).

On 9 December, the Ministry of health published information on vaccination for the general public. This information was based on the ECDC material on vaccination (Ministerstvo zdravotnictví ČR, 2009k).

Between December 2009 and August 2010, the European Medicines Agency (EMA) published regular updates on safety monitoring of vaccines and medicines used during the pandemic (European Medicines Agency, 2010). In its update on pandemic medicines of 18 December, the EMA reaffirmed that the available data on the three pandemic vaccines and Tamiflu® showed no unexpected serious safety issues (European Medicines Agency, 2010).

Communication in the media

The number of A/H1N1 associated media stories published in the main news TV show (CTV Udalosti), two important daily newspapers (Lidove Noviny, Blesk) and one of the main weekly newspapers (Respekt) is shown in Figure 8 (purple curve). This curve is similar to the curve in Germany as it also has two major peaks over the time of the pandemic (week 14/2009 – week 14/2010). The first peak was also reached in week 18 (96 A/H1N1 associated media stories), when the WHO declared the pandemic phase 4 and shortly after,

the pandemic phase 5. Thereafter, the media attention declined sharply and rose again slightly, when the first laboratory-confirmed case of A/H1N1 in Czech Republic occurred in week 22 (28 A/H1N1 associated media stories). In week 24, when the WHO declared the pandemic phase 6, 21 A/H1N1 associated media stories were published. The media attention remained rather low between week 26 and week 39. This was the time of the first wave of A/H1N1 in Czech Republic. The number of A/H1N1 related media stories rose to 61 stories in week 45. The first confirmed A/H1N1 death had occurred in week 44.

After week 45, the media attention declined sharply, but reached the second peak in week 48 (64 A/H1N1 associated media stories). In this week, the Czech Republic decided on the vaccine schedule as well as priority groups and started the vaccination program. After this second peak, which was approximately halfway through the second A/H1N1 wave, the media attention remained at a rather low level until week 14 in 2010.

3.4.6 Risk perception and human behavior

In late November 2009, the Gallup Organization conducted a survey called the Eurobarometer in the 27 EU Member States, as well as in Norway, Switzerland and Iceland to examine public opinion about influenza and pandemic A/H1N1. 61% (N=1002) of Czech interviewees believed it was unlikely or rather unlikely that they would personally catch the A/H1N1influenza. Furthermore, 47% stated that is was not likely or not likely at all that they would get vaccinated against the pandemic A/H1N1 virus. Health professionals were the most trusted source to inform about pandemic A/H1N1. 83% mentioned that they trust health professionals mostly or completely (The Gallup Organization, 2010)

In August 2010, the VENICE consortium conducted a web-based survey covering 27 European member states in addition to Norway and Iceland in order to estimate A/H1N1 vaccination coverage rates in different target groups and entire populations during the pandemic. For 22 countries, estimates on the vaccination coverage were provided.

In Czech Republic, the vaccination program was implemented from the end of November 2009 until the end of May 2010. The country signed a contract to purchase one million

Pandemrix pandemic vaccines, of which approximately two thirds were planned to be used for chronically ill people and pregnant women and one third for health professionals and state authorities. Since these groups did not show much interest in the vaccination, it was offered to the general population on a free basis (Tomášková et al 2012). However, the uptake of pandemic vaccine was very low in Czech Republic with an overall vaccine coverage of only 0,6% and 7% among healthcare workers (see

Table **8**).

Table 8: A/H1N1 vaccination coverage in different target groups and the entire population in Czech Republic

(Mereckiene et al., 2012)

Vaccination coverage (%)					
Country	Overall (n=22)**a**	≥ 6 months of age with chronic diseases and underlying conditions (n=9)	Pregnant women (n=12)**b**	Children (n=12)**c**	Healthcare workers (n=13)**d**
Czech Republic	**0.6**	**NA**	**0**	**NA**	**7**

a Some countries recommended pandemic vaccine for some population groups but calculated overall vaccination coverage.

b Pregnant women: all countries that provided vaccination coverage recommended vaccination to all pregnant women (with or without risk indication).

c Groups for which vaccination coverage were measured: France, Iceland, Italy, Norway and Slovenia (n=5), ≥6months–<18years of age; England, ≥6 months–<5 years of age; Finland, ≤15 years of age; Ireland, >6months–<15years or age; Luxembourg, at risk; Netherlands, ≥6 months–4years of age; Portugal, ≥6 months–12 years of age.

d Healthcare workers: Czech Republic, England, Malta, Netherlands, Portugal (n=5) recommended pandemic vaccine to only healthcare workers with close contact with patients; Estonia recommended for healthcare workers with close contact with patient and with no contact with patients, but contact with potentially contaminated material; Hungary, Malta, Romania, Spain, Sweden and Slovakia (n=6) recommended pandemic vaccine to all healthcare workers.

The attitudes of students from two Czech universities to A/H1N1 as well as influenza vaccination were assessed in a survey. This study included 343 questionnaires filled out by randomly selected students from the medical faculties of University of Ostrava and of Masaryk University in Brno from November to December 2010. The participants rated the risk of personally getting infected with A/H1N1 as 3.8 on a scale ranging from 0 to 10. Women perceived a higher risk than men ($p<0.001$). 9% of the students considered some of the recommended preventive measures, which are beyond usual measures like hand washing. Most commonly, the applied measures included travel restrictions to areas with a high disease frequency, reduction of social contacts or avoiding public crowds. The interest in the vaccination against A/H1N1 among the students was rather low, since 5% of the respondents wanted to get vaccinated. 3% of the participants were vaccinated when the vaccine was available. As a reason for the low interest in the A/H1N1 vaccination the low perception of its importance was mentioned. This reason was stated by 56% of the students. Contradictory information about the vaccination in the media is considered as another reason by the authors for the generally low vaccination uptake rates in Czech Republic (Tomášková et al 2012).

3.5 Denmark

3.5.1 Epidemiology and progress of the A/H1N1 pandemic

The blue bars in Figure 9 show the number of A/H1N1 cases per week in Denmark. The first laboratory confirmed A/H1N1 case was reported on 1st May in Denmark. This person was infected in New York and came back to Denmark on 29 April (National Board of Health, 2009e).

In its risk assessment update on 20 May, the ECDC again reported a continuing lack of data on parameters needed for right risk assessment. The ECDC considered available data and stated that the pandemic A/H1N1 infections have been generally mild in Europe. Now there was more evidence that the virus was able to spread easily from one person to another and that it preferentially infected younger age groups. ECDC concluded that the spread of the

pandemic A/H1N1 virus will continue (European Centre for Disease Prevention and Control, 2009p).

On 11 June, the WHO raised the level of influenza pandemic alert to phase 6, declaring a pandemic (World Health Organization, 2009h). The severity of the pandemic was considered to be moderate by the WHO (World Health Organization, 2009i). As of 11 June, Denmark has reported 11 cases of A/H1N1, all of which have been relatively mild. By then, infection in Denmark was still limited to persons who had been abroad and in some cases their immediate contacts (National Board of Health, 2009g).

In its Threat Assessment, published on 1 July, the ECDC announced the first isolation of an oseltamivir (also known as Tamiflu®) resistant mutant A/H1N1 virus in Denmark. The virus was not a reassortant virus and was still susceptible to zanamivir (also known as Relenza®). There was no evidence that the virus has been transmitted to other persons. ECDC stated that this phenomenon is well-known in influenza viruses and emphasized the need for continued surveillance of this problem (European Centre for Disease Prevention and Control, 2009u).

According to an ECDC risk assessment published on 20 July, 20-30% of the population was expected to be affected over the first major wave of the pandemic. Clinical attack rates were expected to be highest in children and young adults. The estimate for hospitalization rates in Europe was 1-2% and the case fatality rate was estimated to be 0.1-0.2% of all clinical cases. ECDC stated that most cases experienced a mild and self-limiting illness, but people with chronic underlying medical conditions, pregnant women and young children were at higher risk of experiencing severe disease and deaths (European Centre for Disease Prevention and Control, 2009w).

Similar to the UK, Germany and Spain, Denmark saw two waves of the influenza A/H1N1 pandemic in 2009. The first wave in the summer, surrounding week 30 was mostly due to imported cases of pandemic influenza A/H1N1 and only limited community transmission occurred (Mølbak et al., 2011).

The virus continued to spread, but at a low level over the summer (see Figure 9). On 3 September, Denmark reported the first death from pandemic A/H1N1 infection of a Danish citizen in Norway (National Board of Health, 2009i). The reported number of confirmed A/H1N1 deaths is illustrated in Figure 9 (red curve).

On 21 August, the ECDC published its planning assumptions for the first major wave of infection, which was expected to take place in the autumn and winter of 2009/2010 (European Centre for Disease Prevention and Control, 2009ab).

In late September, the ECDC has reduced its planning assumption. This decision was based on experience from Southern Hemisphere countries. It became more apparent that most pandemic A/H1N1 cases experienced a mild disease; therefore hospitalization and case fatality rates were revised downwards (European Centre for Disease Prevention and Control, 2009ad).

In early autumn, the numbers of pandemic A/H1N1 infections have started to increase again, indicating the beginning of the expected autumn/winter wave. In the Denmark, the second wave peaked in week 46/2009 (see Figure 9).

In its 7th risk assessment issued on 6 November, the ECDC has revised its planning assumptions. The following EU reasonable worst case planning assumptions for the first year up to mid-May 2010 were published: clinical attack rate: up to 20% of population, hospitalization rate: up to 100 per 100.000 population and case fatality rate: up to 3 per 100.000 population (European Centre for Disease Prevention and Control, 2009ag). The number of pandemic A/H1N1 infections decreased constantly in Denmark. The end of the autumn wave was in early January 2010.

In February 2010, evidence showed decreasing or low pandemic A/H1N1 activity in many countries, but the WHO Emergency Committee agreed that it was too early to conclude that

the pandemic A/H1N1 virus has run its course. Thus, the pandemic influenza alert phase was not changed (World Health Organization, 2010a). On 10 August 2010, the WHO Emergency Committee assessed the global situation again. This time the Committee concluded that the world was entering the post-pandemic period (World Health Organization, 2010c).

Overall, only 5% of the Danish population was infected. According to estimates approx. 300,000 Danes have had a clinical infection with the new H1N1 influenza virus (Andersen, 2010a). The highest risk was observed in the age group 5–14 years. Of these, 15 % were infected, followed by children under the age of 5 (8%) and 15-64 year-olds (4%). Like in the other countries, elderly people were less affected due to the fact that most of them were already immunized (Mølbak et al.., 2011). In total, 53 patients with influenza A/H1N1 infection were admitted to intensive care units, 11 of whom did not suffer from a chronic condition. The total number of A/H1N1 related deaths reported by the Danish national health authority (SSI) was 30, which is in line with the total number of fatal cases in Denmark reported to the ECDC. However, there are slight differences in distribution of deaths per week between these two sources, which may be caused by a delay in reporting to the ECDC.

3.5.2 Surveillance

On 30 April, the European Commission agreed on a common case definition for the European Union in order to detect cases of influenza caused by the new virus. This case definition is presented in Table 4.

In Denmark, two surveillance schemes for influenza-like illness (ILI) were already established, both based on primary health care consultations. The sentinel surveillance system was established in 1994 as a voluntary reporting system of general practitioners (GPs). It provides weekly reports on the total number of consultations and age-specific numbers of ILI-consultations. Although reporting in this system usually stops during the summer (week 20-week 40), data were collected throughout the year in 2009. GPs were encouraged to report the number of patients who have visited the GP and to take samples from patients fulfilling the A/H1N1 disease definition (Andersen, 2009b).

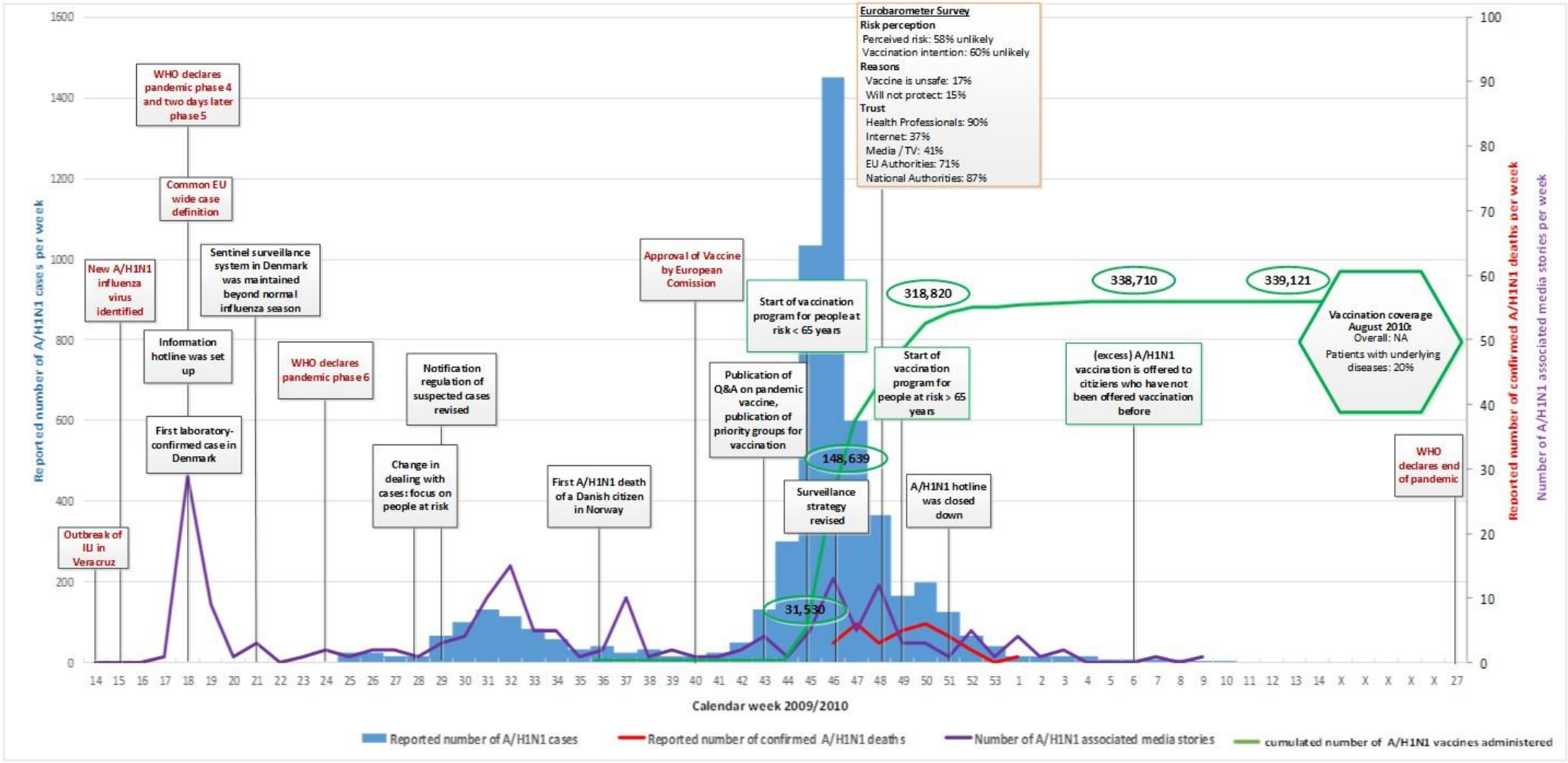
The other system was established in 2006 in collaboration with the Danish Medical on-call service (DMOS) and replaces the function of the general practitioners after opening hours. The physicians in service routinely report consultations due to influenza-like illness. Furthermore, influenza A became a laboratory reportable disease in 2009. Moreover, two new surveillance systems were set up in 2009. One was a surveillance system for influenza-related hospitalizations. This system collected data on hospitalizations from the national registry of all hospital contacts (Landspatientregisteret). The other surveillance system was an active reporting of influenza patients from all Intensive Care Units (ICUs) between week 46, 2009, and week 11, 2010 (Mølbak et al., 2011).

On 15 July, the Danish notification regulation of suspected cases was revised. The individual notification of suspected cases has been lifted and replaced by mandatory laboratory notification. The voluntary sentinel surveillance in primary health care which comprises submission of weekly reports and samples was in place throughout the year (Andersen, 2009c).

On 16 July, the WHO announced that countries with community-wide transmission are no longer required to forward regular reports of individual confirmed cases to the WHO, as the detection, laboratory-confirmation and investigation of all cases is extremely resource-intensive and not sustainable for these countries (World Health Organization, 2009k).

In view of increasing numbers of pandemic A/H1N1 infections, the Danish National Board of Health changed its surveillance strategy. From 11 November onwards, laboratory testing was only recommended on suspicion of serious influenza disease requiring hospitalization (Andersen, 2009e). Further, an active reporting system of influenza patients from all Intensive Care Units (ICUs) was set up between week 46, 2009, and week 11, 2010 (Mølbak et al.., 2011).

Figure 9: Epidemiology, key events and media attention during the A/H1N1 pandemic in Denmark



Sources: Number of new A/H1N1 cases per week: Based on figure 3 in: Harder et al. (2011): Electronic real time surveillance for influenza-like illness: experience from the 2009 influenza A(H1N1) pandemic in Denmark. *Euro Surveillance*, *16(3).* Reported number of confirmed A/H1N1 deaths: personal communication, Infectious Diseases Epidemiology Department, Statens Serum Institut. Number of A/H1N1 vaccines administered: personal communication, Infectious Diseases Epidemiology Department, Statens Serum Institut. Vaccination coverage: Mereckiene et al. (2012): Influenza A(H1N1)pdm09 vaccination policies and coverage in Europe. *Euro Surveillance*, *17*(4). Number of A/H1N1 associated media stories: results from search in LexisNexis (Politiken&Politiken weekly)

3.5.3 Pandemic management strategy

Initially, Denmark employed a containment strategy. Measures focused on limiting transmission of the virus or delaying the spread in order to gain time to apply effective response measures. This strategy included the following public health measures: those who met the clinical and epidemiological case definition were assessed through swabbing and laboratory testing; cases were treated with antivirals within 48 hours after onset of symptoms and requested to isolate at home or in hospital (depending on their clinical condition) until they were symptom-free; close contacts were traced and offered antiviral prophylaxis (Andersen, 2009a). Furthermore the Danish National Board of Health recommended avoiding unnecessary travel to Mexico. But on 18 May this advice was lifted, partly by the fact that the virus no longer primarily occurred in Mexico (National Board of Health, 2009f).

Acknowledging that the containment of the pandemic A/H1N1 virus was no longer possible, the Danish Board of Health has decided to change its strategy for dealing with influenza A (H1N1) from 7 July 2009. The new strategy focused on the treatment of those who are at risk and preventive treatment for people at risk. From 7 July onwards only risk group patients or patients with a close contact to a risk group patient needed to be swabbed, antiviral treatment was initiated in risk group persons only, prophylactic antiviral treatment was initiated in contacts to laboratory-confirmed cases provided the contact belonged to a risk group. People with one of the following conditions were defined as a risk group patient: chronic pulmonary conditions, cardiovascular disease, diabetes, immunodeficiency, HIV-Infection, pregnant women (2^{nd} and 3^{rd} Trimester). Furthermore, it was recommended to closely monitor pregnant women in their 1^{st} trimester, children < 5 years and severely obese patients (Andersen, 2009c; National Board of Health, 2009h).

3.5.4 Vaccination strategy

On 29 September, the European Commission authorized the first two pandemic vaccines Focetria® (Novartis) and Pandemrix® (GlaxoSmithKline) for use in all Member States of

the European Union and in Iceland, Liechtenstein and Norway (European Commission, 2009b).

On 6 October, the European Commission authorized a third pandemic vaccine, Celvapan®, for use in all EU Member States, Iceland, Lichtenstein and Norway (European Commission, 2009c). The European Medicines Agency (EMA) recommended a two dose schedule for all three authorized vaccines (European Medicines Agency, 2009b).

On 23 October, the Danish National Board of Health published the priority groups for vaccination. According to this document vaccination had to be offered to the following persons: individuals aged six months and above in a clinical at-risk group, pregnant women and household contacts to severe immunosuppressed patients. The vaccine used in Denmark was Pandemrix®. Unlike the European Medicines Agency, the Danish National Board of Health recommended a two dose schedule for all individuals in at-risk groups and for children aged between 6 months and nine years. For otherwise healthy individuals a one dose schedule was recommended (National Board of Health, 2009n).

From the beginning of November 2009 Denmark started its vaccination program. Due to limited supply of Pandemrix®, the Danish National Board of Health has therefore decided to vaccinate those at risk under 65 years first. This decision was based on experience from other countries showing that older people have a lower risk of catching pandemic A/H1N1 (National Board of Health, 2009l; O'Flanagan et al., 2011).

In December, Denmark extended its vaccination program. From the beginning of December on, Denmark started to offer the vaccine also to people at risk who are over 65 years old (National Board of Health, 2009l). On 2 December, the Danish National Board of Health adjusted its vaccination recommendations. From December on, only one dose of vaccine was recommended for patients at risk, unless they had a weakened immune system (Andersen, 2009f; National Board of Health, 2009p). By the end of week 48, Denmark has

distributed nearly 500,000 vaccine doses, primarily to cover risk group vaccination (Andersen, 2009f).

On 12 February, the Danish government decided to extend the vaccination program again. From mid-February on, the pandemic vaccine was also offered to people outside risk groups (National Board of Health, 2010).

3.5.5 Communication

In order to give a better overview, the information published during the pandemic is grouped around the themes: Communication related to personal protective measures, communication related to A/H1N1 treatment, communication related to pandemic control measures, communication related to A/H1N1 vaccination and communication in the media.

Communication related to personal protective measures

In April, the Danish National Board of Health published information leaflets on A/H1N1 for travelers. The leaflet informed on pandemic A/H1N1 symptoms, personal protective measures, travel recommendations and about what to do in case of symptoms (National Board of Health, 2009a).

In addition to the public information and advice on national level, the ECDC provided information on European level. On 27 April, the ECDC published the first general questions and answers on pandemic A/H1N1 virus (European Centre for Disease Prevention and Control, 2010a). In May, the ECDC published two documents on personal protective measures and information for travelers. The documents described personal protective measures to reduce the risk of acquiring influenza, i.e. regular hand washing, respiratory hygiene, avoidance of close contacts and mass gatherings (European Centre for Disease Prevention and Control, 2009k, 2009m, 2009n).

On 1st May, the Danish National Board of health set up an information hotline for citizens who have questions about Influenza A (H1N1) (National Board of Health, 2009e).

On 30 November, the Danish National Board of Health published information leaflets and posters on pandemic A/H1N1 in English and six widely used minority languages (Arabic, Urdu, Bosnian, Turkish, Somali, Persian). These leaflets aimed to inform about symptoms, treatment and personal protective measures like regular hand-washing and respiratory hygiene (National Board of Health, 2009c, 2009d, 2009o)

On 18 December, the Danish National Board of Health closed down its A/H1N1 information hotline. This decision was based on diminishing numbers of pandemic A/H1N1 infections. Citizens who had further questions on pandemic A/H1N1 were asked to look for information on the website of the National Board of Health or to contact their doctor (National Board of Health, 2009r).

Communication related to A/H1N1 treatment

The use of antivirals in some groups involves particularities health professionals should know. Thus, on 8 May, the European Medicines Agency (EMA) published a guidance document on the use of the antiviral medicine Tamiflu in children under one year of age and the antivirals Tamiflu and Relenza in pregnant and breastfeeding women in the case of an influenza A/H1N1 pandemic. The EMA stated that in the event of a pandemic Tamiflu can be used to treat children under the age of one and both antivirals can be used to treat pregnant women, as the benefits of their use outweigh their risks (European Medicines Agency, 2009a).

On 18 August, the ECDC published general guidance on the use of antivirals during influenza pandemics. The document aimed to inform those deciding on antiviral use strategies about the effectiveness of antivirals, side effects of antivirals, priority groups for antiviral use and about necessary arrangements for antiviral delivery and administration (European Centre for Disease Prevention and Control, 2009y).

On 1 October, the Danish National Board of Health published a guidance document for physicians and other health professionals. The document informed that efforts are still focused on the prevention and treatment of patients at risk. Furthermore, it informed health

professionals on general symptoms, risk groups, antiviral treatment of cases, prophylactic antiviral treatment of household contacts at risk and personal protective measures (National Board of Health, 2009j).

Communication related to pandemic control measures

On 19 May, the ECDC published a guidance document on case and contact management. The recommended measures did not differ from the measures already applied in Denmark (European Centre for Disease Prevention and Control, 2009o).

On 6 June, the ECDC published a guidance document on mitigation and containment strategies for national health authorities. ECDC stated that many public health measures are common in both strategies and the implementation of a mitigation strategy would mainly mean to move away from vigorous case finding and contact tracing. Further, the ECDC acknowledged that a containment strategy is very resource-intensive and therefore not a recommended infection control strategy for human influenza beyond pandemic alert phase 4 (European Centre for Disease Prevention and Control, 2009r).

On 26 June, the WHO published a guidance document on public health measures to help countries manage the A/H1N1 pandemic. Besides giving general advice on response measures, the WHO provided additional advice for countries with widespread community-level transmission, for countries with no reported cases and for countries in transition. The WHO advised all countries to concentrate on mitigation measures, to prepare the health-care system for a high volume of patients and to ensure antiviral medicine and vaccine supply. In addition, countries with widespread community-level transmission were advised to cease laboratory-testing of all cases, to reduce the pressure on the health-care system, to primarily focus on the treatment of ill patients, and to consider school closures or the cancellation of mass gathering on a case-by-case basis. Countries with no reported cases were advised that they may consider entry screening at airports and contact tracing, but that these measures are resource intensive and of limited benefit to prevent the spread of the disease. Countries in transition were advised to start the same control measures as countries with widespread community-level transmission (World Health Organization, 2009a).

On 20 July, the ECDC gave scientific advice on reactive and proactive school closures in Europe. ECDC highlighted that there is no consensus on the benefits from proactive school closures (school closure before transmission between the children occurs), but countries and schools were advised to at least have plans for reactive school closures (school closure when many children and/or staff are experiencing illness). These plans should consider the following issues: recommended length of time of closure; the triggers for re-opening; how to sustain teaching and learning; and potential problems that may arise for parents, if they have to take time off work (European Centre for Disease Prevention and Control, 2009x).

In mid-September, the ECDC published a document on public health measures for policy and decision-makers (European Centre for Disease Prevention and Control, 2010a). It provided scientific information on measures that may be applied to reduce the impact of influenza pandemics (i.e. border closures, entry restrictions, personal protective measures, social distancing measures, use of antivirals and vaccines) and aimed to help EU countries to decide on appropriate response measures (European Centre for Disease Prevention and Control, 2009a).

On 23 September, the WHO Emergency Committee held its 5th meeting and agreed on continuing the following recommendations proposed by the WHO Director-General:

- borders should not be closed and travel and trade should not be restricted,
- countries should intensify surveillance of unusual events and
- people who are ill should postpone international travel (World Health Organization, 2009n).

On 26 November, the WHO Emergency Committee held its 6th meeting and agreed that delaying international travel was no longer recommended for ill persons, because pandemic A/H1N1 infections were already widespread (World Health Organization, 2009p).

Communication related to A/H1N1 vaccination

Referring to media reports that have displayed concern about the safety of pandemic vaccine, the WHO has issued a note on pandemic vaccine safety on 6 August. In this statement the WHO outlined the procedures for approval and licensing of vaccines and confirmed that these procedures are strict and do include safety and quality controls. The WHO also stated that the data on influenza vaccine safety collected during the last 60 years do not show a special safety issue. Nonetheless, the WHO advised countries to closely monitor the safety and efficacy of the pandemic vaccine, as rare adverse events may only occur when large numbers of people got vaccinated (World Health Organization, 2009l).

On 13 August, the ECDC published a document on the use of influenza pandemic vaccines during the 2009 A/H1N1 pandemic. The document aimed to inform those deciding on vaccination policies in the European countries on vaccine use and options for prioritization in order to maximize the benefit of available vaccine (European Centre for Disease Prevention and Control, 2009z).

On 21 October, the Department of Epidemiology of the Danish National Board of Health published detailed information on Pandemrix® for health professionals. The document informed about who should not be vaccinated, what the pandemic vaccine contains, how long the vaccine does protect, what side effects the vaccine has, how long the vaccine was tested, the practical handling and storage of the vaccine (Andersen, 2009d).

On European level, information on vaccination was provided by the ECDC. In November, the ECDC published questions and answers on vaccines for health professionals and for the general public on its website (European Centre for Disease Prevention and Control, 2009b, 2009c, 2010a).

On 19 November, the WHO issued a briefing note on pandemic vaccines in which the safety of the vaccines was reaffirmed (World Health Organization, 2009o). The European Medicines Agency (EMA) did hold the same opinion. In a press release published on 20 November, the EMA reasserted the efficacy and safety of pandemic vaccines. Further, the

EMA revised its advice on vaccine schedules and published the following recommendations: Pandemrix® and Focetria® may be used as a single dose in adults (18-60 years) and in children and adolescents (Focetria®: from the age of 9 years; Pandemrix®: from the age of 10 years). Individuals aged over 60 years may also receive one dose of Pandemrix®, but younger children and immunocompromised people should receive two doses (European Medicines Agency, 2009c).

Between December 2009 and August 2010, the European Medicines Agency (EMA) published regular updates on safety monitoring of vaccines and medicines used during the pandemic (European Medicines Agency, 2010). In its update on pandemic medicines of 18 December, the EMA reaffirmed that the available data on the three pandemic vaccines and Tamiflu® showed no unexpected serious safety issues (European Medicines Agency, 2010).

Communication in the media

The search for articles mainly related to A/H1N1 in LexisNexis identified 302 articles published in Politiken and Politiken Weekly from 1 April 2009 to 31 March 2010. Of those, 229 have been classified as mainly related to A/H1N1. Since the articles may have been published twice (or more than twice) due to the particularities of the two newspapers, each article was considered only once in the following analysis. Overall, 176 different articles have been identified. The purple curve in Figure 9 shows the number of A/H1N1 associated media stories per week during the time of the pandemic. Compared to the A/H1N1 associated media stories published in the other countries included in this report, the curve shows a similar shape, but at a lower level. This is due to the inclusion of only two Danish newspapers in contrast to three newspapers and the main TV news show in Germany, Spain and Czech Republic. The curve in Figure 9 shows one major peak in week 18 and three minor peeks thereafter.

In week 18, the WHO declared pandemic phase 4 and two days later, pandemic phase 5. In the same week, the first laboratory-confirmed A/H1N1 case was reported in Denmark. After week 18, the number of A/H1N1 associated media stories declined sharply and remained at a very low level until week 28. Then, the number of media stories increased steadily and reached a minor peak in week 32 (15 A/H1N1 associated media stories). This is roughly the

time when the peak of the first small A/H1N1 wave occurred in Denmark from week 29 to week 36.

Ten A/H1N1 associated media stories were published in week 37, which was shortly after the first A/H1N1 death of a Danish citizen in Norway was reported. The media attention remained rather low until week 45, when the vaccination program for people at risk under 65 years of age started. The number of media stories showed a minor peak in 46 and 48 (13 and 12 A/H1N1 associated media stories, respectively). In week 46, the number of new A/H1N1 cases was also highest within the second A/H1N1 wave in Denmark.

After week 48, the number of A/H1N1 associated media stories declined and remained at a rather low level until week 9 in 2010.

3.5.6 Risk perception and human behavior

In late November 2009, the Gallup Organization conducted a survey called the Eurobarometer in the 27 EU Member States, as well as in Norway, Switzerland and Iceland to examine public opinion about influenza and pandemic A/H1N1. 58% (N=1008) of Danish interviewees believed it was unlikely or rather unlikely that they would personally catch the A/H1N1influenza. Furthermore, 60% stated that is was not likely or not likely at all that they would get vaccinated against the pandemic A/H1N1 virus. Health professionals were the most trusted source to inform about pandemic A/H1N1. 90% mentioned that they trust health professionals mostly or completely (The Gallup Organization, 2010).

The green curve in Figure 9 shows the number of A/H1N1 vaccines administered per week in Denmark. In week 45, when the vaccination program for people at risk started, 31,530 doses have been administered. In week 49, the vaccination program for people at risk > 65 years started. The number of vaccines administered increased sharply until week 50 (318.820 doses administered), but then remained at a rather steady level (number of vaccines administered: personal communication Infectious Disease Epidemiology Department, States Serum Institut).

By the end of the pandemic, 339,515 vaccinated persons were recorded. Of these, 286,568 had a chronic condition, 5,780 were pregnant and 4,073 were contacts to severely immunosuppressed patients. 42,859 healthcare professionals and persons belonging to a key personnel group were vaccinated. After the remaining pandemic vaccines had been offered to healthy persons in mid-February (week 6/2010), 235 vaccinations have been reported. Overall, approximately 30% of all vaccinees received two doses (Andersen, 2010a).

In August 2010, the VENICE consortium conducted a web-based survey covering 27 European member states in addition to Norway and Iceland in order to estimate A/H1N1 vaccination coverage rates in different target groups and entire populations during the pandemic. For 22 countries, estimates on the vaccination coverage were provided. Table 9 shows the vaccination coverage according to the survey results for Denmark.

Table 9: A/H1N1 vaccination coverage in different target groups and the entire population in Denmark

(Mereckiene et al, 2012)

Vaccination coverage (%)					
Country	Overall (n=22)**a**	≥ 6 months of age with chronic diseases and underlying conditions (n=9)	Pregnant women (n=12)**b**	Children (n=12)**c**	Healthcare workers (n=13)**d**
Denmark	**NA**	**20**	**NA**	**NA**	**NA**

a Some countries recommended pandemic vaccine for some population groups but calculated overall vaccination coverage.

b Pregnant women: all countries that provided vaccination coverage recommended vaccination to all pregnant women (with or without risk indication).

c Groups for which vaccination coverage were measured: France, Iceland, Italy, Norway and Slovenia (n=5), ≥6months–<18years of age; England, ≥6 months–<5 years of age; Finland, ≤15 years of age; Ireland, >6months–<15years or age; Luxembourg, at risk; Netherlands, ≥6 months–4years of age; Portugal, ≥6 months–12 years of age.

d Healthcare workers: Czech Republic, England, Malta, Netherlands, Portugal (n=5) recommended pandemic vaccine to only healthcare workers with close contact with patients; Estonia recommended for healthcare workers with close contact with patient and with no contact with patients, but contact with potentially contaminated material; Hungary, Malta, Romania, Spain, Sweden and Slovakia (n=6) recommended pandemic vaccine to all healthcare workers.

4 Discussion

This report presents the progress of the A/H1N1 pandemic in Germany, the UK, Spain, Czech Republic and Denmark. It explores the interaction of what actually happened (epidemic curves), how the countries responded (public health measures), what protective measures the people were recommended (official recommendations), how the media reacted (media attention) and how people perceived the risk and reacted (vaccination uptake) along the timeline of the pandemic.

The first confirmed case of pandemic A/H1N1 in the five countries was reported in late April (European Centre for Disease Prevention and Control, 2009f; Robert Koch-Institute, 2009h; Surveillance Group for New Influenza A(H1N1) Virus Investigation and Control in Spain, 2009). Initially, the five countries observed sporadic importations of the pandemic A/H1N1 virus from Mexico and the US. In the UK, sustained community transmission developed in June and the number of pandemic A/H1N1 cases increased sharply until the peak of the first wave in late June. In Spain and Germany, the number of confirmed cases began to increase in July (Buda et al., 2010; Health Protection Agency, 2010b; Sierra Moros et al., 2010). In Denmark and Czech Republic, the number of cases started to rise in late July. Transmission subsided in all five countries as the summer progressed. In early autumn, transmission accelerated again and the numbers of reported pandemic A/H1N1 cases increased constantly in, Germany, the UK, Spain, Czech Republic and Denmark. This autumn wave peaked between week 45/2009 and week 50/2009 and thereafter, influenza activity decreased steadily. The pandemic influenza wave ended in early to mid-January. Afterwards, only sporadic cases were reported (Buda et al., 2010; Department of Health, 2010a; Larrauri Cámara et al., 2010)

Throughout the pandemic, the highest infection rates were observed in children and young people. Generally, the virus caused a mild illness. More severe disease was especially experienced by cases with underlying conditions (Department of Health, 2010a; Larrauri Cámara et al., 2010; Schaberg & Burger, 2010).

4.1 Control strategy

The initial control strategy in Germany, the UK, Spain, Czech Republic and Denmark focused on limiting transmission of the virus or delaying the spread in order to gain time to apply effective response measures like large-scale vaccination. The measures applied during this containment approach included the laboratory testing of all suspected cases, the tracing of contacts, the provision of antivirals to cases and contacts and the isolation of cases. Further, information on the risk groups, severity and transmissibility of the virus was gathered through detailed analysis of the cases (Health Protection Agency, 2010b; Robert Koch-Institute, 2010a; Santa-Olalla Peralta, Cortes García, Martínez Sánchez, et al., 2010). As the first few pandemic A/H1N1 cases were imported by travelers from Mexico and the US these measures may have helped to slow the initial spread of the virus, but a conclusive proof of this assumption is not possible (Hine, 2010; Robert Koch-Institute, 2010a). The WHO had however already advised countries in late April to rather focus on mitigation measures as the containment of the outbreak was not considered to be feasible (World Health Organization, 2009d). In June, the ECDC too acknowledged that a containment strategy is very resource-intensive and therefore not a recommended infection control strategy for human influenza beyond pandemic alert phase 4, which was announced on 27 April 2009 (European Centre for Disease Prevention and Control, 2009r). Although not recommended by both the ECDC and the WHO, Germany, the UK, Spain and Denmark continued to employ a strategy of containment (the UK and Denmark until early July, Spain until late July and Germany until early August). Therefore, the resource-intensive measures remained in place for longer than may have been beneficial (Hine, 2010; Krause et al., 2010). Probably, this was only possible because of the relatively mild nature of the virus. In a more severe pandemic, public health professionals would probably have been overwhelmed earlier (Hine, 2010).

Although it became apparent at an early stage of the pandemic that the majority of people experienced a mild disease from the pandemic A/H1N1 virus, the lack of data on parameters needed for right risk assessment continued for a long time. Even in mid-June, there were still unresolved issues relating to the severity of the disease, the specific risk groups and whether

or not the virus would remain sensitive to available antivirals (European Centre for Disease Prevention and Control, 2009g, 2009s). In the absence of clarity about the nature of the virus, the likely impact on different groups, and its potential to mutate, the continuation of the containment measures seems reasonable (Robert Koch-Institute, 2010a). Additionally, the virus continued to spread in an uneven manner across, Germany, the UK, Spain, Czech Republic and Denmark with some areas being more affected, while others remained almost unaffected. A move away from the containment approach may have seemed premature in largely unaffected areas. However, as done in the UK for "hot spots" areas, a more tailored, localized strategy might have been more efficient in managing local circumstances in Germany, Spain, Czech Republic and Denmark (Hine, 2010; Krause et al., 2010; Marcic et al., 2010; Sierra Moros et al., 2010).

The move away from the containment approach also affected the reporting and surveillance system. While the surveillance during the containment approach aimed to gather information on the clinical, epidemiological and virological characteristics of the virus through laboratory testing and contact tracing, the surveillance during the mitigation phase rather focused on gathering information on the trend, intensity and impact of the virus. Germany, the UK, Spain and Denmark introduced surveillance systems to monitor severe cases and deaths due to pandemic A/H1N1 (Buda et al., 2010; Health Protection Agency, 2010b; Santa-Olalla Peralta, Cortes García, Martínez Sánchez, et al., 2010; Mølbak et al.., 2011).

However, in Germany the usefulness of these data were limited as the system was introduced too late and only a few sentinel hospitals joined the system (Krause et al., 2010). As the surveillance of severe cases is also relevant for other epidemic outbreaks, these surveillance systems should be improved or implemented as routine systems (Greco, Stern, & Marks, 2011; Krause et al., 2010).

During a pandemic, any changes in response measures should be communicated to the public in order to assuage public concern and maintain confidence in the decisions made by health authorities (Hine, 2010; Krause et al., 2010). The UK was the only country that produced

special leaflets for the public and health professionals to explain why the UK chose to move to a treatment only phase.

Nevertheless, the majority of German, British, Spanish, Czech and Danish citizens were generally satisfied with the way authorities in their countries responded to the pandemic flu as shown in the EU survey conducted in November 2009 to explore public opinion on different aspects of the 2009 A/H1N1 pandemic across Europe. Among others, interviewees were asked how satisfied they were with preventive measures that authorities had taken against the pandemic A/H1N1 virus. In Germany (n=1001) 53%, in the UK (n=1000) 60.8%, in Spain (n=1003) 62.7%, in Czech Republic (n=1002) 42.2% and in Denmark (n=1008) 62.9% stated they were satisfied with the measures taken by the authorities (The Gallup Organization, 2010).

4.2 Vaccination strategy

Another intervention measure that Germany, the UK, Spain, Czech Republic and Denmark employed to counter the impact of the pandemic was large-scale vaccination especially of selected risk and priority groups. Spain decided to procure vaccine for 40% of the population and the UK ordered vaccine for 100% of the population. Both countries decided to order enough vaccine to have two doses for each person (Hine, 2010; Ministerio de Sanidad, Politica Social e Igualdad, 2010b). Germany`s initial plan was to procure enough pandemic vaccine for 100% of the population, this was later revised to 50 million doses (Feufel et al., 2010; Marcic et al., 2010). The nature of the virus, its potential impact on different groups and the number of vaccine doses needed were still not clear when the initial decisions on vaccine procurement were made. Given the uncertainties regarding the virus at the beginning of the outbreak, it was not easy to make a decision about the amount of vaccine to procure. Although, by the end of the pandemic less vaccine than purchased had been distributed (O'Flanagan et al.., 2011), the initial vaccine procurement decisions seems reasonable considering the context in which it was made. The results in chapter 3 show that Germany, the UK, Spain, Czech Republic and Denmark responded to and changed vaccination policy and recommendations in response to available evidence on the characteristics of the virus

regarding the risk groups (Department of Health, 2009g; Ministerio de Sanidad y Politica Social, 2009l; Ministerstvo zdravotnictví ČR, 2009c, 2009j; National Board of Health, 2009n, 2009l; Robert Koch-Institute, 2009c, 2009f), available evidence on the immunogenicity of the pandemic vaccines (Agencia Española de Medicamentos y Productos Sanitarios, 2009d; Department of Health, 2009v; Robert Koch-Institute, 2009g) and in response to the pandemic progress (Department of Health. Joint Committee on Vaccination and Immunisation, 2010; Ministerio de Sanidad, Politica Social e Igualdad, 2010b). The changes were based on advice from national expert groups.

In order to ensure vaccine supply, Germany and the UK had advance-purchase agreements with vaccine manufacturers. As it became evident that less vaccine would be needed, the countries aimed to reduce the amount of vaccine. Vaccine manufacturers were willing to negotiate over ceasing the contract and suspending vaccine deliveries (Hine, 2010; Krause et al., 2010). However, in future, negotiations with vaccine manufacturers should attempt to include break clauses wherever possible, like it was done in the contract between the UK and Baxter Healthcare (Hine, 2010). These break clauses allow for further flexibility in vaccine procurement. This is important when new vaccines are more immunogenic than anticipated so that for most vaccines only a single dose is required, as it has been demonstrated now (Robert Koch-Institute, 2009g).

Due to problems in the manufacturing process of the pandemic vaccines initial supply was limited (Hine, 2010; Marcic et al., 2010). The prioritization of special groups allowed those at greatest risk the chance to be vaccinated first and made best use of limited supply (Department of Health, 2009g; Robert Koch-Institute, 2009c) .

Leaflets and communication on the government websites went alongside the vaccination programs. The general public was informed about the groups being vaccinated, the reasons behind this selection as well as potential side effects and safety of the pandemic vaccine in all five study countries (Bundesministerium für Gesundheit et al., 2009e; Department of Health, 2009n; Ministerio de Sanidad y Politica Social, 2009l; Ministerstvo zdravotnictví

ČR, 2009k; National Board of Health, 2009r). In addition, the UK and Germany issued tailored information for at-risk groups and health professionals (Bundesministerium für Gesundheit et al., 2009a, 2009b, 2009c, 2009d; Department of Health, 2009r, 2009s). Furthermore, information for healthcare professionals was published to inform them on the priority groups for vaccination, the specific pandemic vaccines and on aspects of vaccine administration (Agencia Española de Medicamentos y Productos Sanitarios, 2009d; Andersen, 2009d; Department of Health, 2009p, 2009t; Ministerstvo zdravotnictví ČR, 2009g, 2009i; Robert Koch-Institute & Paul-Ehrlich-Institute, 2009). In addition, to information on national level, the ECDC published questions and answers on vaccines for health professionals and for the general public on its website (European Centre for Disease Prevention and Control, 2009b, 2009c, 2010a).

4.3 Official communication

In order to inform the general public on the pandemic A/H1N1 virus and personal protective measures, Germany, the UK, and Spain developed extensive information materials at an early stage of the pandemic (see the results section 'communication' for each country). For Denmark and Czech Republic, however, the retrieved information is not sufficient for evaluating their communication strategy.

The campaigns in Germany, the UK and Spain provided a basic knowledge of hygiene and personal protective measures in order to prevent a pandemic A/H1N1 infection. In Germany, for the dissemination of information, various materials have been developed (flyers, posters, stickers) and campaigns were broadcasted on TV and radio. The tonality of the communication was calm and factual. The information was understandable, short and concise (Martin, 2010).

To meet the information needs of the population, information and advice was also accessible on government websites (Bundesministerium für Gesundheit, 2009; Hine, 2010; Ministerio de Sanidad y Politica Social, 2009a, Ministerstvo zdravotnictví ČR, 2009; National Board

of Health, 2009). These websites contained all the necessary information in a clearly structured and concise manner.

Disseminating basic information widely in the population was successful as becomes evident in the European survey that examined the public opinion about the pandemic. The majority of German (56.8%, n=1001), Spanish (56.1%, n= 1003), British (55.2%, n=1000), Danish (56,7%, n=1008) and Czech (48,4%, n=1002) citizens stated that they felt well informed about the pandemic A/H1N1 influenza (The Gallup Organization, 2010). Other surveys found similar results (Hine, 2010; Robert Koch-Institute, 2010b).

A clear public understanding of the pandemic and how it may develop, is one prerequisite for an effective response (Hine, 2010), however some of the terminology used during the pandemic was misunderstood by the public. For example, the term pandemic was often assumed to refer to the severity of the disease (Feufel et al., 2010; Hine, 2010; Krause et al., 2010). The communication did not clarify that the term pandemic also refers to the extent of geographic spread of the virus, rather than to the severity of the disease alone (Hine, 2010). The moderate character of the pandemic should have been better communicated to the public as people might have been confused with what they expected and what was actually observable on the ground (Hine, 2010; Krause et al., 2010).

In the absence of any other figures that described the possible development of the pandemic, the UK and the ECDC published planning assumptions of only the "reasonable worst-case". This term was often assumed to refer to likely events, which were eventually not observed in the countries (Hine, 2010). The UK published the following key planning assumptions for the first major pandemic wave: 18.69 million cases, 370,000 people hospitalized, 2.8 million people with complications and up to 65.000 deaths (Department of Health, 2009e). The ECDC estimate for hospitalization rates in Europe was 1-2% and the case fatality rate was estimated to be 0.1-0.2% of all clinical cases (European Centre for Disease Prevention and Control, 2009w). What the UK and ECDC were saying and what was observable in the countries was not consistent. Generally, the virus caused a mild illness and mortality levels

were low (Buda et al., 2010; Department of Health, 2010a, 2010d; Larrauri Cámara et al., 2010; Ministerio de Sanidad, Politica Social e Igualdad, 2010a; Schaberg & Burger, 2010). Although the UK and ECDC revised their planning assumptions downwards as more information on the characteristics of the virus became available, this gap could have risked weakening public trust in the response (Hine, 2010). Instead of publishing planning assumptions which were easily misunderstood, existing and missing evidence should have been communicated in a more transparent way (Feufel et al., 2010). Thus, a more accurate picture of what are facts and what are extrapolations of the pandemic would have been provided to the public.

In addition to the public information campaigns, tailored information for healthcare professionals on the treatment of cases and preventive measures had been published by national authorities. Regarding the vaccination program, appropriate information for healthcare professionals on the priority groups for vaccination, the specific pandemic vaccines and on aspects of vaccine administration had been published (Agencia Española de Medicamentos y Productos Sanitarios, 2009d; Department of Health, 2009p, 2009t; National board of Health, 2009m, 2009n, 2009l, 2009p; Ministerstvo zdravotnictví ČR, 2009g, 2009i; Robert Koch-Institute & Paul-Ehrlich-Institute, 2009). As already observed in the previous chapter, healthcare professionals as the primary contact, have an important role in informing the public and promoting the adoption of preventive measures. But the exchange of information between health authorities and healthcare professionals could have been improved (Hine, 2010; Krause et al., 2010; Schaade et al., 2010; Sierra Moros et al., 2010). According to a review of the response in the UK, some healthcare professionals stated that they did not receive timely information on the response measures from the authorities. Others stated that too much information and guidance was published (Hine, 2010). The issue that healthcare professionals did not receive timely information was also observed in Germany. Here, especially information materials on the vaccination program appeared too late (Krause et al., 2010; Schaade et al., 2010). Thus, to ensure timely and coordinated information for healthcare professionals a source of direct clinical advice, e.g. a hotline or secure internet site, would be helpful in a future outbreak (Hine, 2010).

4.4 Risk perception and human behavior

Although the public felt well informed about the pandemic A/H1N1 virus and about what they can do to protect themselves against it, the uptake of recommended behavior during the 2009 A/H1N1 pandemic was low. According to the European survey 75% of the interviewees in Germany (n=1001), 86.2% of the interviewees in Spain (n=1003), 73.9% of the interviewees in the UK (n=1000), 76.4% of the interviewees in Denmark (n=1008) and 76.1% of the interviewees in Czech Republic (n=1002) did not change their behavior to protect themselves against pandemic flu. Among those who changed their behavior, the most commonly adopted preventive measures were regular hand washing and good respiratory hygiene. Further, the majority of interviewees felt that seasonal flu and pandemic flu are equally dangerous and stated that it was rather unlikely that they will catch the pandemic flu (The Gallup Organization, 2010).

According to several surveys, factors independently associated with the adoption of the preventive measures are high perceived susceptibility to infection, high perceived effectiveness of the measures and high perceived usefulness of the information provided by the government (Agüero, Adell, Giménez, Medina, & Continente, 2011; Rubin, Amlot, Page, & Wessely, 2009; Rubin et al.., 2010). Thus, in any future campaign, more realistic information about the possibility of contracting the virus (based on observation) and revising this information as soon as more direct evidence becomes available, emphasizing the efficacy of recommended behaviors, reducing uncertainty and providing clear information on the practical things that people can do to reduce their risk should help to maximize compliance with recommended measures. Additionally, in times of rapid dissemination of opinion through the internet, this information channel should be better used to detect false information and disseminate reliable information (Krause et al., 2010).

Further, factors like gender, educational level, ethnicity, age, household size, health status, and socioeconomic status do also affect behavioral responses during major outbreaks (Agüero et al., 2011; Rubin et al., 2010). These factors should also be taken into account in

any future campaign. As the interaction of these factors is likely to be complex, the consultation of behavioral scientists would be of value.

Another important aspect of human behavior during a pandemic is the uptake of the available vaccine. Although a lot of information on the pandemic vaccine had been distributed, vaccination coverage rates were low. In Germany, overall vaccination coverage was 4,6% in week 47/2009, 6% in week 49 but had only increased up to 8% overall and 16% in healthcare workers by the end of the second wave (Robert Koch-Institute, 2010b). In Spain, the overall vaccination coverage rate was 27%. For those aged 6 months and above with chronic disease and underlying conditions the vaccination coverage rate was 24%, for pregnant women 9% and for healthcare workers 12% (Mereckiene et al., 2012). In England, the vaccination coverage rate for people under the age of 65 years with chronic disease and underlying conditions was 37.6%, including pregnant women. Further, 23.6% of children between the age of six months and five years, and 40.3% of healthcare workers received the pandemic vaccine in England. Vaccine uptake in Wales was similar and uptake in Northern Ireland and Scotland was higher than in England. 86.5% of people under the age of 65 years with chronic disease and underlying conditions received the pandemic vaccine in Northern Ireland, and up to 54.5% of this group received the vaccine in Scotland. Coverage rates among healthcare workers were 47.7% in Northern Ireland and 55.1% in Scotland (Health Protection Agency, 2010b). In Denmark, 20% of chronically diseased under 65 years of age got vaccinated. Czech Republic had the lowest vaccination uptake with an overall coverage of 0.6% and 7% among healthcare workers (Mereckiene et al., 2012).

However, the methods used for calculating vaccination coverage varied between countries limiting comparability of these data. The UK, Spain, Denmark and Czech Republic used administrative data and Germany used a survey as a reliable system to monitor vaccination rates is still missing in Germany (Health Protection Agency, 2010b; Krause et al., 2010; Mereckiene et al., 2012; Robert Koch-Institute, 2010b). Comparisons are also difficult due to the different starting dates of the vaccination programs. On 21 October, the UK started its vaccination program (Department of Health, 2009k). The German vaccination program

started five days later, on 26 October (Bundesministerium für Gesundheit, 2009), the Danish vaccination program began on 8 November (National Board of Health, 2009l), the Spanish vaccination program commenced only one week later, on 16 November (Ministerio de Sanidad y Politica Social, 2009l) and the Czech vaccination program started on 23 November (O'Flanagan et al.., 2011) . Further, a comparison is difficult due to the different vaccination strategies, i.e. the prioritization of specific groups (Department of Health, 2009g, 2009v; O'Flanagan et al.., 2011, Robert Koch-Institute, 2009c, 2009f).

Reasons for the low vaccination coverage rates were seen in the late arrival of the vaccines, the moderate character of the pandemic, vaccine safety concerns and skepticism regarding the need for vaccination among a large part of the healthcare workers (Greco et al., 2011; Marcic et al., 2010; Martin, 2010; Stern et al., 2010).

According to a survey conducted in Germany the perceived risk due to swine flu dropped after the beginning of the vaccination program from 18% (n=1000) of interviewees who perceived the risk as great or partially great in week 47/2009 to 10% in week 51/2009 (Walter et al.., 2012).

According to a European survey on the public opinion about the pandemic, conducted in November 2009, most of the German (69%, n=1001), Spanish (49%, n=1003), British (49%, n=1000), Danish (58%, n=1008) and Czech (61%, n=1002) citizens believed it was not likely at all or rather unlikely that they would personally contract a A/H1N1 infection. When asked about the intention to get vaccinated 62% of German, 66% of Spanish, 60% of Danish and 47% of Czech citizens stated it was not likely at all or not likely that they would get vaccinated, whereas in the UK only 37% of the respondents stated that they would not get vaccinated. The most stated reasons behind their choice were not being in one of the priority groups and safety concerns of pandemic vaccines (The Gallup Organization, 2010).
Although the EMA and WHO reaffirmed the safety of the pandemic vaccines (European Medicines Agency, 2009c; World Health Organization, 2009o), and national authorities stated that vaccines were safe in their information leaflets (Bundesministerium für

Gesundheit et al., 2009e; Department of Health, 2009n; National Board of Health, 2009b,2009l; Ministerio de Sanidad y Politica Social, 2009l, Ministerstvo zdravotnictví ČR, 2009k), this message was obviously not effectively communicated to the public.

In a future pandemic, authorities may consider giving safety data more prominence. A more clearly risk-focused approach to communication may have helped uptake rates. In order to make informed decisions regarding vaccination, the risks associated with pandemic A/H1N1 infection versus the risk of vaccination need to be more clearly explained. Further, the use of social networking may also help to identify public concerns on vaccination and to adjust information material accordingly (Hine, 2010). So far, Germany, the UK, Czech Republic and Denmark made limited use of social networking.

The interviewees in the aforementioned European survey were asked about the most trusted source from which they received information on the pandemic flu. 79.8% (n=1001) of German, 86.2% (n=1003) of Spanish, 91% (n=1000) of British, 90% of Danish and 82.8% of Czech interviewees said they mostly or completely trust health professionals as source of information. The participants were also asked about the source from which they received information on the pandemic vaccine. 33.3% (n=1001) of German, 24.5% (n=1003) of Spanish, 37.3% (n=1000) of British, 22% of Danish (n=1008) and 18.4% (n=1002) of Czech citizens said they were informed by physicians. Only 9.6% of German, 13.8% of Spanish, 19.2% of Danish and 7.6% of Czech citizens stated that they informed themselves on vaccination through official leaflets. This number was a lot higher in the UK. The majority (64.6%) of British citizens said that they received information from official leaflets (The Gallup Organization, 2010). Another survey conducted by the Robert Koch-Institute found similar results for Germany (Robert Koch-Institute, 2010b). These results show that healthcare professionals need particular attention as they are a key factor informing the public and winning the trust of the population (Greco et al., 2011). According to the survey conducted by the Robert Koch-Institute, the majority of physicians advised people against getting vaccinated (Robert Koch-Institute, 2010b). This result shows how essential it is that healthcare professionals have the right information in order to make informed decisions and

to pass on the right information to patients. Thus, knowledge and understanding of the medical profession regarding the goals, benefits and risks of vaccination should be encouraged in the future (Krause et al., 2010). Therefore, in a future outbreak, professional bodies should be more involved in informing healthcare professionals and the public and in promoting vaccine uptake (Schaade et al., 2010).

As seen in Figure 3, Figure 5 and Figure 9 for Germany, UK, and Denmark, the main vaccine uptake took place in a window of 4 – 6 weeks after start of vaccination. This period could be considered as the window of opportunity during which the public is alert and receptive for information. Precise and well formulated information broadcasted through multiple media channels as well as pro-active correction of misinformation and rumors during this period is one approach to increase public compliance. In addition, the trust of the public in health care professionals particularly family physicians merits that this group of professionals is comprehensively informed ahead of time and that their concerns are taken serious.

4.5 Communication in the media

In all countries included in this analysis, the media attention defined as the number of A/H1N1 associated media stories was highest in week 18, when the WHO declared pandemic phase 4 and 5 and showed only minor peaks thereafter. These smaller peaks in media attention were mostly seen around the time when the first confirmed A/H1N1 death was reported in the respective country. Another aspect, which seems to be related to media attention, is the introduction of the vaccines and the discussion about priority groups.

The combined analysis of the elements described and discussed above, primarily shows that media attention was not really related to the epidemiology of A/H1N1 in the respective country during the course of the pandemic – rather, the attention was highest, considerably before the pandemic started to spread in the respective study countries themselves. Rather when the number of cases in the study countries peaked, the number of A/H1N1 associated

media stories was rather low. The same is true for the number of confirmed A/H1N1 deaths, except for the first one, which seems to be related to a peak in the media attention.

The discrepant time-lag between media attention and the disease's epidemiology poses a challenge for the countries: Firstly, it is very unlikely, that sufficient information about the virus, its potential spread and the disease's severity is known as early as week 18 in 2009. Therefore, only likely projections can be made, which may be based more on fear than on facts.
Secondly, using the initial media attention peak in week 18 to inform the population about the virus, the potential spread in the country as well as recommended preventive and curative measures is rather difficult with missing facts. This first media attention peak can however be used to inform the public about where they can find accurate information at a later stage when more facts about the disease will become known. Since at the time, when more reliable information about the virus was available and the health authorities started to publish information about prevention and treatment of A/H1N1, the media attention was already rather low.

The media such as TV and newspapers were an important source of information, e.g. on the A/H1N1 vaccine, as stated by the participants of the Eurobaromenter survey. When asked from whom or where they received information about the A/H1N1 vaccine, 70 % of the Danish (n=1008) and 63 % of the German participants (n=1001), 63 % of the participants from the UK (n=1000), 62 % of the Spanish (n=1003) and 56 % of the Czech participants (n=1002) named a TV show as source of information. 60 % of the respondents from the UK, 59 % of the German respondents, 58 % of the Spanish (n=1003), 53 % of the Danish (n=1008) and 26 % of the Czech participants (n=1002) said that they received information from a magazine or newspaper (The Gallup Organization 2010). However, the trust in the media was considerably lower than the trust in other sources of information such as health professionals. In the Eurobarometer survey, the participants have been asked how much they trust different sources to inform them about A/H1N1. In this study, 57 % of the Czech participants (n=1002) completely or mostly trusted the media, 41 % of the Danish

participants (n=1008), 36 % of Spanish participants (n=1003), 34 % of the participants from the UK (n=1000) and only 31 % of the German participants (n=1001) (The Gallup Organization 2010). The participants were also asked whether the media paid too much, enough or not enough attention to the pandemic (H1N1) flu. 52 % of the Spanish respondents stated that the media paid too much attention to A/H1N, 46 % of the German and 46 % from the UK, 41 % of the Danish and 29 % of the Czech participants shared the same opinion. In most countries, however, a significant proportion of the participants stated that the media paid enough attention to A/H1N1 (Spain: 36 %, Germany: 44 %, UK: 35 %, Denmark: 51 %, Czech Republic: 55 %). (The Gallup Organization 2010).

Another important source of information may be the internet. In a German survey on risk perception and information-seeking behaviour, overall (n=4003), 27.6% of the participants used the internet as source of information on A/H1N1 (Walter et al, 2012). However, there were differences in the various age groups, and only 10.2% of persons 60 years or older used the internet to receive information (Walter et al, 2012).

In this analysis, influenza-related web search queries from Google Flu Trends were included for Germany and Spain. In contrast to the early peak in the number of the A/H1N1 associated media stories, the peak in the number of search queries for influenza-like disease from Google Flu Trends was significantly later in the course of the pandemic. The trend in the number of influenza-like web queries reflected the actual epidemic curve quite well, and seems to be a better indicator for the progression of the A/H1N1 epidemic compared to the media attention curve. This may indicate that persons start to search for health related information on the internet rather at a time, when cases of the infection already had occurred in the country, in their personal environment or they have been infected themselves.

This health-seeking behavior may offer an opportunity for national and international health authorities to provide up-to-date information as well as to publish recommendations for prevention and treatment directly to their population, while they have a high interest in receiving information.

Further, the data derived from Google Flu Trends may offer new opportunities in terms of surveillance. As Ginsberg et al (2008) pointed out; there is a high correlation between the relative frequency of certain queries and the percentage of physician visits because of influenza-like symptoms in particular areas. On this basis, the frequency of influenza-like disease was accurately estimated in various US regions previously. Since there is a reporting lag of only one day and the search queries can be analyzed quickly, they may be a valuable source for an up-to-date disease activity trend (Ginsberg et al. 2008). This was also shown in this report since the epidemic curves for Germany and Spain were well reflected in the curves from Google Flu Trends.

Another data source for influenza surveillance and especially early stage detection of epidemics may be the micro-blogging service Twitter. Its community has approximately 255 million active users per months with 500 million tweeds per day (https://about.twitter.com/company (assessed 21.07.2014)). Aramaki et al. (2011) conducted a study using positive influenza tweeds to assess their correlation to the gold standard for influenza detection (here: Infectious Disease Surveillance Center (IDSC), Japan). In this study, the highest performance was 0.890 correlation, which was even higher than the Google search queries used by Ginsberg et al. 2008.

However, Twitter's tweeds are very sensitive to excess news periods, which describe a large amount of media attention before the epidemic peak (which was also observed in this study, see above). Nonetheless, Twitter provides a valuable source for surveillance outside the excess news periods and may be useful for early stage detection of influenza epidemics. Furthermore, it may be an important method for official risk communication before or during a pandemic – at least for younger persons using the internet as source of information and being involved in online services such as Google and Twitter, but also further social networks.

4.6 Conclusion

Although, several improvements have been identified regarding the vaccination and information campaigns more work is needed to see how recommendations can be effectively translated into higher vaccination coverage and behavior change. This should also take into account the influence of varying media messages (mainstream media, internet, new social media) during the pandemic and more data on public perceptions and changing behavioral patterns during the different time periods of the pandemic.

4.7 Limitations

4.7.1 Data on pandemic A/H1N1 cases and deaths

The data on confirmed pandemic A/H1N1 cases in the UK, Germany, Spain, Denmark and Czech Republic are not comparable between the countries as there is variability in the data sources, size and representativeness of the surveillance systems (Buda et al., 2010; Health Protection Agency, 2012; Hine, 2010; Kyncl, Havlickova, Nagy, Jirincova, & Piskova, 2013, Larrauri et al., 2011, Mølbak et al.., 2011). However, it is not the aim of the project and this report to compare absolute numbers of cases or the disease's burden between the countries, but rather to show as well as to reflect on similarities and differences concerning the trends of the A/H1N1 epidemiology.

In addition, the shape of the epidemic curves is influenced by changes in the testing and control policies throughout the pandemic. The steep decline in confirmed pandemic A/H1N1 cases, as it was the case in the UK after week 27/2009, can be partly explained by changing testing policies with a general move away from intense contact tracing and laboratory testing of all suspected cases (Health Protection Agency, 2009d). This decline was also observed in Germany after the notification regulation of suspected cases has been revised in week 46/2009 (Buda et al., 2010) and in Denmark after mid-November when laboratory confirmation was only recommended in severe cases (Andersen, 2009e). Also, cases with infections so mild that they did not seek medical care were not reported. As such, there was an under-

reporting of pandemic A/H1N1 cases and the epidemic curves do not represent the true figure of pandemic A/H1N1 cases. However, the intention of this work was to present the trend of the pandemic in the UK, Germany, Spain, Denmark and Czech Republic and the epidemic curves do reflect this trend. This becomes evident in

Figure 12, which presents the weekly number of confirmed pandemic A/H1N1 cases and weekly estimates of new pandemic A/ H1N1 cases in England. The figure shows that the actual number of cases was estimated to be up to a hundred times higher than the number of confirmed cases, but the pandemic profile is still visible in both curves.

Just as reported cases are an underestimate, so are the data on deaths due to the 2009 pandemic influenza. A serious limitation of reporting the number of deaths was the attribution of cause of deaths to the pandemic A/H1N1 virus. A large proportion of deaths caused by pandemic influenza occurred in individuals who suffered from one or more chronic underlying medical condition (Department of Health, 2010a; Larrauri Cámara et al., 2010; Schaberg & Burger, 2010). Thus, many deaths might have been recorded as due to the chronic underlying medical condition, and not to the pandemic A/H1N1 virus (World Health Organization, 2009q).

4.7.2 Systematic literature search

In order to obtain pandemic A/H1N1 surveillance data for Germany, the UK, Spain, Czech Republic and Denmark, a systematic literature search was accomplished using only Medline and Google Scholar. Therefore, there might have been more articles on pandemic A/H1N1 surveillance data in other databases (e.g. Embase), which have not been considered. In addition, one exclusion criteria was to eliminate articles in languages other than English and German. Thus, potential articles on Spanish, Danish and Czech pandemic A/H1N1 surveillance data might have been neglected. Further, the additional search for pandemic A/H1N1 surveillance data on websites of national health authorities and international health agencies might have missed information that has already been removed from the websites by the time the search was conducted.

4.7.3 Literature search on public health measures and official recommendations

Although a lot of information on public health measures taken and official health behavior recommendations released during the 2009 A/H1N1 pandemic was retrieved from grey literature and websites of the national health authorities and international health agencies, this search might have missed information that has already been removed from the websites or was not published. In addition, some information published in Spanish, Danish and Czech might have been neglected due to the language barrier.

4.7.4 Data about communication in the media

The data on the media attention throughout the pandemic are also not comparable between the countries, especially because of different data collection methods (Denmark, UK). However, it was not the aim of this study to compare the number of A/H1N1 associated media stories between the countries, but rather to assess similarities and differences in the trends of the media attention.

ECOM

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Annex

Guidelines and recommendations released during the 2009 A/H1N1 pandemic

Guidelines	Spain	UK	Germany	Denmark	Czech Republic	International
March			**Information campaign:** "Wir gegen Viren" Campaign http://www.wir-gegen-viren.de/ [Accessed on 16.05.12] http://www.bzga.de/presse/pressearchiv/?jahr=2009&nummer=513			
April		**Information leaflet:** Important information about swine flu http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/documents/digitalasset/dh_098680.pdf [Accessed on 14.03.12]		**Information leaflet:** Travel advise http://www.sst.dk/publ/Publ2009/CFF/influenza/SS_Nyinfluenza_flyer_UK_web.pdf [Accessed on 12.03.2013] **Information for health professionals:** Guideline on the handling of suspected cases		

				http://www.ssi.dk/English/News/EPI-NEWS/~/media/Indhold/EN%20-%20engelsk/EPI-NEWS/2009/pdf/EPI-NEWS%20-%202009%20-%20No%2018.ashx [Accessed on 15.03.2013]		
Guidelines	**Spain**	**UK**	**Germany**	**Denmark**	**Czech republic**	**International**
May			**Information for general public:** Presentation on RKI website: Influenza Typ A/H1N1 http://www.pandemierisiko.info/ [Accessed on 15.03.12]		**Information for general public:** Travel recommendations and recommendations on protective measures http://pandemie.mzcr.cz/Pages/104-21509-aktualizavane-doporuceni-ministerstva-zdravotnictvi-pro-cestovatele.html [Accessed on 15.03.2013]	**Information for general public:** ECDC Health Information. Influenza A(H1N1) virus: how to protect yourself. http://www.ecdc.europa.eu/en/healthtopics/Documents/0905_Influenza_A%28H1N1%29_how_to_protect_yourself.pdf [Accessed on 11.03.12] ECDC Information for Travellers. Influenza A(H1N1). http://www.ecdc.europa.eu/en/healthtopics/Documents/0905_Influenza_AH1N1_Info_for_Travellers.pdf [Accessed on 11.03.12]

						ECDC Health Information. Personal protective measures for reducing the risk of acquiring or transmitting human influenza. http://ecdc.europa.eu/en/healthtopics/Documents/09_07_personal_protective_measures_ECDC-2009-0001-00-00-ENEN_final.pdf [Accessed on 11.03.12] **Information for policy makers:** ECDC public health guidance on case and contact management for the new influenza A(H1N1) virus infection. http://www.ecdc.europa.eu/en/publications/Publications/0905_GUI_Influenza_AH1N1_Public_Health_Guidance_on_Case_and_Contact_Management.pdf [Accessed on 11.03.12] Eurpoean Medicines Agency. Guidance for use of antiviral medicines http://www.ema.europa.eu/docs/en_GB/document_library/Press

						_release/2009/11/WC500011127.pdf [Accessed on 12.04.2012]
Guidelines	**Spain**	**UK**	**Germany**	**Denmark**	**Czech Republic**	**International**
June						**Information for policy makers:** ECDC Interim Guidance. Mitigation and delaying (or 'containment') strategies as the new influenza A(H1N1) virus comes into Europe. http://ecdc.europa.eu/en/publications/publications/0906_gui_influenza_ah1n1_mitigation_and_delaying_strategies_for_the_influenza_in_europe.pdf [Accessed on 11.03.12] New influenza A (H1N1) virus: WHO guidance on public health measures, 11 June 2009. http://www.who.int/wer/2009/wer8426.pdf [Accessed on 25.04.12]
Guidelines	**Spain**	**UK**	**Germany**	**Denmark**	**Czech Republic**	**International**
July		**Leaflets on control strategy:** Swine flu pandemic: from containment to treatment - guidance for the NHS	**Information leaflets:** Tipps und Informationen zur Neuen Grippe A/H1N1		**Information for health professionals:** Information on Relenza http://pandemie.mzcr.cz/Pages/286-relenza-	**Information for healthcare professionals:** World Health Organization. Patient Care Checklist. http://www.who.int/csr/resources/publications/swineflu/ah1n1

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		alasset/dh_102891.pdf [Accessed on 14.03.12] (Updated 3 September, 22 October)	Influenza Typ A/H1N1 http://www.bundesaerztekammer.de/downloads/InfluenzaAH1N1.pdf [Accessed on 15.03.12]			
Guidelines	**Spain**	**UK**	**Germany**	**Denmark**	**Czech Republic**	**International**
August **To be continued on next page** **August**	**Public information campaign:** Gripe A. La prevención es la mejor medida http://www.msssi.gob.es/campannas/campanas09/informacion-GripeA.htm [Accessed on 25.05.12] And http://www.informacion-gripea.es [Accessed on 16.03.12] And http://www.face-book.com/informacion-gripea [Accessed on 16.06.12]		**Press release:** Influenza A/H1N1: Hygiene- und Verhaltenstipps im Urlaub http://www.bzga.de/presse/pressearchiv/?jahr=2009&nummer=540 [Accessed on 15.03.12]		**Information for general public:** Questions and answers on A/H1N1 based on ECDC material http://pandemie.mzcr.cz/Pages/249-27809-vyskyt-chripkoveho-viru-ah1n1-a-vy.html [Accessed on 15.03.2013]	**Information for policy makers:** ECDC Health Education. On public health use of influenza antivirals during influenza pandemics (with particular reference to the pandemic (H1N1) 2009). http://www.ecdc.europa.eu/en/healthtopics/Documents/0908_Influenza_AH1N1_On_Public_Health_Use_of_Influenza_Antivirals_during_Influenza_Pandemics.pdf [Accessed on 25.05.12]

	Information for healthcare professionals: Management of severe acute respiratory failure in patients with pneumonia caused by the new virus influenza A (H1N1) in the ICU http://www.msps.es/va/profesionales/saludPublica/gripeA/guiasProtocolosInf/pdf/ProtocoloGripeAenUCI.pdf [Accessed on 15.04.12] AEMPS. Use of antivirals in children under 1 year old, pregnant and breastfeeding women http://www.aemps.gob.es/informa/notasInformativas/medicamentosUsoHumano/2009/docs/NI-Oseltamivir-Zanamivir_agosto-2009.pdf [Accessed on 22.05.12]					ECDC Interim Guidance. Use of specific pandemic influenza vaccines during the H1N1 2009 pandemic. http://www.ecdc.europa.eu/en/publications/Publications/0908_GUI_Pandemic_Influenza_Vaccines_during_the_H1N1_2009_Pandemic.pdf [Accessed on 25.05.12] WHO: Safety of pandemic vaccines http://www.who.int/csr/disease/swineflu/notes/h1n1_safety_vaccines_20090805/en/index.html [Accessed on 23.04.2012]
Guidelines	**Spain**	**UK**	**Germany**	**Denmark**	**Czech Republic**	**International**
September						

To be continued on next page September	**Information on preventive measures:** Guide for families http://www.msc.es/servCiudadanos/alertas/pdf/09-09-10_guia_gripe_A_Familias.pdf [Accessed on 16.04.12] Guide for schools http://www.msc.es/servCiudadanos/alertas/pdf/09-09-10_Recomendaciones_AmbitoEscolar.pdf [Accessed on 16.04.12] Guide for kindergarten http://www.msc.es/servCiudadanos/alertas/pdf/09-09-11-Guarderias.pdf [Accessed on 16.04.12] **Information for healthcare professionals:** Prevention measures and treatment of pregnant women http://www.msc.es/profesionales/saludPublica/gripeA/guiasProtocolosInf/	**Information for policy-makers:** Swine Flu. UK Planning Assumptions http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_104843.pdf [Accessed on 13.05.12] **Information for healthcare professionals:** Pandemic influenza. Recommendations on the use of antiviral medicines for pregnant women, women who are breastfeeding and children under the age of one year. http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_106148.pdf [Accessed on 14.03.12]	**Information for healthcare professionals:** Fachliche Information für Ärzte und Apotheker: Pandemie-Impfstoffe in der Schwangerschaft – Sicherheitsaspekte http://www.pei.de/cln_101/nn_158122/DE/arzneimittelsicherheit-vigilanz/archiv-sicherheitsinformationen/archiv-infos-influenza-pandemie-2009-2010/schwangerschaft-04-09-2009-pandemie-impfstoffe.html [Accessed on 11.06.12]		**Information for general public:** Poster on preventive meas. http://pandemie.mzcr.cz/Pages/124-prevence-a-opatreni-pri-vyskytu-chripky-ah1n1-urceno-pro-pacienty.html [Accessed on 15.03.2013] **Information for health professionals:** Information on antivirals http://pandemie.mzcr.cz/Pages/285-tamiflu-aktualizace-udaju-pro-zdravotniky.html [Accessed on 15.03.2013]	**Information for policy-makers:** ECDC Technical Report. Guide to public health measures to reduce the impact of influenza pandemics in Europe: 'The ECDC Menu' http://www.ecdc.europa.eu/en/publications/Publications/0906_TER_Public_Health_Measures_for_Influenza_Pandemics.pdf [Accessed on 12.04.2012]

	pdf/09-10-09_Embarazada.pdf [Accessed on 18.04.12] Clinical management of adults with pneumonia during the H1N1 pandemic http://www.msc.es/profesionales/saludPublica/gripeA/guiasProtocolosInf/pdf/neumonia.pdf [18.04.12]					
Guidelines	**Spain**	**UK**	**Germany**	**Denmark**	**Czech Republic**	**International**
October	**Information for healthcare professionals:** Guideline for Prevention and control measures in retirement homes http://www.msps.es/va/profesionales/saludPublica/gripeA/guiasProtocolosInf/pdf/09-12-02_ResidenciasPersonasMayores.pdf [Accessed on 05.04.12] Recommendation for primary care	**Information for healthcare professionals:** Antiviral prophylaxis. Guidance on the use of prophylaxis with antiviral medicines during the H1N1 (swine flu) pandemic http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_107132.pdf [Accessed on 14.03.12] Swine Flu. Guidance for planners	**Information for healthcare professionals:** STIKO-Empfehlung zur Impfung gegen die Neue Influenza A (H1N1) http://www.rki.de/DE/Content/Infekt/EpidBull/Archiv/2009/Ausgaben/41_09.pdf?__blob=publicationFile [Accessed on 26.04.12]	**Information for healthcare professionals:** Guidance for physicians and other health professionals on prevention measures and treatment of cases https://www.retsinformation.dk/Forms/R0710.aspx?id=127454 [Accessed on 16.03.2013]		

To be continued on next page	professionals on diagnostic and treatment of H1N1 infections http://www.msc.es/profesionales/saludPublica/gripeA/guiasProtocolosInf/pdf/09-12-02-atencionPrimaria.pdf [Accessed on 19.04.12]	http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/@ps/@sta/@perf/documents/digitalasset/dh_107428.pdf [Accessed on 14.03.12] **Vaccination campaign:** Swine flu vaccination: what you need to know. http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/@ps/@sta/@perf/documents/digitalasset/dh_109109.pdf [Accessed on 14.03.12]	**Information campaign for children:** Das Medienpaket „schütz ich mich - schütz ich dich“ http://www.bzga.de/presse/pressearchiv/?jahr=2009&nummer=551 [15.03.12]	Q&A on pandemic vaccine http://www.ssi.dk/English/News/EPI-NEWS/~/media/Indhold/EN%20-%20engelsk/EPI-NEWS/2009/pdf/EPI-NEWS%20-%202009%20-%20No%2043.ashx [Accessed on 16.03.2013]		
October		**Information for healthcare professionals:** Health and Social Care Workers and Pandemic Influenza. Information for staff who are pregnant or in other at-risk groups http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_108365.pdf [Accessed on 14.03.12]	**Information for healthcare professionals:** RKI-Ratgeber Infektionskrankheiten – Merkblätter für Ärzte: Influenza http://www.rki.de/DE/Content/Infekt/EpidBull/Archiv/2009/Ausgaben/43_09.pd	Recommendations on priority groups for vaccination http://www.sst.dk/~/media/Sundhed%20og%20forebyggelse/Smitsomme%20sygdomme/Influenza/Vaccination_lister/Anbefalinger_vaccination_risikogrupper23okt.ashx		

To be continued on next page October		Clinical Professionals Brief on Swine Flu Vaccination http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_107651.pdf [Accessed on 14.03.12] Pandemic H1N1 2009 Influenza: Clinical Management Guidelines for Adults and Children http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/@ps/@sta/@perf/documents/digitalasset/dh_110617.pdf [Accessed on 14.03.12] Pandemic H1N1 2009 Influenza: Clinical Management Guidelines for Pregnancy http://www.dh.gov.uk/prod_consum_dh/groups/dh_di	f?__blob=publicationFile [15.03.12] Die Impfung zum Schutz vor der Neuen Influenza A (H1N1) – Hinweise für das medizinische Personal http://www.aerztekammer-hamburg.de/aerzte/Pandemie/Hinweise_medizinisches_Personal_092010.pdf [Accessed on 19.04.12] or http://www.dkgev.de/dkg.php/aid/6630/cat/43 [Accessed on 19.04.12] **Information on website:** Was Sie über die Neue Grippe („	[Accessed on 16.03.2013]		

		gitalassets/@dh/@en/@ps/@sta/@perf/documents/digitalasset/dh_110618.pdf [Accessed on 14.03.12]	Schweinegrippe“) wissen müssen https://www.bundesgesundheitsministerium.de/fileadmin/redaktion/pdf_publikationen/62100211-Neue-Grippe-Faltblatt_200912.pdf [Accessed on 15.03.12] **Vaccination campaign:** Impfung gegen die Neue Grippe („ Schweinegrippe“) https://www.bundesgesundheitsministerium.de/fileadmin/redaktion/pdf_publikationen/62100212-Neue-Grippe-Impfen-Faltblatt_200912.pdf [Accessed on 22.02.12]			

			Leaflets for specific target groups: Impfung gegen die Neue Grippe („Schweinegrippe“). Information für Menschen mit chronischen Erkrankungen http://www.thueringen.de/imperia/md/content/tmsfg/aktuell/h1n1/rz_final_chron.erkrankungen.pdf [Accessed on 16.05.12] Impfung gegen die Neue Grippe („Schweinegrippe“). Information für medizinisches Personal http://www.cremlingen.de/content/files/downloads/merkblatt_med_pers.pdf [16.05.12]			

			Impfung gegen die Neue Grippe („Schweinegrippe“). Information für Angehörige von Polizei und Feuerwehr http://www.muenster.de/stadt/gesundheitsamt/pdf/neue-grippe_polizei-feuerwehr.pdf [Accessed on 16.05.12] Impfung gegen die Neue Grippe („Schweinegrippe“). Information für Schwangere http://www.berlin.de/imperia/md/content/landesverwaltungsamt/beihilfe/formulareundmerkblaetter/mb_bm_ges_schweinegrippeinfo_fuer_schwangere.pdf?start&ts=1256892413&file=mb_bm_ges_schweinegrippeinfo			

			_fuer_schwangere.pdf [16.05.12]			
Guidelines	**Spain**	**UK**	**Germany**	**Denmark**	**Czech Republic**	**International**
November	**Vaccination campaign:** http://www.informacion gripea.es [Accessed on 16.03.12] And http://www.informaciongri pea.es/descargas/fichas/fase 2/FICHA_VACUNACION _INGLES_baja.pdf [Accessed on 28.11.11]	**Information for specific target groups:** Swine Flu and Pregnancy. How to protect yourself and your baby. http://www.dh.gov.uk/prod_c onsum_dh/groups/dh_digitala ssets/@dh/@en/documents/di gitalasset/dh_108154.pdf [Accessed on 14.03.12] **Leaflets for health professionals:** Swine Flu. If you can´t catch it, you can´t pass it on http://www.dh.gov.uk/prod _consum_dh/groups/dh_di gitalassets/@dh/@en/@ps/ @sta/@perf/documents/di gitalasset/dh_108392.pdf [Accessed on 14.03.12]	**Information on non-pharmaceutical response measures:** Zur Schließung von Kinder-gemeinschaftseinric htungen im Zusammenhang mit Neuer Influenza A/H1N1 http://edoc.rki.de/do cuments/rki_fv/rew A1WUoUgosU/PD F/217OmEJPp5k2g _01.pdf [Accessed on 11.11.11]	**Information for general public:** Information leaflet and radio spots on influenza A/H1N1 in English and six widely used minority languages http://www.sst.dk/pu bl/publ2010/CFF/Infl uenzavaccination/Infl uenzafolder_COP15. pdf [Accessed on 17.03.2013]	**Information for health professionals:** Information material on vaccine and Tamiflu http://pandemie.mzcr.cz/Page s/364-informacni-material-zaslany-praktickym-lekarum-pro-deti-a-dorost-16112009.html [Accessed on 15.03.2013] Information on use and dosage of Tamiflu for hospitals http://pandemie.mzcr.cz/Pa ges/366-informacni-material-zaslany-20112009-na-luzkova-zdravotnicka-zarizeni-k-distribuce-tamiflu.html [Accessed on 15.03.2013] Information on vaccine for vaccination centres http://pandemie.mzcr.cz/Pa ges/367-informacni-material-odeslany-20112009-na-vakcinacni-centra.html	**Information on vaccination:** ECDC: Q&A for the general public on vaccines and vaccination in relation to the A(H1N1) pandemic. http://www.ecdc.europa.eu/en/healt htopics/pandemic_preparedness/20 09_pandemic_vaccines/Pages/QA_ gp_pandemic_vaccines.aspx [Accessed on 18.02.12] ECDC: Q&A for health professionals on vaccines and vaccination in relation to the A(H1N1) pandemic. http://www.ecdc.europa.eu/en/h ealthtopics/pandemic_preparedn ess/2009_pandemic_vaccines/P ages/QA_hp_pandemic_vaccine s.aspx [Accessed on 18.02.12] European Medicines Agency reaffirms efficacy and safety of H1N1 pandemic vaccines http://www.emea.europa.eu/doc s/en_GB/document_library/Pres s_release/2009/11/WC5000155 58.pdf [Accessed on 21.04.2012]

					[Accessed on 15.03.2013] Decision on risk groups and vaccine schedule http://pandemie.mzcr.cz/Pages/409-rozhodnuti-ze-dne-25-11-2009-kterym-se-stanovi-mimoradne-opatreni-ktere-uklada-povinnost-zdravotnickym-zarizenim-vakcinacni-centra-provest-ockovani-pandemickou-vakcinou-pandemrix.html [Accessed on 15.03.2013]	WHO: Safety of pandemic vaccines http://www.who.int/csr/disease/swineflu/notes/briefing_20091119/en/index.html [23.04.2012]
Guidelines	**Spain**	**UK**	**Germany**	**Denmark**	**Czech Republic**	**International**
December	**Information for healthcare professionals:** Agencia Española de Medicamentos y Productos Sanitarios. Official recommendations on the vaccination program	**Information for specific target groups:** Swine Flu Vaccination: information for parents of children over six months and under five years old http://www.direct.gov.uk/prod_consum_dg/groups/dg_digitalassets/@dg/@en/documents/digitalasset/dg_1	**Information for healthcare professionals:** Mitteilung der Ständigen Impfkommission (STIKO) am Robert Koch-Institut. Impfung gegen die Neue Influenza A	**Information for healthcare professionals:** Adjusted vaccination recommendations http://www.ssi.dk/English/News/EPI-NEWS/~/media/Indhold/EN%20-%20engelsk/EPI-	**Information for general public:** Questions and answers on vaccination based on ECDC material http://pandemie.mzcr.cz/Pages/434-91209-vybrane-otazky-a-odpovedi-tykajici-se-vakcin-a-ockovani-v-souvislosti-s-	

	http://www.aemps.gob.es/informa/notasInformativas/medicamentosUsoHumano/vacunas/2009/docs/NI_campana-vacunacion-H1N1_recomendaciones-oficiales.pdf [25.05.12]	83752.pdf [Accessed on 14.03.12]	(H1N1). Erneute Bewertung der Daten am 24.11.2009 **And** Ergänzende Hinweise des Paul-Ehrlich-Instituts und des Robert Koch-Instituts zur Impfung gegen die Neue Influenza A (H1N1) http://www.rki.de/DE/Content/Infekt/EpidBull/Archiv/2009/Ausgaben/50_09.pdf?__blob=publicationFile [Accessed on 26.04.12]	NEWS/2009/pdf/EPI-NEWS%20-%202009%20-%20No%2049.ashx [Accessed on 16.03.2013]	pandemii-chripky-h1n1-2009.html [Accessed on 15.03.2013]	
January		**Information leaflet:** Swine Flu. Information for asylum seekers, refugees and foreign nationals in the UK http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_110808 [Accessed on 14.03.12]				

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Data used for epidemic curves

Week	Repoerted number of A/H1N1 cases per week UK (Health Protection Agency. Epi reports)	Reported number of confirmed A/H1N1 deaths in UK (Pebody et al. 20110)	New A/H1N1 cases per week England	Total number England	Estimated A/H1N1 cases in England	Estimates lower limit England	Estimates upper limit England	A/H1N1 sentinel detections Spain	A/H1N1 non sentinel detections Spain	Total reported number of A/H1N1 cases per week in Spain (Centro Nacional de Epidemiología. Instituto de Salud Carlos III n.y.)	A/H1N1 incidence rate per 100.000 Spain	Reported number of confirmed A/H1N1 deaths per week in Spain (personal communication with Centro de Coordinación de Alertas y Emergencias Sanitarias (CCAES))
27.04.2009	2											
29.04.2009	3											
18	15											
19	32							0	3	3	0	
20	40							0	1	1	4,63	
21	35							0	4	4	9,27	
22	63			171				1	9	10	8,34	
23	196		142	313				2	0	2	6,44	
24	369	1	164	477				8	6	14	10,74	
25	832	0	585	1.062				12	7	19	9,21	
26	1.672	2	1.480	2.542				16	34	50	11,63	
27	3.675	9	3.162	5.704				21	101	122	11,46	1
28	2.789	6	2.500	8.204				72	158	230	33,75	1
29	931	8	681	8.885	100.000			94	229	323	41,84	2
30	510	8	664	9.549	110.000	60.000	160.000	69	106	175	36,04	1

31	705	12	597	10.146	30.000	15.000	85.000	63	85	148	32,89	2
32	397	9	324	10.470	25.000	15.000	60.000	59	47	106	37,67	1
33	459	7	361	10.831	11.000	6.000	25.000	64	70	134	41,17	7
34	237	7	154	10.985	5.000	3.000	12.000	115	94	209	53,61	5
35	138	3	76	11.061	4.500	2.500	10.000	72	86	158	51,75	6
36	97	1	55	11.116	3.000	1.500	6.500	56	55	111	41,97	3
37	130	2	39	11.155	5.000	3.000	11.000	66	49	115	52,35	5
38	149	2	73	11.228	9.000	5.000	20.000	109	66	175	77,88	9
39	299	4	103	11.331	14.000	7.000	30.000	139	83	222	94,72	1
40	344	8	179	11.510	18.000	9.000	38.000	209	112	321	98,65	2
41	455	17	189	11.699	27.000	13.000	58.000	182	125	307	101,22	6
42	987	15	463	12.162	53.000	27.000	115.000	350	202	552	182,45	8
43	1.389	18	822	12.984	78.000	39.000	169.000	529	493	1022	292,94	8
44	1.678	39	852	13.836	84.000	42.000	181.000	482	498	980	327,92	7
45	2.024	34	1.119	14.955	64.000	32.000	140.000	496	605	1101	359,85	21
46	1.693	40	939	15.894	53.000	26.000	114.000	484	767	1251	371,68	27
47	1.422	25	781	16.675	46.000	23.000	99.000	303	585	888	243,71	28
48	1.380	29	909	17.584	22.000	11.000	47.000	215	378	593	151,42	49
49	968	18	605	18.189	11.000	6.000	24.000	63	234	297	77,72	33
50	783	22	533	18.722	9.000	4.500	19.000	72	153	225	78,55	28
51	571	15	424	19.146	6.000	3.000	13.000	38	84	122	40,8	21
52	362	19	324	19.470				10	53	63	37,5	16
53	309	13	243	19.713						23	29,8	13
1	321	14	282	19.995				8	38	23	29,8	9

2	234	11	174	20.169				8	14	22	29,92	12
3	133	8	103	20.272				1	5	6	21,6	4
4	101	2	77	20.349				5	2	7	18,41	1
5	49	1	28	20.377				1	1	2	18,69	3
6		6						1	1	2	15,74	2
7	98	1		20.458				0	3	3	14,51	1
8								1	0	1	11,32	0
9	65			20.511				1	0	1	10,33	0
10								1	1	2	10,01	1
11	26			20.533				1	2	3	10,94	
12								3	0	3	8,6	
13	32			20.565				0	1	1	5,25	
14										0		
15										0		
16										6		
17										1		
18										0		
19										3		
20										0		

(Source: Centro Nacional de Epidemiología. Instituto de Salud Carlos III n.y.; Harder et al.., 2011; Health Protection Agency, 2010a; Ministerstvo zdravotnictví ČR, 2010; Robert Koch-Institute. Arbeitsgemeinschaft Influenza, 2010;)

Week	Reported number of A/H1N1 cases per week in Czech Republic (pandemie.mzcr.cz)	Reported number of confirmed A/H1N1 deaths per week in Czech Republic (calculated based on ECDC daily reports)	Reported number of new A/H1N1 cases per week in Denmark (Harder et al. 2011)	Reported number of confirmed A/H1N1 deaths per week in Denmark (personal communication SSI 2014)	Reported number ofA/H1N1 cases per week Germany (Arbeitsgemeinschaft Influenza, Wochenberichte)	Reported number of confirmed A/H1N1 deaths per week in Germany (Arbeitsgemeinschaft Influenza Wochenbericht 15. KW)
27.04.2009					0	
29.04.2009					3	
18	0		0		6	
19	0		0		5	
20	0		0		3	
21	0		0		3	
22	0		0		3	
23	0		0		29	
24	0		0		154	
25	0		25		129	
26	9		25		97	
27	6		16		162	
28	5		16		243	
29	7		66		984	
30	16		100		2.627	
31	61		133		3.518	
32	78		116		2.637	
33	19		83		2.230	
34	16		58		2.110	
35	21		33		1.321	

36	19		41		1.051	
37	4		25		829	
38	22		33		750	
39	13		15		873	1
40	0		16		1.294	0
41	6		25		1.535	1
42	7		50		1.875	0
43	5		133		3.318	1
44	37	1	300		9.435	5
45	43	0	1033		23.480	7
46	92	0	1450	3	42.261	21
47	147	1	600	6	46.767	25
48	144	4	366	3	30.494	29
49	96	16	166	5	15.881	25
50	105	12	200	6	9.624	24
51	149	4	125	4	6.160	12
52	80	10	66	2	2.182	14
53	57	8	41	0	1.233	16
1	45	11	16	1	1.088	16
2	32	10	16		519	14
3	29	0	16		369	15
4	27		16		282	4
5	5		8		102	7
6	5		8		75	2

7	12		8		35	3
8	12		8		69	3
9	8		4		43	2
10	5		4		29	1
11	7				22	2
12	1				26	3
13	0				13	

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National contact points

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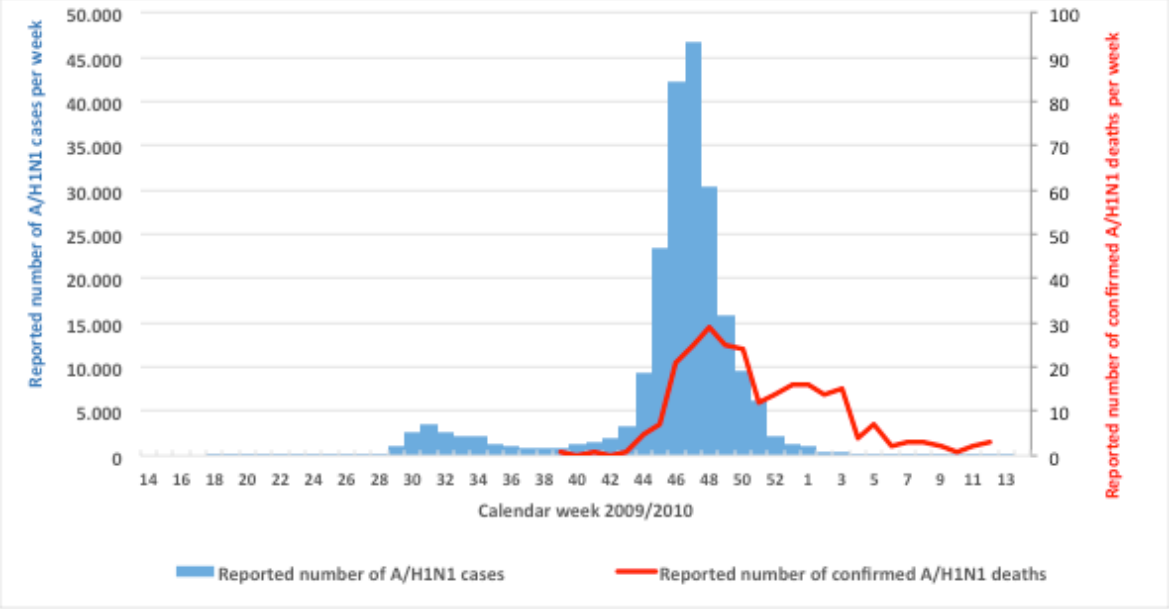
Denmark	Statens Serum Institute, Department of Infectious Disease Epidemiology	Tyra Grove Krause Julita Gil Cuesta	TGV@ssi.dk JUGC@ssi.dk
Czech Republic	Ministry of Health. Dpt. of Public Health Protection and Sanitation Services Management	Jozef Dlhy	Jozef.Dlhy@mzcr.cz
Germany	Robert Koch-Institute, Division Immunization	Ole Wichmann	WichmannO@rki.de

Comprehensive information on epidemic curves and key events per country

Germany

Figure 10: Number of incident and fatal A/H1N1 cases per week during the A/H1N1 pandemic in 2009/2010 in Germany

(Robert Koch-Institute. Arbeitsgemeinschaft Influenza, 2010 [4])



[4] The number of deaths are based on the weekly report by Robert Koch-Institute Arbeitsgemeinschaft Infuenza for the 15th week in 2010 (10.04. - 16.04.2010)

Table 10: Chronology of key events during the 2009 A/H1N1 pandemic in Germany

Month	Day	Event
March 2009		RKI and BZgA: Information campaign "Wir gegen Viren" was developed and launched (Martin, 2010)
April 2009	4	Outbreak of influenza-like illness started in Veracruz, Mexico (European Centre for Disease Prevention and Control, 2010a)
	15	Novel Influenza A/H1N1 identified and isolated in USA (Centers for Disease Control and Prevention, 2009)
	24	WHO confirmed that the outbreak in Mexico was caused by a novel influenza virus (World Health Organization, 2009b)
		RKI: Teleconference with infectious disease experts of the 16 German states to assess the current situation and discuss relevant infection control measures (Robert Koch-Institute, 2010a)
	25	WHO declared the outbreak of influenza A/H1N1 in Mexico and the US as a Public Health Emergency of International Concern (PHEIC) under IHR (2005) (World Health Organization, 2009c)
		RKI: First situation report (Daily report, published until 4.12.2009) (Robert Koch-Institute, 2009b)
	26	RKI distributed information on surveillance and control to local health authorities. The strategy was to contain the spread of the virus (Robert Koch-Institute, 2010a)
	27	Local health authorities started infection control measures at airports and distributed information leaflets for travelers (Robert Koch-Institute, 2010a)
		RKI set up an information hotline for the general public (Robert Koch-Institute, 2010a)
		WHO declared influenza pandemic alert phase 4 (World Health Organization, 2009d)
		First laboratory confirmed case of A/H1N1 announced in Europe. One in Spain and two in the UK (European Centre for Disease Prevention and Control, 2009f)

	29	WHO declared influenza pandemic alert phase 5 (World Health Organization, 2009e)
		RKI reported first confirmed cases in Germany (Robert Koch-Institute, 2009h)
	30	The European Union agreed on a common case definition for the new pandemic virus (European Commission, 2009a)
May 2009	1	First case of secondary transmission in the UK and Germany (European Centre for Disease Prevention and Control, 2009i)
		Free information hotline for the general public set up by Ministry of Health (Robert Koch-Institute, 2010a)
	3	5 cases of in country transmissions in Germany, Spain and UK (European Centre for Disease Prevention and Control, 2009j)
		From week 18 onwards notification regulation for all suspected cases and deaths (Bundesministerium der Justiz, 2009)
June 2009	11	WHO raised the level of influenza pandemic alert from phase 5 to phase 6 (World Health Organization, 2009h) WHO considered severity of pandemic to be moderate (World Health Organization, 2009i)
July 2009	13	Notification regulation of suspected cases revised. From week 29 onwards suspected cases did not have to be reported to state health authorities or RKI anymore; only to regional health authorities (Robert Koch-Institute, 2010a)
	15	Information campaign started (Die Beauftragte der Bundesregierung für Migration, Flüchtlinge und Integration, 2009)
August 2009	Early	Mitigation phase began (Robert Koch-Institute, 2010a)
	17	Statutory health insurances paid costs for laboratory confirmation only for cases with severe disease or cases at risk of developing severe disease (Gilsdorf & Poggensee, 2009)
	24	In week 35 infection control measures at airports were reduced (Robert Koch-Institute, 2010a)
	25	First fatal case in Germany (Robert Koch-Institute, 2009j)

September 2009	29	Authorization of first two pandemic vaccines (Focetria & Pandemrix) by European Commission (European Commission, 2009b)
October 2009	6	Authorization of third pandemic vaccine by EC (European Commission, 2009c)
	12	RKI: STIKO recommendations on priority groups for vaccination were published (Robert Koch-Institute, 2009c)
	14	Central information homepage on H1N1 was launched (Bundesministerium für Gesundheit, 2009)
	15	Number of reported pandemic A/H1N1 deaths: 2 (European Centre for Disease Prevention and Control, 2009ae)
	26	Germany began vaccination (Bundesministerium für Gesundheit, 2009)
November 2009	9	Notification regulation for suspected cases changed from week 46 onwards: Only A/H1N1 related deaths had to be reported. (Robert Koch-Institute, 2010a)
	11	Germany: 1st Impfgipfel at the Ministry of Health (Martin, 2010)
	16	Number of reported pandemic A/H1N1 deaths: 16 (European Centre for Disease Prevention and Control, 2009ah)
	Week 47	Vaccination coverage in persons ≥ 14 years: 4,6% (N=1000) (Walter et al.., 2011; Walter, Böhmer, Reiter, Krause, & Wichmann, 2012)
		Survey result: 18% (N=1000) perceived risk due to swine flu as great or partially great; 34% stated their perception of risk was low (Walter et al.., 2012)
	Week 48	Survey result: 69% (N=1001) believed it was not likely at all or rather unlikely that they would personally catch the A/H1N1influenza; 62% stated it was not likely at all or not likely that they would get vaccinated against pandemic A(H1N1). 80% (N=1001) perceived Health professionals to be the most trusted source of information (The Gallup Organization, 2010)

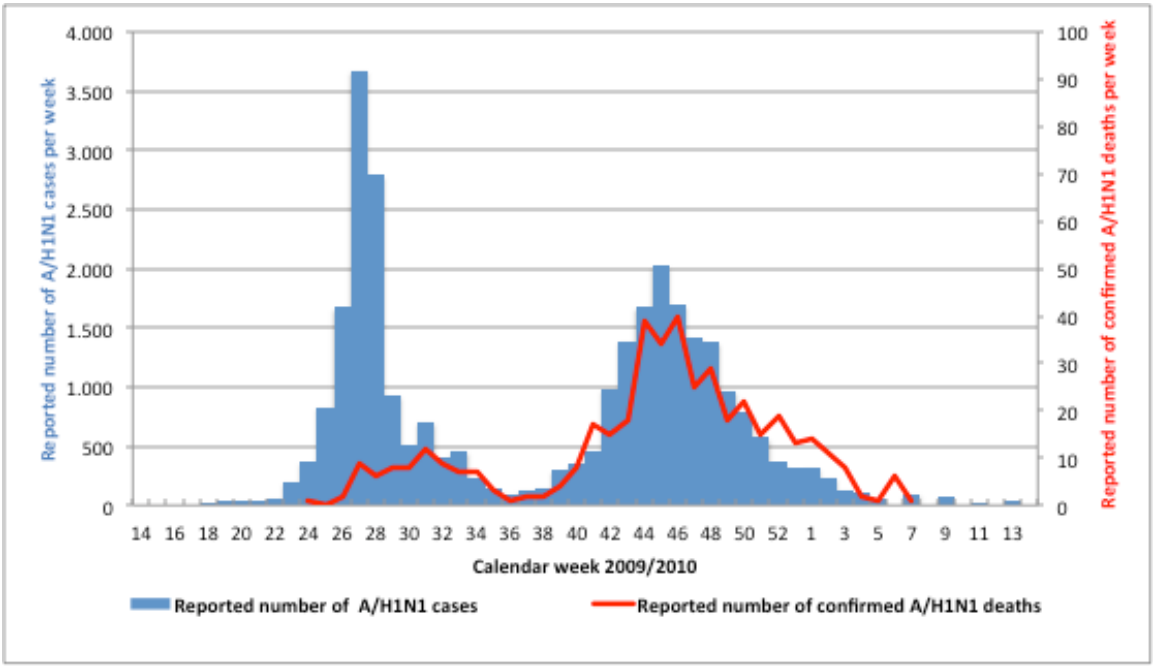
	Week 49	Vaccination coverage in persons ≥ 14 years: 6% (Walter et al.., 2011)
		Week 49: Pandemic Influenza A/H1N1 Surveillance in hospitals (PIKS) started (Buda et al., 2010)
December 2009	4	RKI stopped publishing daily reports (Robert Koch-Institute, 2009b)
	7	2nd Impfgipfel at the Ministry of Health (Martin, 2010)
	11	Number of reported pandemic A/H1N1 deaths: 94 (European Centre for Disease Prevention and Control, 2009ak)
	Week 51	Vaccination coverage in persons ≥ 14 years: 8% (Walter et al.., 2011)
		Survey result: 10% (1000) perceived risk due to swine flu as great or partially great (Walter et al.., 2012)
January 2010	Week 2	Survey result: 10% (N=1000) perceived risk due to swine flu as great or partially great (Walter et al.., 2012)
	15	Number of reported pandemic A/H1N1 deaths: 176 (European Centre for Disease Prevention and Control, 2010c)
February 2010	19	Number of reported pandemic A/H1N1 deaths: 235 (European Centre for Disease Prevention and Control, 2010d)
March 2010	Week 10	Survey result: 65% (N=4.005) stated their perception of risk was low (Walter et al.., 2012)
	19	Number of reported pandemic A/H1N1 deaths: 253 (Buda S, Influenza-Wochenbericht CW15 (2010)(European Centre for Disease Prevention and Control, 2010e)
April 2010	1	Pandemic Influenza A/H1N1 Surveillance in hospitals (PIKS) was terminated (Buda et al., 2010)
	26	Total number of confirmed cases: 225.729 Total number of deaths: 250 Hospitalizations: 7.882 (Buda et al., 2010)
	Aug	Vaccination coverage:

August 2010		General population 8% Healthcare workers 16% Chronic disease (<65) 12% Pregnant women 9% (Mereckiene et al.., 2012)
	10	WHO Director-General: World is no longer in a pandemic (World Health Organization, 2010c)

UK

Figure 11: Number of incident and fatal A/H1N1 cases per week during the A/H1N1 pandemic 2009/2010 in UK

(Health Protection Agency, 2010a, Pebody et al 2010[5])



[5] The number of deaths was only reported until 10th of March 2010.The numbers used for this graph were taken from figure 1 in the article.

Figure 12: Weekly number of confirmed pandemic A/H1N1 cases and weekly estimates of new pandemic A/ H1N1 cases in England, 2009/2010 season

(Health Protection Agency, 2010a)

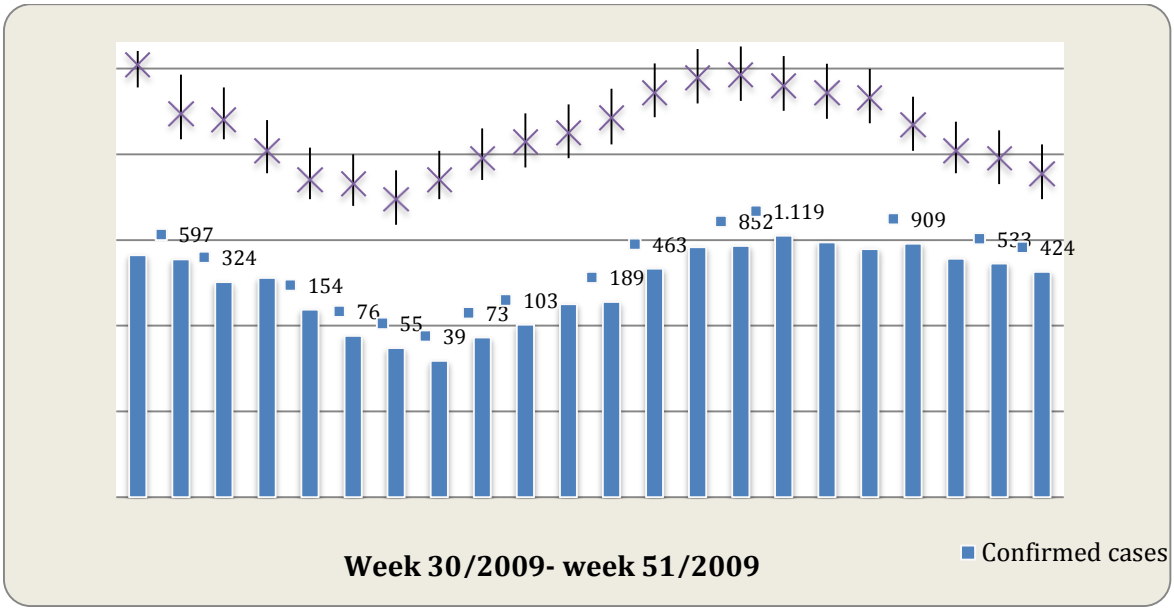


Table 11: Chronology of key events during the 2009 A/H1N1 pandemic in the UK

Month	Day	Event
April 2009	4	Outbreak of influenza-like illness started in Veracruz, Mexico (European Centre for Disease Prevention and Control, 2010a)
	15	Novel Influenza A/H1N1 identified and isolated in USA (Centers for Disease Control and Prevention, 2009)
	24	WHO confirmed that the outbreak in Mexico was caused by a novel influenza virus (World Health Organization, 2009b)
	25	WHO declared the outbreak of influenza A/H1N1 in Mexico and the US as a Public Health Emergency of International Concern (PHEIC) under IHR (2005) (World Health Organization, 2009c)
	27	WHO declared influenza pandemic alert phase 4 (World Health Organization, 2009d)

		First two laboratory confirmed cases of A/H1N1 in the UK (European Centre for Disease Prevention and Control, 2009f)
		Containment strategy (Health Protection Agency, 2009d) Initially, meeting all direct flights from Mexico. Borders were not closed, no restrictions on international or domestic travel and public mass gatherings (Hine, 2010)
	29	WHO declared influenza pandemic alert phase 5 (World Health Organization, 2009e)
		Gordon Brown announced: stockpile of antivirals was to be increased from 33.5 million to 50 million doses (Hine, 2010)
		First confirmed case in England; first UK school closure (Hine, 2010)
	30	The European Union agreed on a common case definition for the new pandemic virus (European Commission, 2009a)
		Information campaign started on TV, radio and in print media. Swine Flu Information Line was set up (Hine, 2010)
May 2009	1	First case of secondary transmission in the UK and Germany (European Centre for Disease Prevention and Control, 2009i)
	2	HPA put in place regional Flu Response Centers (Health Protection Agency, 2010c)
	3	5 cases of in country transmissions in Germany, Spain and UK (European Centre for Disease Prevention and Control, 2009j)
	6	Ministers agreed that containment phase should continue (Hine, 2010)
	11	Ministers decided to procure enough pre-pandemic vaccine for 45% of the population without waiting for Phase 6 (Hine, 2010)
	15	British Foreign& Commonwealth Office stopped to advice against all but essential travel to Mexico. Agreements for up to 90 million doses of pre-pandemic vaccines were signed (Hine, 2010)

	16	Survey result: Percentage of very or fairly worried about the possibility of catching pandemic A/H1N1: 16,6 % (N= 1173) (Rubin, Potts, & Michie, 2010)
	20	HPA recommended mass prophylaxis at schools were any pupils were affected should cease (Department of Health. Scientific Advisory Group for Emergencies (SAGE), 2009a)
	21	Ministers decided not to change the prophylaxis policy at schools as recommended by HPA (Hine, 2010)
	22	HPA stopped meeting flights from Mexico (Health Protection Agency, 2009a)
June 2009	1	Scottish Flu Response Center was established to relieve the pressure on NHS 24 (Hine, 2010)
	10	Ministers agreed on policy for "hot spots" (Health Protection Agency, 2010c; Hine, 2010)
	11	WHO raised the level of influenza pandemic alert from phase 5 to phase 6 (World Health Organization, 2009h) WHO considered severity of pandemic to be moderate (World Health Organization, 2009i)
	13	Total number of cases reached 1000 (Hine, 2010)
	15	First death reported in Europe; in the UK (European Centre for Disease Prevention and Control, 2009t)
	16	Survey result: Percentage of very or fairly worried about the possibility of catching pandemic A/H1N1: 19,3 % (N= 1050) (Rubin et al.., 2010)
	17	Ministers agreed to procure vaccine for 100% of the population (Hine, 2010) DH`s Joint Committee on Vaccination and Immunization (JCVI) first meeting: priority groups for vaccination were discussed (Final advice on 8 October) (Department of Health. Joint Committee on Vaccination and Immunisation, 2009a)
	26	Contracts were signed with GlaxoSmithKline and Baxter Healthcare: 132 million doses of H1N1 vaccine (2 doses for the whole UK population) (Hine, 2010)

July 2009	2	Mitigation strategy started (Health Protection Agency, 2009d)
	6	MHRA developed a web-based reporting system for use by public and healthcare professionals wanting to report adverse reactions to antivirals and when available to vaccines (Medicines and Healthcare products Regulatory Agency, 2009a)
	13	Besides a few small changes, SAGE endorsed the JCVI`S advice concerning the priority groups for vaccination (Department of Health. Scientific Advisory Group for Emergencies (SAGE), 2009b)
	15	Survey result: Percentage of very or fairly worried about the possibility of catching pandemic A/H1N1: 32,9 % (N=1050) (Rubin et al.., 2010)
	16	Ministers agreed that the priority groups identified by SAGE would be vaccinated (Hine, 2010) Publication of planning assumptions calculated by SAGE. Key figures: nearly 19 million cases, 2,8 million people with complications, 370.000 people hospitalized, up to 65.000 deaths (Department of Health, 2009e)
	23	National Pandemic Flu Service went live in England (Department of Health, 2009f)
	29	Ministers bought 30 million doses of additional Pandemrix vaccine to make up any possible shortfall (Hine, 2010)
August 2009	7	JCVI discussed the vaccine strategy and priority groups once more (Department of Health. Joint Committee on Vaccination and Immunisation, 2009b)
	13	UK published priority groups for the vaccination program (Department of Health, 2009g)
September 2009	3	Planning assumptions revised: reduction in hospitalization rate from 2% to 1%, reduction of upper case fatality rate from 0,35% to 0,1% (Department of Health, 2009i)
	10	Number of reported pandemic A/H1N1 deaths: 76 (European Centre for Disease Prevention and Control, 2009ac)
	13	Survey result: Likelihood of pandemic vaccine uptake (N=5175): Very likely: 31,7 %

		Fairly likely: 24,4 % Not very likely: 19,4 % Very unlikely: 20,8 % Not sure: 3,7 % (Rubin et al.., 2010)
	29	Authorization of first two pandemic vaccines (Focetria & Pandemrix) by European Commission (European Commission, 2009b)
October 2009	1	Web based reporting system across England introduced to collect information on all laboratory confirmed cases admitted to NHS trusts (Health Protection Agency, 2010b)
	6	Authorization of third pandemic vaccine by EC (European Commission, 2009c)
	8	JCVI reconfirmed the priority groups for vaccination and advised on dosage of vaccine (Department of Health. Joint Committee on Vaccination and Immunisation, 2009c)
	12	SAGE discussed and agreed the JCVI recommendations (Department of Health. Scientific Advisory Group for Emergencies (SAGE), 2009c)
	14	Four health ministers agreed that vaccination program should start at the same time throughout the UK (Hine, 2010)
	15	Number of reported pandemic A/H1N1 deaths: 95 (European Centre for Disease Prevention and Control, 2009ae)
	21	UK begins vaccination: front-line healthcare workers and patients who fall into at-risk categories (Department of Health, 2009k)
	22	Planning assumptions revised: Reasonable worst case for the clinical attack rate was reduced from 30% to 12%. Reasonable worst case for further deaths was reduced from 19.000 to 1.000 (Department of Health, 2009m)
November 2009	5	Medicines and Healthcare products Regulatory Agency published suspected adverse reaction analysis on pandemic vaccines (Medicines and Healthcare products Regulatory Agency, 2009b)
	16	Number of reported pandemic A/H1N1 deaths: 185 (European Centre for Disease Prevention and Control, 2009ah)

	19	Phase two of vaccination program announced: children over 6 months and under 5 years (Department of Health, 2009u)
	Week 48	Survey result: 49% (N=1000) believed it was not likely at all or rather unlikely that they would personally catch the A/H1N1influenza; 37% stated it was not likely at all or not likely that they would get vaccinated against pandemic A(H1N1). 91% (N=1000) perceived Health professionals to be the most trusted source of information (The Gallup Organization, 2010)
	30	SAGE heard from its modelers that the pandemic had now effectively peaked (Department of Health. Scientific Advisory Group for Emergencies (SAGE), 2009d)
December 2009	11	Number of reported pandemic A/H1N1 deaths: 283 (European Centre for Disease Prevention and Control, 2009aj)
	23	Department of Health wrote to Baxter Healthcare to stop supply of Celvapan® from 28 February (Hine, 2010)
January 2010	8	JCVI statement: vaccination of further groups of people is not recommended (Department of Health. Joint Committee on Vaccination and Immunisation, 2010)
	11	SAGE met for the last time (Department of Health. Scientific Advisory Group for Emergencies (SAGE), 2010)
	14	Agreement to start negotiating with GlaxoSmithKline (GSK) over ceasing the contract and suspending Pandemrix deliveries from 16 January (Hine, 2010)
	15	Number of reported pandemic A/H1N1 deaths: 362 (European Centre for Disease Prevention and Control, 2010b)
February 2010	4	Agreement that vaccination program was not extended to other healthy age groups. Strategic reserve of 15 million doses was set up (Hine, 2010)
	11	National Pandemic Flu Service was closed down (Hine, 2010)
March 2010	12	Reported deaths across the UK: 440 (Pebody et al., 2010)
	18	H1N1 (2009) swine flu vaccine provided for protection of travelers to Southern Hemisphere countries (Department of Health, 2010c)

April 2010	1	Antivirals were no longer available from national stockpiles; Swine Flu Information Line was closed down; Treatment of cases returned to business as usual (Hine, 2010)
	6	Agreement with GSK to only take deliveries of just under 35 million doses of Pandemrix® (The Secretary of State for Health, 2010)
	15	Total number of deaths: 474 (Department of Health, 2010d)
August 2010	Aug	Vaccination coverage **England:** Chronic disease (<65) 37,6%, including pregnant women Children (6 month to 5) 23,6% Healthcare workers 40,3% Vaccine uptake in Wales was similar. **Northern Ireland:** Chronic disease (<65) 86,5% Children 38,3% Healthcare workers 47,7% **Scotland:** Chronic disease (<65) 54,5% Children 44,6% Healthcare workers 55,1% (Health Protection Agency, 2010b)
	10	WHO Director-General: World is no longer in a pandemic (World Health Organization, 2010c)

Spain

Figure 13: Number of incident and fatal A/H1N1 cases per week during the A/H1N1 pandemic 2009/2010 in Spain

(Centro Nacional de Epidemiología. Instituto de Salud Carlos III n.y., number of fatal cases: personal communication with Centro de Coordinación de Alertas y Emergencias Sanitarias, Ministerio de Sanidad, Servicios Sociales e Igualdad)

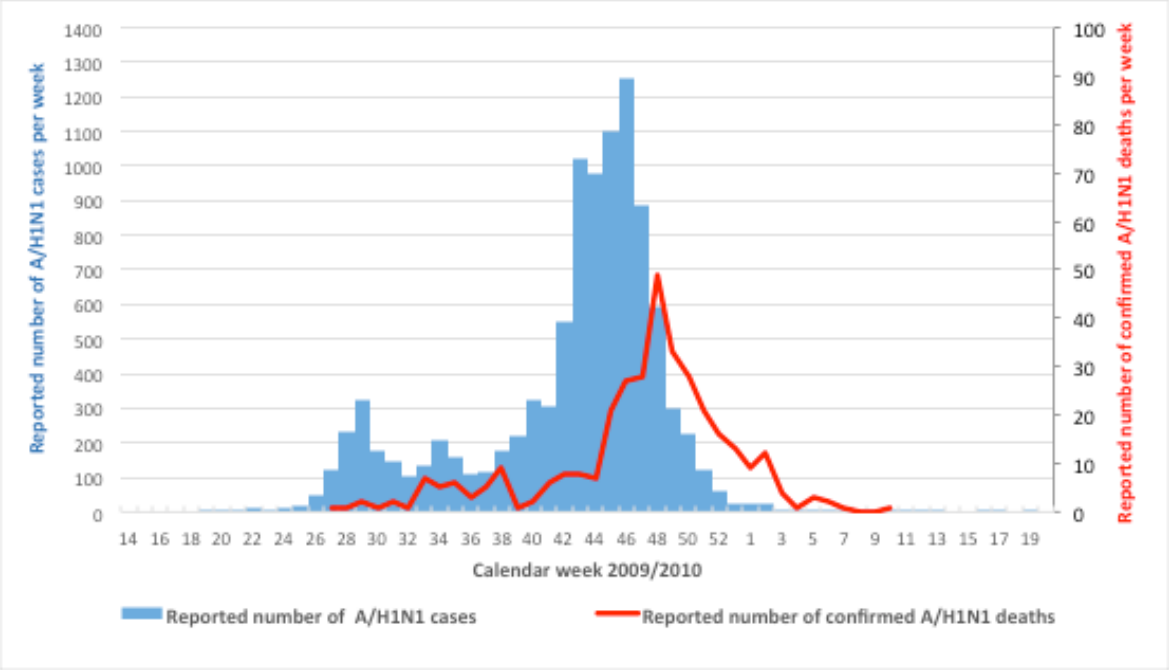


Table 12: Chronology of key events during the 2009 A/H1N1 pandemic in Spain

Month	Day	Event
April 2009	4	Outbreak of influenza-like illness started in Veracruz, Mexico (European Centre for Disease Prevention and Control, 2010a)
	15	Novel Influenza A/H1N1 identified and isolated in USA (Centers for Disease Control and Prevention, 2009)
	24	WHO confirmed that the outbreak in Mexico was caused by a novel influenza virus (World Health Organization, 2009b)

		The Coordinating Centre for Health Alerts and Emergencies (CCAES) at the Spanish Ministry of Health and Social Policy issued a warning to the surveillance network in its daily report (Surveillance Group for New Influenza A(H1N1) Virus Investigation and Control in Spain, 2009)
		Ministry of Health and Social Policy (MHSP) published information and advice for travelers on its website (Surveillance Group for New Influenza A(H1N1) Virus Investigation and Control in Spain, 2009)
	25	WHO declared the outbreak of influenza A/H1N1 in Mexico and the US as a Public Health Emergency of International Concern (PHEIC) under IHR (2005) (World Health Organization, 2009c)
		National Influenza Preparedness and Response Plan activated (Surveillance Group for New Influenza A(H1N1) Virus Investigation and Control in Spain, 2009)
		CCAES distributed a case definition and protocols for infection control and management of cases and contacts (Surveillance Group for New Influenza A(H1N1) Virus Investigation and Control in Spain, 2009)
		Surveillance and disease control at airports started, meeting all flights from affected areas until 16 June (Dávila Cornejo et al., 2010)
	26	First 3 cases under investigation (Surveillance Group for New Influenza A(H1N1) Virus Investigation and Control in Spain, 2009)
	27	MHSP recommended to avoid any non-essential travel to Mexico (Surveillance Group for New Influenza A(H1N1) Virus Investigation and Control in Spain, 2009)
		WHO declared influenza pandemic alert phase 4 (World Health Organization, 2009d)
		First meeting of the Surveillance Subcommittee (Altogether 31 meetings until March 22) (Sierra Moros et al., 2010)
		First laboratory confirmed case of A/H1N1 in Spain (European Centre for Disease Prevention and Control, 2009f)
		Exclusive supply of antivirals to hospitals (Ministerio de Sanidad, Politica Social e Igualdad, 2010b)

	28	The Surveillance Subcommittee agreed on a protocol on case and contact management: Antivirals were offered to all cases and contacts. Isolation of cases and contacts was recommended (Santa-Olalla Peralta, Cortes García, Martínez Sánchez, et al., 2010; Sierra Moros et al., 2010)
		First meeting of the Subcommittee on Vaccines and Antivirals (SVA) (Ministerio de Sanidad, Politica Social e Igualdad, 2010b)
	29	WHO declared influenza pandemic alert phase 5 (World Health Organization, 2009e)
		First case of secondary transmission (Surveillance Group for New Influenza A(H1N1) Virus Investigation and Control in Spain, 2009)
	30	The European Union agreed on a common case definition for the new pandemic virus (European Commission, 2009a)
May 2009	1	Regional Influenza laboratories started initial testing (Santa-Olalla Peralta, Cortes García, Martínez Sánchez, et al., 2010)
	7	The CSP (Comisión de Salud Pública) approved a new case definition based on the EU case definition (Surveillance Group for New Influenza A(H1N1) Virus Investigation and Control in Spain, 2009)
	11	First confirmed tertiary case. Number of confirmed cases: 98. 76 had a history of travel to Mexico (Surveillance Group for New Influenza A(H1N1) Virus Investigation and Control in Spain, 2009)
	13	CSP agreed on purchasing vaccine for 40% of the population. Enough vaccine for 18,3 million people (Ministerio de Sanidad, Politica Social e Igualdad, 2010b)
	20	Case and contact management protocol updated: Antivirals will be given only to cases with severe disease, those with risk factors and contacts with risk factors. Isolation of cases should be maintained. No quarantine of contacts (Santa-Olalla Peralta, Cortes García, Martínez Sánchez, et al., 2010)
	22	First outbreak without travel history at the Military Academy of Engineering in Hoyo de Manzanares (Ministerio de Sanidad, Politica Social e Igualdad, 2010a)

June 2009	11	WHO raised the level of influenza pandemic alert from phase 5 to phase 6 (World Health Organization, 2009h) WHO considered severity of pandemic to be moderate (World Health Organization, 2009i)
	26	The CSP approved a surveillance strategy based on 5 points: • surveillance of severe cases, • the influenza surveillance through SISS (Spanish Influenza Surveillance System), • the monitoring of cluster of cases with acute respiratory infection (confirmation of first cases only; case-based notification not required), • monitoring of influenza or acute respiratory disease from the primary care computerized database and • case-based monitoring of flu cases in the community. No need of identification, monitoring or administration of prophylaxis to contacts. (Santa-Olalla Peralta, Cortes García, Martínez Sánchez, et al., 2010)
July 2009	1	First fatal case in Spain (European Centre for Disease Prevention and Control, 2010a)
	27	Mitigation phase began (Sierra Moros et al., 2010)
	28	Case-based monitoring of cases in the community was ceased (Ministerio de Sanidad, Politica Social e Igualdad, 2010a)
		SVA agreed on population groups for antiviral treatment: cases requiring hospitalization and those at risk of complications. (approved by CSP on 29. July) (Ministerio de Sanidad, Politica Social e Igualdad, 2010a)
August 2009	7	AEMPS released recommendations on the use of antivirals in children under 1 year old, pregnant and breastfeeding women and people with swallowing problems (Agencia Española de Medicamentos y Productos Sanitarios, 2009a)
	14	Information campaign “Gripe A. La prevención es la major medida” started (Ministerio de Sanidad y Politica Social, 2009a)
	31	Agreement on priority groups for vaccination (Ministerio de Sanidad, Politica Social e Igualdad, 2010b)

September 2009	9	CSP approved surveillance strategy update: Investigation of clusters of cases only in those cases deemed necessary to make a special intervention. (Ministerio de Sanidad, Politica Social e Igualdad, 2010a)
	10	Number of reported pandemic A/H1N1 deaths: 25 (European Centre for Disease Prevention and Control, 2009ac)
	29	Authorization of first two pandemic vaccines (Focetria & Pandemrix) by European Commission (European Commission, 2009b)
October 2009	1	Vaccine became available for use (Venice II)
	6	Authorization of third pandemic vaccine by EC (European Commission, 2009c)
	15	Number of reported pandemic A/H1N1 deaths: 43 (European Centre for Disease Prevention and Control, 2009ae)
	29	Regular supply of antiviral drugs in pharmacies permitted (Agencia Española de Medicamentos y Productos Sanitarios, 2009b)
November 2009	16	Vaccination campaign started (Ministerio de Sanidad y Politica Social, 2009l)
		Authorization of a new pandemic vaccine Panenza in Spain (Agencia Española de Medicamentos y Productos Sanitarios, 2009c)
		Number of reported pandemic A/H1N1 deaths: 88 (European Centre for Disease Prevention and Control, 2009ah)
	21	AEMPS: Official recommendations on vaccination published (Agencia Española de Medicamentos y Productos Sanitarios, 2009d)
	Week 48	Survey result: 49% (N=1003) believed it was not likely at all or rather unlikely that they would personally catch the A/H1N1influenza; 66% stated it was not likely at all or not likely that they would get vaccinated against pandemic A(H1N1). 86% (N=1003) perceived Health professionals to be the most trusted source of information (The Gallup Organization, 2010)

December 2009	4	Surveillance Subcommittee eased the monitoring of severe cases (Ministerio de Sanidad, Politica Social e Igualdad, 2010a)
	11	Number of reported pandemic A/H1N1 deaths: 169 (European Centre for Disease Prevention and Control, 2009aj)
January 2010	15	Number of reported pandemic A/H1N1 deaths: 271 (European Centre for Disease Prevention and Control, 2010b)
February 2010	1	Case-based monitoring of severe cases was suspended (Ministerio de Sanidad, Politica Social e Igualdad, 2010a)
April 2010	1	Weekly reporting of new hospitalized cases and case-based notification of fatal cases was stopped (Ministerio de Sanidad, Politica Social e Igualdad, 2010a)
		Total number of reported deaths: 348 (Ministerio de Sanidad, Politica Social e Igualdad, 2010a)
	15	End of vaccination campaign (Ministerio de Sanidad, Politica Social e Igualdad, 2010b)
August 2010	Aug	Vaccination coverage: General population 27% Healthcare workers 12% Chronic disease (<65) 24% Pregnant women 9% (Mereckiene et al.., 2012)
	10	WHO Director-General: World is no longer in a pandemic (World Health Organization, 2010c)

Czech Republic

Figure 14: Number of incident and fatal A/H1N1 cases per week during the A/H1N1 pandemic in 2009/2010 in Czech Republic

(Ministerstvo zdravotnictví ČR, 2010[6]).

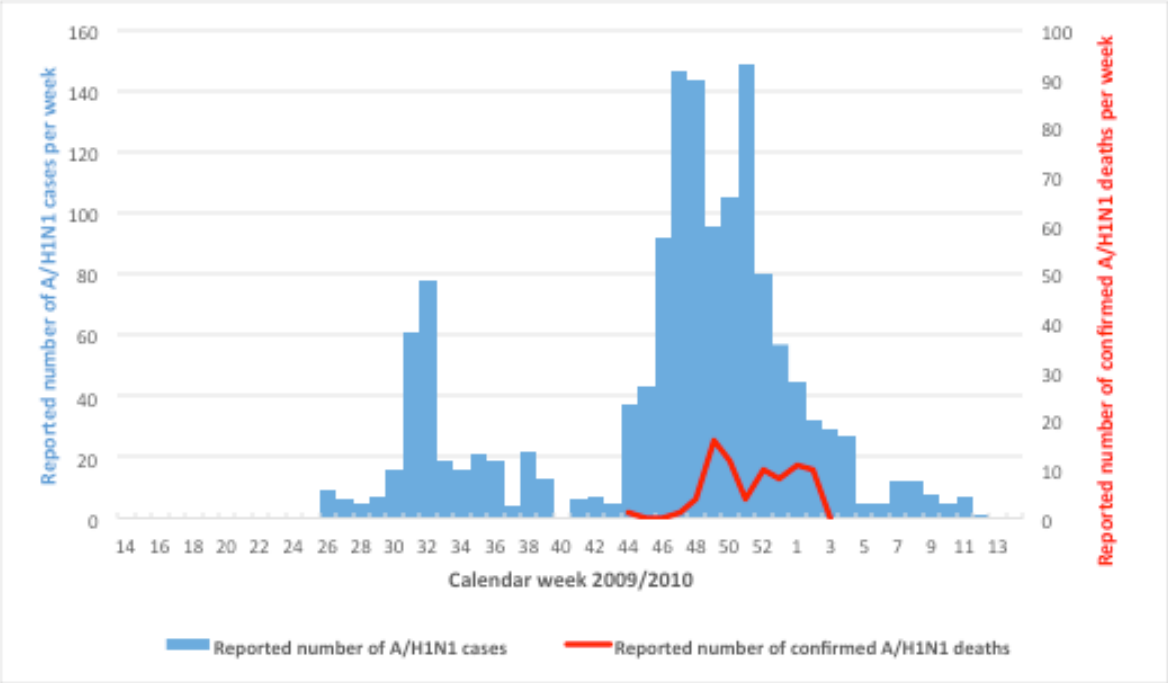


Table 13: Chronology of key events during the 2009 A/H1N1 pandemic in Czech Republic

Month	Day	Event
May	21	Travel recommendations and recommendations on protective measures (Ministerstvo zdravotnictví ČR, 2009a)
	25	First laboratory-confirmed case in Czech Republic (European Centre for Disease Prevention and Control, 2009q)
July	31	Information on Relenza for health professionals published (Ministerstvo zdravotnictví ČR, 2009b)

[6] The number of fatal cases has been calculated based on the daily reports from ECDC.

August	21	Purchase agreement between GSK and Czech Republic to buy 1 million doses of Pandemrix. First delivery can be expected in week 48/2009 (Ministerstvo zdravotnictví ČR, 2009c)
	27	Questions and answers based on ECDC material published (Ministerstvo zdravotnictví ČR, 2009d)
September 2009	16	Poster on preventive measures (Ministerstvo zdravotnictví ČR, 2009e)
	23	Information on antivirals for health professionals published (Ministerstvo zdravotnictví ČR, 2009f)
October 2009	26	First fatal case was reported in the Czech Republic (European Centre for Disease Prevention and Control, 2009af)
November 2009	16	Information material on vaccine and Tamiflu sent to GP (Ministerstvo zdravotnictví ČR, 2009g)
	20	Information on use and dosage of Tamiflu for hospitals published (Ministerstvo zdravotnictví ČR, 2009h) Information on vaccine for vaccination centers published (Ministerstvo zdravotnictví ČR, 2009i)
	23	Czech Republic started vaccination program (O'Flanagan et al.., 2011)
	25	Decision on risk groups and vaccine schedule published (Ministerstvo zdravotnictví ČR, 2009j)
	Week 48	Survey result: 61% (N=1002) believed it was not likely at all or rather unlikely that they would personally catch the A/H1N1influenza; 47% stated it was not likely at all or not likely that they would get vaccinated against pandemic A(H1N1). 83% (N=1002) perceived Health professionals to be the most trusted source of information (The Gallup Organization, 2010)
December 2009	4	Reported deaths in the Czech Republic: 22 (European Centre for Disease Prevention and Control, 2009ai)
	9	Questions and answers on vaccination based on ECDC material published (Ministerstvo zdravotnictví ČR, 2009k)

	11	Number of reported pandemic A/H1N1 deaths: 34 (European Centre for Disease Prevention and Control, 2009aj)
	28	Reported deaths in the Czech Republic: 48 (European Centre for Disease Prevention and Control, 2009al)
January 2010	15	Number of reported pandemic A/H1N1 deaths: 83 (European Centre for Disease Prevention and Control, 2010c)
February 2010	19	Number of reported pandemic A/H1N1 deaths: 96 (European Centre for Disease Prevention and Control, 2010d)
March 2010	19	Number of reported pandemic A/H1N1 deaths: 98 (European Centre for Disease Prevention and Control, 2010e)
August 2010	Aug	Vaccination coverage: General population 0,6% Healthcare workers 7% Pregnant women 0% (Mereckiene et al.., 2012)

Denmark

Figure 15: Number of incident and fatal A/H1N1 cases per week during the A/H1N1 pandemic 2009/2010 in Denmark

(Harder et al., 2011, personal communication with Infectious Diseases Epidemiology Department, Statens Serum Institute[7])

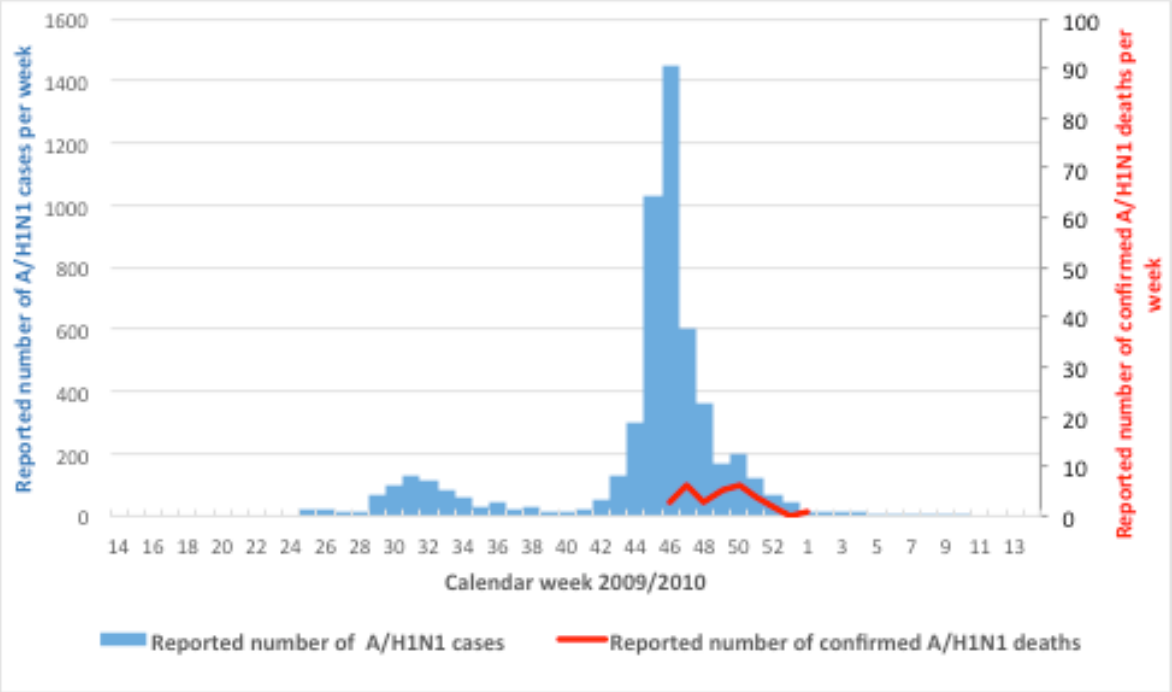


Table 14 Chronology of key events during the 2009 A/H1N1 pandemic in Denmark

Month	Day	Event
April 2009	29	Advice against all unnecessary travel to Mexico (National Board of Health, 2009a)
		Department of Epidemiology published a guideline on the handling of suspected patients (Andersen, 2009a)

[7] The total number of fatal cases is in line with the daily reports from ECDC. However, there are slight differences in the number of deaths per week, which may be due to a lag in reporting to ECDC.

		Containment strategy (National Board of Health, 2009h)
May 2009	1	First laboratory confirmed A/H1N1 case in Denmark (National Board of Health, 2009b)
		Information hotline was set up (National Board of Health, 2009e)
	18	Advice against travel to Mexico was lifted (National Board of Health, 2009f)
		Due to the novel influenza virus A(H1N1) outbreaks, the sentinel surveillance of influenza in Denmark was maintained beyond the normal influenza season (Andersen, 2009b)
June 2009	11	Total number of cases: 11, all of which have been relatively mild. Infection in Denmark is still limited to persons who have been abroad and in some cases their immediate contacts (National Board of Health, 2009g)
July 2009	6	Board of Health has decided to change its strategy for dealing with influenza A (H1N1) from 7 July 2009. Concentrating now on the treatment of those who are at risk and preventive treatment for people at risk (Andersen, 2009c; National Board of Health, 2009h)
	15	Notification regulation of suspected cases revised. The individual notification of suspected cases has been lifted and replaced by mandatory laboratory notification. The voluntary sentinel surveillance in primary health care which comprises submission of weekly reports and samples will be in place throughout the year (Andersen, 2009c)
September 2009	3	First death of a Danish citizen in Norway (National Board of Health, 2009i)
October 2009	1	Guidance for physicians and other health professionals on prevention measures and treatment of cases was published (National Board of Health, 2009k,2009j)
	21	Department of Epidemiology published questions and answers on pandemic vaccine (Pandemrix) (Andersen, 2009d)

	23	National Board of Health recommendations on priority groups for vaccination were published (National Board of Health, 2009m, 2009n)
November 2009	8	Denmark begins vaccination: people at risk who are under 65 years of age (National Board of Health, 2009l; O'Flanagan, Cotter, & Mereckiene, 2011)
	Week 46	Active reporting of influenza patients from all Intensive Care Units (ICUs) between week 46, 2009, and week 11, 2010 (Mølbak et al.., 2011).
	11	Surveillance strategy revised (Andersen, 2009e)
	Week 48	Survey result: 58% (N=1008) believed it was not likely at all or rather unlikely that they would personally catch the A/H1N1influenza; 60% stated it was not likely at all or not likely that they would get vaccinated against pandemic A(H1N1) 90% (N=1008) perceived Health professionals to be the most trusted source of information (The Gallup Organization, 2010)
	30	Information leaflet and radio spots on influenza A/H1N1 in English and six widely used minority languages were published (Arabic, Urdu, Bosnian, Turkish, Somali, Persian) (National Board of Health, 2009c, 2009d, 2009o)
December 2009	Early Dec.	From the beginning of December vaccination of people at risk who are over 65 years old started (National Board of Health, 2009l)
	2	Board of Health adjusted vaccination recommendations. From now on, only one dose of vaccine for patients at risk, unless they have a weakened immune system (Andersen, 2009f; National Board of Health, 2009p)
		By the end of week 48, the SSI had distributed nearly 500,000 vaccine doses, primarily to cover risk group vaccination (Andersen, 2009f)
	9	Number of reported deaths in Denmark : 16, including three outside risk groups (National Board of Health, 2009q)
	18	A/H1N1 hotline was closed down (National Board of Health, 2009r)

January 2010	6	Total number of confirmed cases: nearly 5.000 Total number of deaths: 30 Hospitalizations: 1.000 (Andersen, 2010b)
February 2010	12	The government has decided to offer the excess influenza A (H1N1) vaccines for the citizens who have not already been offered the vaccine (National Board of Health, 2010)
June 2010	9	Total number of deaths: 32 - mainly among persons with underlying risk factors. Total number of vaccinated persons: 339,515, including 286,568 with chronic illness, 5,780 pregnant women and 4,073 contacts to severely immunosuppressed patients. A total of 42,859 persons from the groups of healthcare professionals and key personnel were vaccinated (Andersen, 2010a)
August 2010	Aug	Vaccination coverage: Chronic disease (<65) 20% (Mereckiene et al.., 2012)

In-depth description of events and recommendations

In order to give an in-depth description of the events, the pandemic has been split up into five time periods. Each time period is characterized by a different stage in the pandemic progress and different response activities of the UK, Germany, Spain, Denmark and the Czech Republic:

- Time period 1 (01/04/2009 to 21/06/2009). This time period is characterized by the emergence of the pandemic A/H1N1 virus in Mexico and the spread of the virus to the UK, Spain, Germany, Denmark and the Czech Republic. It also describes early response strategies to contain the spread of the virus.
- Time period 2 (22/06/2009 to 02/08/2009). Numbers of confirmed cases increased constantly, therefore a change in prevention and control policy from containment to mitigation took place in this time period.

- Time period 3 (03/08/2009 to 04/10/2009). Numbers of confirmed cases decreased during the summer. In this time period countries started to prepare the vaccination program.
- Time period 4 (05/10/2009 to week 30/11/2009). This time period is characterized by the autumn winter wave with a high number of confirmed cases. In this time period the UK, Germany, Spain, Denmark and the Czech Republic started their vaccination programs and campaigns.
- Time period 5 (01/12/2009 to 15/04/2010). This is the post peak period. During this time period the numbers of confirmed pandemic cases started to decline constantly.

To structure the information of each time period, the events were allocated to the following themes: situation, surveillance, control strategy and treatment of cases, vaccination strategy and communication. For a better overview each country is presented separately.

Germany

Time period 1

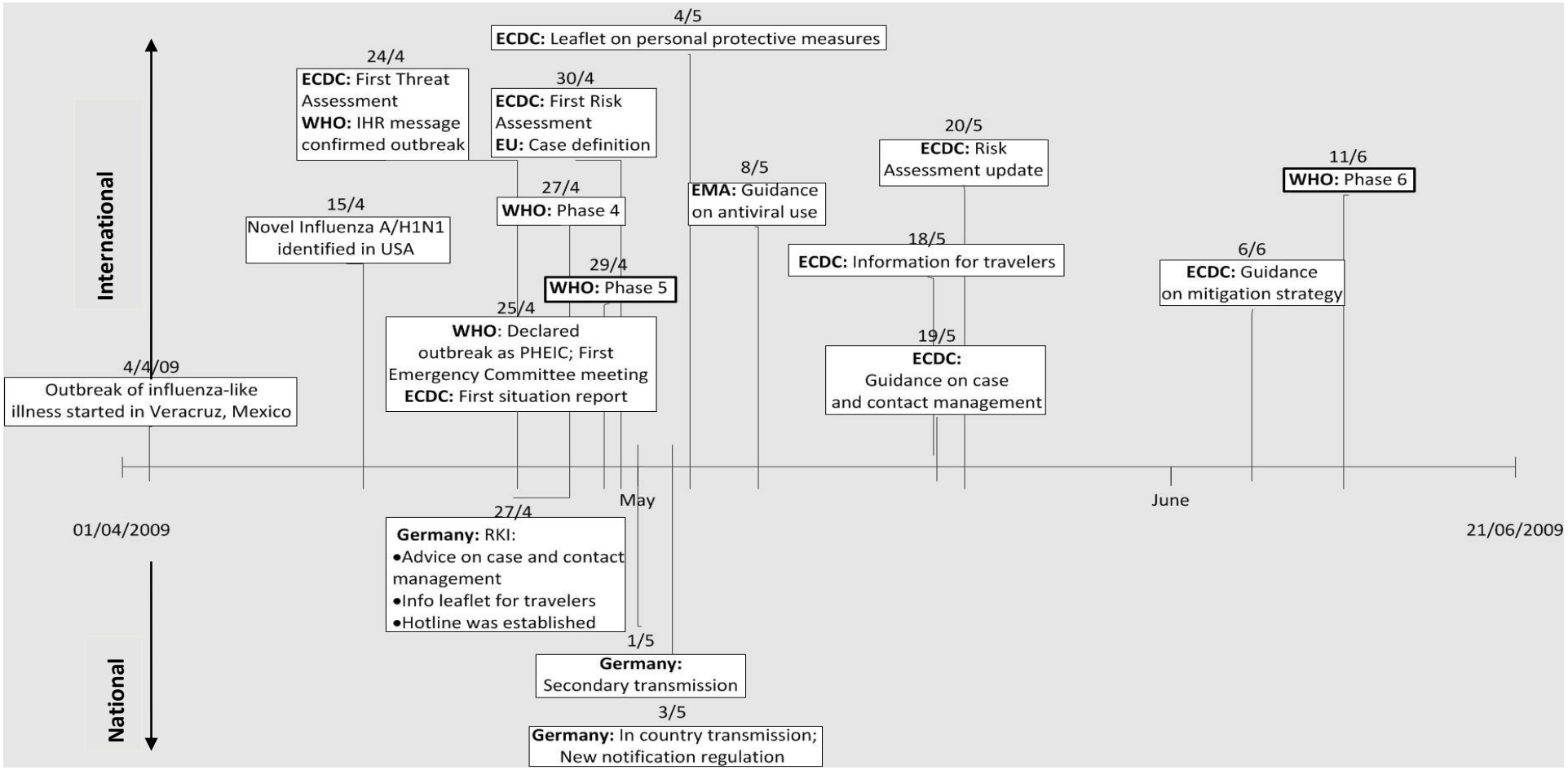


Figure 16: Chronological overview of national and international events in the Germany for time period 1 (01/04/2009 to 21/06/2009)

Situation

The pandemic started in Veracruz, Mexico where an outbreak of influenza-like illness was recorded in early April 2009 (European Centre for Disease Prevention and Control, 2010a). A few days later several parts of Mexico reported further outbreaks of influenza-like illness. Analysis of samples detected an Influenza A virus but it was not possible to identify the subtype (World Health Organization, 2011). In mid-April, the US Centers for Disease Control and Prevention (CDC) analyzed a sample from two children with respiratory illness in southern California, USA and identified the virus as a swine influenza A/H1N1 virus (Centers for Disease Control and Prevention, 2009). On 24 April WHO reported that virus isolates from Mexican patients were genetically identical to the new strain of swine influenza A/H1N1 virus discovered in California (World Health Organization, 2009b). On the same day ECDC published its first Threat Assessment saying that although the public health situation was still limited to Mexico and the US further vigilance was required in Europe to ensure the identification of the new virus (European Centre for Disease Prevention and Control, 2009d).

One day later, on 25 April 2009, the first WHO Emergency Committee meeting was held. International experts came together to assess the situation in Mexico and the US and to advice the WHO Director-General, Dr. Margaret Chan, on response measures. The Committee reported more information on the clinical presentation, epidemiology and virology of cases was needed, but concluded that the situation was of international concern. Thus, Dr. Margret Chan declared the outbreak in Mexico and the US as a public health emergency of international concern (PHEIC) under International Health Regulations (2005) and advised all countries to intensify surveillance for influenza-like illness and respiratory disease (World Health Organization, 2009c).

On the same day, the ECDC started to publish daily situation reports in which the current epidemiological situation was summarized. So far, 8 cases of pandemic A/H1N1 have been confirmed in the United States of America. In Mexico City 854 cases of pneumonia have been reported, including 59 deaths (European Centre for Disease Prevention and Control, 2009e).

Two days later, on 27 April, the first laboratory confirmed pandemic A/H1N1 cases have been reported in Europe, one in Spain and two in the UK (European Centre for Disease Prevention and Control, 2009f). Based on available data on confirmed pandemic A/H1N1 cases in Mexico, the USA, Canada, and reports on suspected cases in other countries, the WHO Director-General raised the level of influenza pandemic alert to phase 4 (World Health Organization, 2009d). While phase 3 is characterized by sporadic cases and limited human-to-human transmission of an influenza reassortant virus, phase 4 is defined by confirmed human-to-human transmission of an influenza reassortant virus capable to cause sustained outbreaks in a community (World Health Organization, 2012). The WHO Director-General, Dr. Margaret Chan, did not recommend any trade or travel restrictions and advised to center on mitigation measures as the containment of the outbreak was not considered to be feasible (World Health Organization, 2009d).

Two days later, on 29 April, the influenza pandemic alert was raised to phase 5 (World Health Organization, 2009e). This was a signal that a pandemic was coming up and human to human spread of the virus into at least two countries of one WHO region was evident, namely Mexico and USA (European Centre for Disease Prevention and Control, 2009h; World Health Organization, 2012).

In its first risk assessment, published on 30 April, the ECDC reported missing information and data to define the seriousness of the potential pandemic. So far, the majority of pandemic A/H1N1 cases experienced a mild disease and the case fatality rate was judged not to be different than for seasonal influenza (European Centre for Disease Prevention and Control, 2009g).

As of 30 April, 3 confirmed cases have been reported Germany. Shortly after, secondary transmission of the virus was notified in Germany (European Centre for Disease Prevention and Control, 2009i).

As of 12 May, Germany has reported 12 confirmed pandemic A/H1N1 cases (European Centre for Disease Prevention and Control, 2009l).

In its risk assessment update on 20 May, the ECDC again reported a continuing lack of data on parameters needed for right risk assessment. The ECDC considered available data and stated that the pandemic A/H1N1 infections have been generally mild in Europe. Now there

was more evidence that the virus was able to spread easily from one person to another and that it preferentially infected younger age groups. ECDC concluded that the spread of the pandemic A/H1N1 virus will continue (European Centre for Disease Prevention and Control, 2009p).

On 11 June, the WHO raised the level of influenza pandemic alert to phase 6, declaring a pandemic (World Health Organization, 2009h). The severity of the pandemic was considered to be moderate by the WHO (World Health Organization, 2009i).

As of 15 June, Germany has reported 127 confirmed pandemic A/H1N1 to the ECDC (European Centre for Disease Prevention and Control, 2009t).

Surveillance

On 30 April, the European Commission agreed on a common case definition for the European Union in order to detect cases of influenza caused by the new virus. This case definition is presented in Table 15 (see chapter 0).

To receive information on pandemic A/H1N1 infections at an early stage, a new notification regulation for physicians under § 6 IfSG came into force on 03.05.2009 saying that all suspected cases, confirmed cases and deaths from pandemic A/H1N1 virus have to be reported by name to the local health authorities (Bundesministerium der Justiz, 2009).

Control strategy and treatment of cases

Initially, Germany employed a containment strategy. Measures focused on limiting transmission of the virus or delaying the spread in order to gain time to apply effective response measures. This strategy included the following public health measures: those who met the clinical and epidemiological case definition were assessed through swabbing and laboratory testing; cases were treated with antivirals within 48 hours after onset of symptoms and requested to isolate at home or in hospital (depending on their clinical condition) for at least seven days. Contacts were additionally asked to self-isolate at home for seven days with restrictions on visits (Robert Koch-Institute, 2010a).

To avoid the introduction of the pandemic A/H1N1 virus through international air traffic, health authorities agreed that instead of meeting all flights from Mexico, suspected cases had to be notified by the pilot of the plane and were examined at the airport of destination

by medical teams. Contact details of passengers were collected and information leaflets about pandemic influenza were distributed (Marcic et al., 2010). The infection control measures at German airports were kept up until week 35/2009 (Robert Koch-Institute, 2010a).

School closures were not recommended as a means of reducing the spread of the virus (Robert Koch-Institute, 2010a).

Vaccination strategy

As the new virus first emerged in April 2009, it was not possible to adjust the 2009/2010 seasonal influenza vaccine to this new influenza A/H1N1 strain (Robert Koch-Institute, 2009c). The production of a pandemic-specific vaccine takes four to six months and can only be started when the new strain has been isolated (Hine, 2010).

At the time Germany started to develop their vaccination strategy, the severity and infectivity of the pandemic A/H1N1 virus was still uncertain. Thus, it was difficult to decide on the quantity of required vaccine (Marcic et al., 2010). Germany had advance-purchase agreement contracts with vaccine manufacturers in order to secure sufficient vaccine supply in the event of a pandemic. These contracts were a result of Germany's pre-pandemic planning and were activated with the announcement of pandemic influenza alert phase 6 (Marcic et al., 2010). The advance-purchase agreements in place included the assumption that enough vaccine for 100% of the population to have two doses would be needed (Marcic et al., 2010). Later, this assumption was revised downwards and only 50 million doses of pandemic vaccine were ordered (Feufel et al., 2010).

Communication

In order to give a better overview, the information published during time period 1 is grouped around the themes: personal protective measures, treatment of cases and control strategy.

<u>Personal protective measures:</u>

In Germany, the Robert Koch-Institute (RKI) and the Federal Centre for Health Education (BZgA) had already launched the information campaign "Wir gegen Viren" in March 2009, before pandemic A/H1N1 infections occurred in Germany. This campaign aimed to convey

basic knowledge on hygiene and personal protective measures to the public in order to prevent viral infections. To disseminate the information, the RKI and BZgA developed posters, leaflets, sticker and a TV spot on hand washing (Robert Koch-Institute & Bundeszentrale für gesundheitliche Aufklärung, 2009). During the pandemic, these media were then refined and adjusted to the pandemic A/H1N1 influenza (Martin, 2010).

On 27 April, German health authority staff at airports started to distribute information leaflets in four different languages to travelers from affected countries. The leaflets informed on pandemic A/H1N1 symptoms and advised travelers to seek medical care in case of onset of symptoms. On the same day, the RKI set up an information hotline to provide a response to inquiries from citizens (Robert Koch-Institute, 2010a).

In addition to the public information and advice on national level, the ECDC provided information on European level. On 27 April, the ECDC published the first general questions and answers on pandemic A/H1N1 virus (European Centre for Disease Prevention and Control, 2010a). In May, the ECDC published two documents on personal protective measures and information for travelers. The documents described personal protective measures to reduce the risk of acquiring influenza, i.e. regular hand washing, respiratory hygiene, avoidance of close contacts and mass gatherings (European Centre for Disease Prevention and Control, 2009k, 2009m, 2009n).

Treatment of cases:

The use of antivirals in some groups involves particularities health professionals should know. Thus, on 8 May, the European Medicines Agency (EMA) published a guidance document on the use of the antiviral medicine Tamiflu in children under one year of age and the antivirals Tamiflu and Relenza in pregnant and breastfeeding women in the case of an influenza A/H1N1 pandemic. The EMA stated that in the event of a pandemic Tamiflu can be used to treat children under the age of one and both antivirals can be used to treat pregnant women, as the benefits of their use outweigh their risks (European Medicines Agency, 2009a).

Control strategy:

On 19 May, the ECDC published a guidance document on case and contact management. The recommended measures did not differ from the measures already applied in Germany, Spain and the UK (European Centre for Disease Prevention and Control, 2009o).

On 6 June, the ECDC published a guidance document on mitigation and containment strategies for national health authorities. ECDC stated that many public health measures are common in both strategies and the implementation of a mitigation strategy would mainly mean to move away from vigorous case finding and contact tracing. Further, the ECDC acknowledged that a containment strategy is very resource-intensive and therefore not a recommended infection control strategy for human influenza beyond pandemic alert phase 4 (European Centre for Disease Prevention and Control, 2009r).

Time period 2

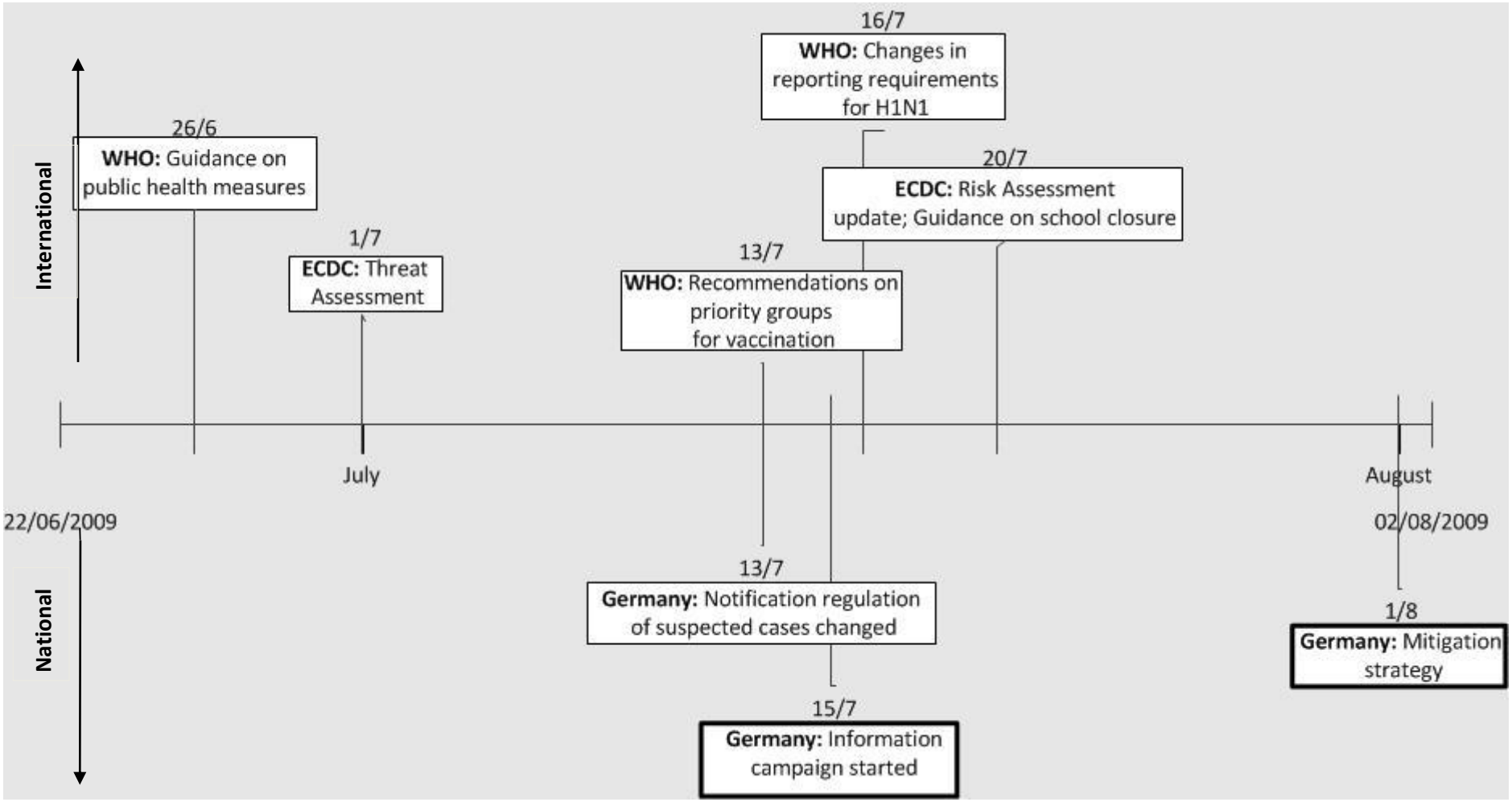


Figure 17: Chronological overview of national and international events in the Germany for time period 2 (22/06/2009 to 02/08/2009)

Situation

The numbers of confirmed pandemic A/H1N1 cases increased constantly. By the end of June, Germany has reported 429 confirmed cases. Numbers of confirmed cases continued to rise until early August.

In its Threat Assessment, published on 1 July, the ECDC announced the first isolation of an oseltamivir (also known as Tamiflu®) resistant mutant A/H1N1 virus in Denmark. The virus was not a reassortant virus and was still susceptible to zanamivir (also known as Relenza®). There was no evidence that the virus has been transmitted to other persons. ECDC stated that this phenomenon is well-known in influenza viruses and emphasized the need for continued surveillance of this problem (European Centre for Disease Prevention and Control, 2009u).

According to an ECDC risk assessment published on 20 July, 20-30% of the population was expected to be affected over the first major wave of the pandemic. Clinical attack rates were expected to be highest in children and young adults. The estimate for hospitalization rates in Europe was 1-2% and the case fatality rate was estimated to be 0.1-0.2% of all clinical cases. ECDC stated that most cases experienced a mild and self-limiting illness, but people with chronic underlying medical conditions, pregnant women and young children were at higher risk of experiencing severe disease and deaths (European Centre for Disease Prevention and Control, 2009w).

Surveillance

On 13 July, the surveillance strategy in Germany was modified. From week 29/2009 onwards regional health authorities were no longer required to submit reports on suspected cases to the state health authorities or to the Robert Koch-Institute (Robert Koch-Institute, 2010a).

On 16 July, the WHO announced that countries with community-wide transmission are no longer required to forward regular reports of individual confirmed cases to the WHO, as the

detection, laboratory-confirmation and investigation of all cases is extremely resource-intensive and not sustainable for these countries (World Health Organization, 2009k).

Control strategy and treatment of cases

In early August 2009, Germany has changed its response strategy and moved to a mitigation strategy. The new strategy focused on risk groups and included the following changes: Contact-tracing was ceased, isolation was recommended for cases with contact to vulnerable persons only, antivirals were only given to cases in at-risk groups with signs of developing severe illness, case-based reporting requirements were relaxed and in late August infection control measures at airports were reduced (Robert Koch-Institute, 2010a).

Vaccination strategy

As initial supplies of pandemic vaccine were limited, the WHO Strategic Advisory Group of Experts (SAGE) on Immunization recommended that the following groups should be prioritized for vaccination: health-care workers; pregnant women; individuals aged above six months with a chronic medical condition; healthy individuals aged between 15 years and up to 49 years; healthy children; healthy individuals aged between 50 years and up to 64 years; and healthy individuals aged 65 years or above. The order of priority should be based on country-specific conditions (World Health Organization, 2009j).

Communication

In order to give a better overview, the information published during time period 2 is grouped around the themes: control strategy, personal protective measures and non-pharmaceutical response measures.

Control strategy:

On 26 June, the WHO published a guidance document on public health measures to help countries manage the A/H1N1 pandemic. Besides giving general advice on response measures, the WHO provided additional advice for countries with widespread community-level transmission, for countries with no reported cases and for countries in transition. The WHO advised all countries to concentrate on mitigation measures, to prepare the health-care

system for a high volume of patients and to ensure antiviral medicine and vaccine supply. In addition, countries with widespread community-level transmission were advised to cease laboratory-testing of all cases, to reduce the pressure on the health-care system, to primarily focus on the treatment of ill patients, and to consider school closures or the cancellation of mass gathering on a case-by-case basis. Countries with no reported cases were advised that they may consider entry screening at airports and contact tracing, but that these measures are resource intensive and of limited benefit to prevent the spread of the disease. Countries in transition were advised to start the same control measures as countries with widespread community-level transmission (World Health Organization, 2009a).

Personal protective measures:

On 15 July, Germany started its A/H1N1 pandemic information campaign by publishing an information leaflet on personal protective measures in 11 languages (Die Beauftragte der Bundesregierung für Migration, Flüchtlinge und Integration, 2009). In addition, the Federal Centre for Health Education (BZgA) provided information to the public on modes of transmission, symptoms of an A/H1N1 infection and on general hygiene measures to prevent the spread of the virus (Bundeszentrale für gesundheitliche Aufklärung, 2009a). Further, the Robert Koch-Institute developed a document that aimed to inform the public about the influenza viruses and a pandemic in general, about modes of transmission of influenza viruses and about personal protective measures to prevent an influenza infection (Robert Koch-Institute, 2009i).

Non-pharmaceutical response measures:

On 20 July, the ECDC gave scientific advice on reactive and proactive school closures in Europe. ECDC highlighted that there is no consensus on the benefits from proactive school closures (school closure before transmission between the children occurs), but countries and schools were advised to at least have plans for reactive school closures (school closure when many children and/or staff are experiencing illness). These plans should consider the following issues: recommended length of time of closure; the triggers for re-opening; how to sustain teaching and learning; and potential problems that may arise for parents, if they have to take time off work (European Centre for Disease Prevention and Control, 2009x).

Time period 3

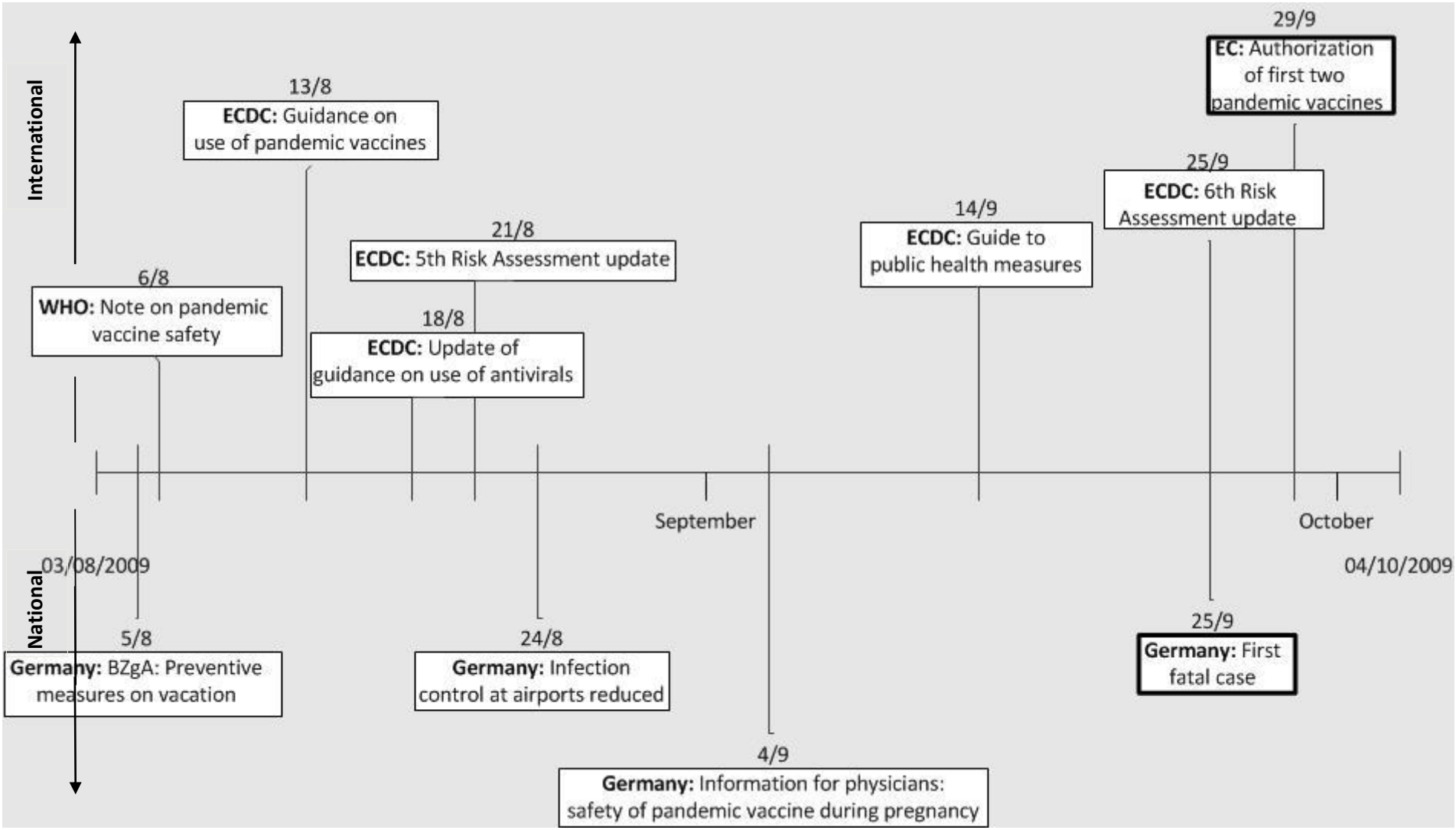


Figure 18: Chronological overview of national and international events in Germany for time period 3 (03/08/2009 to 04/10/2009)

Situation

As of 4 August, Germany has reported 7177 confirmed cases to the ECDC (European Centre for Disease Prevention and Control, 2009aa). The virus continued to spread in the county, but at a low level over the summer. On 25 September, Germany reported the first fatal case from pandemic A/H1N1 infection (Robert Koch-Institute, 2009j).

On 21 August, the ECDC published its planning assumptions for the first major wave of infection, which was expected to take place in the autumn and winter of 2009/2010. However, these planning assumptions did not differ from those published on 20 July (European Centre for Disease Prevention and Control, 2009ab).

In late September, the ECDC has reduced its planning assumption. This decision was based on experience from Southern Hemisphere countries. It became more apparent that most pandemic A/H1N1 cases experienced a mild disease; therefore hospitalization and case fatality rates were revised downwards (European Centre for Disease Prevention and Control, 2009ad).

Surveillance

No surveillance strategy modifications were introduced.

Control strategy and treatment of cases

In week 35/2009 infection control measures at German airports were reduced (Robert Koch-Institute, 2010a).

Vaccination Strategy

On 29 September, the European Commission authorized the first two pandemic vaccines Focetria® (Novartis) and Pandemrix® (GlaxoSmithKline) for use in all Member States of the European Union and in Iceland, Liechtenstein and Norway (European Commission, 2009b).

Communication

During time period 3 a lot of information and guidance has been issued. In order to give a better overview, the publications are grouped around the themes: personal protective measures, non-pharmaceutical response measures, treatment of cases and vaccination.

Personal protective measures:

During the summer holiday season Germany observed importations of the pandemic A/H1N1 virus from affected countries, especially from Spain. Thus, in early August the Federal Centre for Health Education (BZgA) in Germany issued a press release on personal protective measures on vacation to remind holiday-maker of performing the recommended hygiene measures even on holiday (i.e. avoidance of close contacts with sick people, frequently hand washing, good respiratory hygiene, self-isolation of sick people) (Bundeszentrale für gesundheitliche Aufklärung, 2009b).

Non-pharmaceutical response measures:

In mid-September, the ECDC published a document on public health measures for policy and decision-makers (European Centre for Disease Prevention and Control, 2010a). It provided scientific information on measures that may be applied to reduce the impact of influenza pandemics (i.e. border closures, entry restrictions, personal protective measures, social distancing measures, use of antivirals and vaccines) and aimed to help EU countries to decide on appropriate response measures (European Centre for Disease Prevention and Control, 2009a).

On 23 September, the WHO Emergency Committee held its 5th meeting and agreed on continuing the following recommendations proposed by the WHO Director-General:

- borders should not be closed and travel and trade should not be restricted,
- countries should intensify surveillance of unusual events and
- people who are ill should postpone international travel (World Health Organization, 2009n).

Treatment of cases:

On 18 August, the ECDC published general guidance on the use of antivirals during influenza pandemics. The document aimed to inform those deciding on antiviral use strategies about the effectiveness of antivirals, side effects of antivirals, priority groups for antiviral use and about necessary arrangements for antiviral delivery and administration (European Centre for Disease Prevention and Control, 2009y).

Vaccination:

Referring to media reports that have displayed concern about the safety of pandemic vaccine, the WHO has issued a note on pandemic vaccine safety on 6 August. In this statement the WHO outlined the procedures for approval and licensing of vaccines and confirmed that these procedures are strict and do include safety and quality controls. The WHO also stated that the data on influenza vaccine safety collected during the last 60 years do not show a special safety issue. Nonetheless, the WHO advised countries to closely monitor the safety and efficacy of the pandemic vaccine, as rare adverse events may only come to light when large numbers of people got vaccinated (World Health Organization, 2009l).

On 13 August, the ECDC published a document on the use of influenza pandemic vaccines during the 2009 A/H1N1 pandemic. The document aimed to inform those deciding on vaccination policies in the European countries on vaccine use and options for prioritization in order to maximize the benefit of available vaccine (European Centre for Disease Prevention and Control, 2009z).

On 4 September, the German Paul-Ehrlich-Institute issued information for physicians and pharmacists on the safety of pandemic vaccines during pregnancy. The Paul-Ehrlich-Institute considered existing scientific evidence and concluded that the pandemic A/H1N1 vaccines do not pose a risk to pregnant women. However, the Paul-Ehrlich-Institute stated that this conclusion did not involve the recommendation of vaccinating all pregnant women at this point; and recommended to only vaccinate pregnant women if the potential benefits of the vaccine outweigh its potential risks (Paul-Ehrlich-Institute, 2009).

Time period 4

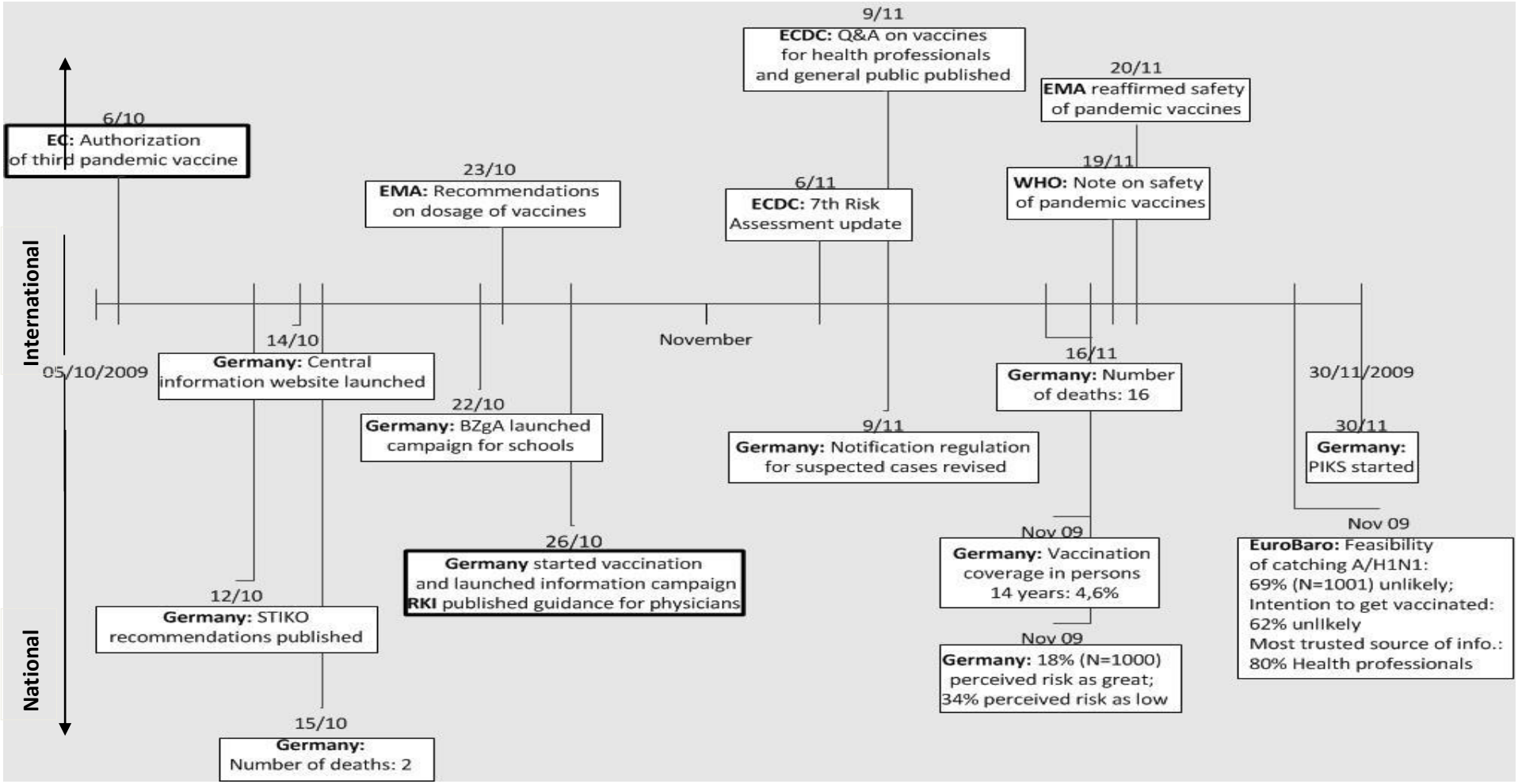


Figure 19: Chronological overview of national and international events in Germany for time period 4 (05/10/2009 to 30/11/2009)

Situation

In early autumn, the numbers of pandemic A/H1N1 infections in Germany have started to increase again, indicating the beginning of the expected autumn/winter wave. The second wave reached its peak in week 47/2009 (Buda et al., 2010).

On 16 November, Germany has reported 16 deaths due to pandemic A/H1N1 (European Centre for Disease Prevention and Control, 2009ah).

As more information on the pandemic A/H1N1 virus became available showing that it remains relatively mild for most people and suggesting that the second peak may not be as high as actually thought, ECDC has revised its planning assumptions. In its 7th risk assessment issued on 6 November the following EU reasonable worst case planning assumptions for the first year up to mid-May 2010 were published: clinical attack rate: up to 20% of population, hospitalization rate: up to 100 per 100.000 population and case fatality rate: up to 3 per 100.000 population (European Centre for Disease Prevention and Control, 2009ag).

To monitor pandemic influenza A/H1N1 vaccine uptake during the vaccination campaign in Germany, thirteen telephone-surveys were performed between November 2009 and April 2010. According to these surveys, the vaccination coverage in persons ≥ 14 years of age was 4,6% (N=1000) in week 47 and 6% in week 49 (Walter et al.., 2011).

The aforementioned 13 surveys were also monitoring knowledge, attitude and behavior concerning pandemic influenza infection and vaccination against pandemic influenza. During the peak of the pandemic, only 18% (N=1000) of participants perceived risk due to swine flu as great or partially great; 34% stated their perception of risk was low (Walter et al.., 2011, 2012)

In late November, the Gallup Organization conducted a survey called the Eurobarometer in the 27 EU Member States, as well as in Norway, Switzerland and Iceland to examine public opinion about influenza and pandemic A/H1N1. 69% (N=1001) believed it was unlikely or rather unlikely that they would personally catch the A/H1N1influenza. Furthermore, 62%

stated that is was not likely or not likely at all that they would get vaccinated against the pandemic A/H1N1 virus. Health professionals were the most trusted source to inform about pandemic A/H1N1. 80% mentioned that they trust health professionals mostly or completely (The Gallup Organization, 2010).

Surveillance

In view of increasing numbers of A/H1N1 infections, the German surveillance strategy was modified. From week 46/2009 onwards only laboratory confirmed cases and deaths relating to a pandemic A/H1N1 infection had to be reported to the RKI (Buda et al., 2010). To reduce the reporting effort for local health authorities, it was possible to only forward weekly aggregated case numbers to state health authorities and the RKI. In addition, laboratory testing was only recommended and reimbursed for cases with a high risk of developing severe disease, in order to ensure laboratory capacity and to reduce costs (Robert Koch-Institute, 2010a). In order to gather information on hospitalizations and deaths due to pandemic A/H1N1 infections, the RKI set up the Pandemic Influenza A/H1N1 Hospital Surveillance System (Pandemische Influenza A(H1N1) Krankenhaus Surveillance; PIKS). From week 49/2009 onwards all hospitals were able to forward weekly aggregated numbers of hospital admission and deaths relating to a pandemic A/H1N1 infection to the RKI on a voluntary basis (Buda et al., 2010).

Control strategy and treatment of cases

During time period 4, no control strategy modifications have been implemented.

Vaccination strategy

On 6 October, the European Commission authorized a third pandemic vaccine, Celvapan®, for use in all EU Member States, Iceland, Lichtenstein and Norway (European Commission, 2009c).

On 12 October, the Robert Koch-Institute published the priority groups for vaccination recommended by the German Committee on Vaccination (Ständige Impfkommission; STIKO). According to the STIKO, three groups were identified that should be prioritized for vaccination in the following order: front-line health and social care workers; individuals

aged six months and above in a clinical at-risk group; and pregnant women. Clinical at-risk groups were considered to be the same as in the UK. The Robert Koch-Institute and Paul-Ehrlich-Institute recommended a one dose schedule for Pandemrix® for those aged 10 and up to 60 years. Individuals above 60 years of age should receive two doses and children aged below ten and over six months two half adult doses of Pandemrix® (Robert Koch-Institute, 2009c).

While the Robert Koch-Institute and the Paul-Ehrlich-Institute considered a one dose schedule for Pandemrix® to be sufficient for those aged 10 years and above, the European Medicines Agency (EMA) recommended a two dose schedule for all three authorized vaccines (European Medicines Agency, 2009b).

The German vaccination program started on 26 October (Bundesministerium für Gesundheit, 2009).

Communication

Same as during time period 3 a lot of information and guidance has been issued during time period 4. In order to give a better overview the publications are again grouped around the themes: personal protective measures, non-pharmaceutical response measures, treatment of cases and vaccination.

Personal protective measures:

Before the start of the vaccination program the Federal Ministry of Health in Germany has revised its offer of information. In order to provide solid information for the general public and for health professionals, the Federal Ministry of Health, together with the Robert Koch-Institute, the Federal Centre for Health Education and the Paul-Ehrlich-Institute, launched the central information website www.neuegrippe.bund.de (Bundesministerium für Gesundheit, 2009). This website provided information on the pandemic A/H1N1 virus, personal protective measures and the pandemic vaccine.

In late October, the Federal Centre for Health Education developed a media package on hygiene practices for schools and kindergartens, called “schütz ich mich-schütz ich dich”. Posters, stickers and leaflets aimed to inform children and adolescents on proper hand and respiratory hygiene. The materials were produced in two different designs to ensure age-

appropriate speech of children and adolescents (Bundeszentrale für gesundheitliche Aufklärung, 2009c).

Non-pharmaceutical response measures:

Due to increasing numbers of pandemic A/H1N1 cases, the Robert Koch-Institute received many queries regarding the effectiveness of school closures as a means to contain the spread of the virus. Thus, on 16 November, the RKI published a brief overview on aspects of reactive and proactive school closures and stated that with respect to the current epidemiological situation proactive school closures were not recommended. Further, the RKI stated that decisions on reactive school closures should depend on the epidemiological situation but an effect on the progress of the pandemic wave cannot be expected from reactive school closures (Robert Koch-Institute, 2009e).

On 26 November, the WHO Emergency Committee held its 6th meeting and agreed that delaying international travel was no longer recommended for ill persons, because pandemic A/H1N1 infections were already widespread (World Health Organization, 2009p).

Treatment of cases:

In late October, the RKI published a guidance document for physicians. This document contained information on the epidemiological and clinical characteristics of the pandemic A/H1N1 virus, the antiviral treatment, the vaccination, the notification regulations, and preventive and control measures (Robert Koch-Institute, 2009a).

Vaccination:

Together with the start of the vaccination program, the public information campaign was launched in Germany. Information and advice was accessible on government websites and made available to the general public through leaflets (Bundesministerium für Gesundheit et al.., 2009e; Department of Health, 2009n; Ministerio de Sanidad y Politica Social, 2009l). In addition to the mainstream public information, the Federal Ministry of Health in Germany published tailored information for specific target groups (i.e. people with chronic underlying conditions; health professionals; pregnant women; and fire fighters and policemen) (Bundesministerium für Gesundheit et al., 2009a, 2009b, 2009c, 2009d). Furthermore,

clinical professional briefs on pandemic vaccination were published (Robert Koch-Institute & Paul-Ehrlich-Institute, 2009).

On European level, information on vaccination was provided by the ECDC. In November the ECDC published questions and answers on vaccines for health professionals and for the general public on its website (European Centre for Disease Prevention and Control, 2009b, 2009c, 2010a).

On 19 November, the WHO issued a briefing note on pandemic vaccines in which the safety of the vaccines was reaffirmed (World Health Organization, 2009o). The European Medicines Agency (EMA) did hold the same opinion. In a press release published on 20 November, the EMA reasserted the efficacy and safety of pandemic vaccines. Further, the EMA revised its advice on vaccine schedules and published the following recommendations: Pandemrix® and Focetria® may be used as a single dose in adults (18-60 years) and in children and adolescents (Focetria®: from the age of 9 years; Pandemrix®: from the age of 10 years). Individuals aged over 60 years may also receive one dose of Pandemrix®, but younger children and immunocompromised people should receive two doses (European Medicines Agency, 2009c).

Time period 5

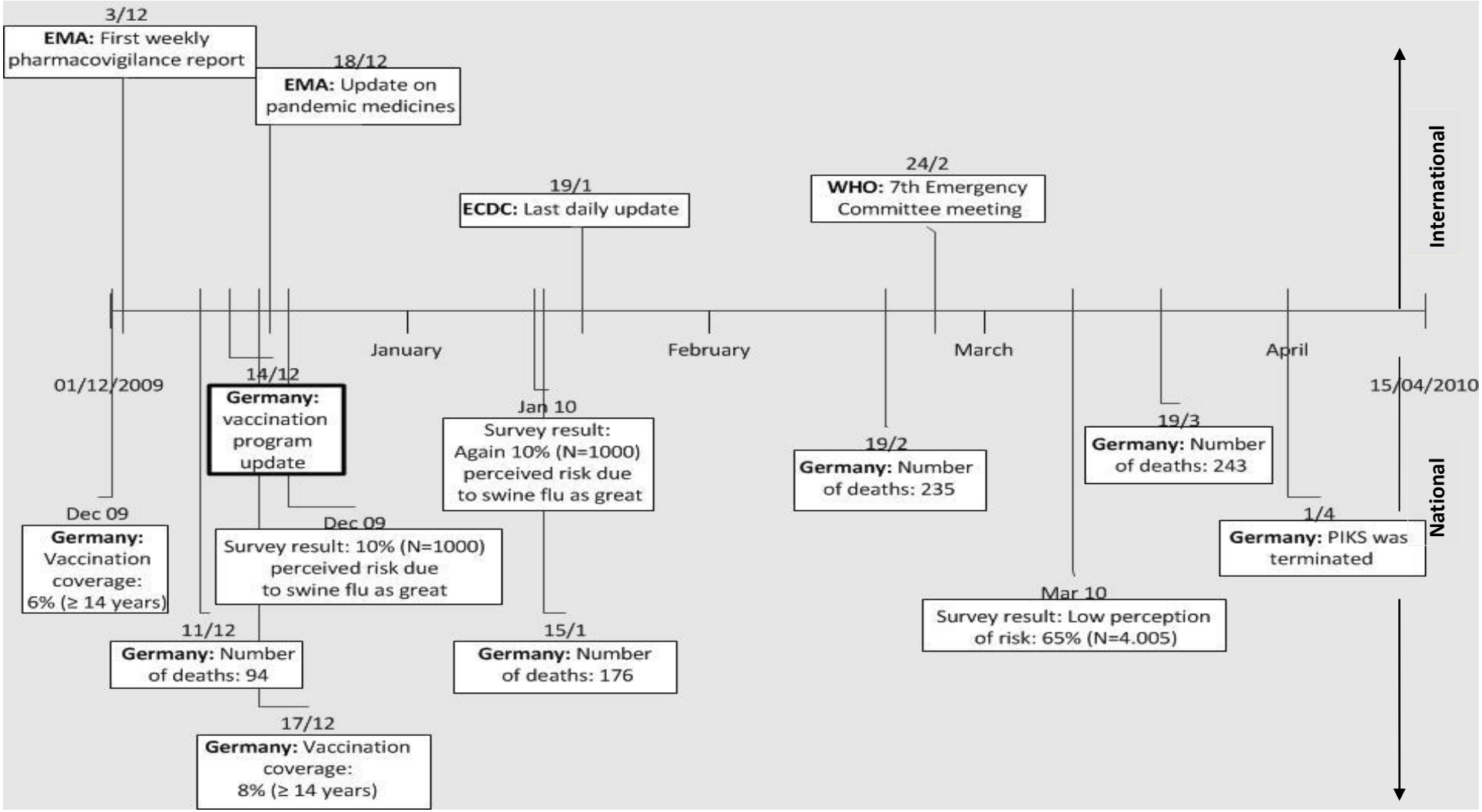


Figure 20: Chronological overview of national and international events in Germany for time period 5 (01/12/2009 to 15/04/2010)

Situation

The number of pandemic A/H1N1 infections decreased constantly in Germany. On 11 December, Germany has reported 94 deaths due to pandemic A/H1N1 (European Centre for Disease Prevention and Control, 2009ak).

According to the survey monitoring vaccine uptake during the vaccination campaign in Germany, the vaccination coverage in persons ≥ 14 years of age was 8% (N=1000) in week 51/2009 (Walter et al.., 2011).

Furthermore, only 10% (N=1000) of participants perceived risk due to swine flu as great or partially great (Walter et al.., 2011, 2012).

The end of the autumn wave was in early January 2010. Afterwards only sporadic cases have been reported (Buda et al., 2010). However, the number of reported deaths increased from 176 in Mid-January to 235 in Mid-February (European Centre for Disease Prevention and Control, 2010c,d).

In February 2010, evidence showed decreasing or low pandemic A/H1N1 activity in many countries, but the WHO Emergency Committee agreed that it was too early to conclude that the pandemic A/H1N1 virus has run its course. Thus, the pandemic influenza alert phase was not changed (World Health Organization, 2010a). On 10 August 2010, the WHO Emergency Committee assessed the global situation again. This time the Committee concluded that the world was entering the post-pandemic period (World Health Organization, 2010c).

By the end of the pandemic, Germany has reported 225.729 cases and 250 deaths of pandemic A/H1N1 virus (Buda et al., 2010).

Surveillance

No surveillance strategy modifications were introduced.

Control strategy and treatment of cases

No control strategy modifications were introduced.

Vaccination strategy

So far, in Germany the Committee on Vaccination (Ständige Impfkommission; STIKO) recommended to offer pandemic vaccines to the following groups: front-line health and social care workers, individuals aged six months and above in a clinical at-risk group and pregnant women. Based on new data suggesting that young children and adolescents have an increased risk of contracting the pandemic A/H1N1 virus and of developing severe disease from the virus, the German Committee on Vaccination extended its recommendations on priority groups for vaccination. This update was published on 14 December and included the following changes: After vaccination of the three identified priority groups, vaccine should also be offered to household contacts of people in at-risk groups, all children and adolescents aged between 6 months and 24 years, all adults aged between 25 and 59 years, and all individuals aged 60 years and over (Robert Koch-Institute, 2009f). In addition to the updated recommendations on priority groups for vaccination by the German Committee on Vaccination, the Robert Koch-Institute (RKI) and Paul-Ehrlich-Institute (PEI) updated their recommendations on vaccine dosage. So far, the RKI and PEI recommended a one dose schedule for Pandemrix® for those aged 10 and up to 60 years. Individuals above 60 years of age should receive two doses and children aged below ten and over six months two half adult doses of Pandemrix® (Robert Koch-Institute, 2009c). Now, on the basis of available data on the pandemic vaccine Pandemrix®, the RKI and PEI recommended a one dose schedule for those aged 10 and above and one half adult dose schedule for children aged between 6 months and 9 years (Robert Koch-Institute, 2009g).

Communication

During time period 5, only little information and guidance has been published. Thus, the information and guidance is only grouped around the theme: vaccination.

<u>Vaccination:</u>

Between December 2009 and August 2010, the European Medicines Agency (EMA) published regular updates on safety monitoring of vaccines and medicines used during the pandemic (European Medicines Agency, 2010). In its update on pandemic medicines of 18

December, the EMA reaffirmed that the available data on the three pandemic vaccines and Tamiflu® showed no unexpected serious safety issues (European Medicines Agency, 2010).

UK

Time period 1

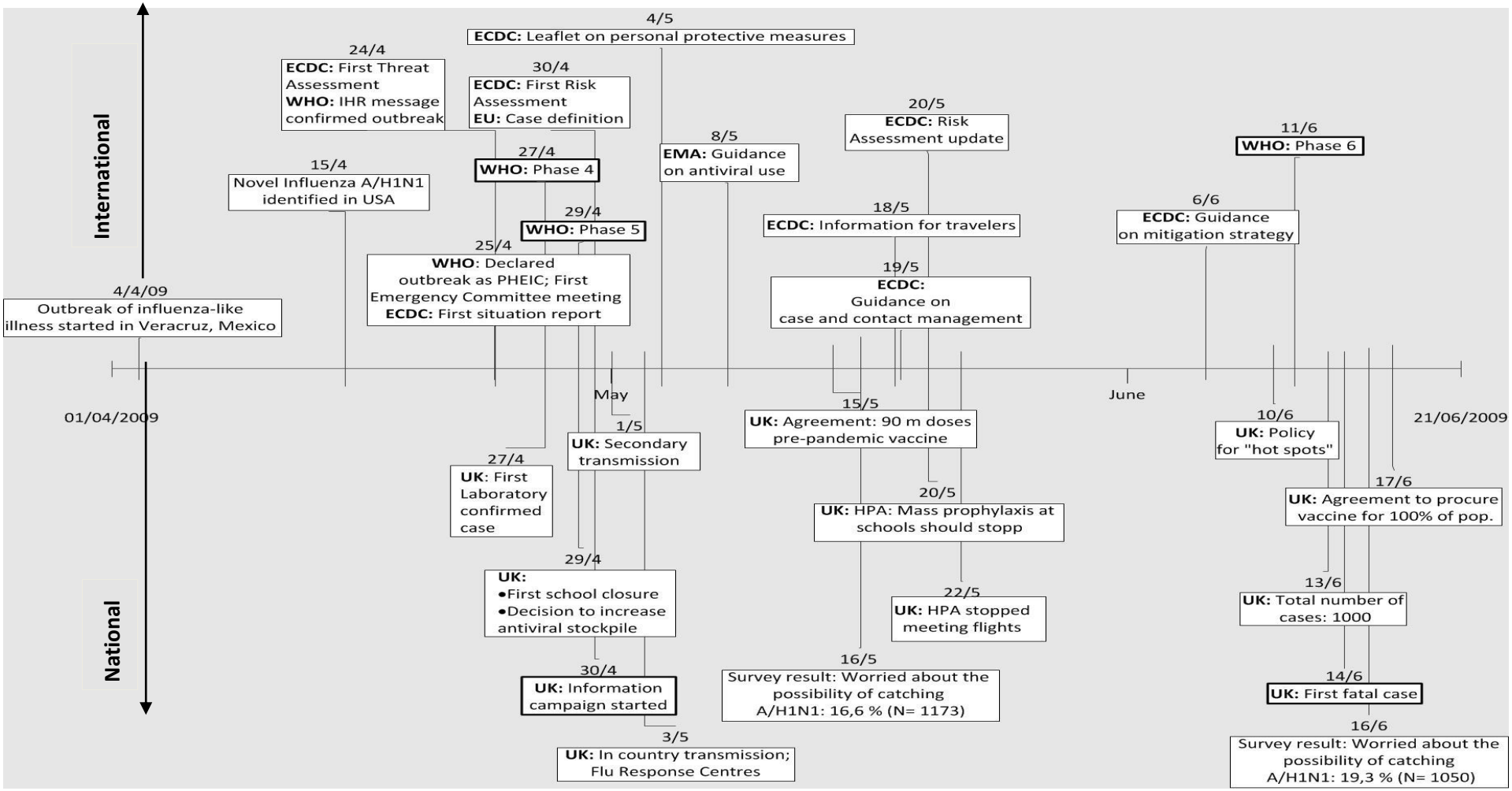


Figure 21: Chronological overview of national and international events in the UK for time period 1 (01/04/2009 to 21/06/2009)

Situation

The pandemic started in Veracruz, Mexico where an outbreak of influenza-like illness was recorded in early April 2009 (European Centre for Disease Prevention and Control, 2010a). A few days later several parts of Mexico reported further outbreaks of influenza-like illness. Analysis of samples detected an Influenza A virus but it was not possible to identify the subtype (World Health Organization, 2011). In mid-April, the US Centers for Disease Control and Prevention (CDC) analyzed a sample from two children with respiratory illness in southern California, USA and identified the virus as a swine influenza A/H1N1 virus (Centers for Disease Control and Prevention, 2009). On 24 April WHO reported that virus isolates from Mexican patients were genetically identical to the new strain of swine influenza A/H1N1 virus discovered in California (World Health Organization, 2009b). On the same day ECDC published its first Threat Assessment saying that although the public health situation was still limited to Mexico and the US further vigilance was required in Europe to ensure the identification of the new virus (European Centre for Disease Prevention and Control, 2009d).

One day later, on 25 April 2009, the first WHO Emergency Committee meeting was held. International experts came together to assess the situation in Mexico and the US and to advice the WHO Director-General, Dr. Margaret Chan, on response measures. The Committee reported more information on the clinical presentation, epidemiology and virology of cases was needed, but concluded that the situation was of international concern. Thus, Dr. Margret Chan declared the outbreak in Mexico and the US as a public health emergency of international concern (PHEIC) under International Health Regulations (2005) and advised all countries to intensify surveillance for influenza-like illness and respiratory disease (World Health Organization, 2009c).

On the same day, the ECDC started to publish daily situation reports in which the current epidemiological situation was summarized. So far, 8 cases of pandemic A/H1N1 have been confirmed in the United States of America. In Mexico City 854 cases of pneumonia have been reported, including 59 deaths (European Centre for Disease Prevention and Control, 2009e).

Two days later, on 27 April, the first two laboratory confirmed pandemic A/H1N1 cases have been reported in the UK (European Centre for Disease Prevention and Control, 2009f). Based on available data on confirmed pandemic A/H1N1 cases in Mexico, the USA, Canada, and reports on suspected cases in other countries, the WHO Director-General raised the level of influenza pandemic alert to phase 4 (World Health Organization, 2009d). While phase 3 is characterized by sporadic cases and limited human-to-human transmission of an influenza reassortant virus, phase 4 is defined by confirmed human-to-human transmission of an influenza reassortant virus capable to cause sustained outbreaks in a community (World Health Organization, 2012). The WHO Director-General, Dr. Margaret Chan, did not recommend any trade or travel restrictions and advised to center on mitigation measures as the containment of the outbreak was not considered to be feasible (World Health Organization, 2009d).

Two days later, on 29 April, the influenza pandemic alert was raised to phase 5 (World Health Organization, 2009e). This was a signal that a pandemic was coming up and human to human spread of the virus into at least two countries of one WHO region was evident, namely Mexico and USA (European Centre for Disease Prevention and Control, 2009h; World Health Organization, 2012).

In its first risk assessment, published on 30 April, the ECDC reported missing information and data to define the seriousness of the potential pandemic. So far, the majority of pandemic A/H1N1 cases experienced a mild disease and the case fatality rate was judged not to be different than for seasonal influenza (European Centre for Disease Prevention and Control, 2009g).

As of 30 April, 5 confirmed cases have been reported in the UK. Shortly after, secondary transmission of the virus was also notified in the UK (European Centre for Disease Prevention and Control, 2009i).

As of 12 May, the UK has reported 65 confirmed pandemic A/H1N1 cases (European Centre for Disease Prevention and Control, 2009l). At the start of the Sixty-second World Health Assembly on 18 May, members shared their experiences with the current outbreak of pandemic influenza A/H1N1. Altogether, 40 countries have reported 8829 confirmed cases of pandemic A/H1N1. 97, 9% of the total number of cases was reported by six countries: the

USA (4714 cases), Mexico (3103 cases), Canada (496 cases), Japan (125 cases), Spain (103 cases)[8] and the UK (101) (World Health Organization, 2009f).

In its risk assessment update on 20 May, the ECDC again reported a continuing lack of data on parameters needed for right risk assessment. The ECDC considered available data and stated that the pandemic A/H1N1 infections have been generally mild in Europe. Now there was more evidence that the virus was able to spread easily from one person to another and that it preferentially infected younger age groups. ECDC concluded that the spread of the pandemic A/H1N1 virus will continue (European Centre for Disease Prevention and Control, 2009p).

On 11 June, the WHO raised the level of influenza pandemic alert to phase 6, declaring a pandemic (World Health Organization, 2009h). The severity of the pandemic was considered to be moderate by the WHO (World Health Organization, 2009i).

As of 15 June, the UK has reported 1320 confirmed pandemic A/H1N1 to the ECDC. Additionally, the first fatal case in Europe was reported in Scotland (European Centre for Disease Prevention and Control, 2009t).

To monitor public risk perception in relation to the pandemic A/H1N1 outbreak, 36 telephone surveys were conducted on weekly intervals across the UK between 1 May 2009 and 10 January 2010. The results in Mid-May showed that only 16,6% (N=1173) of interviewees stated to be very or fairly worried about the possibility of catching pandemic A/H1N1. Along with the growing number of reported pandemic A/H1N1 cases, the percentage of worried persons increased as well. By Mid of June, 19,3% (N=1050) of interviewees stated to be very or fairly worried about the possibility of catching pandemic A/H1N1 (Rubin et al.., 2010).

[8] Please note that the number of cases shown in Figure 6 differs from this number of cases. Figure 9 only shows data on confirmed cases from the SISS as the Spanish Ministry of Health and Social Policy (MHSP) stopped reporting total numbers of cases on 28 July 2009. Hereafter, the MHSP only reported incidence rates which were calculated from the SISS data (Ministerio de Sanidad y Politica Social, 2009c).

Surveillance

On 30 April, the European Commission agreed on a common case definition for the European Union in order to detect cases of influenza caused by the new virus. This case definition is presented in Table 15.

Table 15: EU case definition for pandemic A/H1N1 infection (European Commission, 2009a)

Clinical criteria: Any person with one of the following three: • fever > 38 °C AND signs and symptoms of acute respiratory infection, • pneumonia (severe respiratory illness), • death from an unexplained acute respiratory illness.
Laboratory criteria: At least one of the following tests: • RT-PCR, • viral culture (requiring BSL 3 facilities), • four-fold rise in novel influenza virus A/H1N1 specific neutralising antibodies (implies the need for paired sera, from acute phase illness and then at convalescent stage 10-14 days later minimum).
Epidemiological criteria: At least one of the following three in the seven days before disease onset: • a person who was a close contact to a confirmed case of novel influenza A/H1N1 virus infection while the case was ill, • a person who has travelled to an area where sustained human-to-human transmission of novel influenza A/H1N1 is documented, • a person working in a laboratory where samples of the novel influenza A/H1N1 virus are tested.
Case classification: A. *Case under investigation:* Any person meeting the clinical and epidemiological criteria. B. *Probable case:* Any person meeting the clinical AND epidemiological criteria AND with a laboratory result showing positive influenza A infection of an unsubtypable type. C. *Confirmed case:* Any person meeting the laboratory criteria for confirmation.

Control strategy and treatment of cases

Initially, the UK employed a containment strategy. Measures focused on limiting transmission of the virus or delaying the spread in order to gain time to apply effective response measures. This strategy included the following public health measures: those who met the clinical and epidemiological case definition were assessed through swabbing and laboratory testing; cases were treated with antivirals within 48 hours after onset of symptoms and requested to isolate at home or in hospital (depending on their clinical condition) for at least seven days; close contacts were traced and offered antiviral prophylaxis. Contacts were asked to self-isolate only if they developed symptoms (Health Protection Agency, 2010b).

To avoid the introduction of the pandemic A/H1N1 virus through international air traffic, the UK started to meet all direct flights from Mexico at an early stage. Medical teams checked passengers and crew members on clinical symptoms and distributed information leaflets about pandemic influenza. In addition, contact details of passengers were collected to be able to inform them if it turned out that a person with confirmed pandemic A/H1N1 infection was aboard the same flight (Hine, 2010).

Health protection authorities in the UK advised schools to close for one week in the event of a confirmed pandemic A/H1N1 case at school and antiviral prophylaxis was given to all close contacts. The first school closure in the UK was on 29 April. On the same day, Gordon Brown announced that in order to provide antivirals for 80% of the population, the antiviral stockpile was to be increased from 33, 5 million to 50 million doses (Hine, 2010). To implement the control strategy at regional level in England, the HPA put in place Flu Response Centers staffed by HPA and NHS staff (Health Protection Agency, 2010c).

On 20 May, the HPA in the UK proposed to change the actions regarding the contact management at schools. Instead of offering antiviral prophylaxis to all contacts, only the closest contacts should be given antivirals to reduce the risk of viral resistance due to non-compliance with the specified course of treatment (Department of Health. Scientific Advisory Group for Emergencies (SAGE), 2009a). However, the UK maintained its initial containment actions until 22 May, at which point the first adjustment was made. Based on

information on reduced prevalence of pandemic A/H1N1 in Mexico, the HPA stopped meeting all flight from Mexico (Health Protection Agency, 2009a).

As the numbers of cases increased steadily, the containment actions became more and more resource-intensive. Especially in the most affected areas in the UK, such as London and the West Midlands, the measures became unsustainable. Therefore, on 10 June, the initial containment approach in the UK was relaxed for "hot spot" areas. As proposed by the HPA, antiviral prophylaxis was only offered to the closest contacts. Additionally, laboratory testing was not necessary anymore if the clinical diagnosis indicated a high probability that the case was positive (Health Protection Agency, 2010c; Hine, 2010).

Vaccination strategy

As the new virus first emerged in April 2009, it was not possible to adjust the 2009/2010 seasonal influenza vaccine to this new influenza A/H1N1 strain (Robert Koch-Institute, 2009c). The production of a pandemic-specific vaccine takes four to six months and can only be started when the new strain has been isolated (Hine, 2010).

At the time the UK started to develop their vaccination strategy, the severity and infectivity of the pandemic A/H1N1 virus was still uncertain. Thus, it was difficult to decide on the quantity of required vaccine (Hine, 2010; Marcic et al., 2010). The ministers in the UK decided to procure 90 million doses of pre-pandemic vaccine, enough for 45% of the population to have two doses. Pre-pandemic vaccines contain the virus strain most likely to be similar to the pandemic strain. The ministers in the UK started to negotiate with the vaccine manufactures GlaxoSmithKline and Baxter Healthcare on the supply of the pre-pandemic vaccine. In the end, no pre-pandemic vaccines were purchased, as the negotiations were still ongoing when the influenza pandemic alert phase 6 was declared by the WHO, which triggered the advance-purchase agreements (Hine, 2010). The UK had advance-purchase agreement contracts with vaccine manufacturers in order to secure sufficient vaccine supply in the event of a pandemic. These contracts were a result of the UK's pre-pandemic planning and were activated with the announcement of pandemic influenza alert phase 6. On 17 June, the ministers in the UK decided to purchase pandemic vaccine for 100% of the population (Hine, 2010).

Communication

In order to give a better overview, the information published during time period 1 is grouped around the themes: personal protective measures, treatment of cases and control strategy.

Personal protective measures:

On 30 April, the information campaign started in the UK. The campaign ran on TV, on radio and in print media. Additionally, posters and leaflets were used and an information line was set up to provide up-to-date advice to the public. Further, advice and information was accessible on the government website. Same as in Spain and Germany, following good hygiene practices, i.e. using and disposing tissues and washing hands, was recommended as the best way to protect oneself from contracting the virus. To remember this, the UK campaign used the following slogan: "Catch it, bin it, kill it" (Department of Health, 2009a; Hine, 2010).

In addition to the public information and advice on national level, the ECDC provided information on European level. On 27 April, the ECDC published the first general questions and answers on pandemic A/H1N1 virus (European Centre for Disease Prevention and Control, 2010a). In May, the ECDC published two documents on personal protective measures and information for travelers. The documents described personal protective measures to reduce the risk of acquiring influenza, i.e. regular hand washing, respiratory hygiene, avoidance of close contacts and mass gatherings (European Centre for Disease Prevention and Control, 2009k, 2009m, 2009n).

Treatment of cases:

The use of antivirals in some groups involves particularities health professionals should know. Thus, on 8 May, the European Medicines Agency (EMA) published a guidance document on the use of the antiviral medicine Tamiflu in children under one year of age and the antivirals Tamiflu and Relenza in pregnant and breastfeeding women in the case of an influenza A/H1N1 pandemic. The EMA stated that in the event of a pandemic Tamiflu can be used to treat children under the age of one and both antivirals can be used to treat pregnant women, as the benefits of their use outweigh their risks (European Medicines Agency, 2009a).

Control strategy:

On 19 May, the ECDC published a guidance document on case and contact management. The recommended measures did not differ from the measures already applied in Germany, Spain and the UK (European Centre for Disease Prevention and Control, 2009o).

On 6 June, the ECDC published a guidance document on mitigation and containment strategies for national health authorities. ECDC stated that many public health measures are common in both strategies and the implementation of a mitigation strategy would mainly mean to move away from vigorous case finding and contact tracing. Further, the ECDC acknowledged that a containment strategy is very resource-intensive and therefore not a recommended infection control strategy for human influenza beyond pandemic alert phase 4 (European Centre for Disease Prevention and Control, 2009r).

Time period 2

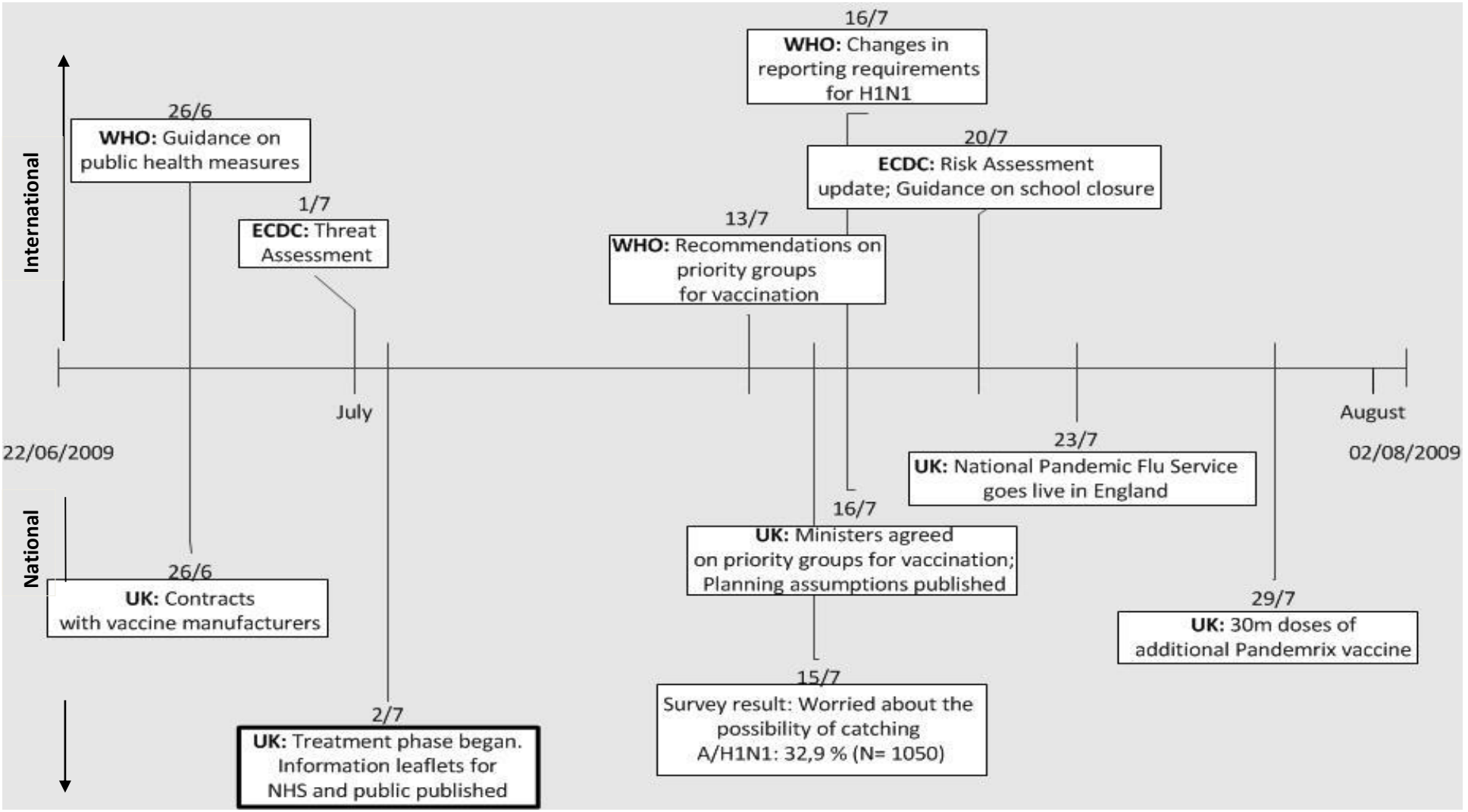


Figure 22: Chronological overview of national and international events in the UK for time period 2 (22/06/2009 to 02/08/2009)

Situation

The numbers of confirmed pandemic A/H1N1 cases increased constantly. By the end of June the UK has reported 6929 confirmed cases (Health Protection Agency, 2009b). On 1 July, the UK has reported 3 fatal cases (European Centre for Disease Prevention and Control, 2009v). The number of pandemic A/H1N1 cases has increased sharply until the peak of the first wave in week 27/2009.

In its Threat Assessment, published on 1 July, the ECDC announced the first isolation of an oseltamivir (also known as Tamiflu®) resistant mutant A/H1N1 virus in Denmark. The virus was not a reassortant virus and was still susceptible to zanamivir (also known as Relenza®). There was no evidence that the virus has been transmitted to other persons. ECDC stated that this phenomenon is well-known in influenza viruses and emphasized the need for continued surveillance of this problem (European Centre for Disease Prevention and Control, 2009u).

To monitor public risk perception in relation to the pandemic A/H1N1 outbreak, 36 telephone surveys were conducted on weekly intervals across the UK between 1 May 2009 and 10 January 2010. In Mid-July, the percentage of worried persons had increased again compared to the percentage of Mid June (19,3%; N=1050). This time 32,9% (N=1050) of interviewees stated to be very or fairly worried about the possibility of catching pandemic A/H1N1 (Rubin et al.., 2010).

On 16 July, the Department of Health in the UK made its first planning assumptions public. The figures represented a “reasonable worst case”, not a prediction on how the pandemic will evolve. The following key planning assumptions for the first major pandemic wave were published: 18.69 million cases, 370.000 people hospitalized, 2.8 million people with complications and up to 65.000 deaths. These figures referred to the total UK population of about 62.3 million (Department of Health, 2009e).

According to an ECDC risk assessment published on 20 July, 20-30% of the population was expected to be affected over the first major wave of the pandemic. Clinical attack rates were expected to be highest in children and young adults. The estimate for hospitalization rates in Europe was 1-2% and the case fatality rate was estimated to be 0.1-0.2% of all clinical cases. ECDC stated that most cases experienced a mild and self-limiting illness, but people with chronic underlying medical conditions, pregnant women and young children were at higher risk of experiencing severe disease and deaths (European Centre for Disease Prevention and Control, 2009w).

Surveillance

On 2 July, the surveillance strategy in the UK was modified. This change implied that laboratory testing of all cases and case-tracing was ceased (Health Protection Agency, 2009d). To monitor the safety of the medicines and vaccines that are on the market, the Medicines and Healthcare products Regulatory Agency (MHRA) of the UK has a an on-line reporting system in place, called the Yellow Card Scheme. This system is open to members of the public as well as healthcare professionals wanting to report suspected adverse drug reactions. On 6 July, a special web-based system for reporting suspected adverse drug reactions to Tamiflu, Relenza and to future pandemic vaccine was put into operation for the duration of the pandemic (Medicines and Healthcare products Regulatory Agency, 2009a).

On 16 July, the WHO announced that countries with community-wide transmission are no longer required to forward regular reports of individual confirmed cases to the WHO, as the detection, laboratory-confirmation and investigation of all cases is extremely resource-intensive and not sustainable for these countries (World Health Organization, 2009k).

Control strategy and treatment of cases

Acknowledging that the containment of the pandemic A/H1N1 virus was no longer possible, the ministers in the UK changed the response strategy on 2 July. Due to the widespread of the virus within the UK, ministers decided to move from containment into the treatment phase. As already described in the previous chapter this change meant that laboratory testing was no longer required for all cases and case-tracing was ceased. Further, antiviral treatment

was only offered to clinical cases (Health Protection Agency, 2009d). Additionally, to relieve some of the pressures on the health system, the National Pandemic Flu Service was launched in England on 23 July. This was an online and telephone self-care service that allowed people to be assessed for pandemic flu and, if required, to get access to antivirals. If symptoms were causing concern or if cases were in an at-risk group, they were advised to contact their GP. Those who were authorized to receive antivirals were able to pick up the drugs from one of the 2.000 antiviral collection points that were established across England. In Scotland, Wales and Northern Ireland A/H1N1 cases accessed antivirals through the normal primary care route, by taking a GP prescription to a pharmacy. In England, all clinical cases received antivirals, whereas GPs in the devolved administrations were advised to prescribe antivirals to cases in at-risk groups and any other cases based on clinical discretion (Department of Health, 2009f; Hine, 2010).

Vaccination strategy

The UK`s initial vaccination strategy was to provide pandemic vaccine for 100% of the population. Thus, on 26 June, contracts were signed with GlaxoSmithKline and Baxter Healthcare to make available 132 million doses of pandemic vaccine, enough for the whole population to have two doses of vaccine (Hine, 2010).

As initial supplies of pandemic vaccine were limited, the WHO Strategic Advisory Group of Experts (SAGE) on Immunization recommended that the following groups should be prioritized for vaccination: health-care workers; pregnant women; individuals aged above six months with a chronic medical condition; healthy individuals aged between 15 years and up to 49 years; healthy children; healthy individuals aged between 50 years and up to 64 years; and healthy individuals aged 65 years or above. The order of priority should be based on country-specific conditions (World Health Organization, 2009j).

Three days later, on 16 July, UK ministers agreed on the following priority groups for vaccination advised by DH´s Joint Committee on Vaccination and Immunisation (JCVI) and previously endorsed by DH`s Scientific Advisory Group for Emergencies (SAGE): individuals aged between six months and 65 years in the current seasonal flu at-risk group; pregnant women; children aged between 3 years and up to 16 years; and frontline health and

social care workers (Department of Health. Joint Committee on Vaccination and Immunisation, 2009a; Department of Health. Scientific Advisory Group for Emergencies (SAGE), 2009b; Hine, 2010).

At the beginning of the vaccine production, vaccine manufacturers had problems with low vaccine output. GlaxoSmithKline and Baxter Healthcare reacted to this problem by modifying their production process and thereby increased their vaccine output. Thus, on 29 July, the ministers in the UK decided to buy 30 million doses of additional pandemic vaccine from GlaxoSmithKline to ensure pandemic vaccine supply (Hine, 2010).

Communication

In order to give a better overview, the information published during time period 2 is grouped around the themes: control strategy and non-pharmaceutical response measures.

Control strategy:

On 26 June, the WHO published a guidance document on public health measures to help countries manage the A/H1N1 pandemic. Besides giving general advice on response measures, the WHO provided additional advice for countries with widespread community-level transmission, for countries with no reported cases and for countries in transition. The WHO advised all countries to concentrate on mitigation measures, to prepare the health-care system for a high volume of patients and to ensure antiviral medicine and vaccine supply. In addition, countries with widespread community-level transmission were advised to cease laboratory-testing of all cases, to reduce the pressure on the health-care system, to primarily focus on the treatment of ill patients, and to consider school closures or the cancellation of mass gathering on a case-by-case basis. Countries with no reported cases were advised that they may consider entry screening at airports and contact tracing, but that these measures are resource intensive and of limited benefit to prevent the spread of the disease. Countries in transition were advised to start the same control measures as countries with widespread community-level transmission (World Health Organization, 2009a).

On 2 July, the Department of Health in the UK published three documents on the new response strategy. The first document was intended for the NHS which outlined the rationale

of the movement from containment to treatment and set responsibilities for the NHS during the treatment phase (Department of Health, 2009b). The second document provided clear information to the public explaining why the UK has chosen to move to a treatment phase, and the third document summarized scientific issues relevant to the new response strategy (Department of Health, 2009c, 2009d).

Non-pharmaceutical response measures:

On 20 July, the ECDC gave scientific advice on reactive and proactive school closures in Europe. ECDC highlighted that there is no consensus on the benefits from proactive school closures (school closure before transmission between the children occurs), but countries and schools were advised to at least have plans for reactive school closures (school closure when many children and/or staff are experiencing illness). These plans should consider the following issues: recommended length of time of closure; the triggers for re-opening; how to sustain teaching and learning; and potential problems that may arise for parents, if they have to take time off work (European Centre for Disease Prevention and Control, 2009x).

Time period 3

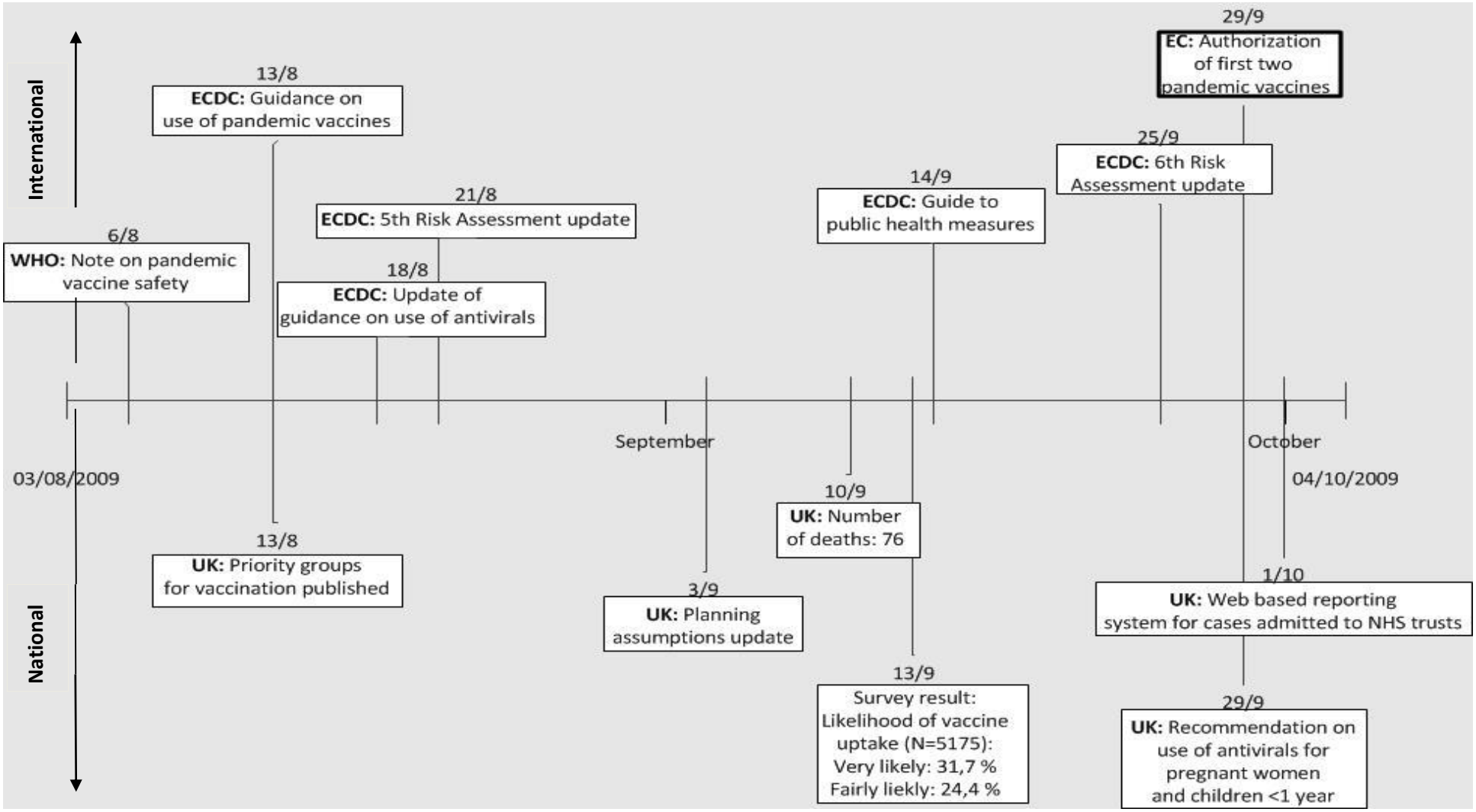


Figure 23: Chronological overview of national and international events in the UK for time period 3 (03/08/2009 to 04/10/2009)

Situation

As of 4 August, the UK the UK has reported 11912 cases to the ECDC. The UK has stopped laboratory testing of all suspected cases; therefore the reported numbers severely underestimate the true figure in the country. So far, the UK has recorded 30 deaths from pandemic A/H1N1 infection (European Centre for Disease Prevention and Control, 2009aa). The virus continued to spread in the country, but at a low level over the summer.
On 10 September, the number of reported deaths in the UK reached 76 (European Centre for Disease Prevention and Control, 2009ac).

According to a survey observing people´s attitude towards the pandemic vaccine conducted between 14 August and 13 September 2009, 31,7% (N=5175) of respondents ranked the likelihood of getting vaccinated as very likely and 24,4% as fairly likely (Rubin et al.., 2010)

On 21 August, the ECDC published its planning assumptions for the first major wave of infection, which was expected to take place in the autumn and winter of 2009/2010. However, these planning assumptions did not differ from those published on 20 July (European Centre for Disease Prevention and Control, 2009ab).
In contrast to the ECDC, the Department of Health in the UK has modified its planning assumptions in early September. Based on the latest evidence on the severity of the pandemic A/H1N1 virus, the following values have been revised downwards: hospitalization rate from 2% to 1% and upper case fatality rate from 0, 35% to 0, 1% (Department of Health, 2009i).
In late September, the ECDC has reduced its planning assumption as well. This decision was based on experience from Southern Hemisphere countries. It became more apparent that most pandemic A/H1N1 cases experienced a mild disease; therefore hospitalization and case fatality rates were revised downwards and were now in line with the figures published in the UK in early September (European Centre for Disease Prevention and Control, 2009ad).

Surveillance

In October, the Health Protection Agency set up a web based reporting system for NHS Trusts across England to gather information on hospitalized pandemic A/H1N1 cases. With

this system the Health Protection Agency aimed to collect clinical, epidemiological and demographic data on all hospitalized cases with a confirmed pandemic A/H1N1 infection (Health Protection Agency, 2010b).

Control strategy and treatment of cases

During time period 3, no control strategy modifications were introduced.

Vaccination Strategy

On 13 August, the priority groups for the pandemic A/H1N1 vaccination program were announced in the UK. Based on advice from the Joint Committee for Vaccination and Immunisation (JCVI) and the Scientific Advisory Group for Emergencies (SAGE) four groups have been identified to be at highest risk of developing severe disease from a pandemic A/H1N1 infection. These groups should be prioritized for vaccination in the following order:

- people aged between six months and up to 65 years in the present seasonal flu vaccine clinical at-risk groups,
- all pregnant women,
- household contacts of immunocompromised people, and
- individuals aged ≥ 65 in the present seasonal flu vaccine clinical at-risk groups.

In addition, front-line health and social care workers should be vaccinated together with the first clinical at-risk group (Department of Health, 2009g). Members of the clinical at-risk group were individuals with one of the following underlying clinical condition: chronic respiratory disease; chronic heart disease; chronic renal disease; chronic liver disease; chronic neurological disease; immunosuppression; and diabetes mellitus (Department of Health, 2009h).

On 29 September, the European Commission authorized the first two pandemic vaccines Focetria® (Novartis) and Pandemrix® (GlaxoSmithKline) for use in all Member States of the European Union and in Iceland, Liechtenstein and Norway (European Commission, 2009b).

Communication

During time period 3 a lot of information and guidance has been issued. In order to give a better overview, the publications are grouped around the themes: non-pharmaceutical response measures, treatment of cases and vaccination.

Non-pharmaceutical response measures:

In mid-September, the ECDC published a document on public health measures for policy and decision-makers (European Centre for Disease Prevention and Control, 2010a). It provided scientific information on measures that may be applied to reduce the impact of influenza pandemics (i.e. border closures, entry restrictions, personal protective measures, social distancing measures, use of antivirals and vaccines) and aimed to help EU countries to decide on appropriate response measures (European Centre for Disease Prevention and Control, 2009a).

On 23 September, the WHO Emergency Committee held its 5th meeting and agreed on continuing the following recommendations proposed by the WHO Director-General:

- borders should not be closed and travel and trade should not be restricted,
- countries should intensify surveillance of unusual events and
- people who are ill should postpone international travel (World Health Organization, 2009n).

Treatment of cases:

The use of antivirals in some groups involves particularities health professionals should know. Therefore, the following recommendations on the use of antivirals in children, pregnant women and women who are breastfeeding were published the UK:

- zanamivir (Relenza®) or oseltamivir (Tamiflu®) can be used in pregnant women, but zanamivir was recommended as first choice for treatment and prophylaxis,
- the preferred antiviral medicine for breastfeeding women is oseltamivir,
- children under the age of one year should only be treated with oseltamivir,
- post exposure prophylaxis for children under the age of one should only be offered after a thorough benefit-risk assessment (Department of Health, 2009j)

On 18 August, the ECDC published general guidance on the use of antivirals during influenza pandemics. The document aimed to inform those deciding on antiviral use strategies about the effectiveness of antivirals, side effects of antivirals, priority groups for antiviral use and about necessary arrangements for antiviral delivery and administration (European Centre for Disease Prevention and Control, 2009y).

Vaccination:

Referring to media reports that have displayed concern about the safety of pandemic vaccine, the WHO has issued a note on pandemic vaccine safety on 6 August. In this statement the WHO outlined the procedures for approval and licensing of vaccines and confirmed that these procedures are strict and do include safety and quality controls. The WHO also stated that the data on influenza vaccine safety collected during the last 60 years do not show a special safety issue. Nonetheless, the WHO advised countries to closely monitor the safety and efficacy of the pandemic vaccine, as rare adverse events may only come to light when large numbers of people got vaccinated (World Health Organization, 2009l).

On 13 August, the ECDC published a document on the use of influenza pandemic vaccines during the 2009 A/H1N1 pandemic. The document aimed to inform those deciding on vaccination policies in the European countries on vaccine use and options for prioritization in order to maximize the benefit of available vaccine (European Centre for Disease Prevention and Control, 2009z).

Time period 4

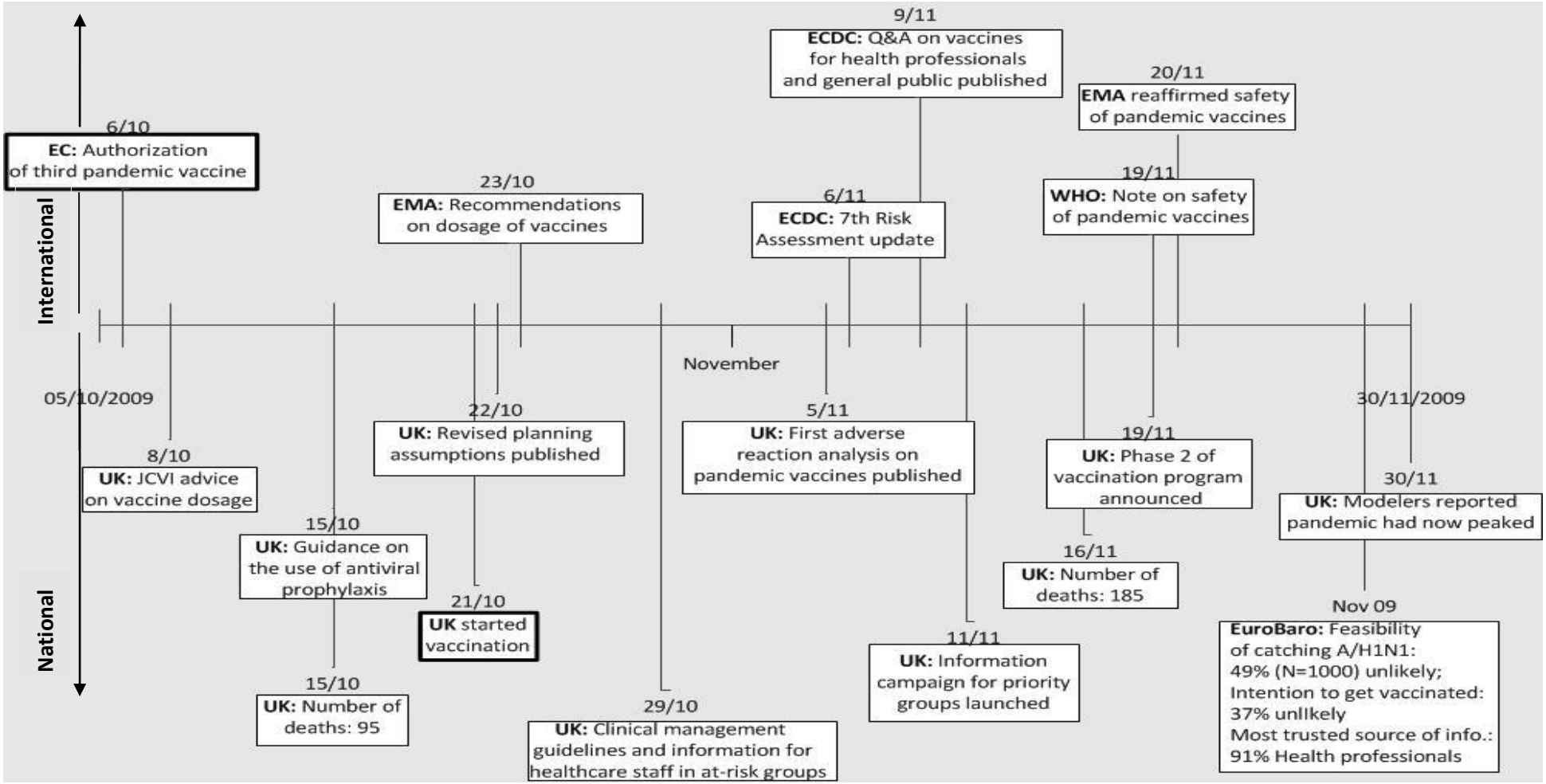


Figure 24: Chronological overview of national and international events in the UK for time period 4 (05/10/2009 to 30/11/2009)

Situation

In early autumn, the numbers of pandemic A/H1N1 infections in the UK have started to increase again, indicating the beginning of the expected autumn/winter wave. In the UK the second wave peaked in week 45/2009 (Department of Health, 2010a).

On 15 October, the number of reported deaths in the UK reached 95 (European Centre for Disease Prevention and Control, 2009ae). On months later, this number had increased up to 185 (European Centre for Disease Prevention and Control, 2009ah).

As more information on the pandemic A/H1N1 virus became available showing that it remains relatively mild for most people and suggesting that the second peak may not be as high as actually thought, the worst-case planning assumptions for the UK were revised downwards once more. In the new planning assumptions, published on 22 October, the reasonable worst case for the clinical attack rate was reduced from 30% to 12% and the reasonable worst case for further deaths was reduced from 19.000 to 1.000 (Department of Health, 2009m).

In its 7th risk assessment issued on 6 November, the ECDC has revised its planning assumptions as well. The following EU reasonable worst case planning assumptions for the first year up to mid-May 2010 were published: clinical attack rate: up to 20% of population, hospitalization rate: up to 100 per 100.000 population and case fatality rate: up to 3 per 100.000 population (European Centre for Disease Prevention and Control, 2009ag).

On 30 November, the UK`s Scientific Advisory Groups for Emergencies held a meeting in which modelers announced that the pandemic had now peaked and that the recently published worst case assumptions will not be reached (Department of Health. Scientific Advisory Group for Emergencies (SAGE), 2009d).

In late November, the Gallup Organization conducted a survey called the Eurobarometer in the 27 EU Member States, as well as in Norway, Switzerland and Iceland to examine public opinion about influenza and pandemic A/H1N1. 49% (N=1000) believed it was unlikely or rather unlikely that they would personally catch the A/H1N1influenza. Furthermore, 37% stated that is was not likely or not likely at all that they would get vaccinated against the

pandemic A/H1N1 virus. Health professionals were the most trusted source to inform about pandemic A/H1N1. 91% mentioned that they trust health professionals mostly or completely (The Gallup Organization, 2010).

Surveillance

During time period 4, no surveillance strategy modification was introduced.

Control strategy and treatment of cases

During time period 4, no control strategy modifications have been implemented.

Vaccination strategy

On 6 October, the European Commission authorized a third pandemic vaccine, Celvapan®, for use in all EU Member States, Iceland, Lichtenstein and Norway (European Commission, 2009c).

As the European Commission has now authorized both vaccines procured by the UK (Pandemrix® and Celvapan®), the DH`s Joint Committee on Vaccination and Immunization gave the following advice on vaccine dosage: one dose of Pandemrix® for those aged 10 years and above; two doses for immunocompromised individuals; two half adult doses for children aged below ten years and over six months; and two doses of Celvapan® for all age groups (Department of Health. Joint Committee on Vaccination and Immunisation, 2009c). Four days later, on 12 October, this advice was endorsed by DH`s Scientific Advisory Group for Emergencies (SAGE) (Department of Health. Scientific Advisory Group for Emergencies (SAGE), 2009c).

While the DH`s Joint Committee on Vaccination and Immunization considered a one dose schedule for Pandemrix® to be sufficient for those aged 10 years and above, the European Medicines Agency (EMA) recommended a two dose schedule for all three authorized vaccines (European Medicines Agency, 2009b).

On 21 October, the UK started its vaccination program (Department of Health, 2009k).

On 19 November, phase two of the UK`s vaccination program was announced by the Department of Health. Chief Medical Officer Liam Donaldson stated that the vaccination

program will be extended and vaccine will also be offered to all children over six months of age and under five years old. This decision was based on evidence showing that this age group is at higher risk of developing severe disease from an A/H1N1 infection than other healthy age groups (Department of Health, 2009u).

Communication

Same as during time period 3 a lot of information and guidance has been issued during time period 4. In order to give a better overview the publications are again grouped around the themes: non-pharmaceutical response measures, treatment of cases and vaccination.

Non-pharmaceutical response measures:

On 26 November, the WHO Emergency Committee held its 6th meeting and agreed that delaying international travel was no longer recommended for ill persons, because pandemic A/H1N1 infections were already widespread (World Health Organization, 2009p).

Treatment of cases:

The Department of Health in the UK published clinical management guidelines for adults and children and for pregnant women (Department of Health & Royal College of Obstetricians and Gynaecologists, 2009; Department of Health, 2009q). A third document aimed to provide guidance for health professionals on the use of antiviral prophylaxis during the A/H1N1 pandemic. It informed on situations when the use of antiviral prophylaxis in pregnant women and people with underlying medical conditions was considered to be appropriate (Department of Health, 2009l). In addition, information for health and social care workers who are pregnant or in other at-risk groups was published. This document gave advice on protecting healthcare employees who are pregnant, or in one of the other at risk groups (Department of Health, 2009o).

Vaccination:

Together with the start of the vaccination program, the public information campaign was launched in the UK. Information and advice was accessible on government websites and made available to the general public through leaflets (Department of Health, 2009n). In addition to the mainstream public information, the Department of Health in the UK produced tailored information for health professionals and pregnant women (Department of Health,

2009r, 2009s). Furthermore, clinical professional briefs on pandemic vaccination were published (Department of Health, 2009p, 2009t).

On 5 November, the Medicines and Healthcare products Regulatory Agency (MHRA) in the UK published its first adverse reaction analysis on pandemic vaccines. In this report, the MHRA stated that there have been no new safety issues identified and that the benefits for Celvapan® and Pandemrix® still outweigh their risks (Medicines and Healthcare products Regulatory Agency, 2009b).

On European level, information on vaccination was provided by the ECDC. In November the ECDC published questions and answers on vaccines for health professionals and for the general public on its website (European Centre for Disease Prevention and Control, 2009b, 2009c, 2010a).

On 19 November, the WHO issued a briefing note on pandemic vaccines in which the safety of the vaccines was reaffirmed (World Health Organization, 2009o). The European Medicines Agency (EMA) did hold the same opinion. In a press release published on 20 November, the EMA reasserted the efficacy and safety of pandemic vaccines. Further, the EMA revised its advice on vaccine schedules and published the following recommendations: Pandemrix® and Focetria® may be used as a single dose in adults (18-60 years) and in children and adolescents (Focetria®: from the age of 9 years; Pandemrix®: from the age of 10 years). Individuals aged over 60 years may also receive one dose of Pandemrix®, but younger children and immunocompromised people should receive two doses (European Medicines Agency, 2009c).

Time period 5

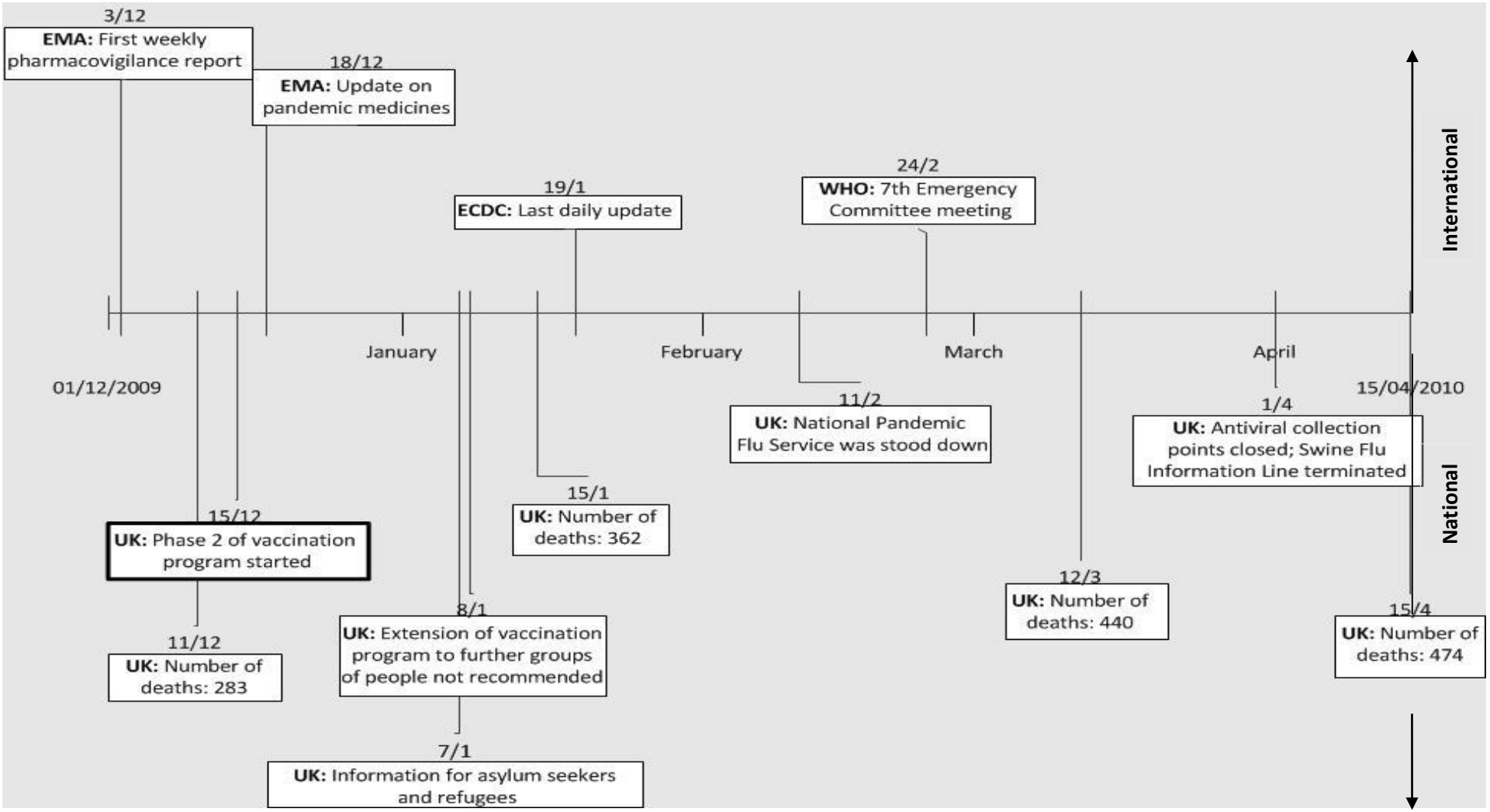


Figure 25: Chronological overview of national and international events in the UK for time period 5 (01/12/2009 to 15/04/2010)

Situation

The number of pandemic A/H1N1 infections decreased constantly in the UK. On 11 December, the UK has reported 283 deaths due to pandemic A/H1N1 (European Centre for Disease Prevention and Control, 2009aj).

The end of the autumn wave was in early January 2010. Afterwards only sporadic cases have been reported (Department of Health, 2010a).

In February 2010, evidence showed decreasing or low pandemic A/H1N1 activity in many countries, but the WHO Emergency Committee agreed that it was too early to conclude that the pandemic A/H1N1 virus has run its course. Thus, the pandemic influenza alert phase was not changed (World Health Organization, 2010a). On 10 August 2010, the WHO Emergency Committee assessed the global situation again. This time the Committee concluded that the world was entering the post-pandemic period (World Health Organization, 2010c). Altogether, the UK has reported 474 pandemic A/H1N1 influenza related deaths (Department of Health, 2010d).

Surveillance

No surveillance strategy modifications were introduced.

Control strategy and treatment of cases

The National Pandemic Flu Service (NPFS) was launched in England in order to reduce the pressure on primary care. With decreasing numbers of pandemic A/H1N1 cases this service was not required anymore and was closed down on 11 February. During its operation, the NPFS distributed antivirals to 1.1 million people.

Two months later, on 1st April, antiviral collection points in England closed and the Swine Flu Information Line was stood down. Further, it was no longer possible to obtain antivirals from national stockpiles (Hine, 2010).

Vaccination strategy

In December, the UK extended its vaccination program. As already announced in mid November, the UK started to offer pandemic vaccine to children over 6 months and under 5

years of age. The recommendation on the vaccine dosage was updated and one half adult dose of Pandemrix® was now considered to be sufficient for children over six months (Department of Health, 2009v). The DH`s Joint Committee on Vaccination and Immunization in the UK did not recommend to extend the vaccination program to other groups of the population. This recommendation was based on the latest epidemiological evidence and modeling predictions, which showed that pandemic A/H1N1 activity has decreased and a third wave was unlikely (Department of Health. Joint Committee on Vaccination and Immunisation, 2010). On 4 February, ministers approved this advice, but decided to set up a strategic reserve of 15 million doses of pandemic vaccine (Hine, 2010). The Department of Health has already contacted Baxter Healthcare in late December 2009 to stop supply of Celvapan® from 28 February 2010. This was possible, because a break clause was agreed with Baxter Healthcare at the time the UK ordered the vaccine in 2009 (Hine, 2010). On 14 January 2010, ministers agreed to stop deliveries of Pandemrix® as well. As this contract did not include a break clause, the Department of Health commenced negotiations with GlaxoSmithKline over terminating vaccine deliveries. On 6 April, the Department of Health achieved agreement to only take deliveries of just under 35 million doses of Pandemrix® (The Secretary of State for Health, 2010).

Communication

During time period 5, only little information and guidance has been published. Thus, the information and guidance is only grouped around the themes: vaccination and personal protective measures.

Vaccination:

In December 2009, the UK started to offer pandemic vaccine to children over 6 months and under 5 years of age. The Department of Health developed a leaflet for parents that contained tailored information about the second phase of the vaccination program (Department of Health, 2009w).

Between December 2009 and August 2010, the European Medicines Agency (EMA) published regular updates on safety monitoring of vaccines and medicines used during the pandemic (European Medicines Agency, 2010). In its update on pandemic medicines of 18

December, the EMA reaffirmed that the available data on the three pandemic vaccines and Tamiflu® showed no unexpected serious safety issues (European Medicines Agency, 2010).

Personal protective measures:

In early January, the Department of Health in the UK published information leaflets in 32 languages to provide information on the pandemic A/H1N1 virus, personal protective measures, and the vaccination program for people who cannot speak or read English and who may not have access to a regular flow of news, i.e., an asylum seeker or refugee or a member of an established migrant group (Department of Health, 2010b).

Spain

Time period 1

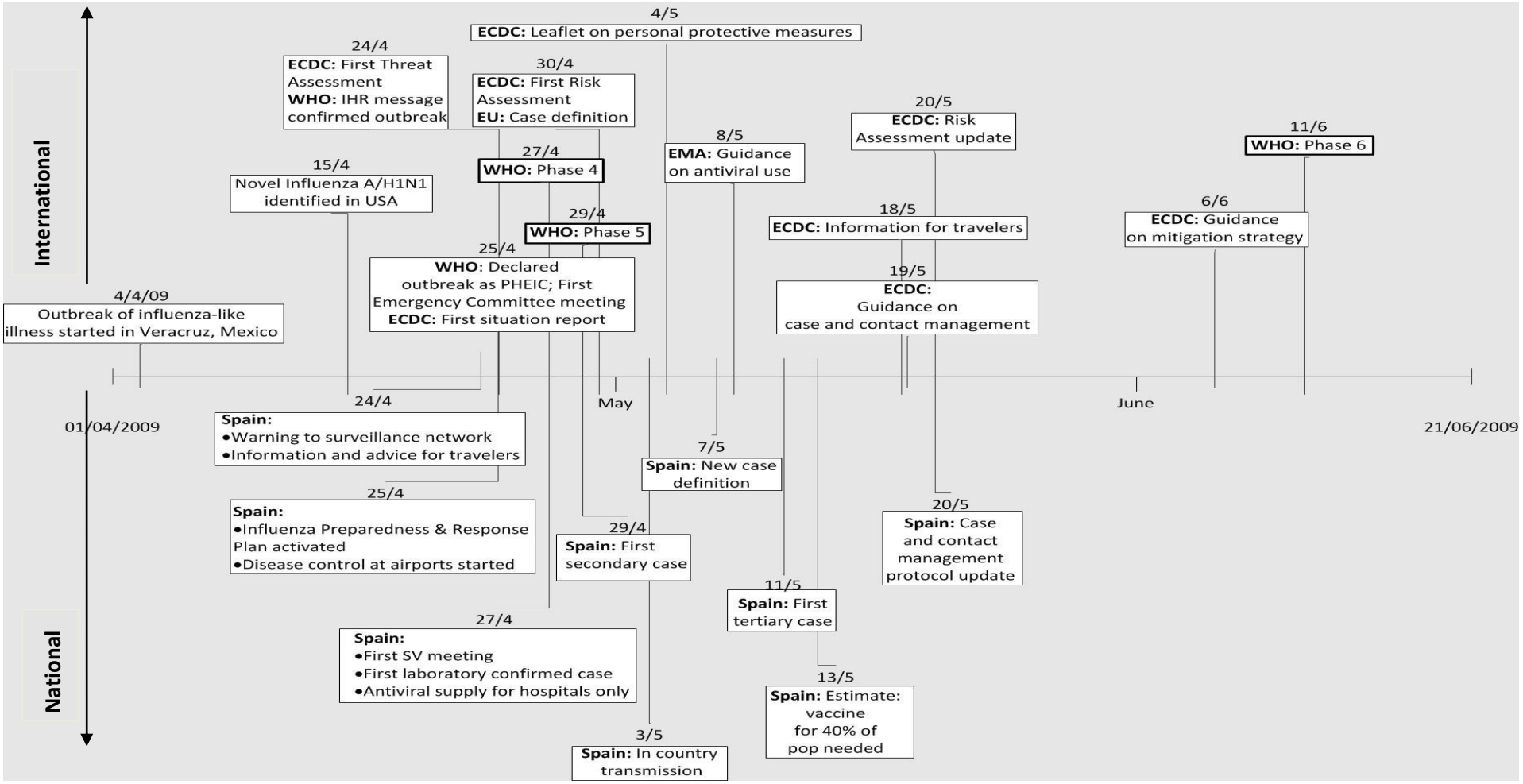


Figure 26: Chronological overview of national and international events in Spain for time period 1 (01/04/2009 to 21/06/2009)

Situation

The pandemic started in Veracruz, Mexico where an outbreak of influenza-like illness was recorded in early April 2009 (European Centre for Disease Prevention and Control, 2010a). A few days later several parts of Mexico reported further outbreaks of influenza-like illness. Analysis of samples detected an Influenza A virus but it was not possible to identify the subtype (World Health Organization, 2011). In mid-April, the US Centers for Disease Control and Prevention (CDC) analyzed a sample from two children with respiratory illness in southern California, USA and identified the virus as a swine influenza A/H1N1 virus (Centers for Disease Control and Prevention, 2009). On 24 April WHO reported that virus isolates from Mexican patients were genetically identical to the new strain of swine influenza A/H1N1 virus discovered in California (World Health Organization, 2009b). On the same day ECDC published its first Threat Assessment saying that although the public health situation was still limited to Mexico and the US further vigilance was required in Europe to ensure the identification of the new virus (European Centre for Disease Prevention and Control, 2009d).

One day later, on 25 April 2009, the first WHO Emergency Committee meeting was held. International experts came together to assess the situation in Mexico and the US and to advice the WHO Director-General, Dr. Margaret Chan, on response measures. The Committee reported more information on the clinical presentation, epidemiology and virology of cases was needed, but concluded that the situation was of international concern. Thus, Dr. Margret Chan declared the outbreak in Mexico and the US as a public health emergency of international concern (PHEIC) under International Health Regulations (2005) and advised all countries to intensify surveillance for influenza-like illness and respiratory disease (World Health Organization, 2009c).

On the same day, the ECDC started to publish daily situation reports in which the current epidemiological situation was summarized. So far, 8 cases of pandemic A/H1N1 have been confirmed in the United States of America. In Mexico City 854 cases of pneumonia have been reported, including 59 deaths (European Centre for Disease Prevention and Control, 2009e).

Two days later, on 27 April, the first laboratory confirmed pandemic A/H1N1 case has been reported in Europe and in Spain (European Centre for Disease Prevention and Control, 2009f). Based on available data on confirmed pandemic A/H1N1 cases in Mexico, the USA, Canada, and reports on suspected cases in other countries, the WHO Director-General raised the level of influenza pandemic alert to phase 4 (World Health Organization, 2009d). While phase 3 is characterized by sporadic cases and limited human-to-human transmission of an influenza reassortant virus, phase 4 is defined by confirmed human-to-human transmission of an influenza reassortant virus capable to cause sustained outbreaks in a community (World Health Organization, 2012). The WHO Director-General, Dr. Margaret Chan, did not recommend any trade or travel restrictions and advised to center on mitigation measures as the containment of the outbreak was not considered to be feasible (World Health Organization, 2009d).

Two days later, on 29 April, the influenza pandemic alert was raised to phase 5 (World Health Organization, 2009e). This was a signal that a pandemic was coming up and human to human spread of the virus into at least two countries of one WHO region was evident, namely Mexico and USA (European Centre for Disease Prevention and Control, 2009h; World Health Organization, 2012).

In its first risk assessment, published on 30 April, the ECDC reported missing information and data to define the seriousness of the potential pandemic. So far, the majority of pandemic A/H1N1 cases experienced a mild disease and the case fatality rate was judged not to be different than for seasonal influenza (European Centre for Disease Prevention and Control, 2009g).

As of 30 April, 10 confirmed cases have been reported in Spain (10 cases). Unlike all the other cases, one case in Spain had no history of travel to Mexico. This was the first evidence of human-to-human transmission within the EU (European Centre for Disease Prevention and Control, 2009h)..

As of 12 May, Spain has reported 98 confirmed pandemic A/H1N1 cases (European Centre for Disease Prevention and Control, 2009l). An analysis of the Spanish cases showed that of the 98 confirmed pandemic A/H1N1 cases, 21 were confirmed secondary cases and one case

was a tertiary case (Surveillance Group for New Influenza A(H1N1) Virus Investigation and Control in Spain, 2009).

At the start of the Sixty-second World Health Assembly on 18 May, members shared their experiences with the current outbreak of pandemic influenza A/H1N1. Altogether, 40 countries have reported 8829 confirmed cases of pandemic A/H1N1. 97, 9% of the total number of cases was reported by six countries: the USA (4714 cases), Mexico (3103 cases), Canada (496 cases), Japan (125 cases), Spain (103 cases)[9] and the UK (101) (World Health Organization, 2009f).

In its risk assessment update on 20 May, the ECDC again reported a continuing lack of data on parameters needed for right risk assessment. The ECDC considered available data and stated that the pandemic A/H1N1 infections have been generally mild in Europe. Now there was more evidence that the virus was able to spread easily from one person to another and that it preferentially infected younger age groups. ECDC concluded that the spread of the pandemic A/H1N1 virus will continue (European Centre for Disease Prevention and Control, 2009p).

On 11 June, the WHO raised the level of influenza pandemic alert to phase 6, declaring a pandemic (World Health Organization, 2009h). The severity of the pandemic was considered to be moderate by the WHO (World Health Organization, 2009i).

As of 15 June, Spain has reported 488 confirmed pandemic A/H1N1 to the ECDC (European Centre for Disease Prevention and Control, 2009t).

Surveillance

On 30 April, the European Commission agreed on a common case definition for the European Union in order to detect cases of influenza caused by the new virus. This case definition is presented in Table 15.

[9] Please note that the number of cases shown in Figure 6 differs from this number of cases. Figure 6 only shows data on confirmed cases from the SISS as the Spanish Ministry of Health and Social Policy (MHSP) stopped reporting total numbers of cases on 28 July 2009. Hereafter, the MHSP only reported incidence rates which were calculated from the SISS data (Ministerio de Sanidad y Politica Social, 2009c).

Based on the situation in Mexico and the US, the Coordinating Centre for Health Alerts and Emergencies (CCAES) at the Spanish Ministry of Health and Social Policy issued a national epidemiologic alert on 24 April. National and regional public health authorities were asked to enhance surveillance and to report urgently any case of influenza-like illness and severe respiratory disease among people who traveled to Mexico or who had contact with a confirmed case of pandemic A/H1N1 infection (Surveillance Group for New Influenza A(H1N1) Virus Investigation and Control in Spain, 2009).

Following the declaration of a public health emergency of international concern (PHEIC), the Ministry of Health and Social Policy launched the National Plan for Preparedness and Response to an influenza pandemic, including the activation of the Surveillance Subcommittee, which held its first meeting on 27 April. This committee was responsible for defining and agreeing the strategy of surveillance, although all decisions had to be presented to the Public Health Commission for approval (Sierra Moros et al., 2010).

Spain`s initial case definition was amended and finally adopted on 7 May, 2009, to accommodate to the EU case definition. The modification included the following changes: the temperature defining fever was increased from 37,5º C to 38º C and the incubation period was reduced from 10 to 7 days (Santa-Olalla Peralta, Cortes García, Martínez Sánchez, et al., 2010). To gather epidemiological data of pandemic A/H1N1 infections, a case-based surveillance was implemented which differed from the usual flu surveillance maintained by the Spanish Influenza Surveillance System (Sierra Moros et al., 2010).

Control strategy and treatment of cases

Initially, Spain employed a containment strategy. Measures focused on limiting transmission of the virus or delaying the spread in order to gain time to apply effective response measures. This strategy included the following public health measures: those who met the clinical and epidemiological case definition were assessed through swabbing and laboratory testing; cases were treated with antivirals within 48 hours after onset of symptoms and requested to isolate at home or in hospital (depending on their clinical condition) for at least seven days. Contacts were additionally asked to self-isolate at home for ten days with restrictions on visits (Santa-Olalla Peralta, Cortes García, Martínez Sánchez, et al., 2010).

To avoid the introduction of the pandemic A/H1N1 virus through international air traffic, Spain started to meet all direct flights from Mexico at an early stage. Medical teams checked passengers and crew members on clinical symptoms and distributed information leaflets about pandemic influenza. In addition, contact details of passengers were collected to be able to inform them if it turned out that a person with confirmed pandemic A/H1N1 infection was aboard the same flight. Spain maintained this measure until 16 June. The infection control measures at German airports were kept up until week 35/2009 (Dávila Cornejo et al., 2010).

School closures were not recommended as a means of reducing the spread of the virus (Ministerio de Sanidad, Servicios Sociales e Igualdad, 2009).

On May 20, the Surveillance Subcommittee in Spain changed the case and contact management strategy. It was agreed that antivirals will be given only to cases with severe disease, those with risk factors and contacts with risk factors. Whereas the isolation of cases should be maintained, the isolation of contacts was not considered to be necessary anymore (Santa-Olalla Peralta, Cortes García, Martínez Sánchez, et al., 2010).

Vaccination strategy

As the new virus first emerged in April 2009, it was not possible to adjust the 2009/2010 seasonal influenza vaccine to this new influenza A/H1N1 strain (Robert Koch-Institute, 2009c). The production of a pandemic-specific vaccine takes four to six months and can only be started when the new strain has been isolated (Hine, 2010).

At the time Spain started to develop their vaccination strategy, the severity and infectivity of the pandemic A/H1N1 virus was still uncertain. Thus, it was difficult to decide on the quantity of required vaccine (Hine, 2010; Marcic et al., 2010). On 13 May, the Public Health Commission in Spain adopted an estimate saying that vaccine for 40% of the population would be needed. On the basis that two doses of vaccine per person were needed to achieve a sufficient immune response, the Public Health Commission planned to procure 36.6 million doses of pandemic vaccine (Ministerio de Sanidad, Politica Social e Igualdad, 2010b).

Communication

In order to give a better overview, the information published during time period 1 is grouped around the themes: personal protective measures, treatment of cases and control strategy.

Personal protective measures:

On 24 April, the Spanish Ministry of Health and Social Policy published information on personal protective measures for the public and for travelers on its website. The information aimed to raise early awareness of the pandemic A/H1N1 virus among the public and informed on personal protective measures, i.e. regular hand washing, respiratory hygiene and avoidance of close contacts with sick people (Surveillance Group for New Influenza A(H1N1) Virus Investigation and Control in Spain, 2009).

In addition to the public information and advice on national level, the ECDC provided information on European level. On 27 April, the ECDC published the first general questions and answers on pandemic A/H1N1 virus (European Centre for Disease Prevention and Control, 2010a). In May, the ECDC published two documents on personal protective measures and information for travelers. The documents described personal protective measures to reduce the risk of acquiring influenza, i.e. regular hand washing, respiratory hygiene, avoidance of close contacts and mass gatherings (European Centre for Disease Prevention and Control, 2009k, 2009m, 2009n).

Treatment of cases:

The use of antivirals in some groups involves particularities health professionals should know. Thus, on 8 May, the European Medicines Agency (EMA) published a guidance document on the use of the antiviral medicine Tamiflu in children under one year of age and the antivirals Tamiflu and Relenza in pregnant and breastfeeding women in the case of an influenza A/H1N1 pandemic. The EMA stated that in the event of a pandemic Tamiflu can be used to treat children under the age of one and both antivirals can be used to treat pregnant women, as the benefits of their use outweigh their risks (European Medicines Agency, 2009a).

Control strategy:

On 19 May, the ECDC published a guidance document on case and contact management. The recommended measures did not differ from the measures already applied in Germany, Spain and the UK (European Centre for Disease Prevention and Control, 2009o).

On 6 June, the ECDC published a guidance document on mitigation and containment strategies for national health authorities. ECDC stated that many public health measures are common in both strategies and the implementation of a mitigation strategy would mainly mean to move away from vigorous case finding and contact tracing. Further, the ECDC acknowledged that a containment strategy is very resource-intensive and therefore not a recommended infection control strategy for human influenza beyond pandemic alert phase 4 (European Centre for Disease Prevention and Control, 2009r).

Time period 2

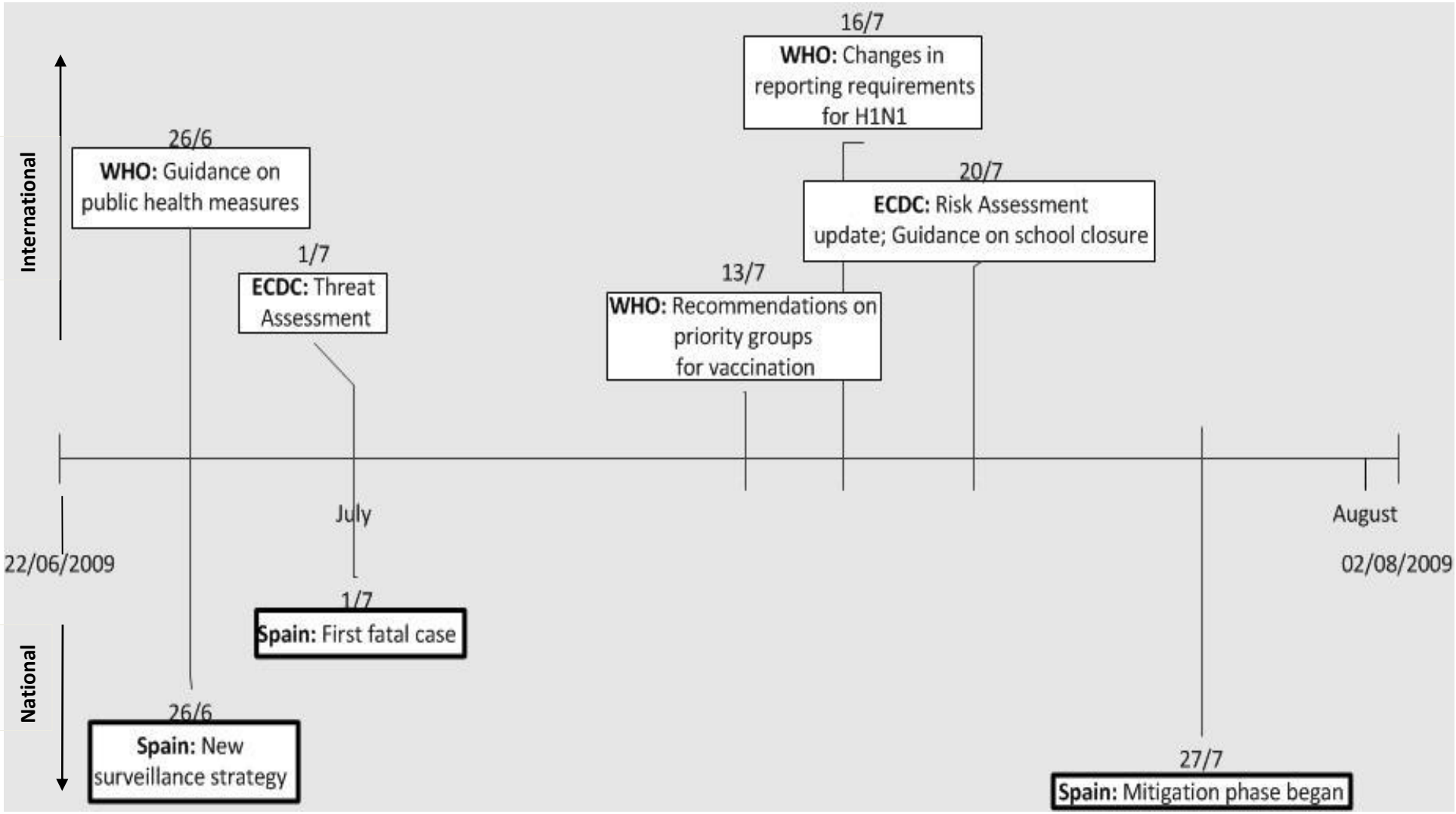


Figure 27: Chronological overview of national and international events in Spain for time period 2 (22/06/2009 to 02/08/2009)

Situation

The numbers of confirmed pandemic A/H1N1 cases increased constantly. By the end of June, Spain has reported 717 confirmed cases (Ministerio de Sanidad y Politica Social, 2009b). On 1 July, Spain confirmed its first fatal case (European Centre for Disease Prevention and Control, 2010a), which raised the cumulative number of deaths in the EU to four (UK three cases, Spain one case) (European Centre for Disease Prevention and Control, 2009v). The numbers of infections continued to increase until week 29/2009.

In its Threat Assessment, published on 1 July, the ECDC announced the first isolation of an oseltamivir (also known as Tamiflu®) resistant mutant A/H1N1 virus in Denmark. The virus was not a reassortant virus and was still susceptible to zanamivir (also known as Relenza®). There was no evidence that the virus has been transmitted to other persons. ECDC stated that this phenomenon is well-known in influenza viruses and emphasized the need for continued surveillance of this problem (European Centre for Disease Prevention and Control, 2009u).

According to an ECDC risk assessment published on 20 July, 20-30% of the population was expected to be affected over the first major wave of the pandemic. Clinical attack rates were expected to be highest in children and young adults. The estimate for hospitalization rates in Europe was 1-2% and the case fatality rate was estimated to be 0.1-0.2% of all clinical cases. ECDC stated that most cases experienced a mild and self-limiting illness, but people with chronic underlying medical conditions, pregnant women and young children were at higher risk of experiencing severe disease and deaths (European Centre for Disease Prevention and Control, 2009w).

Surveillance

On 26 June, Spain modified its surveillance strategy. The Public Health Commission approved a strategy based on 5 points, saying that:

- a case-based surveillance of severe cases should start,
- the influenza surveillance through the SISS should be maintained,
- monitoring of clusters of acute respiratory illness should be maintained, but a

case-based notification was not required anymore and only the first cases had to be swabbed for laboratory confirmation,

- monitoring of influenza or acute respiratory disease from the primary care computerized database, as well as
- case-based monitoring of flu cases in the community should be maintained.

In addition, the identification and monitoring of contacts and administration of prophylaxis to contacts was ceased. (Santa-Olalla Peralta, Cortes García, Martínez Sánchez, et al., 2010).

On 16 July, the WHO announced that countries with community-wide transmission are no longer required to forward regular reports of individual confirmed cases to the WHO, as the detection, laboratory-confirmation and investigation of all cases is extremely resource-intensive and not sustainable for these countries (World Health Organization, 2009k).

On 27 July, the Spanish Surveillance Subcommittee agreed on a surveillance strategy update that suppressed the case-based surveillance of cases in the community. One day later, this new strategy was approved by the Spanish Public Health Commission (Ministerio de Sanidad, Politica Social e Igualdad, 2010a; Sierra Moros et al., 2010).

Control strategy and treatment of cases

On 27 July, Spain moved from containment to mitigation, although response measures have already been changed towards a mitigation strategy in late June, i.e. contact tracing was ceased. Case-based reporting of cases in the community was stopped and antivirals were only given to cases requiring hospitalization and to those at risk of complications (Ministerio de Sanidad, Politica Social e Igualdad, 2010b; Sierra Moros et al., 2010).

Vaccination strategy

As initial supplies of pandemic vaccine were limited, the WHO Strategic Advisory Group of Experts (SAGE) on Immunization recommended that the following groups should be prioritized for vaccination: health-care workers; pregnant women; individuals aged above six months with a chronic medical condition; healthy individuals aged between 15 years and up to 49 years; healthy children; healthy individuals aged between 50 years and up to 64

years; and healthy individuals aged 65 years or above. The order of priority should be based on country-specific conditions (World Health Organization, 2009j).

Communication

In order to give a better overview, the information published during time period 2 is grouped around the themes: control strategy and non-pharmaceutical response measures.

Control strategy:

On 26 June, the WHO published a guidance document on public health measures to help countries manage the A/H1N1 pandemic. Besides giving general advice on response measures, the WHO provided additional advice for countries with widespread community-level transmission, for countries with no reported cases and for countries in transition. The WHO advised all countries to concentrate on mitigation measures, to prepare the health-care system for a high volume of patients and to ensure antiviral medicine and vaccine supply. In addition, countries with widespread community-level transmission were advised to cease laboratory-testing of all cases, to reduce the pressure on the health-care system, to primarily focus on the treatment of ill patients, and to consider school closures or the cancellation of mass gathering on a case-by-case basis. Countries with no reported cases were advised that they may consider entry screening at airports and contact tracing, but that these measures are resource intensive and of limited benefit to prevent the spread of the disease. Countries in transition were advised to start the same control measures as countries with widespread community-level transmission (World Health Organization, 2009a).

Non-pharmaceutical response measures:

On 20 July, the ECDC gave scientific advice on reactive and proactive school closures in Europe. ECDC highlighted that there is no consensus on the benefits from proactive school closures (school closure before transmission between the children occurs), but countries and schools were advised to at least have plans for reactive school closures (school closure when many children and/or staff are experiencing illness). These plans should consider the following issues: recommended length of time of closure; the triggers for re-opening; how to sustain teaching and learning; and potential problems that may arise for parents, if they have to take time off work (European Centre for Disease Prevention and Control, 2009x).

Time period 3

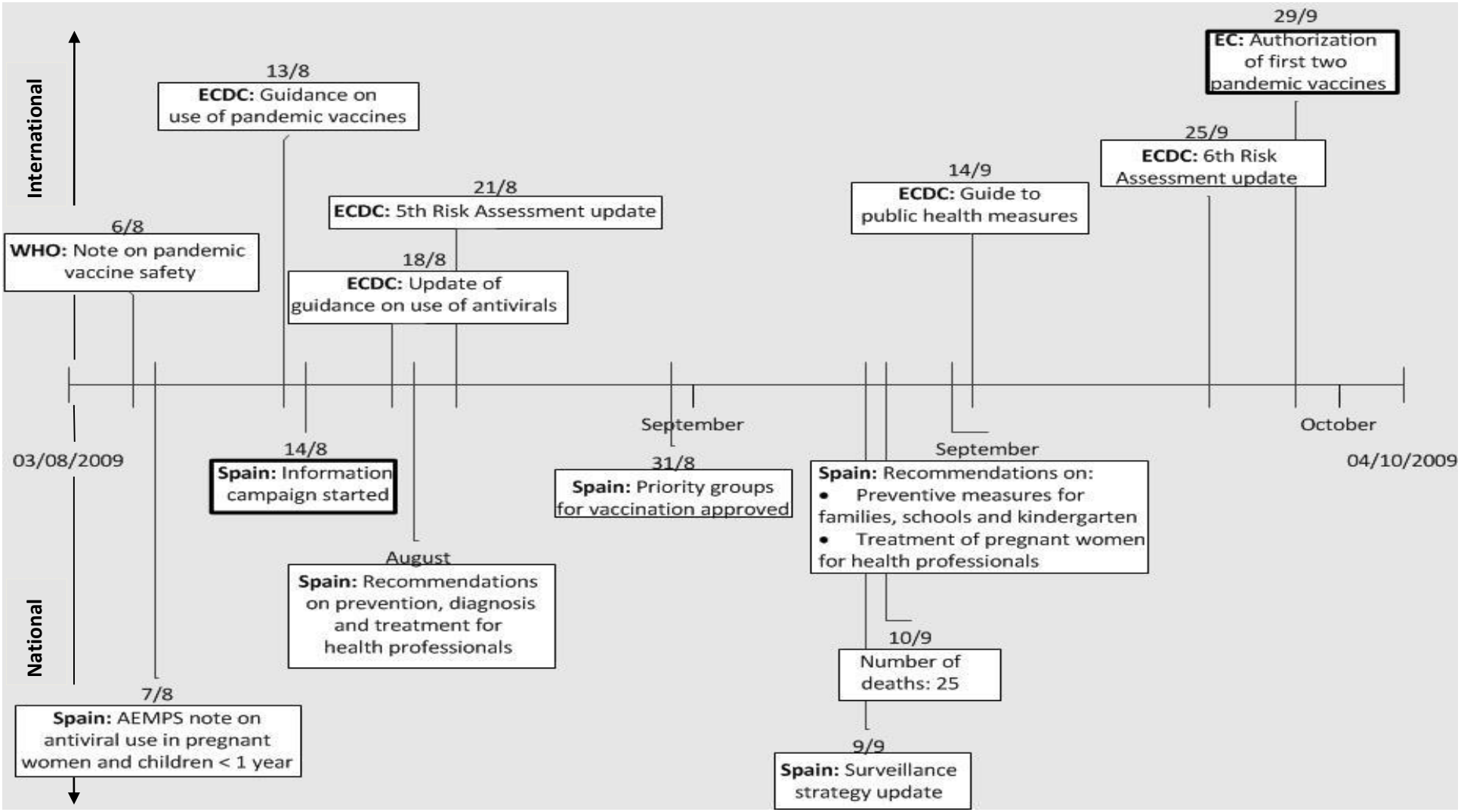


Figure 28: Chronological overview of national and international events in Spain for time period 3 (03/08/2009 to 04/10/2009)

Situation

As of 4 August, Spain has reported 1538 confirmed cases to the ECDC. Spain has stopped laboratory testing of all suspected cases; therefore the reported numbers severely underestimate the true figure in the two countries. So far, Spain has recorded 7 deaths from pandemic A/H1N1 infection (European Centre for Disease Prevention and Control, 2009aa). The virus continued to spread in the country, but at a low level over the summer. On 10 September, Spain reported 25 deaths due to pandemic A/H1N1 (European Centre for Disease Prevention and Control, 2009ac).

On 21 August, the ECDC published its planning assumptions for the first major wave of infection, which was expected to take place in the autumn and winter of 2009/2010. However, these planning assumptions did not differ from those published on 20 July (European Centre for Disease Prevention and Control, 2009ab).
In late September, the ECDC has reduced its planning assumption. This decision was based on experience from Southern Hemisphere countries. It became more apparent that most pandemic A/H1N1 cases experienced a mild disease; therefore hospitalization and case fatality rates were revised downwards (European Centre for Disease Prevention and Control, 2009ad).

Surveillance

On 9 September, the Spanish Public Health Commission revised the surveillance strategy once again. According to the new strategy, the investigation of clusters of cases was only recommended in those cases deemed necessary to make a special intervention (Ministerio de Sanidad, Politica Social e Igualdad, 2010a).

Control strategy and treatment of cases

No control strategy modification was introduced.

Vaccination Strategy

In Spain, an agreement on priority groups for vaccination against pandemic A/H1N1 has been achieved on 31 August. The following population groups were considered to be priority groups for vaccination, but should not be prioritized in any order:

- health and social care workers,
- pregnant women,
- people working in essential public services (e.g. firefighters, policemen, workers at prisons, etc.), and
- individuals aged over six months in a clinical at-risk group.

Clinical at-risk groups were considered to be the same as in the UK (Ministerio de Sanidad y Politica Social, 2009l; Ministerio de Sanidad, Politica Social e Igualdad, 2010b).

On 29 September, the European Commission authorized the first two pandemic vaccines Focetria® (Novartis) and Pandemrix® (GlaxoSmithKline) for use in all Member States of the European Union and in Iceland, Liechtenstein and Norway (European Commission, 2009b).

Communication

During time period 3 a lot of information and guidance has been issued. In order to give a better overview, the publications are grouped around the themes: personal protective measures, non-pharmaceutical response measures, treatment of cases and vaccination.

<u>Personal protective measures:</u>

In mid-August, the pandemic A/H1N1 information campaign “Gripe A. La prevención es la major medida” started in Spain (Ministerio de Sanidad y Politica Social, 2009a). Therefore, the Ministry of Health and Social Policy has launched the information website “informaciongripea.es”. This website provided information about the disease and advice on personal protective measures for the general public. In addition, information and advice was made available to the public through posters, information leaflets, social networks and over the radio (Ministerio de Sanidad y Politica Social, 2009a, 2012). Besides the mainstream public information campaign, the Ministry of Health and Social Policy published tailored

information and guidance on preventive measures for families, schools and kindergartens (Ministerio de Sanidad y Politica Social, 2009e, 2009f, 2009g).

Non-pharmaceutical response measures:

In mid-September, the ECDC published a document on public health measures for policy and decision-makers (European Centre for Disease Prevention and Control, 2010a). It provided scientific information on measures that may be applied to reduce the impact of influenza pandemics (i.e. border closures, entry restrictions, personal protective measures, social distancing measures, use of antivirals and vaccines) and aimed to help EU countries to decide on appropriate response measures (European Centre for Disease Prevention and Control, 2009a).

On 23 September, the WHO Emergency Committee held its 5th meeting and agreed on continuing the following recommendations proposed by the WHO Director-General:

- borders should not be closed and travel and trade should not be restricted,
- countries should intensify surveillance of unusual events and
- people who are ill should postpone international travel (World Health Organization, 2009n).

Treatment of cases:

The use of antivirals in some groups involves particularities health professionals should know. Therefore, the following recommendations on the use of antivirals in children, pregnant women and women who are breastfeeding were published in Spain:

- zanamivir (Relenza®) or oseltamivir (Tamiflu®) can be used in pregnant women, but zanamivir was recommended as first choice for treatment and prophylaxis,
- the preferred antiviral medicine for breastfeeding women is oseltamivir,
- children under the age of one year should only be treated with oseltamivir,
- post exposure prophylaxis for children under the age of one should only be offered after a thorough benefit-risk assessment (Agencia Española de Medicamentos y Productos Sanitarios, 2009a)

Besides the guidance on the use of antivirals, the Spanish Ministry of Health published recommendations on the treatment of cases with severe acute respiratory failure, recommendations on the clinical management of adults with pneumonia and recommendations on the treatment of pregnant women. The three documents aimed to inform health professionals on diagnostic tests, general and severe symptoms, antiviral treatment or the treatment of complications, and personal protective measures (Ministerio de Sanidad y Politica Social, 2009d, 2009h, 2009i).

On 18 August, the ECDC published general guidance on the use of antivirals during influenza pandemics. The document aimed to inform those deciding on antiviral use strategies about the effectiveness of antivirals, side effects of antivirals, priority groups for antiviral use and about necessary arrangements for antiviral delivery and administration (European Centre for Disease Prevention and Control, 2009y).

Vaccination:

Referring to media reports that have displayed concern about the safety of pandemic vaccine, the WHO has issued a note on pandemic vaccine safety on 6 August. In this statement the WHO outlined the procedures for approval and licensing of vaccines and confirmed that these procedures are strict and do include safety and quality controls. The WHO also stated that the data on influenza vaccine safety collected during the last 60 years do not show a special safety issue. Nonetheless, the WHO advised countries to closely monitor the safety and efficacy of the pandemic vaccine, as rare adverse events may only come to light when large numbers of people got vaccinated (World Health Organization, 2009l).

On 13 August, the ECDC published a document on the use of influenza pandemic vaccines during the 2009 A/H1N1 pandemic. The document aimed to inform those deciding on vaccination policies in the European countries on vaccine use and options for prioritization in order to maximize the benefit of available vaccine (European Centre for Disease Prevention and Control, 2009z).

Time period 4

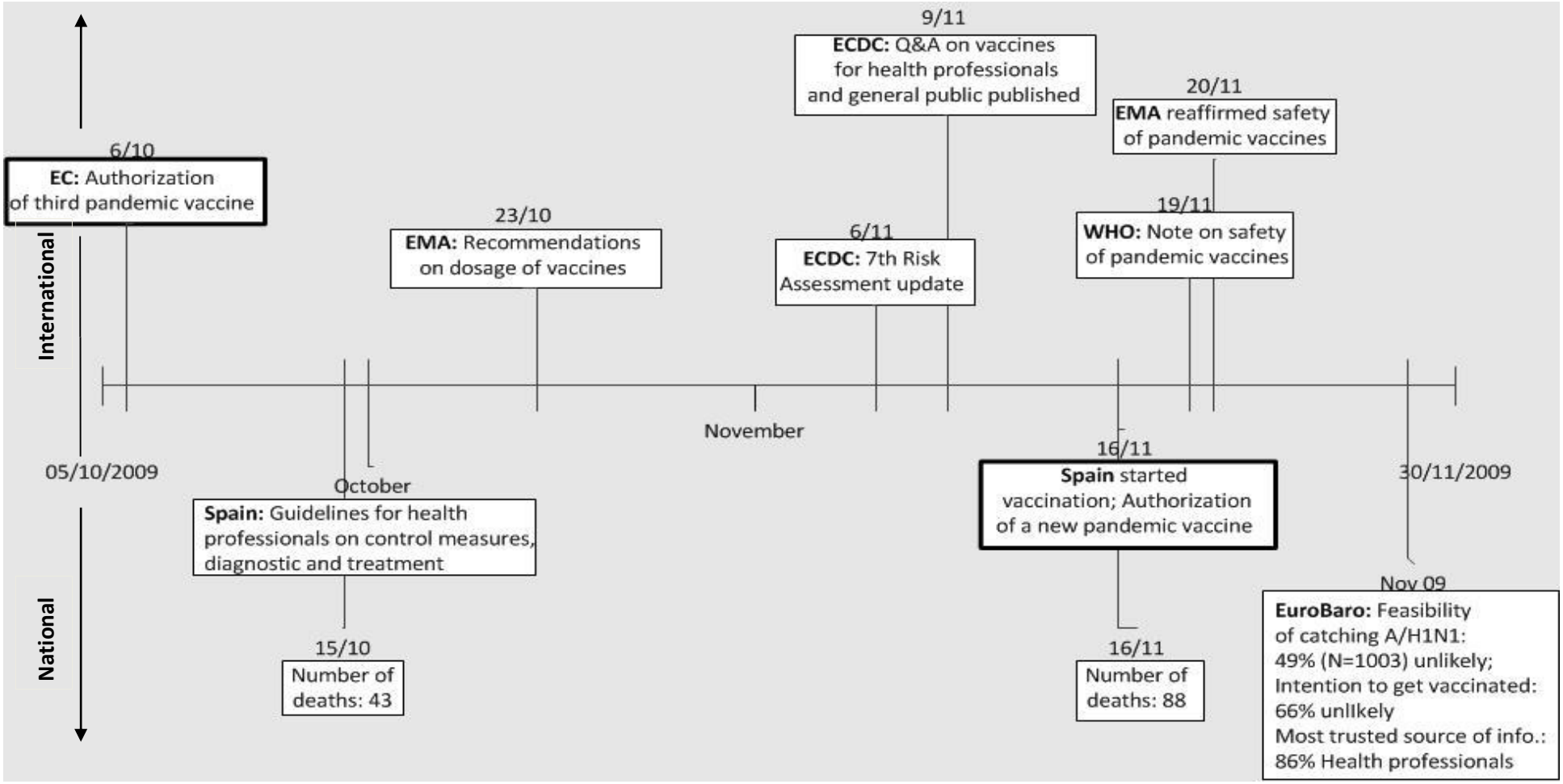


Figure 29: Chronological overview of national and international events in Spain for time period 4 (05/10/2009 to 30/11/2009)

Situation

In early autumn, the numbers of pandemic A/H1N1 infections in Spain have started to increase again, indicating the beginning of the expected autumn/winter wave. In Spain the autumn wave peaked in week 46/2009 reaching the weekly incidence rate of nearly 372 cases/ 100.000 population (Larrauri Cámara et al., 2010). In Mid-November, the number of reported deaths due to pandemic A/H1N1 in Spain reached 88 (European Centre for Disease Prevention and Control, 2009ah).

In its 7th risk assessment issued on 6 November, the ECDC has revised its planning assumptions. The following EU reasonable worst case planning assumptions for the first year up to mid-May 2010 were published: clinical attack rate: up to 20% of population, hospitalization rate: up to 100 per 100.000 population and case fatality rate: up to 3 per 100.000 population (European Centre for Disease Prevention and Control, 2009ag).

In late November, the Gallup Organization conducted a survey called the Eurobarometer in the 27 EU Member States, as well as in Norway, Switzerland and Iceland to examine public opinion about influenza and pandemic A/H1N1. 49% (N=1003) of Spanish interviewees believed it was unlikely or rather unlikely that they would personally catch the A/H1N1influenza. Furthermore, 66% stated that is was not likely or not likely at all that they would get vaccinated against the pandemic A/H1N1 virus. Health professionals were the most trusted source to inform about pandemic A/H1N1. 86% mentioned that they trust health professionals mostly or completely (The Gallup Organization, 2010).

Surveillance

During time period 4, no surveillance strategy modifications have been implemented.

Control strategy and treatment of cases

During time period 4, no control strategy modifications have been implemented.

Vaccination strategy

On 6 October, the European Commission authorized a third pandemic vaccine, Celvapan®, for use in all EU Member States, Iceland, Lichtenstein and Norway (European Commission, 2009c).

On 16 November the Spanish vaccination program commenced (Ministerio de Sanidad y Politica Social, 2009l). Just in time for the start of the vaccination program the new pandemic vaccine Panenza® was authorized in Spain. It has been authorized by a decentralized procedure in which national agencies of Spain, France, Germany, Italy, Belgium and Luxembourg have participated. Panenza® is a vaccine without an adjuvant and was administered to pregnant women (Agencia Española de Medicamentos y Productos Sanitarios, 2009c). Pandemrix® was recommended to be administered to adults aged between 18 and 60 years only. The first choice for the other age groups was Focetria®. The Spanish Medicines and Healthcare Products Agency (Agencia Española de Medicamentos y Productos Sanitarios; AEMPS) recommended a one dose schedule for Pandemrix® and Focetria® for individuals aged over six months (Agencia Española de Medicamentos y Productos Sanitarios, 2009d).

Communication

Same as during time period 3 a lot of information and guidance has been issued during time period 4. In order to give a better overview the publications are again grouped around the themes: non-pharmaceutical response measures, treatment of cases and vaccination.

Non-pharmaceutical response measures:

On 26 November, the WHO Emergency Committee held its 6th meeting and agreed that delaying international travel was no longer recommended for ill persons, because pandemic A/H1N1 infections were already widespread (World Health Organization, 2009p).

Treatment of cases:

In October, the Spanish Ministry of Health and Social Policy published two documents for health professionals. The first document aimed to inform health professionals on diagnostic procedures and the treatment of pandemic A/H1N1 infections. It contained

recommendations regarding the criteria for hospitalization, the organization of care, the treatment with antivirals and personal protective measures (Ministerio de Sanidad y Politica Social, 2009j). The second document included recommendations on prevention and control measures in retirement homes. It informed on general hygiene measures, the management of cases and on available pandemic vaccines (Ministerio de Sanidad y Politica Social, 2009k).

Vaccination:

Together with the start of the vaccination program, the public information campaign was launched in Spain. Information and advice was accessible on government websites and made available to the general public through leaflets (Bundesministerium für Gesundheit et al.., 2009e; Department of Health, 2009n; Ministerio de Sanidad y Politica Social, 2009l).

On 5 November, the Medicines and Healthcare products Regulatory Agency (MHRA) in the UK published its first adverse reaction analysis on pandemic vaccines. In this report, the MHRA stated that there have been no new safety issues identified and that the benefits for Celvapan® and Pandemrix® still outweigh their risks (Medicines and Healthcare products Regulatory Agency, 2009b).

On European level, information on vaccination was provided by the ECDC. In November the ECDC published questions and answers on vaccines for health professionals and for the general public on its website (European Centre for Disease Prevention and Control, 2009b, 2009c, 2010a).

On 19 November, the WHO issued a briefing note on pandemic vaccines in which the safety of the vaccines was reaffirmed (World Health Organization, 2009o). The European Medicines Agency (EMA) did hold the same opinion. In a press release published on 20 November, the EMA reasserted the efficacy and safety of pandemic vaccines. Further, the EMA revised its advice on vaccine schedules and published the following recommendations: Pandemrix® and Focetria® may be used as a single dose in adults (18-60 years) and in children and adolescents (Focetria®: from the age of 9 years; Pandemrix®: from the age of 10 years). Individuals aged over 60 years may also receive one dose of Pandemrix®, but

younger children and immunocompromised people should receive two doses (European Medicines Agency, 2009c).

Time period 5

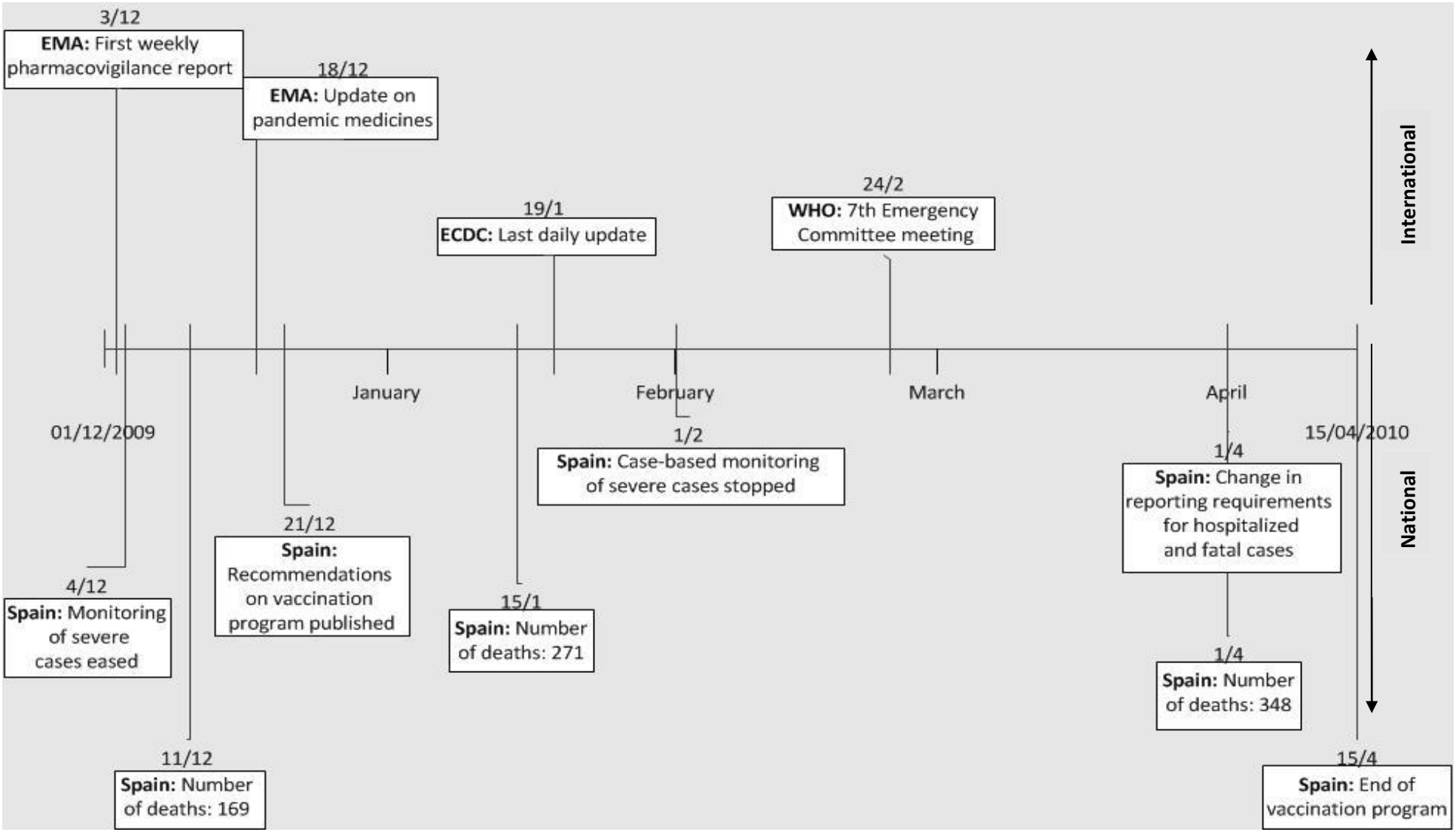


Figure 30: Chronological overview of national and international events in Spain for time period 5 (01/12/2009 to 15/04/2010)

Situation

The number of pandemic A/H1N1 infections decreased constantly in Spain. The end of the autumn wave was in early January 2010. Afterwards only sporadic cases have been reported (Larrauri Cámara et al., 2010). In Mid-January, the number of reported deaths due to pandemic A/H1N1 in Spain reached 271 (European Centre for Disease Prevention and Control, 2010b).

In February 2010, evidence showed decreasing or low pandemic A/H1N1 activity in many countries, but the WHO Emergency Committee agreed that it was too early to conclude that the pandemic A/H1N1 virus has run its course. Thus, the pandemic influenza alert phase was not changed (World Health Organization, 2010a). On 10 August 2010, the WHO Emergency Committee assessed the global situation again. This time the Committee concluded that the world was entering the post-pandemic period (World Health Organization, 2010c).

Altogether, the total number of reported deaths due to pandemic A/H1N1 influenza across Spain was 348 (Ministerio de Sanidad, Politica Social e Igualdad, 2010a).

Surveillance

On 4 December, the Spanish Surveillance Subcommittee eased the reporting requirements for severe cases. Two month later, on 1st February, the case-based monitoring of severe cases was stopped in favor of weekly aggregated reports of severe pandemic A/H1N1 cases. On 1st April, this new reporting requirement was ceased as well. Additionally, the notification of pandemic influenza A/H1N1 related deaths was stopped (Ministerio de Sanidad, Politica Social e Igualdad, 2010a).

Control strategy and treatment of cases

No control strategy modifications were introduced.

Vaccination strategy

No vaccination strategy modifications were introduced.

Communication

During time period 5, only little information and guidance has been published. Thus, the information and guidance is only grouped around the theme: vaccination.

Vaccination:

Between December 2009 and August 2010, the European Medicines Agency (EMA) published regular updates on safety monitoring of vaccines and medicines used during the pandemic (European Medicines Agency, 2010). In its update on pandemic medicines of 18 December, the EMA reaffirmed that the available data on the three pandemic vaccines and Tamiflu® showed no unexpected serious safety issues (European Medicines Agency, 2010).

On 21 December, the Spanish Medicines and Healthcare Products Agency (Agencia Española de Medicamentos y Productos Sanitarios; AEMPS) issued official recommendations on the vaccination program. This document informed health professionals on the priority groups for vaccination, the specific pandemic vaccines and on aspects for vaccine administration (Agencia Española de Medicamentos y Productos Sanitarios, 2009d).

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Czech Republic

Time period 1

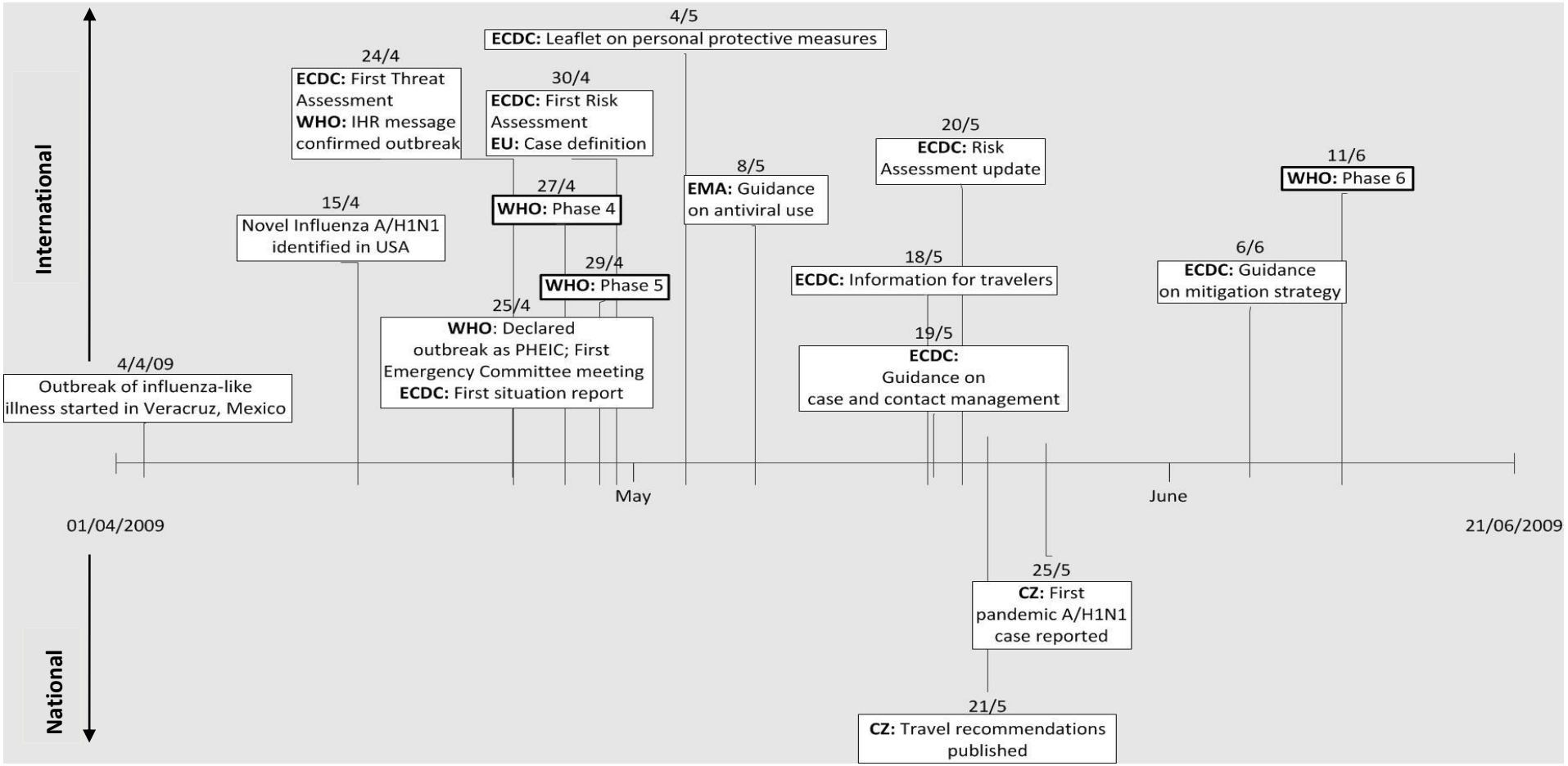

Figure 31: Chronological overview of national and international events in the Czech Republic for time period 1 (01/04/2009 to 21/06/2009)

Situation

The pandemic started in Veracruz, Mexico where an outbreak of influenza-like illness was recorded in early April 2009 (European Centre for Disease Prevention and Control, 2010a). A few days later several parts of Mexico reported further outbreaks of influenza-like illness. Analysis of samples detected an Influenza A virus but it was not possible to identify the subtype (World Health Organization, 2011). In mid-April, the US Centers for Disease Control and Prevention (CDC) analyzed a sample from two children with respiratory illness in southern California, USA and identified the virus as a swine influenza A/H1N1 virus (Centers for Disease Control and Prevention, 2009). On 24 April WHO reported that virus isolates from Mexican patients were genetically identical to the new strain of swine influenza A/H1N1 virus discovered in California (World Health Organization, 2009b). On the same day ECDC published its first Threat Assessment saying that although the public health situation was still limited to Mexico and the US further vigilance was required in Europe to ensure the identification of the new virus (European Centre for Disease Prevention and Control, 2009d).

One day later, on 25 April 2009, the first WHO Emergency Committee meeting was held. International experts came together to assess the situation in Mexico and the US and to advice the WHO Director-General, Dr. Margaret Chan, on response measures. The Committee reported more information on the clinical presentation, epidemiology and virology of cases was needed, but concluded that the situation was of international concern. Thus, Dr. Margret Chan declared the outbreak in Mexico and the US as a public health emergency of international concern (PHEIC) under International Health Regulations (2005) and advised all countries to intensify surveillance for influenza-like illness and respiratory disease (World Health Organization, 2009c).

On the same day, the ECDC started to publish daily situation reports in which the current epidemiological situation was summarized. So far, 8 cases of pandemic A/H1N1 have been confirmed in the United States of America. In Mexico City 854 cases of pneumonia have been reported, including 59 deaths (European Centre for Disease Prevention and Control, 2009e).

Two days later, on 27 April, the first laboratory confirmed pandemic A/H1N1 cases have been reported in Europe, one in Spain and two in the UK (European Centre for Disease Prevention and Control, 2009f). Based on available data on confirmed pandemic A/H1N1 cases in Mexico, the USA, Canada, and reports on suspected cases in other countries, the WHO Director-General raised the level of influenza pandemic alert to phase 4 (World Health Organization, 2009d). While phase 3 is characterized by sporadic cases and limited human-to-human transmission of an influenza reassortant virus, phase 4 is defined by confirmed human-to-human transmission of an influenza reassortant virus capable to cause sustained outbreaks in a community (World Health Organization, 2012). The WHO Director-General, Dr. Margaret Chan, did not recommend any trade or travel restrictions and advised to center on mitigation measures as the containment of the outbreak was not considered to be feasible (World Health Organization, 2009d).

Two days later, on 29 April, the influenza pandemic alert was raised to phase 5 (World Health Organization, 2009e). This was a signal that a pandemic was coming up and human to human spread of the virus into at least two countries of one WHO region was evident, namely Mexico and USA (European Centre for Disease Prevention and Control, 2009h; World Health Organization, 2012).

In its first risk assessment, published on 30 April, the ECDC reported missing information and data to define the seriousness of the potential pandemic. So far, the majority of pandemic A/H1N1 cases experienced a mild disease and the case fatality rate was judged not to be different than for seasonal influenza (European Centre for Disease Prevention and Control, 2009g).

At the start of the Sixty-second World Health Assembly on 18 May, members shared their experiences with the current outbreak of pandemic influenza A/H1N1. Altogether, 40 countries have reported 8829 confirmed cases of pandemic A/H1N1 (World Health Organization, 2009f).

On 25 May, the Czech Republic reported its first laboratory-confirmed case of pandemic A/H1N1 (European Centre for Disease Prevention and Control, 2009q).

In its risk assessment update on 20 May, the ECDC again reported a continuing lack of data on parameters needed for right risk assessment. The ECDC considered available data and

stated that the pandemic A/H1N1 infections have been generally mild in Europe. Now there was more evidence that the virus was able to spread easily from one person to another and that it preferentially infected younger age groups. ECDC concluded that the spread of the pandemic A/H1N1 virus will continue (European Centre for Disease Prevention and Control, 2009p).

On 11 June, the WHO raised the level of influenza pandemic alert to phase 6, declaring a pandemic (World Health Organization, 2009h). The severity of the pandemic was considered to be moderate by the WHO (World Health Organization, 2009i).

Surveillance

On 30 April, the European Commission agreed on a common case definition for the European Union in order to detect cases of influenza caused by the new virus. This case definition is presented in Table 15 (see chapter 0).

In the Czech Republic, the surveillance system to monitor influenza and other viral acute respiratory infections was active throughout the year and used the European Union case definition for influenza. Data were collected on a weekly basis and analysed at national level. The information was provided to the European Centre for Disease Prevention and Control (ECDC) and the World Health Organization (WHO) (Kyncl et al.., 2013).

Communication

In order to give a better overview, the information published during time period 1 is grouped around the themes: personal protective measures, treatment of cases and control strategy.

<u>Personal protective measures:</u>

The ECDC provided information on European level. On 27 April, the ECDC published the first general questions and answers on pandemic A/H1N1 virus (European Centre for Disease Prevention and Control, 2010a). In May, the ECDC published two documents on personal protective measures and information for travelers. The documents described personal protective measures to reduce the risk of acquiring influenza, i.e. regular hand

washing, respiratory hygiene, avoidance of close contacts and mass gatherings (European Centre for Disease Prevention and Control, 2009k, 2009m, 2009n).

On 21 May travel recommendations and recommendations on protective measures were published by the Czech Ministry of Health. This leaflet was based on information given by the ECDC. It informed about the symptoms of pandemic A/H1N1 infection and provided instructions on general hygiene measures to avoid pandemic A/H1N1 infection (Ministerstvo zdravotnictví ČR, 2009a).

Treatment of cases:

The use of antivirals in some groups involves particularities health professionals should know. Thus, on 8 May, the European Medicines Agency (EMA) published a guidance document on the use of the antiviral medicine Tamiflu in children under one year of age and the antivirals Tamiflu and Relenza in pregnant and breastfeeding women in the case of an influenza A/H1N1 pandemic. The EMA stated that in the event of a pandemic Tamiflu can be used to treat children under the age of one and both antivirals can be used to treat pregnant women, as the benefits of their use outweigh their risks (European Medicines Agency, 2009a).

Control strategy:

On 19 May, the ECDC published a guidance document on case and contact management. The recommended measures did not differ from the measures already applied in Germany, Spain and the UK (European Centre for Disease Prevention and Control, 2009o).

On 6 June, the ECDC published a guidance document on mitigation and containment strategies for national health authorities. ECDC stated that many public health measures are common in both strategies and the implementation of a mitigation strategy would mainly mean to move away from vigorous case finding and contact tracing. Further, the ECDC acknowledged that a containment strategy is very resource-intensive and therefore not a recommended infection control strategy for human influenza beyond pandemic alert phase 4 (European Centre for Disease Prevention and Control, 2009r).

Time period 2

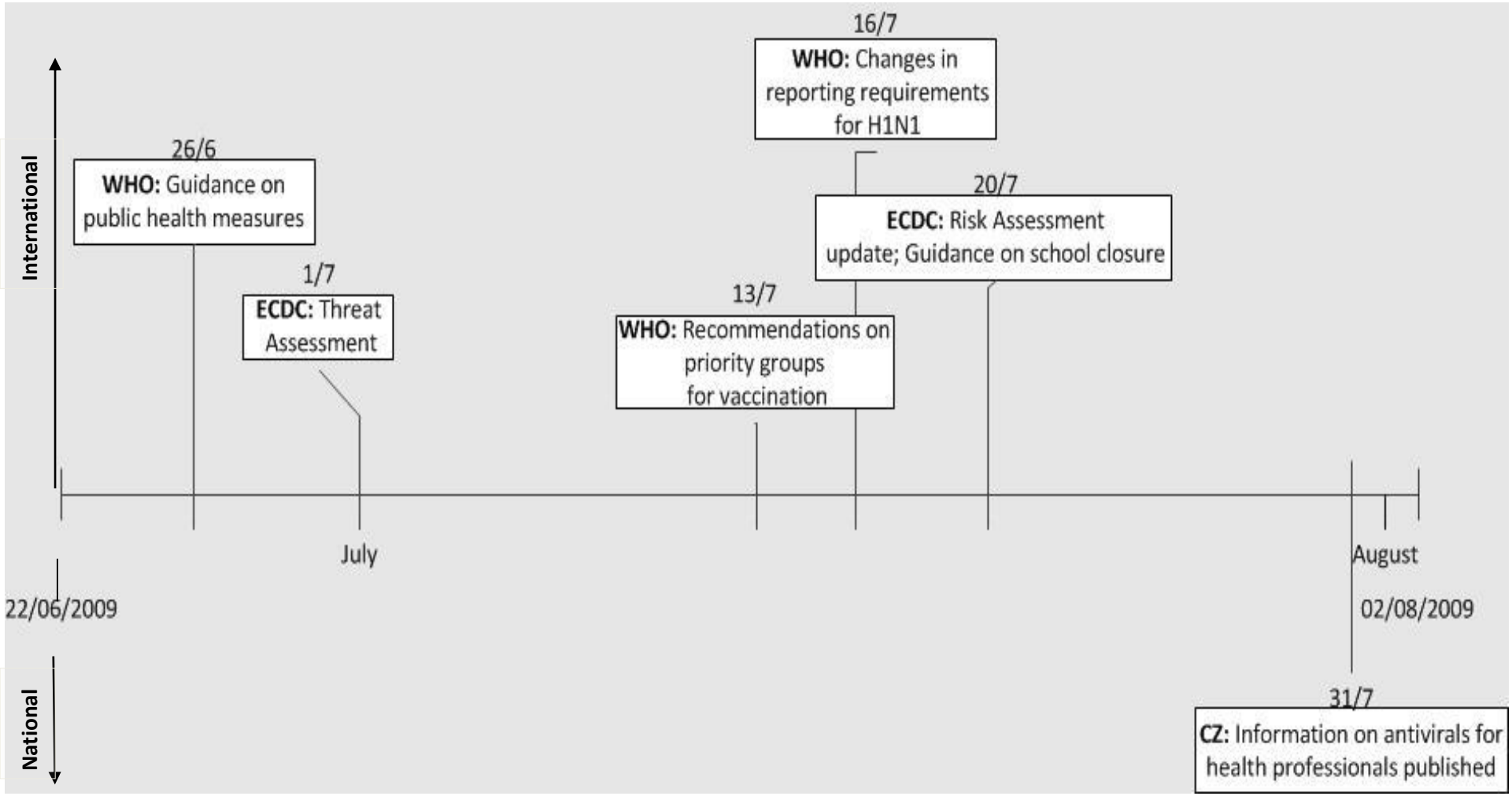

Figure 32: Chronological overview of national and international events in the Czech Republic for time period 2 (22/06/2009 to 02/08/2009)

Situation

In Czech Republic, the number of pandemic A/H1N1 cases has increased sharply until the peak of the first wave in week 32/2009.

In its Threat Assessment, published on 1 July, the ECDC announced the first isolation of an oseltamivir (also known as Tamiflu®) resistant mutant A/H1N1 virus in Denmark. The virus was not a reassortant virus and was still susceptible to zanamivir (also known as Relenza®). There was no evidence that the virus has been transmitted to other persons. ECDC stated that this phenomenon is well-known in influenza viruses and emphasized the need for continued surveillance of this problem (European Centre for Disease Prevention and Control, 2009u).

According to an ECDC risk assessment published on 20 July, 20-30% of the population was expected to be affected over the first major wave of the pandemic. Clinical attack rates were expected to be highest in children and young adults. The estimate for hospitalization rates in Europe was 1-2% and the case fatality rate was estimated to be 0.1-0.2% of all clinical cases. ECDC stated that most cases experienced a mild and self-limiting illness, but people with chronic underlying medical conditions, pregnant women and young children were at higher risk of experiencing severe disease and deaths (European Centre for Disease Prevention and Control, 2009w).

Surveillance

On 16 July, the WHO announced that countries with community-wide transmission are no longer required to forward regular reports of individual confirmed cases to the WHO, as the detection, laboratory-confirmation and investigation of all cases is extremely resource-intensive and not sustainable for these countries (World Health Organization, 2009k).

Vaccination strategy

As initial supplies of pandemic vaccine were limited, the WHO Strategic Advisory Group of Experts (SAGE) on Immunization recommended that the following groups should be

prioritized for vaccination: health-care workers; pregnant women; individuals aged above six months with a chronic medical condition; healthy individuals aged between 15 years and up to 49 years; healthy children; healthy individuals aged between 50 years and up to 64 years; and healthy individuals aged 65 years or above. The order of priority should be based on country-specific conditions (World Health Organization, 2009j).

Communication

In order to give a better overview, the information published during time period 2 is grouped around the themes: control strategy, non-pharmaceutical response measures and treatment of cases.

Control strategy:

On 26 June, the WHO published a guidance document on public health measures to help countries manage the A/H1N1 pandemic. Besides giving general advice on response measures, the WHO provided additional advice for countries with widespread community-level transmission, for countries with no reported cases and for countries in transition. The WHO advised all countries to concentrate on mitigation measures, to prepare the health-care system for a high volume of patients and to ensure antiviral medicine and vaccine supply. In addition, countries with widespread community-level transmission were advised to cease laboratory-testing of all cases, to reduce the pressure on the health-care system, to primarily focus on the treatment of ill patients, and to consider school closures or the cancellation of mass gathering on a case-by-case basis. Countries with no reported cases were advised that they may consider entry screening at airports and contact tracing, but that these measures are resource intensive and of limited benefit to prevent the spread of the disease. Countries in transition were advised to start the same control measures as countries with widespread community-level transmission (World Health Organization, 2009a).

Non-pharmaceutical response measures:

On 20 July, the ECDC gave scientific advice on reactive and proactive school closures in Europe. ECDC highlighted that there is no consensus on the benefits from proactive school closures (school closure before transmission between the children occurs), but countries and schools were advised to at least have plans for reactive school closures (school closure when

many children and/or staff are experiencing illness). These plans should consider the following issues: recommended length of time of closure; the triggers for re-opening; how to sustain teaching and learning; and potential problems that may arise for parents, if they have to take time off work (European Centre for Disease Prevention and Control, 2009x).

Treatment of cases:

On 31 July, the Ministry of Health published information on Relenza for health professionals. This information was based on advice from the European Medicines Agency and contained the following recommendations: Relenza in the current situation was indicated for the treatment of diseases of proven influenza virus A (H1N1) in adults, adolescents and children over 5 years of age. It was not intended for prophylactic use. Treatment should have been initiated as soon as possible after the outbreak of flu symptoms and within 48 hours of onset of symptoms in adults and within 36 hours of onset of symptoms in children (Ministerstvo zdravotnictví ČR, 2009b).

Time period 3

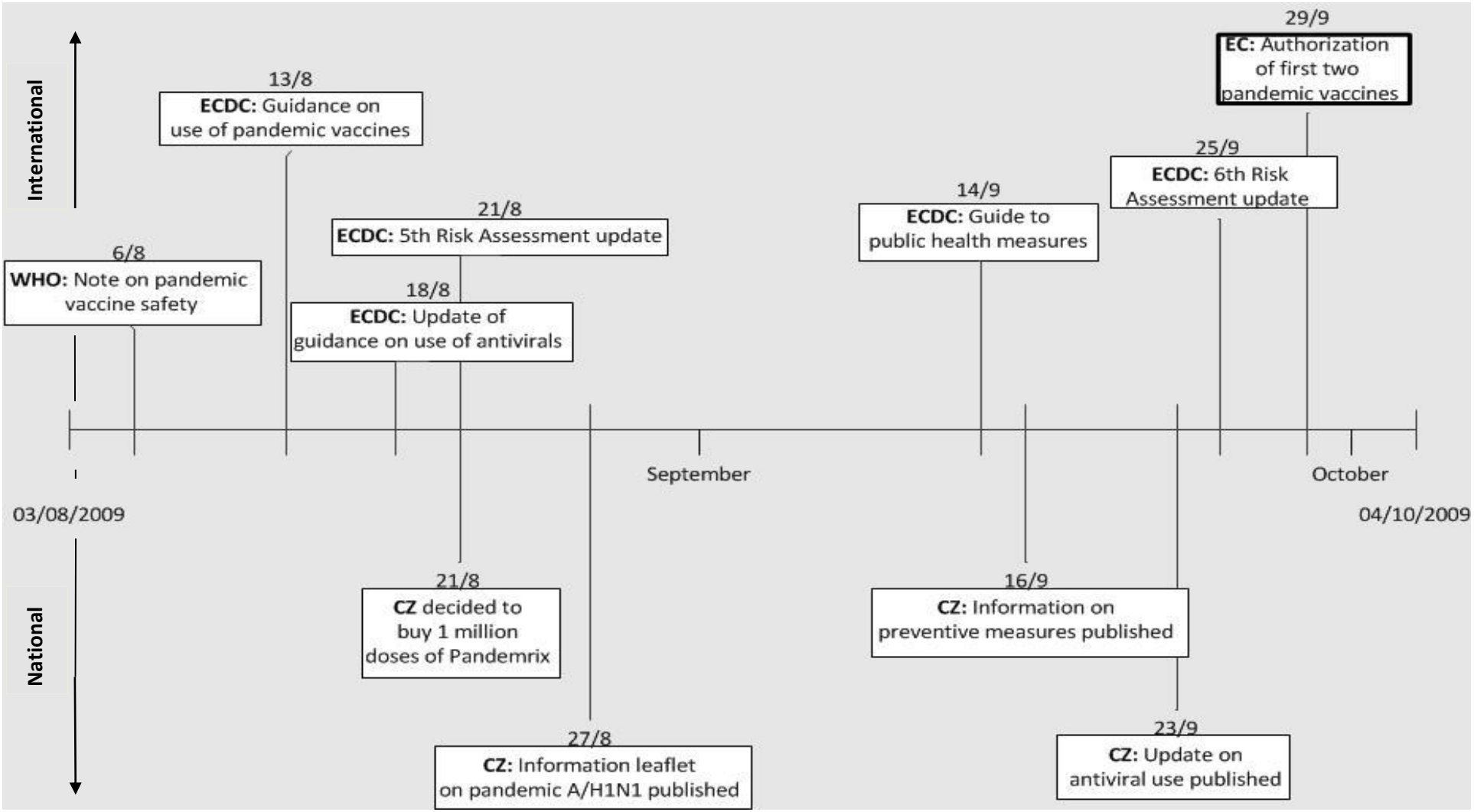

Figure 33: Chronological overview of national and international events in the Czech Republic for time period 3 (03/08/2009 to 04/10/2009)

Situation

Same as in the other countries, the virus continued to spread in Czech Republic, but at a low level over the summer.

On 21 August, the ECDC published its planning assumptions for the first major wave of infection, which was expected to take place in the autumn and winter of 2009/2010. However, these planning assumptions did not differ from those published on 20 July (European Centre for Disease Prevention and Control, 2009ab).
In late September, the ECDC has reduced its planning assumptions. This decision was based on experience from Southern Hemisphere countries. It became more apparent that most pandemic A/H1N1 cases experienced a mild disease; therefore hospitalization and case fatality rates were revised downwards (European Centre for Disease Prevention and Control, 2009ad).

Vaccination Strategy

On 21 August, the Czech Republic decided to buy 1 million doses of Pandemrix from GlaxoSmithKline. First deliveries were expected in week 48/2009 (Ministerstvo zdravotnictví ČR, 2009c).

On 29 September, the European Commission authorized the first two pandemic vaccines Focetria® (Novartis) and Pandemrix® (GlaxoSmithKline) for use in all Member States of the European Union and in Iceland, Liechtenstein and Norway (European Commission, 2009b).

Communication

In order to give a better overview, the publications issued during time period 3 are grouped around the themes: personal protective measures, non-pharmaceutical response measures, treatment of cases and vaccination.

Personal protective measures:

On 27 August, the Ministry of Health published a document on personal protective measures based on ECDC material. This document aimed to answer frequently asked questions on pandemic A/H1N1. It informed about symptoms of pandemic influenza A/H1N1, ways of transmission, general hygiene measures, risk groups, and control measures (Ministerstvo zdravotnictví ČR, 2009d). About three weeks later, on 16 September, a poster on preventive measures was published (Ministerstvo zdravotnictví ČR, 2009e).

Non-pharmaceutical response measures:

In mid-September, the ECDC published a document on public health measures for policy and decision-makers (European Centre for Disease Prevention and Control, 2010a). It provided scientific information on measures that may be applied to reduce the impact of influenza pandemics (i.e. border closures, entry restrictions, personal protective measures, social distancing measures, use of antivirals and vaccines) and aimed to help EU countries to decide on appropriate response measures (European Centre for Disease Prevention and Control, 2009a).

On 23 September, the WHO Emergency Committee held its 5th meeting and agreed on continuing the following recommendations proposed by the WHO Director-General:

- borders should not be closed and travel and trade should not be restricted,
- countries should intensify surveillance of unusual events and
- people who are ill should postpone international travel (World Health Organization, 2009n).

Treatment of cases:

On 18 August, the ECDC published general guidance on the use of antivirals during influenza pandemics. The document aimed to inform those deciding on antiviral use strategies about the effectiveness of antivirals, side effects of antivirals, priority groups for antiviral use and about necessary arrangements for antiviral delivery and administration (European Centre for Disease Prevention and Control, 2009y).

On 23 September, a document providing information on antivirals for health professionals was published. This document contained information on the use and dosage of antivirals, contraindications and side effects. According to this document, the prophylactic use of antivirals was not recommended (Ministerstvo zdravotnictví ČR, 2009f).

Vaccination:

Referring to media reports that have displayed concern about the safety of pandemic vaccine, the WHO has issued a note on pandemic vaccine safety on 6 August. In this statement the WHO outlined the procedures for approval and licensing of vaccines and confirmed that these procedures are strict and do include safety and quality controls. The WHO also stated that the data on influenza vaccine safety collected during the last 60 years do not show a special safety issue. Nonetheless, the WHO advised countries to closely monitor the safety and efficacy of the pandemic vaccine, as rare adverse events may only come to light when large numbers of people got vaccinated (World Health Organization, 2009l).

On 13 August, the ECDC published a document on the use of influenza pandemic vaccines during the 2009 A/H1N1 pandemic. The document aimed to inform those deciding on vaccination policies in the European countries on vaccine use and options for prioritization in order to maximize the benefit of available vaccine (European Centre for Disease Prevention and Control, 2009z).

Time period 4

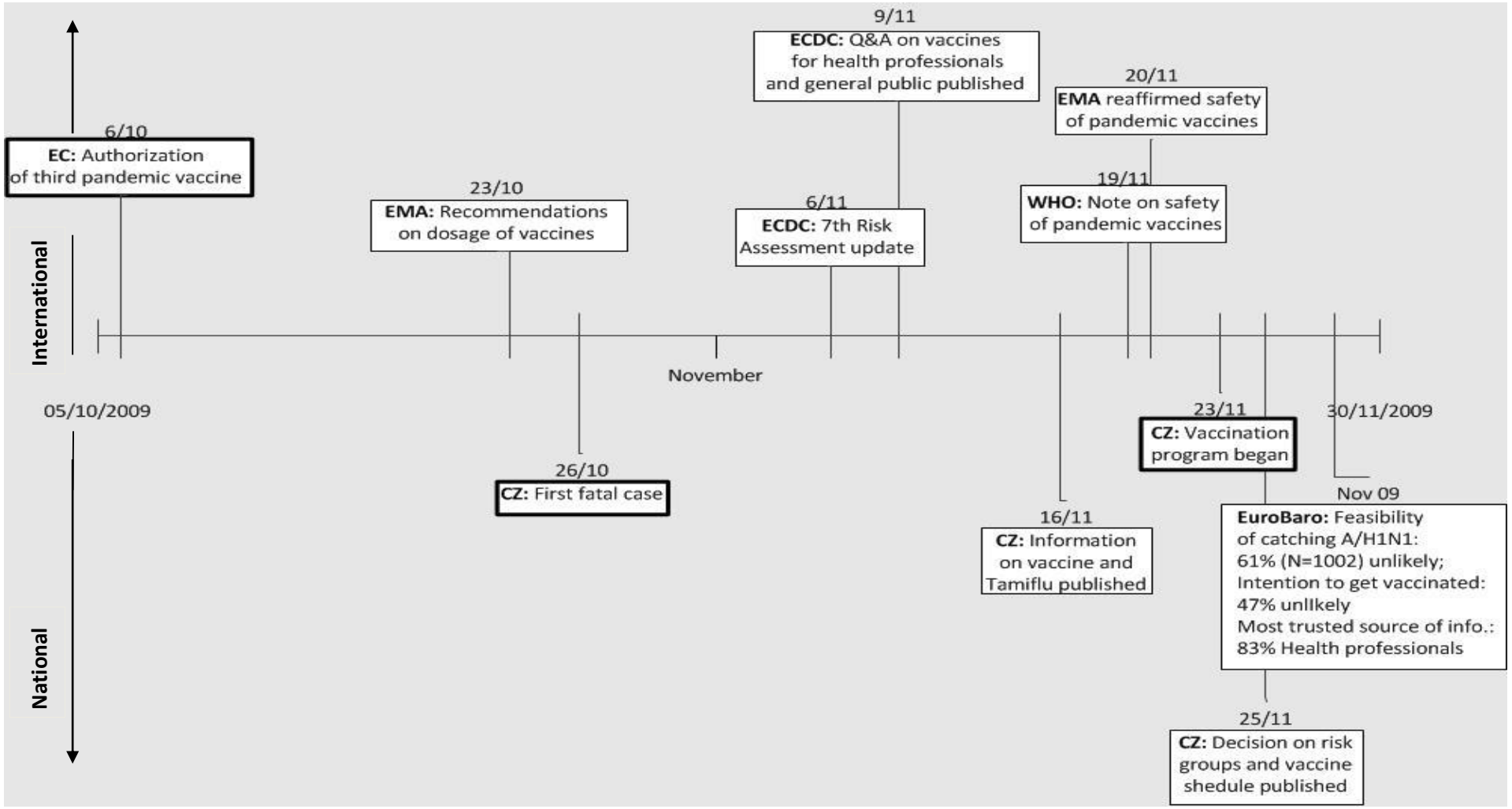

Figure 34: Chronological overview of national and international events in the Czech Republic for time period 4 (05/10/2009 to 30/11/2009)

Situation

In early autumn, the numbers of pandemic A/H1N1 infections have started to increase again, indicating the beginning of the expected autumn/winter wave. In the Czech Republic the second wave peaked around week 51/2009. On 26 October, the Czech Republic reported the first fatal case due to pandemic A/H1N1(European Centre for Disease Prevention and Control, 2009af).

In its 7th risk assessment issued on 6 November, the ECDC has revised its planning assumptions. The following EU reasonable worst case planning assumptions for the first year up to mid-May 2010 were published: clinical attack rate: up to 20% of population, hospitalization rate: up to 100 per 100.000 population and case fatality rate: up to 3 per 100.000 population (European Centre for Disease Prevention and Control, 2009ag).

In late November, the Gallup Organization conducted a survey called the Eurobarometer in the 27 EU Member States, as well as in Norway, Switzerland and Iceland to examine public opinion about influenza and pandemic A/H1N1. 61% (N=1002) of Czech interviewees believed it was unlikely or rather unlikely that they would personally catch the A/H1N1influenza. Furthermore, 47% stated that is was not likely or not likely at all that they would get vaccinated against the pandemic A/H1N1 virus. Health professionals were the most trusted source to inform about pandemic A/H1N1. 83% mentioned that they trust health professionals mostly or completely (The Gallup Organization, 2010).

Vaccination strategy

On 6 October, the European Commission authorized a third pandemic vaccine, Celvapan®, for use in all EU Member States, Iceland, Lichtenstein and Norway (European Commission, 2009c).

The European Medicines Agency (EMA) recommended a two dose schedule for all three authorized vaccines (European Medicines Agency, 2009b).

On 23 November the Czech Republic started its vaccination program (O'Flanagan et al.., 2011). Three days later the decision on risk groups and vaccine schedules were published. The pandemic vaccine was recommended for the following groups:

- Individuals with chronic conditions (e.g chronic heart disease, chronic pulmonary disease, chronic kidney disease, immunocompromised person),
- Individuals performing essential public services and
- Healthcare workers.

For these groups listed above a single-dose vaccine schedule was recommended, except for immunocompromised individuals where the vaccine was administered in a two-dose schedule (Ministerstvo zdravotnictví ČR, 2009c, 2009j).

Communication

In order to give a better overview the publications issued during time period 4 are again grouped around the themes: non-pharmaceutical response measures, treatment of cases and vaccination.

Non-pharmaceutical response measures:

On 26 November, the WHO Emergency Committee held its 6th meeting and agreed that delaying international travel was no longer recommended for ill persons, because pandemic A/H1N1 infections were already widespread (World Health Organization, 2009p).

Treatment of cases:

On 16 November an information letter was sent to GP that informed about the start of the vaccination program and the Tamiflu distribution process (Ministerstvo zdravotnictví ČR, 2009g).

On 20 November the Ministry of Health published Information on the amount of antivirals distributed to hospitals and recommended dosage of antivirals for children and adults (Ministerstvo zdravotnictví ČR, 2009h).

Vaccination:

On European level, information on vaccination was provided by the ECDC. In November the ECDC published questions and answers on vaccines for health professionals and for the

general public on its website (European Centre for Disease Prevention and Control, 2009b, 2009c, 2010a).

On 19 November, the WHO issued a briefing note on pandemic vaccines in which the safety of the vaccines was reaffirmed (World Health Organization, 2009o). The European Medicines Agency (EMA) did hold the same opinion. In a press release published on 20 November, the EMA reasserted the efficacy and safety of pandemic vaccines. Further, the EMA revised its advice on vaccine schedules and published the following recommendations: Pandemrix® and Focetria® may be used as a single dose in adults (18-60 years) and in children and adolescents (Focetria®: from the age of 9 years; Pandemrix®: from the age of 10 years). Individuals aged over 60 years may also receive one dose of Pandemrix®, but younger children and immunocompromised people should receive two doses (European Medicines Agency, 2009c).

On 20 November, information on the vaccination strategy, general conditions for the distribution and storage of vaccine, and the risk groups was published on the website of the Czech Ministry of Health (Ministerstvo zdravotnictví ČR, 2009i).

Time period 5

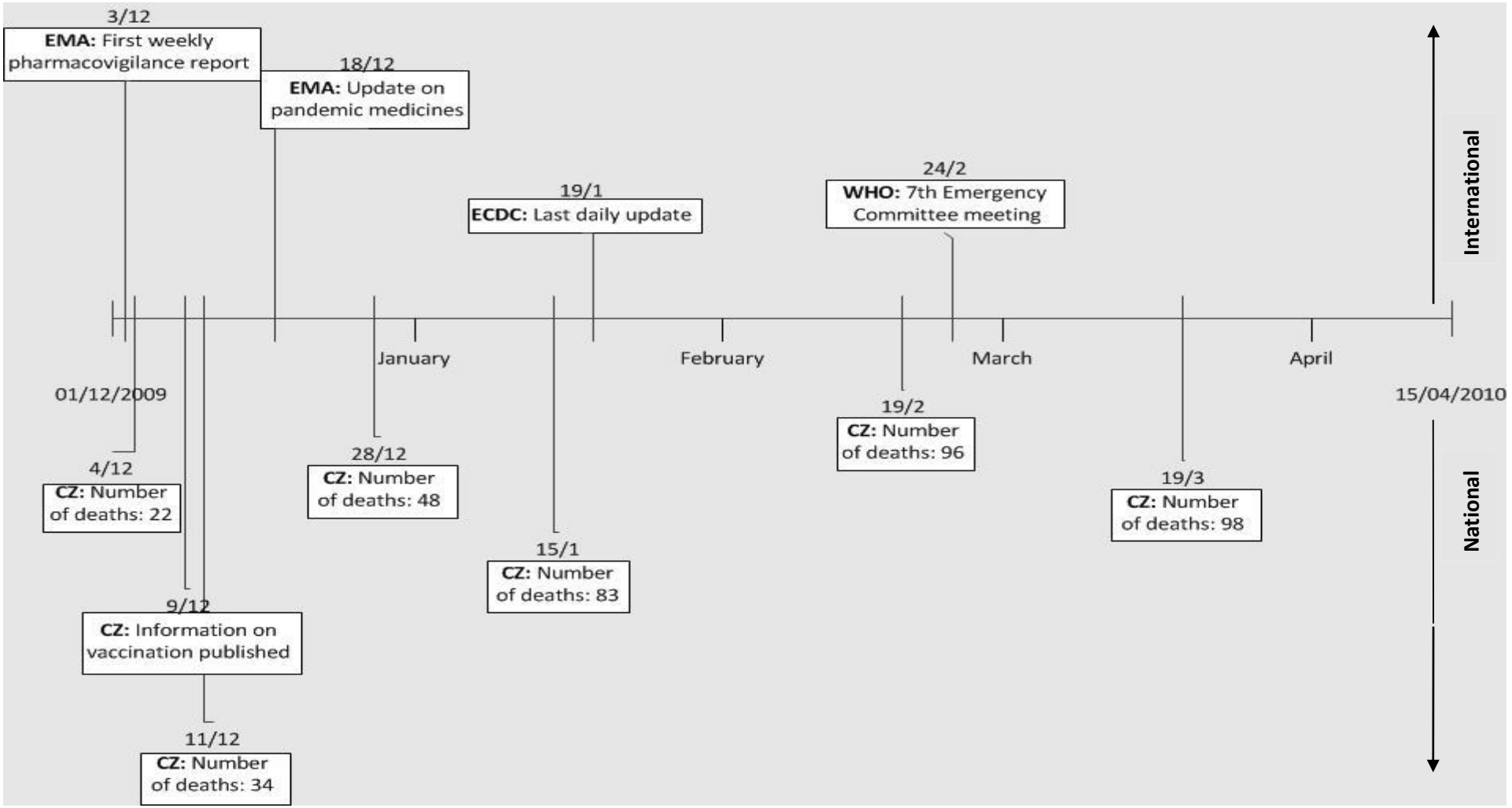

Figure 35: Chronological overview of national and international events in the Czech Republic for time period 5 (01/12/2009 to 15/04/2010)

Situation

The number of pandemic A/H1N1 infections decreased constantly in the Czech Republic. The end of the autumn wave was in end of January 2010. Afterwards only sporadic cases have been reported. On 4 December, the number of reported deaths in the Czech Republic raised to 22 (European Centre for Disease Prevention and Control, 2009ai). Three weeks later the number of reported deaths reached 48 (European Centre for Disease Prevention and Control, 2009al). In Mid-January 2010 the number of deaths had climbed up to 83 people in the Czech Republic (European Centre for Disease Prevention and Control, 2010c) and reached a total of 98 by the end of March 2010 (European Centre for Disease Prevention and Control, 2010e).

In February 2010, evidence showed decreasing or low pandemic A/H1N1 activity in many countries, but the WHO Emergency Committee agreed that it was too early to conclude that the pandemic A/H1N1 virus has run its course. Thus, the pandemic influenza alert phase was not changed (World Health Organization, 2010a). On 10 August 2010, the WHO Emergency Committee assessed the global situation again. This time the Committee concluded that the world was entering the post-pandemic period (World Health Organization, 2010c).

Communication

During time period 5, only little information and guidance has been published. Thus, the information and guidance is only grouped around the theme vaccination.

Vaccination:

On 9 December, the Ministry of health published information on vaccination for the general public. This information was based on the ECDC material on vaccination (Ministerstvo zdravotnictví ČR, 2009k).

Between December 2009 and August 2010, the European Medicines Agency (EMA) published regular updates on safety monitoring of vaccines and medicines used during the pandemic (European Medicines Agency, 2010). In its update on pandemic medicines of 18

December, the EMA reaffirmed that the available data on the three pandemic vaccines and Tamiflu® showed no unexpected serious safety issues (European Medicines Agency, 2010).

Denmark

Time period 1

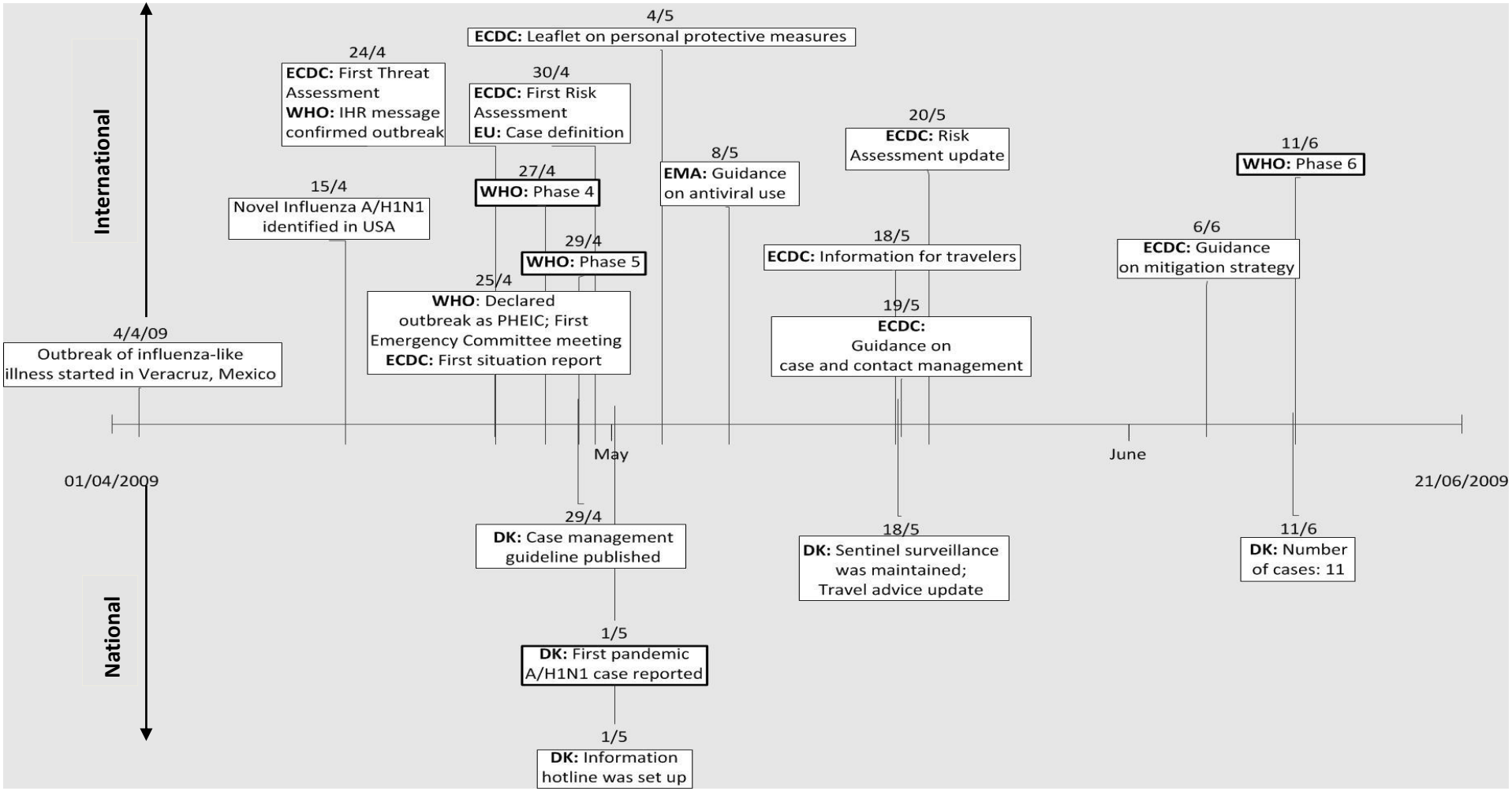

Figure 36: Chronological overview of national and international events in Denmark for time period 1 (01/04/2009 to 21/06/2009)

Situation

The pandemic started in Veracruz, Mexico where an outbreak of influenza-like illness was recorded in early April 2009 (European Centre for Disease Prevention and Control, 2010a). A few days later several parts of Mexico reported further outbreaks of influenza-like illness. Analysis of samples detected an Influenza A virus but it was not possible to identify the subtype (World Health Organization, 2011). In mid-April, the US Centers for Disease Control and Prevention (CDC) analyzed a sample from two children with respiratory illness in southern California, USA and identified the virus as a swine influenza A/H1N1 virus (Centers for Disease Control and Prevention, 2009). On 24 April WHO reported that virus isolates from Mexican patients were genetically identical to the new strain of swine influenza A/H1N1 virus discovered in California (World Health Organization, 2009b). On the same day ECDC published its first Threat Assessment saying that although the public health situation was still limited to Mexico and the US further vigilance was required in Europe to ensure the identification of the new virus (European Centre for Disease Prevention and Control, 2009d).

One day later, on 25 April 2009, the first WHO Emergency Committee meeting was held. International experts came together to assess the situation in Mexico and the US and to advice the WHO Director-General, Dr. Margaret Chan, on response measures. The Committee reported more information on the clinical presentation, epidemiology and virology of cases was needed, but concluded that the situation was of international concern. Thus, Dr. Margret Chan declared the outbreak in Mexico and the US as a public health emergency of international concern (PHEIC) under International Health Regulations (2005) and advised all countries to intensify surveillance for influenza-like illness and respiratory disease (World Health Organization, 2009c).

On the same day, the ECDC started to publish daily situation reports in which the current epidemiological situation was summarized. So far, 8 cases of pandemic A/H1N1 have been confirmed in the United States of America. In Mexico City 854 cases of pneumonia have been reported, including 59 deaths (European Centre for Disease Prevention and Control, 2009e).

Two days later, on 27 April, the first laboratory confirmed pandemic A/H1N1 cases have been reported in Europe, one in Spain and two in the UK (European Centre for Disease Prevention and Control, 2009f). Based on available data on confirmed pandemic A/H1N1 cases in Mexico, the USA, Canada, and reports on suspected cases in other countries, the WHO Director-General raised the level of influenza pandemic alert to phase 4 (World Health Organization, 2009d). While phase 3 is characterized by sporadic cases and limited human-to-human transmission of an influenza reassortant virus, phase 4 is defined by confirmed human-to-human transmission of an influenza reassortant virus capable to cause sustained outbreaks in a community (World Health Organization, 2012). The WHO Director-General, Dr. Margaret Chan, did not recommend any trade or travel restrictions and advised to center on mitigation measures as the containment of the outbreak was not considered to be feasible (World Health Organization, 2009d).

Two days later, on 29 April, the influenza pandemic alert was raised to phase 5 (World Health Organization, 2009e). This was a signal that a pandemic was coming up and human to human spread of the virus into at least two countries of one WHO region was evident, namely Mexico and USA (European Centre for Disease Prevention and Control, 2009h; World Health Organization, 2012).

In its first risk assessment, published on 30 April, the ECDC reported missing information and data to define the seriousness of the potential pandemic. So far, the majority of pandemic A/H1N1 cases experienced a mild disease and the case fatality rate was judged not to be different than for seasonal influenza (European Centre for Disease Prevention and Control, 2009g).

On 1st May the first laboratory confirmed A/H1N1 case was reported in Denmark. The infected individual was infected in New York and came back to Denmark on 29 April (National Board of Health, 2009e).

In its risk assessment update on 20 May, the ECDC again reported a continuing lack of data on parameters needed for right risk assessment. The ECDC considered available data and stated that the pandemic A/H1N1 infections have been generally mild in Europe. Now there was more evidence that the virus was able to spread easily from one person to another and that it preferentially infected younger age groups. ECDC concluded that the spread of the

pandemic A/H1N1 virus will continue (European Centre for Disease Prevention and Control, 2009p).

On 11 June, the WHO raised the level of influenza pandemic alert to phase 6, declaring a pandemic (World Health Organization, 2009h). The severity of the pandemic was considered to be moderate by the WHO (World Health Organization, 2009i).

As of 11 June Denmark has reported 11 cases of A/H1N1, all of which have been relatively mild. By then, Infection in Denmark was still limited to persons who have been abroad and in some cases their immediate contacts (National Board of Health, 2009g).

Surveillance

On 30 April, the European Commission agreed on a common case definition for the European Union in order to detect cases of influenza caused by the new virus. This case definition is presented in Table 15 (see chapter 0).

Due to the novel influenza virus A/H1N1 outbreaks, the sentinel surveillance of influenza in Denmark was maintained beyond the normal influenza season. GPs were encouraged to report the number of patients who have visited the GP and to take samples from patients fulfilling the A/H1N1 disease definition (Andersen, 2009b).

Control strategy and treatment of cases

Initially, Denmark employed a containment strategy. Measures focused on limiting transmission of the virus or delaying the spread in order to gain time to apply effective response measures. This strategy included the following public health measures: those who met the clinical and epidemiological case definition were assessed through swabbing and laboratory testing; cases were treated with antivirals within 48 hours after onset of symptoms and requested to isolate at home or in hospital (depending on their clinical condition) until they were symptom-free; close contacts were traced and offered antiviral prophylaxis (Andersen, 2009a). Furthermore the Danish National Board of Health recommended avoiding unnecessary travel to Mexico. But on 18 May this advice was lifted, partly by the fact that the virus no longer primarily occurred in Mexico (National Board of Health, 2009f).

Communication

In order to give a better overview, the information published during time period 1 is grouped around the themes: personal protective measures, treatment of cases and control strategy.

Personal protective measures:

In April, the Danish National Board of Health published information leaflets on A/H1N1 for travelers. The leaflet informed on pandemic A/H1N1 symptoms, personal protective measures, travel recommendations and about what to do in case of symptoms (National Board of Health, 2009a).

In addition to the public information and advice on national level, the ECDC provided information on European level. On 27 April, the ECDC published the first general questions and answers on pandemic A/H1N1 virus (European Centre for Disease Prevention and Control, 2010a). In May, the ECDC published two documents on personal protective measures and information for travelers. The documents described personal protective measures to reduce the risk of acquiring influenza, i.e. regular hand washing, respiratory hygiene, avoidance of close contacts and mass gatherings (European Centre for Disease Prevention and Control, 2009k, 2009m, 2009n).

On 1st May, the Danish National Board of health set up an information hotline for citizens who have questions about Influenza A (H1N1) (National Board of Health, 2009e).

Treatment of cases:

The use of antivirals in some groups involves particularities health professionals should know. Thus, on 8 May, the European Medicines Agency (EMA) published a guidance document on the use of the antiviral medicine Tamiflu in children under one year of age and the antivirals Tamiflu and Relenza in pregnant and breastfeeding women in the case of an influenza A/H1N1 pandemic. The EMA stated that in the event of a pandemic Tamiflu can be used to treat children under the age of one and both antivirals can be used to treat pregnant women, as the benefits of their use outweigh their risks (European Medicines Agency, 2009a).

Control strategy:

On 19 May, the ECDC published a guidance document on case and contact management. The recommended measures did not differ from the measures already applied in Denmark (European Centre for Disease Prevention and Control, 2009o).

On 6 June, the ECDC published a guidance document on mitigation and containment strategies for national health authorities. ECDC stated that many public health measures are common in both strategies and the implementation of a mitigation strategy would mainly mean to move away from vigorous case finding and contact tracing. Further, the ECDC acknowledged that a containment strategy is very resource-intensive and therefore not a recommended infection control strategy for human influenza beyond pandemic alert phase 4 (European Centre for Disease Prevention and Control, 2009r).

Time period 2

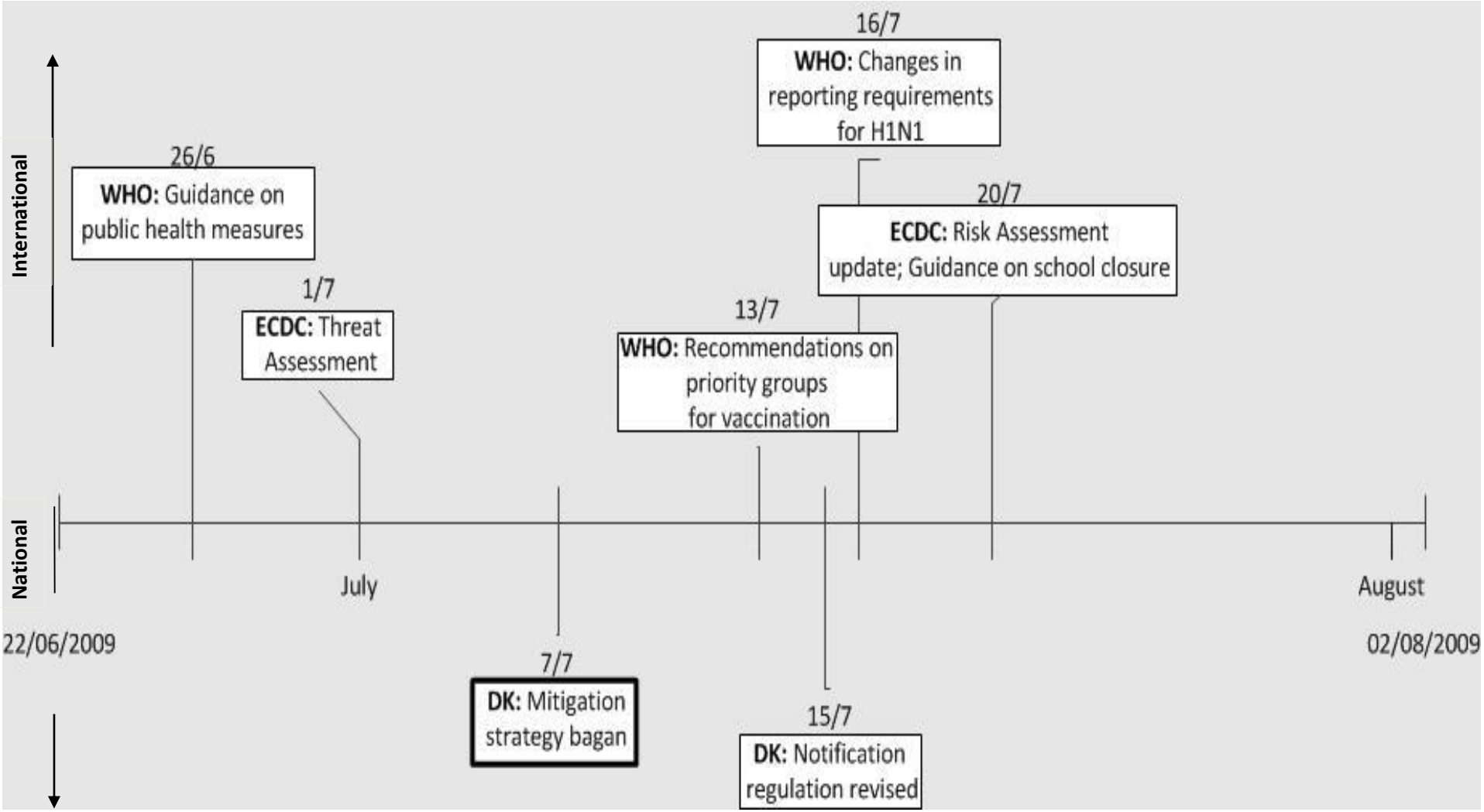

Figure 37: Chronological overview of national and international events in Denmark for time period 2 (22/06/2009 to 02/08/2009)

Situation

The numbers of confirmed pandemic A/H1N1 cases increased constantly. In Denmark the numbers of infections continued to increase until the peak of the first wave in week.

In its Threat Assessment, published on 1 July, the ECDC announced the first isolation of an oseltamivir (also known as Tamiflu®) resistant mutant A/H1N1 virus in Denmark. The virus was not a reassortant virus and was still susceptible to zanamivir (also known as Relenza®). There was no evidence that the virus has been transmitted to other persons. ECDC stated that this phenomenon is well-known in influenza viruses and emphasized the need for continued surveillance of this problem (European Centre for Disease Prevention and Control, 2009u).

According to an ECDC risk assessment published on 20 July, 20-30% of the population was expected to be affected over the first major wave of the pandemic. Clinical attack rates were expected to be highest in children and young adults. The estimate for hospitalization rates in Europe was 1-2% and the case fatality rate was estimated to be 0.1-0.2% of all clinical cases. ECDC stated that most cases experienced a mild and self-limiting illness, but people with chronic underlying medical conditions, pregnant women and young children were at higher risk of experiencing severe disease and deaths (European Centre for Disease Prevention and Control, 2009w).

Surveillance

On 15 July, the Danish notification regulation of suspected cases was revised. The individual notification of suspected cases has been lifted and replaced by mandatory laboratory notification. The voluntary sentinel surveillance in primary health care which comprises submission of weekly reports and samples was in place throughout the year (Andersen, 2009c).

On 16 July, the WHO announced that countries with community-wide transmission are no longer required to forward regular reports of individual confirmed cases to the WHO, as the

detection, laboratory-confirmation and investigation of all cases is extremely resource-intensive and not sustainable for these countries (World Health Organization, 2009k).

Control strategy and treatment of cases

Acknowledging that the containment of the pandemic A/H1N1 virus was no longer possible, the Danish Board of Health has decided to change its strategy for dealing with influenza A (H1N1) from 7 July 2009. The new strategy focused on the treatment of those who are at risk and preventive treatment for people at risk. From 7 July onwards only risk group patients or patients with a close contact to a risk group patient needed to be swabbed, antiviral treatment was initiated in risk group persons only, prophylactic antiviral treatment was initiated in contacts to laboratory-confirmed cases provided the contact belonged to a risk group. People with one of the following conditions were defined as a risk group patient: chronic pulmonary conditions, cardiovascular disease, diabetes, immunodeficiency, HIV-Infection, pregnant women (2^{nd} and 3^{rd} Trimester). Furthermore, it was recommended to closely monitor pregnant women in their 1^{st} trimester, children < 5 years and severely obese patients (Andersen, 2009c; National Board of Health, 2009h).

Communication

In order to give a better overview, the information published during time period 2 is grouped around the themes: control strategy and non-pharmaceutical response measures.

Control strategy:

On 26 June, the WHO published a guidance document on public health measures to help countries manage the A/H1N1 pandemic. Besides giving general advice on response measures, the WHO provided additional advice for countries with widespread community-level transmission, for countries with no reported cases and for countries in transition. The WHO advised all countries to concentrate on mitigation measures, to prepare the health-care system for a high volume of patients and to ensure antiviral medicine and vaccine supply. In addition, countries with widespread community-level transmission were advised to cease laboratory-testing of all cases, to reduce the pressure on the health-care system, to primarily focus on the treatment of ill patients, and to consider school closures or the cancellation of

mass gathering on a case-by-case basis. Countries with no reported cases were advised that they may consider entry screening at airports and contact tracing, but that these measures are resource intensive and of limited benefit to prevent the spread of the disease. Countries in transition were advised to start the same control measures as countries with widespread community-level transmission (World Health Organization, 2009a).

Non-pharmaceutical response measures:

On 20 July, the ECDC gave scientific advice on reactive and proactive school closures in Europe. ECDC highlighted that there is no consensus on the benefits from proactive school closures (school closure before transmission between the children occurs), but countries and schools were advised to at least have plans for reactive school closures (school closure when many children and/or staff are experiencing illness). These plans should consider the following issues: recommended length of time of closure; the triggers for re-opening; how to sustain teaching and learning; and potential problems that may arise for parents, if they have to take time off work (European Centre for Disease Prevention and Control, 2009x).

Time period 3

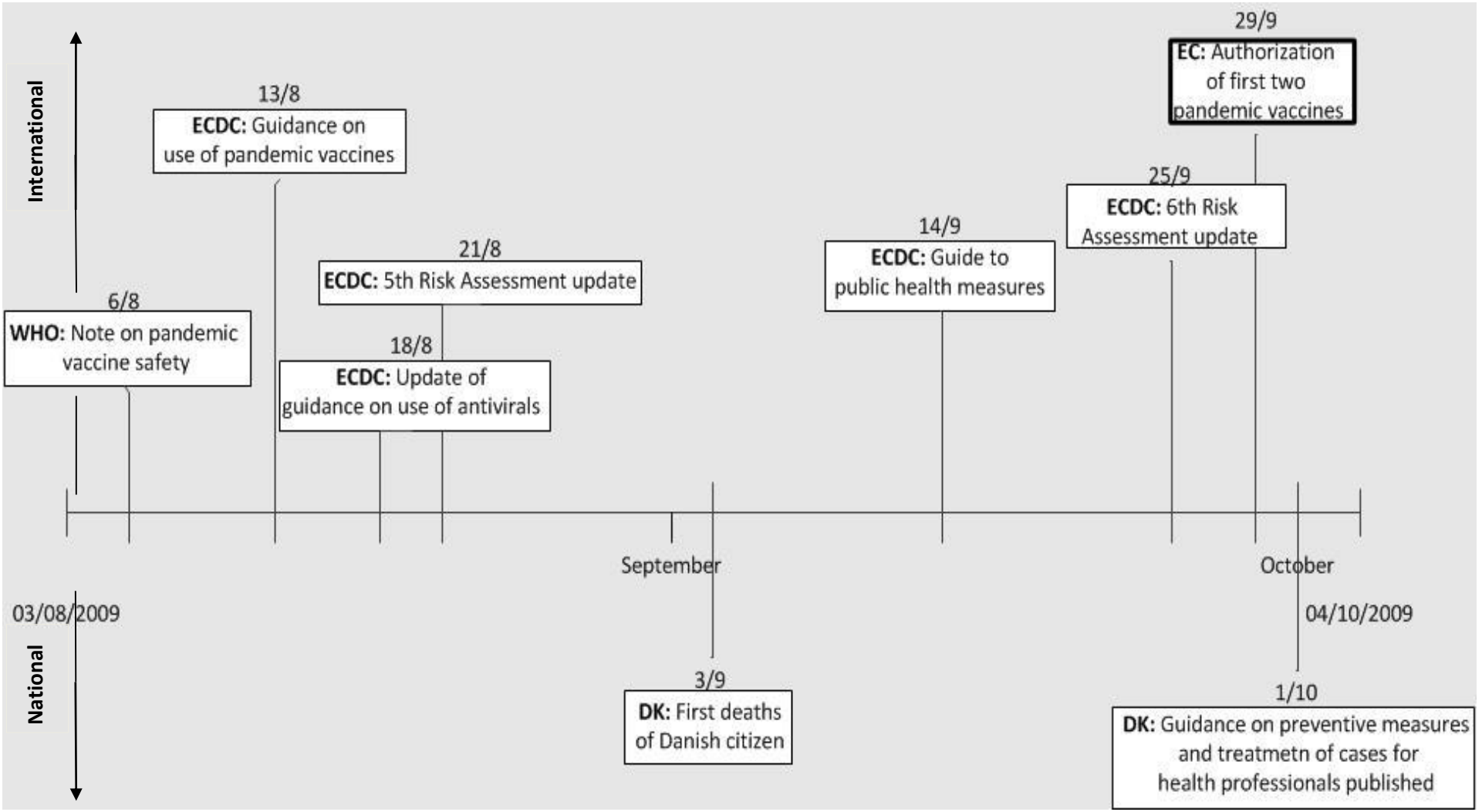

Figure 38: Chronological overview of national and international events in Denmark for time period 3 (03/08/2009 to 04/10/2009)

Situation

The virus continued to spread, but at a low level over the summer. On 3 September, Denmark reported the first death from pandemic A/H1N1 infection of a Danish citizen in Norway (National Board of Health, 2009i).

On 21 August, the ECDC published its planning assumptions for the first major wave of infection, which was expected to take place in the autumn and winter of 2009/2010 (European Centre for Disease Prevention and Control, 2009ab).
In late September, the ECDC has reduced its planning assumption. This decision was based on experience from Southern Hemisphere countries. It became more apparent that most pandemic A/H1N1 cases experienced a mild disease; therefore hospitalization and case fatality rates were revised downwards (European Centre for Disease Prevention and Control, 2009ad).

Surveillance

No surveillance strategy modifications were introduced during time period 3.

Control strategy and treatment of cases

No control strategy modifications were introduced during time period 3.

Vaccination Strategy

On 29 September, the European Commission authorized the first two pandemic vaccines Focetria® (Novartis) and Pandemrix® (GlaxoSmithKline) for use in all Member States of the European Union and in Iceland, Liechtenstein and Norway (European Commission, 2009b).

Communication

In order to give a better overview, the publications issued during time period 3 are grouped around the themes: non-pharmaceutical response measures, treatment of cases and vaccination.

Non-pharmaceutical response measures:

In mid-September, the ECDC published a document on public health measures for policy and decision-makers (European Centre for Disease Prevention and Control, 2010a). It provided scientific information on measures that may be applied to reduce the impact of influenza pandemics (i.e. border closures, entry restrictions, personal protective measures, social distancing measures, use of antivirals and vaccines) and aimed to help EU countries to decide on appropriate response measures (European Centre for Disease Prevention and Control, 2009a).

On 23 September, the WHO Emergency Committee held its 5th meeting and agreed on continuing the following recommendations proposed by the WHO Director-General:

- borders should not be closed and travel and trade should not be restricted,
- countries should intensify surveillance of unusual events and
- people who are ill should postpone international travel (World Health Organization, 2009n).

Treatment of cases:

On 18 August, the ECDC published general guidance on the use of antivirals during influenza pandemics. The document aimed to inform those deciding on antiviral use strategies about the effectiveness of antivirals, side effects of antivirals, priority groups for antiviral use and about necessary arrangements for antiviral delivery and administration (European Centre for Disease Prevention and Control, 2009y).

On 1 October, the Danish National Board of health published a guidance document for physicians and other health professionals. The document informed that efforts are still focused on the prevention and treatment of patients at risk. Furthermore, it informed health professionals on general symptoms, risk groups, antiviral treatment of cases, prophylactic antiviral treatment of household contacts at risk and personal protective measures (National Board of Health, 2009j).

Vaccination:

Referring to media reports that have displayed concern about the safety of pandemic vaccine, the WHO has issued a note on pandemic vaccine safety on 6 August. In this statement the WHO outlined the procedures for approval and licensing of vaccines and confirmed that these procedures are strict and do include safety and quality controls. The WHO also stated that the data on influenza vaccine safety collected during the last 60 years do not show a special safety issue. Nonetheless, the WHO advised countries to closely monitor the safety and efficacy of the pandemic vaccine, as rare adverse events may only come to light when large numbers of people got vaccinated (World Health Organization, 2009l).

On 13 August, the ECDC published a document on the use of influenza pandemic vaccines during the 2009 A/H1N1 pandemic. The document aimed to inform those deciding on vaccination policies in the European countries on vaccine use and options for prioritization in order to maximize the benefit of available vaccine (European Centre for Disease Prevention and Control, 2009z).

Time period 4

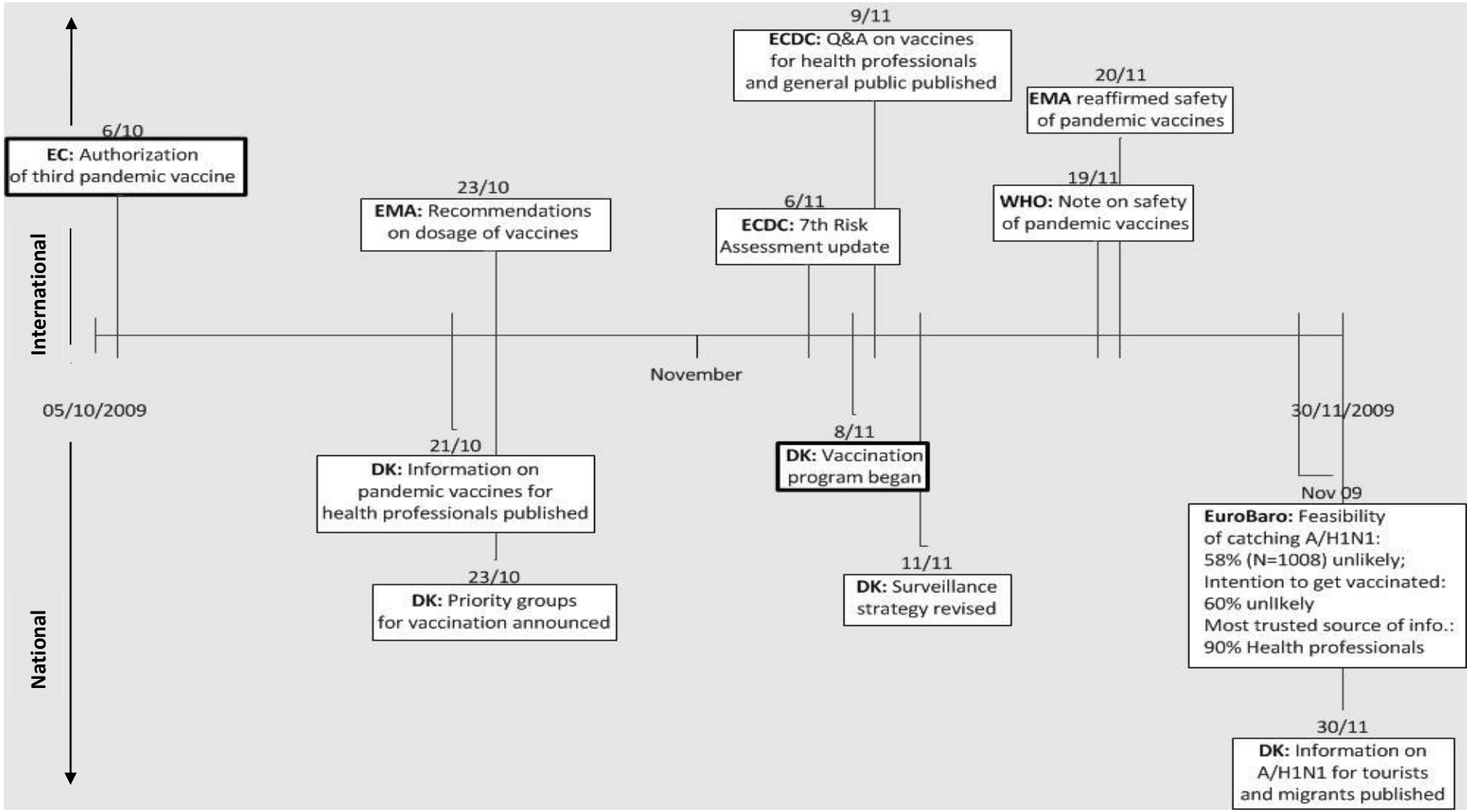

Figure 39: Chronological overview of national and international events in Denmark for time period 4 (05/10/2009 to 30/11/2009)

Situation

In early autumn, the numbers of pandemic A/H1N1 infections have started to increase again, indicating the beginning of the expected autumn/winter wave. In the Denmark the second wave peaked in week 46/2009.

In its 7th risk assessment issued on 6 November, the ECDC has revised its planning assumptions. The following EU reasonable worst case planning assumptions for the first year up to mid-May 2010 were published: clinical attack rate: up to 20% of population, hospitalization rate: up to 100 per 100.000 population and case fatality rate: up to 3 per 100.000 population (European Centre for Disease Prevention and Control, 2009ag).

In late November, the Gallup Organization conducted a survey called the Eurobarometer in the 27 EU Member States, as well as in Norway, Switzerland and Iceland to examine public opinion about influenza and pandemic A/H1N1. 58% (N=1008) of Danish interviewees believed it was unlikely or rather unlikely that they would personally catch the A/H1N1influenza. Furthermore, 60% stated that is was not likely or not likely at all that they would get vaccinated against the pandemic A/H1N1 virus. Health professionals were the most trusted source to inform about pandemic A/H1N1. 90% mentioned that they trust health professionals mostly or completely (The Gallup Organization, 2010).

Surveillance

In view of increasing numbers of pandemic A/H1N1 infections, the Danish National Board of Health changed its surveillance strategy. From 11 November onwards, laboratory testing was only recommended on suspicion of serious influenza disease requiring hospitalization (Andersen, 2009e). Further, an active reporting system of influenza patients from all Intensive Care Units (ICUs) was set up between week 46, 2009, and week 11, 2010 (Mølbak et al.., 2011).

Control strategy and treatment of cases

During time period 4, no control strategy modifications have been implemented.

Vaccination strategy

On 6 October, the European Commission authorized a third pandemic vaccine, Celvapan®, for use in all EU Member States, Iceland, Lichtenstein and Norway (European Commission, 2009c).

The European Medicines Agency (EMA) recommended a two dose schedule for all three authorized vaccines (European Medicines Agency, 2009b).

On 23 October, the Danish National Board of Health published the priority groups for vaccination. According to this document vaccination had to be offered to the following persons: individuals aged six months and above in a clinical at-risk group, pregnant women and household contacts to severe immunosuppressed patients. The vaccine used in Denmark was Pandemrix®. Unlike the European Medicines Agency, the Danish National Board of Health recommended a two dose schedule for all individuals in at-risk groups and for children aged between 6 months and nine years. For otherwise healthy individuals a one dose schedule was recommended (National Board of Health, 2009n).

From the beginning of November 2009 Denmark started its vaccination program. Due to limited supply of Pandemrix®, the Danish National Board of Health has therefore decided to vaccinate those at risk under 65 years first. This decision was based on experience from other countries showing that older people have a lower risk of catching pandemic A/H1N1 (National Board of Health, 2009l; O'Flanagan et al.., 2011).

Communication

In order to give a better overview the publications published during time period 4 are again grouped around the themes: personal protective measures, non-pharmaceutical response measures and vaccination.

<u>Personal protective measures:</u>

On 30 November, the Danish National Board of Health published information leaflets and posters on pandemic A/H1N1 in English and six widely used minority languages (Arabic, Urdu, Bosnian, Turkish, Somali, Persian). These leaflets aimed to inform about symptoms,

treatment and personal protective measures like regular hand-washing and respiratory hygiene (National Board of Health, 2009c, 2009d, 2009o)

Non-pharmaceutical response measures:

On 26 November, the WHO Emergency Committee held its 6th meeting and agreed that delaying international travel was no longer recommended for ill persons, because pandemic A/H1N1 infections were already widespread (World Health Organization, 2009p).

Vaccination:

On 21 October, the Department of Epidemiology of the Danish National Board of Health published detailed information on Pandemrix® for health professionals. The document informed about who should not be vaccinated, what the pandemic vaccine contains, how long the vaccine does protect, what side effects the vaccine has, how long the vaccine was tested, the practical handling and storage of the vaccine (Andersen, 2009d).

On European level, information on vaccination was provided by the ECDC. In November the ECDC published questions and answers on vaccines for health professionals and for the general public on its website (European Centre for Disease Prevention and Control, 2009b, 2009c, 2010a).

On 19 November, the WHO issued a briefing note on pandemic vaccines in which the safety of the vaccines was reaffirmed (World Health Organization, 2009o). The European Medicines Agency (EMA) did hold the same opinion. In a press release published on 20 November, the EMA reasserted the efficacy and safety of pandemic vaccines. Further, the EMA revised its advice on vaccine schedules and published the following recommendations: Pandemrix® and Focetria® may be used as a single dose in adults (18-60 years) and in children and adolescents (Focetria®: from the age of 9 years; Pandemrix®: from the age of 10 years). Individuals aged over 60 years may also receive one dose of Pandemrix®, but younger children and immunocompromised people should receive two doses (European Medicines Agency, 2009c).

Time period 5

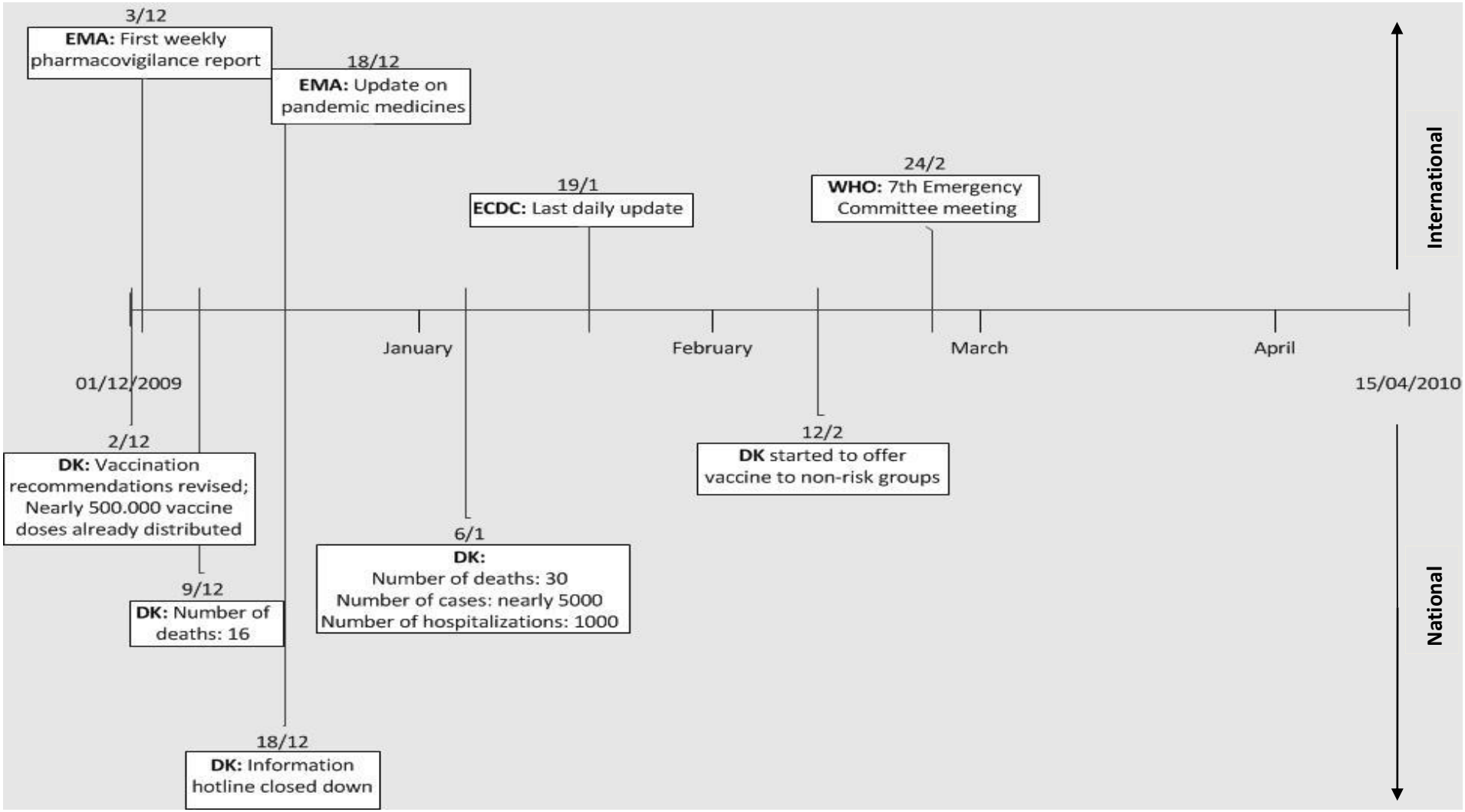

Figure 40: Chronological overview of national and international events in Denmark for time period 5 (01/12/2009 to 15/04/2010)

Situation

The number of pandemic A/H1N1 infections decreased constantly in Denmark. The end of the autumn wave was in early January 2010.

On 9 December Denmark has reported 16 deaths of pandemic A/H1N1, including three outside risk groups (National Board of Health, 2009q).

By the end of the second wave in January 2010, Denmark has reported a total of nearly 5.000 confirmed pandemic A/H1N1 cases, 30 deaths of pandemic A/H1N1 and 1.000 hospitalizations (Andersen, 2010b).

In February 2010, evidence showed decreasing or low pandemic A/H1N1 activity in many countries, but the WHO Emergency Committee agreed that it was too early to conclude that the pandemic A/H1N1 virus has run its course. Thus, the pandemic influenza alert phase was not changed (World Health Organization, 2010a). On 10 August 2010, the WHO Emergency Committee assessed the global situation again. This time the Committee concluded that the world was entering the post-pandemic period (World Health Organization, 2010c).

Surveillance

No surveillance strategy modifications were introduced during ime period 5.

Control strategy and treatment of cases

No control strategy modifications were introduced during ime period 5.

Vaccination strategy

In December Denmark extended its vaccination program. From the beginning of December Denmark started to offer the vaccine also to people at risk who are over 65 years old (National Board of Health, 2009l).

On 2 December the Danish National Board of Health adjusted its vaccination recommendations. From December on, only one dose of vaccine was recommended for patients at risk, unless they had a weakened immune system (Andersen, 2009f; National Board of Health, 2009p).

By the end of week 48, Denmark has distributed nearly 500,000 vaccine doses, primarily to cover risk group vaccination (Andersen, 2009f).
On 12 February the Danish government decided to extend the vaccination program again. From Mid-February on the pandemic vaccine was also offered to people outside risk groups (National Board of Health, 2010).

Communication

During time period 5, only little information and guidance has been published. Thus, the information and guidance is only grouped around the themes: vaccination and personal protective measures.

Vaccination:

Between December 2009 and August 2010, the European Medicines Agency (EMA) published regular updates on safety monitoring of vaccines and medicines used during the pandemic (European Medicines Agency, 2010). In its update on pandemic medicines of 18 December, the EMA reaffirmed that the available data on the three pandemic vaccines and Tamiflu® showed no unexpected serious safety issues (European Medicines Agency, 2010).

Personal protective measures:

On 18 December the Danish National Board of Health closed down its A/H1N1 information hotline. This decision was based on diminishing numbers of pandemic A/H1N1 infections. Citizens who had further questions on pandemic A/H1N1 were asked to look for information on the website of the National Board of Health or to contact their doctor (National Board of Health, 2009r)