Master of Public Health

Master international de Santé Publique

Comparison and analysis of intervention strategies against pandemic influenza A/H1N1 in 2009 among four European countries:

England, Hungary, Portugal, Sweden

The following measures are considered: antiviral agents for influenza and influenza vaccines, social distancing measures, restriction on travel and hygiene measures.

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LIST OF ACRONYMS USED

ISO 3166-1 Country Codes:

FR	France
HU	Hungary
PT	Portugal
SE	Sweden
UK	United Kingdom

WHO	World Health Organization
IHR	International Health Regulation
ECDC	European centre for Disease Prevention and Control
CDC	Centre for Disease Control
EU	European Union
MS	Member State
GP	General Practitioner
PCT	Primary Care Trust
SARS	Severe Acute Respiratory Syndrome
ILI	Influenza Like Illness
SARI	Severe Acute Respiratory Illness
GDP	Gross Domestic Product
VENICE	Vaccine European New Integrated Collaboration Effort

TABLE OF CONTENTS

ABSTRACT

BACKGROUND
On June 11th, 2009 the World Health Organization raised the influenza pandemic alert level from phase 5 to phase 6, declaring that the newly emerged influenza caused by a new influenza A virus (H1N1) had reached pandemic level. Assessing health strategy policies, which were implemented to reduce the Health impact of influenza A/H1N1, is now topical and relevant in order to learn how the next ones should be addressed. We compare and analyse the control strategies aiming at preventing or controlling the spread of the disease during the pandemic 2009 among four European countries: England, Hungary, Portugal and Sweden. The following two pharmaceutical and three non-pharmaceutical measures are considered: antiviral agents for influenza and influenza vaccines, social distancing measures, restriction on travel and hygiene measures.

METHODOLOGY
England, Hungary, France, Portugal and Sweden who had an influenza A/H1N1 vaccination plan and whose websites could be accessed were selected. A standardised worksheet questionnaire was sent to each governmental department in charge of pandemic influenza response. Various indicators, based on the WHO check-list for influenza epidemic preparedness and the ECDC pandemic preparedness self assessment indicators, were identified. Conference-call were planned after the return of each survey.

RESULTS
Four countries answered the Survey. All the countries started by attempting delaying and moved to mitigation for epidemiological data and European recommendations. Implementation of school closures or public gathering restrictions were scarce and non significant. No cancellation of travel occurred. Voluntary quarantines were implemented but not compulsory quarantine. The recommendation for personal public health measures were homogeneous among the countries. Three countries recommended the antiviral drugs treatment of severe cases and risk groups whereas one country recommended treatment with antivirals for all ILI cases. All the countries had a prophylaxis strategy. The stockpile used during the pandemic was low. The objectives of pandemic vaccination differed among the countries but none of the countries reached their objectives. Modification of priority groups during the vaccination campaign occurred mostly for epidemiological data. All the countries developed a communication strategy but all faced anti-vaccination campaigns.

CONCLUSIONS
Countries followed the WHO and ECDC recommendations during the pandemic influenza for non pharmaceutical intervention strategies, which play a dominant role when pharmaceutical measures are not available. The preparedness plans were a major tool to act during the pandemic. The objectives and strategies concerning pandemic vaccination and drugs use differed. Countries all faced two majors challenges: information via internet and issues related to mass vaccination campaigns. It was a relatively mild disease but further epidemiological studies to assess the severity of the pandemic are needed. The impact of the strategies used during the pandemic will probably be difficult to assess, and reflections about related indicators will be necessary in case of a future pandemic. This project gives clarification of strategies among four European countries and could be worth being implemented in other European countries. Furthermore, how convincing people to get vaccinated is a major issue for public health authorities.

RESUME

Comparaison et analyse des stratégies de contrôle visant à prévenir ou réduire la propagation de la maladie au cours de la pandémie 2009 dans quatre pays européens: Angleterre, Hongrie, Portugal et Suède. Les médicaments antiviraux, les vaccins antigrippaux ainsi que les mesures de distanciation sociale, de restriction de voyage et d'hygiène sont considérés.

Le 11 Juin 2009, l'Organisation Mondiale de la Santé (OMS) passait l'alerte sur le virus grippal A/H1N1 du niveau 5 à 6, déclarant ainsi que la grippe émergente avait atteint le niveau de pandémie. L'évaluation des stratégies politiques de santé qui ont été mises en œuvre pour réduire l'impact sanitaire de la grippe A/H1N1, est désormais appropriée afin de tirer des leçons pour le futur.
Les pays ayant un plan de vaccination contre le virus A/H1N1 et dont les sites Web étaient accessibles ont été sélectionnés. Un questionnaire a été envoyé à chaque département gouvernemental en charge de la réponse. Plusieurs indicateurs à visée d'auto-évaluation lors de la période pré-pandémique, élaborés par l'OMS et le Centre Européen de Prévention et de Contrôle des Maladies (CEPCM), ont été sélectionnés. Après le retour des questionnaires, nous avons fixé un entretien téléphonique par pays.

Quatre pays ont répondu à l'enquête. Lors de l'apparition des premiers cas de grippe A/H1N1, tous les pays ont réagi par des stratégies visant à contenir la propagation du virus, avant de passer à des stratégies d'atténuation dans un second temps. La fermeture des écoles ou la restriction des rassemblements publics ont été rares et non significatives. Aucun vol ou autre mode de voyage n'a été annulé. Les personnes malades de la grippe étaient vivement incitées à rester chez elles sans caractère obligatoire toutefois. Les recommandations pour les mesures de santé publique individuelles sont homogènes entre les pays. Trois pays ont recommandé l'utilisation des antiviraux pour traitement des cas graves et des groupes à risque. Un pays a recommandé l'utilisation des médicaments antiviraux pour tous les cas présentant les symptômes du virus. Tous les pays avaient une stratégie de prévention à l'aide d'antiviraux. Finalement, l'utilisation des médicaments antiviraux durant la pandémie a été faible.
Les objectifs concernant la vaccination étaient différents et aucun pays n'a atteint ses objectifs. Des modifications au cours de la campagne de vaccination ont été décidées, surtout en raison de données épidémiologiques. Tous les pays ont développé une stratégie de communication et tous ont été confrontés à des campagnes contre la vaccination.

En matière de mesures non pharmaceutiques, les pays ont suivi les recommandations de l'OMS et du CEPCM au cours de la pandémie de grippe. Ces dernières jouent un rôle dominant lorsque les mesures pharmaceutiques ne sont pas disponibles. Les plans de lutte en cas de grippe pandémique, élaborés après 2005, ont été des outils majeurs pour les autorités. Les objectifs et les stratégies antivirales et vaccinales ont été différentes selon les pays. Tous les pays étaient confrontés à deux défis majeurs: l'information via Internet et les questions relatives aux campagnes de vaccination de masse. Cette grippe A/H1N1 était relativement bénigne, mais d'autres études épidémiologiques sont nécessaires pour conclure sur sa sévérité. L'impact des stratégies utilisées lors de la pandémie de 2009 sera probablement difficile à évaluer. Engager des réflexions sur les indicateurs nécessaires en cas de futur pandémie serait utile.
Ce projet donne une clarification sur les stratégies de quatre pays européens en matière de lutte contre la grippe A/H1N1 et pourrait s'ouvrir à d'autres pays. En outre, convaincre les gens de se faire vacciner est un enjeu majeur pour les autorités de santé publique.

INTRODUCTION

Explosive and unusually deadly outbreaks of influenza occurred throughout recorded history, probably originating in the earliest cities where humans lived crowded together in close proximity to domestic animals. Pandemics are always remarkable global events. Caused as they are by a highly contagious virus to which populations have little if any immunity, they benefit from almost universal susceptibility to infection. This gives them their distinctive features: they spread to all parts of the world very quickly, usually within less than a year, and cause illness in more than a quarter of the total population. It is this abrupt upsurge in illness, outstripping response capacity, that makes pandemics so disruptive, in addition to the excess mortality they invariably cause.
The emergence of avian influenza H5N1in Asia since 2003 and the threat of a human influenza pandemic had prompted urgent development of national preparedness plans. By the start of 2008, all European countries had pandemic plans with public health responses, usually conforming to the original World Health Organization 2005 health sector template.

On June 11th 2009, the World Health Organization raised the influenza pandemic alert level from phase 5 to phase 6, declaring that the newly emerged influenza caused by a new influenza A virus (H1N1) had reached pandemic level. After the three pandemics that had occurred in the last century – in 1918/19 ('Spanish' flu), 1957/58 ('Asian' flu) and 1968/69 ('Hong Kong' flu), a new pandemic emerged with uncertainties: how to assess the virulence, the transmissibility and origin of the virus, when should public health responses be implemented at country level, and to what extent?
The new virus proved to be relatively mild but reached more than 200 countries around the world and infected hundreds of millions of people. One year after, the global impact of this new pandemic remained uncertain. Assessing health strategy policies, which are implemented to reduce the Health impact of influenza A/H1N1, is topical and relevant in order to learn how the next ones should be addressed : which lessons can we already get from this pandemic influenza?
The various plans that were implemented and the criticism that some concrete measures aroused definitely shows that we need to study those intervention strategies.

This thesis will first synthesize the present knowledge on the topic and secondly will present the study: among the pharmaceutical and non-pharmaceutical measures in England, Hungary, Portugal and Sweden; what were the objectives, what was implemented and what was the decision making process?

Part 1 : KNOWLEDGE ON THE TOPIC

The three pandemics of the 20th century are the best documented in terms of their origins, patterns of international spread, and impact: which lessons can we learn from those previous pandemics? More specifically, which are the present scientific knowledges about the intervention strategies against the A/H1N1 pandemic influenza?

1 HISTORY AND LESSONS FROM PAST PANDEMICS AND PANDEMIC THREATS

The most serious influenza pandemic in recent history was the 1918 Spanish flu caused by a H1N1 virus that killed more than fifty million people worldwide causing most deaths in young and healthy people. In the 20th century, two other influenza pandemics occurred, the Asian flu (H2N2) of 1957 and the Hong Kong flu (H3N2) of 1968. The latter two pandemics were milder than the 1918 one but still resulted in significant mortality with close to two million people dying from the 1957 and one million from the 1968 pandemics, respectively.

1.1 1918: "Spanish flu" H1N1 Pandemic

This pandemic was the most devastating pandemic of the 20th century. Somewhere between twenty to forty percent of the global population was ill. Rather than just preying on the very young and old, as seasonal flu typically does, this one killed many healthy young adults too during the second wave: mortality was the highest among adults 20 to 50 years old (1).
With no medical tools available, control efforts turned to non pharmacological measures and we learned a lot about those measures. Except for travelling restriction, the non pharmacological measures were largely the same as those considered today.

1.2 1957-58: "Asian flu" H2N2 Pandemic

First identified in China, this virus caused roughly seventy thousand deaths in the United States (especially transmitted among children). Because this strain has not circulated in humans since 1968, no one under forty years old has immunity to it. The virus was quickly identified, due to advances in scientific technology, and a vaccine was available in limited supply by August 1957. Still, two waves of infection struck, in the fall of '57 and then January-February of '58. The elderly had the highest death rates (1).
In 1957, the pandemic was the first major test of the WHO Global Influenza Surveillance Network and the benefits of sharing data provided major incentives for international collaboration (2). Vaccines were available but the quantities, however, were too small for wide scale use. Moreover, as the disease was so much milder than in 1918, health authorities decided against an expansion of vaccine production to the scale needed for population-wide vaccination. Then, the greatest problem was inadequate manufacturing capacity. For health authorities, the biggest challenge presented by the 1957 pandemic was the provision of adequate medical and hospital services. Measures to delay the speed of spread and thus flatten the peak occurrence of cases were considered justified if they allowed the maintenance of medical and other essential services.

1.3 1968-69: “Hong Kong flu” H3N2 Pandemic

First detected in Hong Kong, this virus caused roughly thirty-four thousand deaths in the United

States during the 1968-69 season (transmitted and affected all age groups). H3N2 viruses still circulate today. Those over the age of 65 were most likely to die. The virus was similar to the 1957-58 Asian flu, so some people may have had some level of immunity.

1.4 1976: Swine Flu Threat and 2003: Severe Acute Respiratory Syndrome

When a new virus was first identified at Fort Dix, the concern that a major pandemic could sweep across the world led to a mass vaccination campaign in the United States. In fact, the virus - later named "swine flu" - never moved outside the Fort Dix area. We learned from this vaccination campaign that media and public awareness can be a major obstacle to implementing a large program and that explanations should be communicated by those who can give authoritative scientific information. We learned also that the risk of potentially unnecessary costs in a mass vaccination campaign is minimal (3).
The SARS experience has shown the capacity of a global alerts and the importance of international collaboration. The outbreak was contained through traditional public health interventions without any vaccines or effective treatments (4).

1.5 Conclusion

The evidence of multiple waves in the 20th century pandemics underlines the importance of active real-time viral surveillance at a global scale. Although our ability to produce a vaccine in sufficient quantities to cover people who are exposed in a first pandemic wave is very limited with today's technology, an inter-wave period would provide time to increase the production. The signature pandemic feature of shifts in age-specific mortality patterns should influence vaccination priorities (2). Furthermore, the importance of transparency on the part of public authorities has been clearly illustrated by a series of health “crises” in Europe over the past quarter of a century.
Major differences between 1918 and today include antibiotics and vaccines availability, higher life expectancy with an increase of elderly people or people with chronic diseases, increase of travels, legal interpretations of privacy and civil and constitutional rights, and access to information via the media and the Internet. Population adherence to public health measures and messages might well be high during the initial phase of an epidemic perceived as dangerous, but then decrease with time (5).

2 PUBLIC HEALTH MEASURES

2.1 Non-pharmaceutical public health interventions for pandemic influenza

2.1.1 Personal public health measures

Infection control measures

Measures such as hand hygiene and respiratory etiquette to prevent the spread of infection are widely supported in literature and broadly accepted (6)(7)(8). Controlled studies have shown a protective effect of hand hygiene when treating patient with respiratory illnesses (9)(10)(11) but there is no evidence of a high effectiveness in everyday situations (12).
Antimicrobial hand washing products are not shown to offer an advantage over soap and water (9). Some authors reports that the most important factor regarding hands is not simply washing them, but avoid touching eyes and mouth (13).

Protective equipment for health care professionals and for the general public

Uncertainty about the mode of influenza transmission influenced the debate about when and whether to use masks or N95 respirators during a pandemic influenza. Personnel engaged in aerosol generating activities or providing direct patient care for suspected or confirmed swine flu influenza A/H1N1 cases should use particulate respirator (N 95, FFP2 or equivalent), eye protection, down and gloves (14). During SARS, certain particulate respirators with high level of protection (FFP3) were recommended, to help reduce health care worker's exposures to airborne organisms. However, in Europe there are concerns that the use of respirators may not be practical in routine settings, and that compliance with these measures can be low.
With the exception of some evidence from SARS, a recent evaluation of the evidence base did not find any published data that directly supports the use of masks, respirators, or other personal protective equipment by the public, or other steps such as disinfecting surfaces beyond usual practices (15).

2.1.2 Mandatory social distancing measures

Although social distancing measures were a recent focus of investigation and were implemented in Asia and North America during SARS when no antiviral drugs and vaccines were available, their effectiveness in an influenza outbreak has not yet been established (16)(9).
Isolation, quarantine, sheltering, location-based community restrictions and travel restrictions are less recommended than voluntary measures, especially over the long term (17)(15).

Isolation measures and quarantine

If most of the infected individuals are not infectious until they develop apparent clinical symptoms, isolation and quarantine are more likely to be effective in controlling the disease. The 2003 outbreak of SARS was contained largely through traditional public health interventions, but most SARS patients were not infectious until they developed severe lower respiratory infections (18). Therefore, quarantine and isolation are considered to be less effective for influenza than for SARS (19). WHO and ECDC recommended for this Pandemic A/H1N1 2009 self isolation by people who though they had or are developed influenza.

School closure

School closure for reducing transmission (decreasing attack rate and reproductive number, flattening the pandemic influenza curves) is one of the key components of many countries' non pharmaceutical mitigation strategies. However, the estimated costs of school closure are significant and school closure is likely to significantly exacerbate the pressures on the health system through staff absenteeism (20)(21)(22).
Most empirical studies suggest a decline in community transmission rates of respiratory infections with school closures (23)(24). Furthermore, we learned that among the many non pharmacological interventions that were undertaken in 1918, closing schools, gathering restrictions were among the most effective measures to decrease the impact of the pandemic in a community and these measures of social distancing were most effective if applied early and maintained for as long as possible (25)(26)(5). On the other hand, the WHO Writing Group noted older studies showing increases in the spread of disease and subsequent illness after a school holiday, and protective effects when schools remained open (27). WHO could provide general advice but not specific recommendations for school closure and no agreed triggers to implement school closure exists.
Recent modelling studies generally support school closure and confinement at home as an effective means of reducing overall attack rates within communities when coupled with antiviral prophylaxis, but predicting the effect of closing schools and workplaces is difficult since infectious individuals may be displaced into other settings (28)(29).

Travelling restriction

The practice of trying to reduce the spread of pandemic influenza by travel restrictions has been modelled on a number of occasions. Travels must be drastically curtailed to achieve any significant delay (30). Air traffic restrictions were seen to have little impact until traffic was almost completely stopped. Such total restrictions are unrealistic at global level, but might be efficiently and realistically applied at a local level (31). Exit screening has been thought to be useful by WHO in a pandemic influenza but it's similar to WHO, ECDC advice for self-isolation by people who think they have or are developing influenza (32)(33)(34).

Entry screening is not recommended by WHO, except as a short-term strategy right at the start of a pandemic affecting a country: it has been considered to be wasteful (33)(9). Furthermore, entry screening implementation could bring out different interrogations due to the lack of knowledge at the beginning of a pandemic: what is an affected area? which travel to postpone?
Entry screening of travellers through health declarations or thermal scanning at international borders had little documented effect on detecting SARS cases (4).

International Health Regulation entered into force on 2007 with establishing a number of procedures and temporary recommendations: countries should not close borders or restrict international traffic and trade, should maintain surveillance of unusual flu-like illness and recommend to delay travel in case of illness.

2.1.3 Conclusion

The effectiveness of these interventions is limited and depends on how influenza viruses are transmitted: transmission of a respiratory disease has multiple channels for finding its way in the social interactions among individuals. Still, it is also where we can find opportunities for slowing down transmission in a very cost effective way, by providing clear, comprehensive and sound guidelines to the public (35). Furthermore, non pharmaceutical interventions may have an important supplementary role, particularly in delaying the spread of a pandemic virus when pharmaceutical interventions are not available yet.

2.2 Pharmaceutical interventions for pandemic influenza

2.2.1 Vaccines

The studies

Influenza vaccines are effective in preventing influenza and influenza associated complications, including death (36). Vaccination is the most effective intervention for a pandemic (37)(28). Pandemic vaccines are unlikely to be available at the initial stage of a pandemic (for instance, it was not known in 2008 which strain would cause the next pandemic) and the limited production capacity for vaccines raises the question about the best strategy to mitigate an influenza pandemic. Furthermore how to protect a population against a disease when one group is particularly effective at spreading disease and another group is more vulnerable to the effects of the disease?

Real time surveillance in a pandemic, flexible setting of vaccination priority is essential to minimize mortality: for 1918 like scenario, it would have been better to target people older than forty-five years old; for 1957 like scenario to target people older than forty-five, and for 1968 like scenario to target people between forty-five and sixty-four years old (38). Based on a study made in Mexico, a strategy targeting age groups from six to fifty-nine years of age is the most effective in reducing hospitalizations and deaths, compared with a more traditional strategy used for seasonal influenza and a vaccination strategy (39).
The time of vaccine availability is critical: the use of age-structured model for the spread of an

influenza pandemic in a recent study showed that if the vaccine becomes available during the pandemic, when the number of new cases is close to its peak value, priority should be given to groups with a high risk of developing complications. In case there is a vaccine available before the epidemic starts, vaccination of groups with a high risk of infection can be considered (40).
The Virus transmissibility is also a major determinant for the vaccination effectiveness: a morbidity-based strategy is better for moderately transmissible strains and a Mortality-based strategy is better for a high transmission strain (41). Vaccination is sensitive to how the groups mix and how well the disease spreads in each group. The model of the following study supports the idea that using some vaccine stocks for schoolchildren might decrease morbidity and mortality among elderly people but suggests that if all the vaccine were given to schoolchildren, more older people might die. The most prudent policy would be here to supplement rather than replace vaccination of the elderly with vaccination of children (42).

International recommendations for A H1N1 Influenza 2009 Pandemic

The severity of the pandemic was considered in July 2009 to be moderate, with most patients experiencing uncomplicated, self-limited illness. Nevertheless, some groups appeared to be at increased risk for severe disease and death from infection. All countries should immunize their health-care workers as a first priority. Following groups were asked for consideration (countries needed to determine their order of priority): pregnant women, individuals aged more than six months with one of several chronic medical conditions, healthy young adults, healthy children, healthy adults aged more than forty-nine years old and less than sixty-five years old, healthy adults aged more than sixty-five years old (43).

2.2.2 Antivirals

Knowledge

Influenza is usually a self limited disease which doesn't require treatment. However, antiviral drugs use may be the only available pharmaceutical intervention in the early phase of a pandemic influenza.

Two groups of antiviral drugs are available for the treatment and prophylaxis of influenza. These are the adamantanes (amantadine and rimantadine) and the neuraminidase inhibitors (oseltamivir and zanamivir)(44). The adamantanes may be effective against pandemic strains, but concern exists about adverse reactions and the development of antiviral resistance (45). Resistance to amantadine has been demonstrated in a number of avian H5 strains (46) and its use for treatment of influenza is not recommended (47).

The neuraminidase inhibitors (NIs) reduce the period of symptomatic illness from both influenza A and B viruses (48). The development of antiviral resistance has been reported for NIs, particularly related to oseltamivir use for children (49). Anyway, NIs are considered to be a better option for an influenza pandemic.
An influenza pandemic is likely to increase demands on healthcare providers, especially in hospitals. Any strategy involving NIs use would require stockpiles of these drugs (mainly oseltamivir). It has also been shown that antiviral treatments for twenty to twenty-five percent of the population are likely to be sufficient to treat all patients for pandemics with characteristics that have been observed to date. The size of the stockpile used will depend on the clinical attack rate of the pandemic and the severity. Substantial reductions in hospitalization could be achieved with smaller antiviral stockpiles if drugs are reserved for persons at high risk (50). They are some key issues with antiviral treatment: selection of targeted people and distribution of drugs.
It has been shown that antivirals are effective for prophylaxis of influenza (51). The potential use of antiviral agents for prophylaxis has been investigated and may be of greatest use in the earliest phases of a pandemic to delay the spread of the virus (52)(53). Other pandemic influenza modelling studies have focused on the use of NI prophylaxis to contain an epidemic (54).

International recommendations for Influenza A H1N1 2009 Pandemic

The ECDC recommended the use of antivirals for treatment to those who were considered at higher risk of experiencing severe disease, who contracted illness requiring hospitalization or complicated illness (55).
The use of antivirals for prophylaxis could be considered by countries with larger stockpiles. Candidate groups included close contacts of cases (especially those who are at high risk of developing severe disease), healthcare workers with direct patient contact, family contacts and key workers for business continuity purposes (56). During a flu pandemic, Tami-flu can also be used to treat or prevent flu in babies below one year of age (57).
In general, WHO does not recommend the use of antiviral drugs for prevention of pandemic influenza. For people who were exposed to an infected person and are at a higher risk of developing severe or complicated illness, an alternative option is close monitoring for symptoms, followed by prompt early antiviral treatment should symptoms develop. WHO recommends that treatment with oseltamivir should start immediately, no matter when the illness started and without waiting for laboratory results to confirm infection (58).

2.2.3 Conclusion

The efficacy observed with these antiviral drugs has proven the principle that chemoprophylaxis and early treatment are possible in influenza infections (59). Oseltamivir could be the best option for antivirals use in an influenza pandemic. Vaccination is probably the most effective intervention but the time of vaccine availability is critical and the limited production raises the question about the strategy for allocating the vaccine.

2.3 Combination measures for pandemic influenza

2.3.1 Delaying strategies

The suggestion of a case-finding and treatment approach to contain an emerging pandemic coming into a country has been considered in modelling exercises, which concluded that it would not be a sustainable strategy and would require enormous stocks of antivirals and herculean case-finding efforts (60): stochastic influenza simulation model for South-east Asia with low basic reproductive number (Ro), showed that a prepared response with targeted antivirals would have a good chance of containing the disease with an antiviral agent stockpile on the order of one hundred thousand to one million courses for treatment and prophylaxis whereas three million courses of antiviral drugs should be necessary for others (61)(16). Some stochastic simulation models in the United State show similar results (62). With the use of targeted antiviral prophylaxis and if 80% of the exposed persons maintained prophylaxis for up to eight weeks, the epidemic could be contained (63).
Police effectiveness depends critically on how quickly clinical cases are diagnosed and the speed with which antiviral drugs can be distributed. Delays in the initiation of antiviral treatment result in much more pessimistic outcomes (64).

History showed that European communities will not be able to contain the pandemic strain or isolate themselves from it (65).

International recommendations for Influenza A H1N1 2009 Pandemic:
Considering that a pandemic virus can be contained once it has got beyond the initial outbreak, WHO recommended a containment strategy only in phase 4 of the Pandemic (for a specific area). As phase four only lasted for two days during this influenza pandemic, containment strategies were not recommended. However, the term delaying is preferred and delaying strategies could be appropriate to win time. WHO didn't give formal recommendations for delaying strategies. ECDC recommended it for a few weeks to gain time when final preparations had to be made.

2.3.2 Multi-component strategies

Pharmaceutical and non-pharmaceutical measures should not be used exclusively. The protraction of the pandemic wave is essential to gain time while waiting for vaccine development and combined interventions give optimal results. Using a model simulating the spread of influenza within the community, a study showed that an influenza pandemic with a comparable burden to that of 20th century pandemics might be mitigated by combining measures. The results of this study support the stockpiling of antiviral drugs and accelerated vaccine developments (66).
A strategy that emphasizes the use of basic transmission control measures (quarantine, isolation) could have a significant impact at an early stage. Vaccination is the most effective measure for reducing the impact of an established pandemic (provided it is available soon enough) and the success of an antiviral only intervention will depend on its time distribution and on the number of doses available. In the UK, estimates showed (based on 1957 pandemic) that hospitalisation could be reduced by 67% (first pandemic wave) with sufficiently large antiviral coverage (20-25% Stockpile)(67).
Mathematical modelling considered a situation with a constant risk of introduction or re-introduction of virus and showed again the importance of multi-component strategies and timing. This study confirms also that if a pandemic influenza strain cannot be contained within its country of origin, it will become much more difficult to control; a more realistic objective would be to limit its impact (31).

2.3.3 Conclusion

None of the interventions are completely effective when independently implemented and combined interventions may give the most optimal results to gain time while waiting for vaccine development. It is necessary to understand the potential benefits and limitations of all available interventions so that appropriate interventions can be implemented.

3 CONCLUSION OF EXISTING KNOWLEDGE

It was expected that we would soon be facing a new influenza pandemic and thus international public health agencies called for the development of preparedness plans that would ensure the strengthening of a national and global response capacity to the next pandemic. As a result, countries began developing pandemic influenza plans in the late 1990s and many countries had plans in place by 2005. Since then, the degree of preparedness of various countries has varied widely but, in general, surveillance has been improved, systems for rapidly assessing vaccine effectiveness (I-MOVE European programme) and monitoring vaccine safety (VAESCO) were handle by ECDC, stockpiles of antiviral drugs became a reality and various sectors have been actively engaged. However, major difficulties in predicting the transmission dynamics of influenza, its local impact, and the population compliance of such public measures remained. There is a gap between the theory (mathematical models) and the reality. On June 11th 2009, the World Health Organization raised the influenza pandemic level, leading to public health responses at country level. When the Outbreak started in Europe, information was available from the Americas such as the severity of the virus, susceptibility to oseltamivir, immunity in a major large risk group, characteristics of vulnerable groups, determining if and when to begin using vaccine...Which intervention strategies were implemented then in Europe? What were their objectives and the decision making process?

Part 2 : PROJECT

1 OBJECTIVE AND METHODOLOGY

1.1. Objectives

The objective of the study was to assess and compare the control strategies aiming at preventing or controlling the spread of the disease in five European countries during the pandemic influenza: which non-pharmaceutical and pharmaceutical measures were implemented (and did modification occur during the pandemic), what should have been implemented according to their previous published plans and were the objectives mentioned in those plans carried-out?

1.2. Methodology

1.2.1. Study design

The survey aims at analysing the intervention strategies against pandemic A/H1N1 influenza. Five European countries who had a vaccination plan for this pandemic influenza, and whose websites could be accessed, were selected for the survey. We selected England, France, Hungary, Portugal and Sweden for their different approaches and cultures.
We enrolled for those countries gatekeepers responsible for conducting surveys, inside the governmental department in charge of pandemic influenza response. We also selected contact from each agency in charge of infectious surveillance for further information about epidemiological data. The government or agency websites from the countries were also studied to get information related to this topic.

The expected output of this survey is a report which describes, analyses and compares different control strategies aiming at preventing or controlling the spread of the disease during the pandemic.

1.2.2. Data collection

A standardised worksheet questionnaire was developed, using both close-ended and open questions (Annexe 1). Various indicators, based on the WHO check-list for influenza epidemic preparedness and the ECDC pandemic preparedness self assessment indicators, were identified to study non-pharmaceutical measures and pharmaceutical measures. Indicators were also selected to study their communication strategies.

Information was gathered on the objectives of such measures, on their implementation during the pandemic at country level: at the beginning, before, during and after the peak. Information was also sought about determining factors during the decision making process (epidemiological data, economic context, social and cultural context like population compliance).
Concerning antiviral drugs use, we asked questions about how it was monitored, what quantity of the stock-pile was consumed, and which distribution channels were used.
Concerning the pandemic vaccination, we developed further questions about contract with suppliers, priority groups during the pandemic, whether uptake was monitored, recent vaccination coverage results by priority group, administration costs for vaccine, health care setting for vaccination administration, players in the pandemic immunization implementation, experiences from the vaccine distribution.

For the communication during the pandemic, information was collected about the different channels used to communicate, the challenges related to the communication part of the pandemic, whether the country was prepared or not to communication challenges, the reaction of the media, the countries responses to the anti-vaccination campaign and public compliance.

The latest update preparedness plans published from each country were used to analyse the measures planned (68)(69)(70)(71): when the plan was not available in English (Hungary, Portugal), native persons from the country translated the parts needed.

Other information concerning those countries were collected via internet websites, such as: GDP, public health expenditure, life expectancy, healthy life expectancy, prevalence of some underlying chronic conditions as markers, seasonal vaccination plan.
Some epidemiological data available among the five countries were collected: Influenza Like Illness (ILI) consultation per 100000 population with the draw of pandemic curves, incidence of fatal cases.
Even if hospital-based surveillance is an efficient way to collect clinical and laboratory data for severe infectious disease, it contains too much variation in data collection among the European countries; hence Severe Acute Respiratory Illness (SARI) was not collected in the study. Furthermore, the burden on Health-care was low and the countries experimented a relatively low severity during this Pandemic.

1.2.3. Data processing and study time

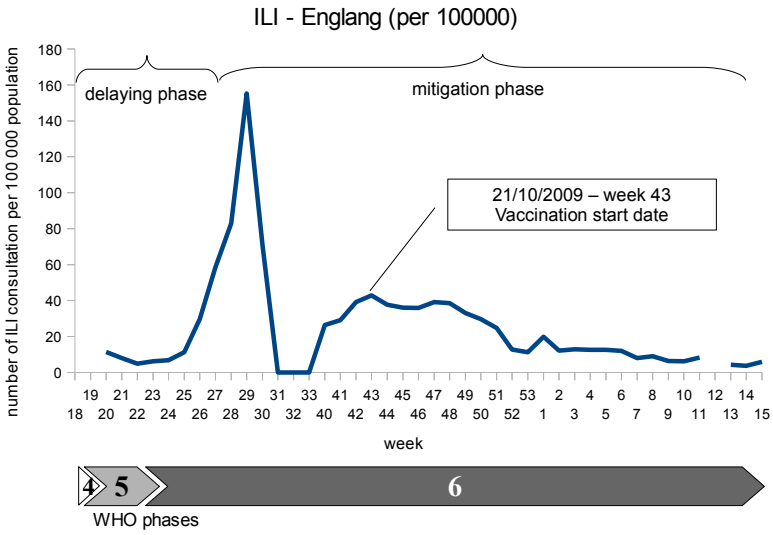
A letter to each Member State was sent in March to explain the objectives of the study. Most of the time, contacts were called beforehand to present the research and its frame.
MSs were asked, after their agreement, to complete the survey between April 1st and April 20th, 2010.
Gatekeepers filled in the form in April or in May, except for France where the Ministry of Health decided not to answer now. We contacted country gatekeepers by email or telephone during this time to answer any questions if needed ; we had planned, after the return of each survey, a twenty-minute conference-call so as to clarify and to go more in detail with those qualitative data when possible. If the appointment couldn't occur, different exchanges were done by email to obtain the same type of information. Each call was recorded and the audio output was added into the survey. In order to better identify the different information channels, we used colour coding's in the report: black was used to report what was filled in directly by the country; red was used to report what was obtained by call or e-mail exchanges; green was used to report what was obtained by government or agency website. The four surveys, with the answers are too voluminous to put in annexes but can be asked here: gaelle.vareilles@gmail.com.

1.2.4. Data analysis

Data were analysed in May. Quantitative data are submitted here below by tables and graphs. The results aim at describing the intervention strategies in each country and the decision making process when available. They were classified by theme and sent to the countries so as to avoid any inaccurate re-transcription of information. The analysis and comparison refer to their own objectives, preparedness plan and international recommendations concerning pharmaceutical and non-pharmaceutical measures during the pandemic.

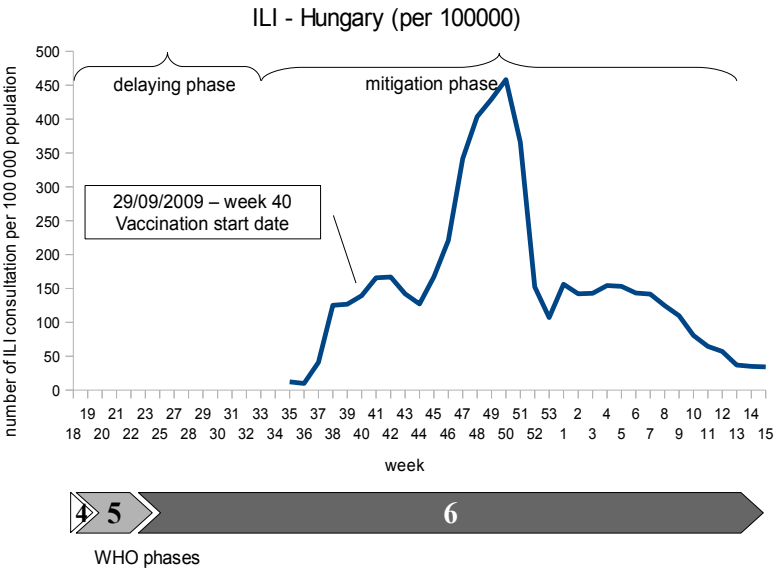
2 RESULTS

Demographic indicators of the countries can be found in Annexe 2.
Pandemic trends:



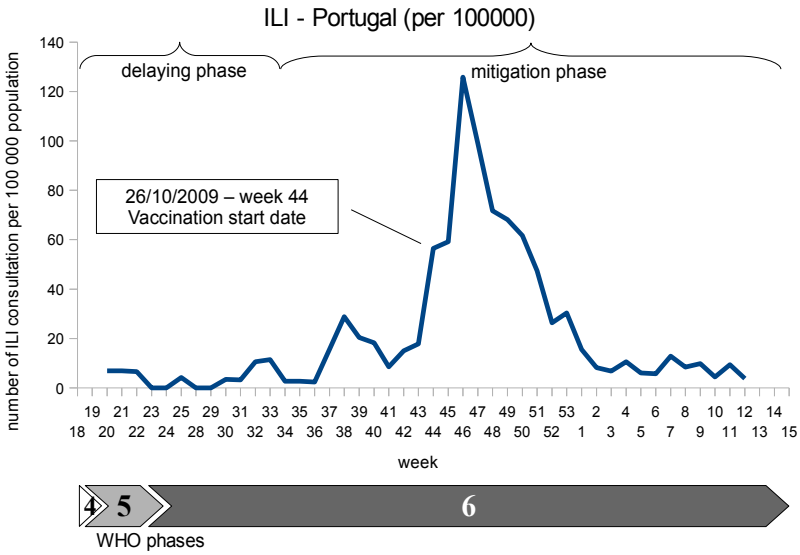
System of ILI surveillance in England
Sentinel surveillance schemes based on networks of Gps representing 2% of the population
Q flu surveillance (GPs surveillance schemes) based on data from 43% of England population
National Pandemic Flu service
National Health Service direct syndromic surveillance project

UK influenza A/H1N1 cumulative deaths on week 18: 296



System of ILI surveillance in Hungary
Sentinel influenza system covers 20% of the population.
Voluntary GPs system

HU influenza A/H1N1 cumulative deaths week 18: 133

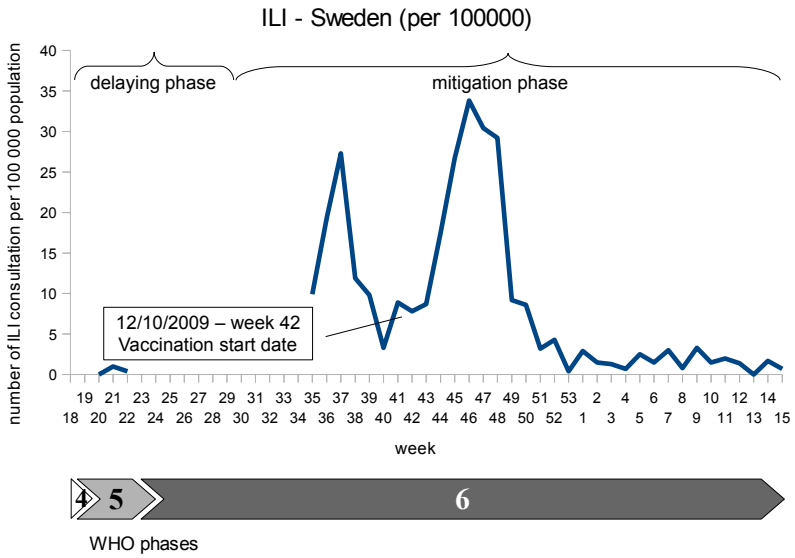


System of ILI surveillance in Portugal

Sentinel doctors (150 GPs) representing about 2% of the population
All GPs (computer data based)
The sentinel network give the trend and the proportion of ILI cases.

The incidence rate is from all the GPs surveillance scheme.

PT influenza A/H1N1 cumulative deaths week 18: 121



System of ILI surveillance in Sweden

Sentinel system with 100 primary care doctors.
Volunteer based system with 12500 Persons.

SW influenza A/H1N1 cumulative deaths week 18: 24

These data come from ECDC Weekly Influenza overview and WHO European influenza work. They are based on nationally organized networks of general practitioners, covering at least 1-20% of the population in the countries and using the same ILI EU definition.
WHO Phases (72)

2.1 Non pharmaceutical measures

2.1.1 Case finding and contact tracing

Case finding and contact tracing were implemented during the delaying phase in the four countries. Families with confirmed cases were contacted; even if the cases were treated and the contacts could receive prophylaxis, no compulsory measure of isolation in hospital and quarantine were

decided.
In Sweden and Hungary, this role was given to the GPs and the national public health network. In Portugal the National Public Health Network and public health doctors (approximately four hundred) led the work and prescribed the prophylaxis. In England, the Health Protection Agency performed the work when at the same time central authorities concentrated activities on final preparation for the autumn wave. In England and Portugal tracing was done at school also where necessary. During the mitigation phase, contact tracing and the reporting of all cases stopped in the countries. The A H1N1 biological tests were not taken any more for all the cases.
In three countries (Hungary, Sweden and Portugal), the mentioned reasons for moving to mitigation phase were mostly the epidemiological data and the European recommendations. Those measures were no longer considered effective according to the international recommendation for Hungary and Sweden (EU consensus on it). In England and Sweden, the significant increase in the number of cases and the fact that they could not contain or prevent the spread indefinitely was explained to the health professional and to the public.

2.1.2 Distancing measures

School closures were considered in the preparedness plan with a legal basis to do it. However, school closures were not advised or implemented by the public health authorities and predefined criteria didn't exist in both cases. In two countries (England and Portugal), school closures were implemented as re active measures in the first few weeks during the containment phase, when the attack rate was very high and was causing huge absenteeism or even, as in Portugal, there was considerable social alarm. In both countries, such measures were scarce. In Portugal, only three or four schools were closed during a maximum of two weeks.

Even if countries have the legal basis to restrict them, no public gatherings were cancelled. Hungary implemented public gathering restrictions with a specific guidance during an important music festival in August 2009.

In all the countries, voluntary quarantine of cases was implemented during the delaying phase (and not so strict during the mitigation phase); there was no compulsory quarantine.
In Hungary, voluntary isolation of contacts was implemented during the delaying phase (with strong advice to stay at home from physicians and public health authorities, who personally visited the cases or called them).

In Portugal and Hungary, suspected or confirmed influenza A (H1N1) 2009 patients were admitted only to designated referral hospitals, during the delaying phase. Those referral hospitals were in growing number as needed by the spread of the pandemic. On the mitigation phase, all hospitals and health services admitted those patients. The reasons mentioned for such modification of strategies are the epidemiological data.

2.1.3 Restriction of travels

No cancellation of travel occurred to or from an affected area (such as in Mexico at the beginning of the pandemic). Travel advice with influenza advice leaflets or warnings were established in the four countries.
Hungary implemented entry screening at the airport during the delaying phase with temperature monitoring and self quarantine, whereas not in the other countries.
There were no exit screenings.

2.1.4 Personal Public Health measures

Hand washing and good hygiene were recommended by all the countries. The use of face masks

by the public was not generally advised. In two countries (England and Portugal), symptomatic cases could contact a national call centre for assessment and advice. The countries had specific recommendations for health professionals with gloves, surgical masks and more specific measures with plastic aprons for professionals in close patient contact, FFP2 or FFP3 respirators for those who performed aerosol generating activities.
England mentioned specific recommendations such as avoiding unnecessary travels and gatherings, antiviral prophylaxis if contact during the delaying phase for pregnant women and risk groups. Portugal emphasized the additional risk for pregnant women and children, with recommendations for prophylaxis and early treatment both in the delaying phase and the mitigation phase.

2.2 Antiviral agents results

	Strategy	Treatment measures (a)	Prophylaxis measures	Stockpile in place (c)	Approximation of stockpile used (d)	Distribution policy
England	Own + WHO, ECDC Guidance	Treatment of all influenza symptomatic cases	Close contact of confirmed cases during the delaying phase	80,00%	3-4,00% Complete figures not available	Antivirals distribution points(e)
Hungary	Own + WHO, ECDC Guidance	Treatment of severe influenza illness people and risk groups	Health care workers	<10%	1,00%	Patient collects from family doctor, hospital or pharmacy
Portugal	Own + WHO, ECDC Guidance	Treatment of severe influenza illness people and risk groups	All contacts during the delaying phase unimmunized people in risk groups during the mitigation phase	25,00%	Not available	Patient collects from family doctor, hospital or pharmacy. Addressed by authorities at the beginning
Sweden	Own	Treatment of risk groups	Family of cases during the delaying phase (b)	20-25%	1,00%	Patient collects from family doctor, hospital or pharmacy

a: Treatment is still a priority over prophylaxis, and no modification of treatment strategies occurred during the pandemic except for Portugal, where prophylaxis is a priority during the delaying phase, and where modification of treatment strategies occurred with guidelines so as to give early treatment and treat more patients.
b: for unimmunized people at high risk for exceptional cases during the mitigation phase
c: Proportion of the population covered by the national stockpile at the beginning of the pandemic
d: Estimation
e: at the beginning to a limited number of pre-identified delivery location in each PCT (central call centre(s) with collection points). The national Pandemic Flu Service was set up following the end of the delaying stage.

Two countries had the possibility to control in a routine way the use of antivirals according to the national priority for those target groups: in England, symptomatic patients contacted the National Pandemic Flu Service for antiviral treatment authorisation on collection point with a specific code:

URN (antiviral authorisation code). Surveillance data were collected by the National Pandemic Flu Line Service, which was a major tool for government coordination of the pandemic response.
In Portugal two systems were effective: the national call centre and GPs computer-based data. The proportion of ILI cases who received antivirals will be investigated soon.

No investigation is carried out to assess the impact of the antivirals use in any of these countries.

2.3 Vaccination

2.3.1 Contract with supplier/Objectives

	Vaccines supplies	**Type of vaccine**	**Member states vaccination strategy**	**Population coverage rate objective**
England	EU suppliers: GSK and Baxter	Pandemrix adjuvant: 1 dose with adjuvant Celvapan: 2 doses without adjuvant Multi doses package	Own vaccination strategy to protect vulnerable people	100,00%
Hungary	Own member state manufacturer	1 dose with adjuvant Single dose package	WHO, ECDC guidance to protect vulnerable people, maintain essential services and to limit the spread of infection in the general population	60,00%
Portugal	EU supplier: GSK	2 doses with adjuvant Multi doses package	WHO, ECDC guidance to protect vulnerable people and maintain essential services	30,00%
Sweden	EU supplier: GSK	2 doses with adjuvant Multi doses package	Own vaccination strategy to protect vulnerable people, maintain health care services and to limit the spread of infection in the general population	100,00%

In England, advance purchase agreements were initially signed with both manufacturers in July 2007. They were then activated in June 2009, following the pandemic declaration by WHO. Variation to the contracts were agreed between the outbreak of the swine flu virus in April 2009, partly to allow for more flexibility and to address some legal issues. England agreed on a variation to their contract with Baxter that allowed orders to be terminated at a pre-determined volume or on a date in 2010, whichever came first.

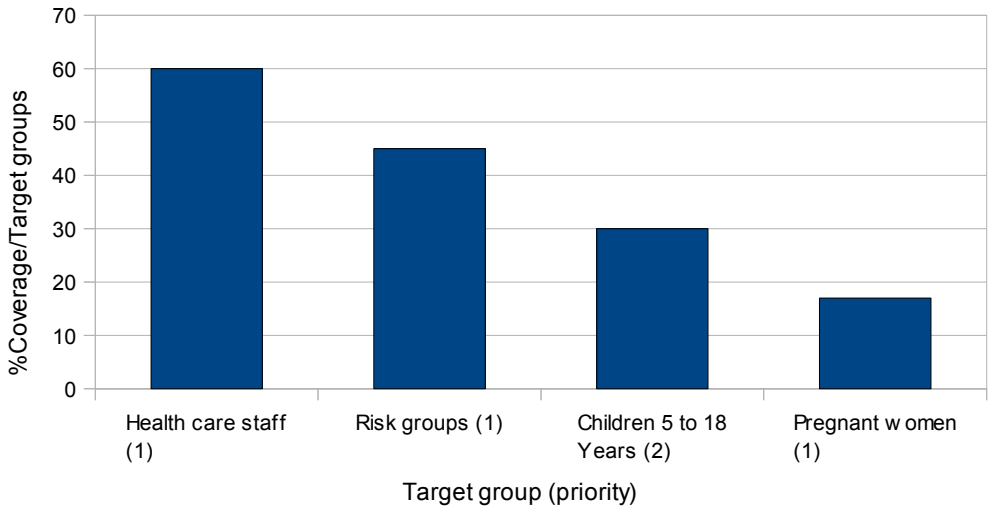
Sweden had an advance purchase agreement for vaccine for the total population, signed in 2007. The agreement was valid for three years with an option for six more years. The contract is under modification.

In Hungary, the first contract was settled in 2005 and a new contract was signed during summer 2009 to order a fix quantity: four million doses for the state, free of charge before first of December and to provide 2 millions doses for the pharmacists. The vaccine had to be provided in less than four months. The price for pandemic vaccine was the same as for the seasonal flu vaccine. There were no initial arrangements made concerning the eventuality of surplus manufactured vaccine in Hungary.

In Portugal, the first contract was signed in spring / summer 2009 for six million doses. At the vaccination start, the delivery of doses was lower than the negotiated amount, and arrived in small quantities. Negotiations with the supplier were under way to reduce the number of doses given the fact that the recommendations changed from two to one dose. The multi doses system was also difficult to manage.

2.3.2 Vaccination coverage

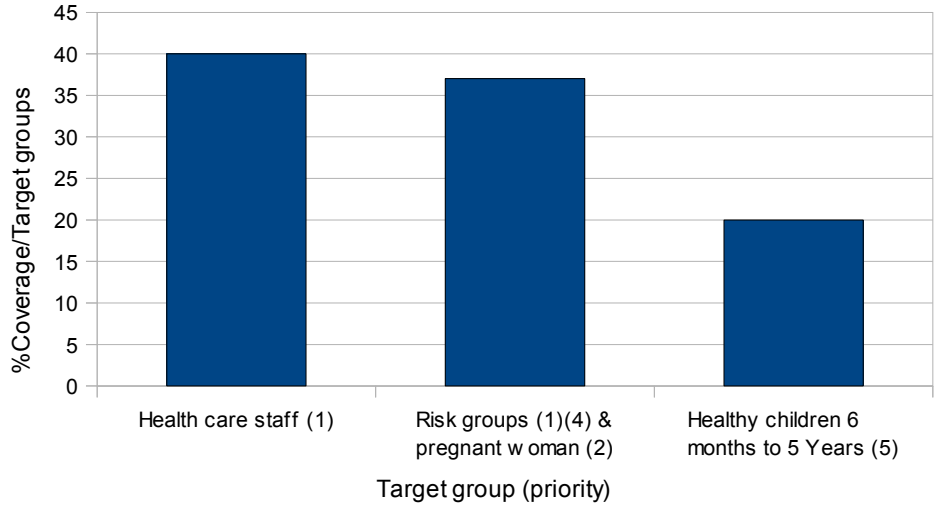
Hungary



Priority groups 1:
Health care staff
Other providers of essential services
Risk groups
Pregnant women
Priority groups 2:
Healthy children from 1year to 18 years old
Priority groups 3:
Poultry workers
People in close contact of children less than 12 months.

Present total population coverage rate: 27%

England



Priority groups 1:
Health care staff
Risk groups (under 65 years old)
Priority groups 2:
Pregnant women
Priority groups 3:
Household contact of immuno-compromised people
Priority groups 4:
Risk groups (over 65 years old)
Priority groups 5:
Children from 6 months to 5 years old

Present total population coverage rate: data not available.

Portugal

%Coverage/Target groups: according to the estimation, 23% of the targeted groups were vaccinated (targeted groups represented 30% of the total population).
The pandemic vaccination coverage rate among physician is mentioned to be higher than seasonal vaccination coverage rate but lower for nurses. The pandemic vaccination coverage among pregnant women is very low.
Present total population coverage rate: approximately 7%

Sweden

%Coverage/Target groups: data not available
Present total population coverage rate: approximately 60% (validation of data is ongoing)

Modification of vaccination campaign during the pandemic:
- Hungary, on week 46 (i.e. 6 weeks after the vaccination start date): children attending secondary school and civil servants with direct contact with clients were included into the vaccination campaign (result of vaccine licence process and epidemiological data). Originally children from the age of 6 months were targeted, but because of the result of licensing process, the lower limit of the age population had to be increase to12 months of age.
- England, on week 47 (i.e. 4 weeks after the vaccination start date), priority groups were extended to healthy children between 6 months and under 5 years of age for epidemiological data.
- Portugal, on week 46 (i.e. 2 weeks after the vaccination start date), vaccination was extended to children from 6 months to 2 years of age; on week 53 vaccination was extended to children up to 12 years of age and, on week 1 (i.e. 10 weeks after the vaccination start date) to prisoners and guards also for epidemiological data and social context (decision of the Ministry of Justice as there are a lot of people together in a small place).

2.3.3 Logistical aspects

	Major player for vaccine implementation (a)	Pandemic flu immunization place	Seasonal flu immunization place (b)
England	GPs	Primary care surgery	Primary care surgery
Hungary	GPs first Other physicians	Primary care surgery / School / Hospital / Vaccination centre / Work place	Primary care surgery / Work place / Hospital
Portugal	GPs first Nurses Other physicians	Primary care surgery / Hospital / Vaccination centre / Work place / Ministry of Health	Primary care surgery / Vaccination centre / Private clinics / Work place
Sweden	GPs Nurses Other physicians	Vaccination centre (and others care centre's)/Hospital/School /Primary care surgery/Work place	Primary care surgery/ Vaccination Centre/Work place/Hospital

a: Ministry of Health is added for Portugal and the whole health system for Sweden
b: Venice project study sources (73)

Negotiation with the staff

Two countries had a special contract with the staff:
- In England a national agreement on GPs' remuneration was established (a fee of £5.25 per dose of vaccination given by GP). The department initiated discussions with the General Practitioners' committee of the British Medical Association in advance of the pandemic being announced, in order to agree on a national delivery mechanism through GPs for the vaccination programme. As it was not possible to secure a national agreement for the delivery of the second phase of the vaccination phase (priority groups were extended to healthy children), Ministers asked Primary Care Trusts to secure the delivery of the vaccination of children through locally enhanced services or other locally commissioned arrangements.
In Hungary, GPs have a special contract with the Hungarian National Health Insurance Fund, so vaccination activity was refunded. GPs received extra fees after the vaccination, which was not a contract but a decree modification. However, special contracts were established with the 203 vaccination centres, which were opened in November. Physicians also received fees for organizing school mass vaccinations.
In Sweden and Portugal, no special contract or incentives were established with the staff.

Vaccination distribution

The vaccine was free of charge for all the population in Sweden; in the others countries, the vaccine was free-of-charge for the targeted groups included in the priority list.

In Hungary, approximately ten thousand places were available for vaccine delivery. The most important distribution channels were through GPs but school campaigns and pharmacies were also contributing significantly. Two hundred and seven vaccination centres were also opened in November to increase the coverage rate among the population but contributed less to the total achieved coverage.

In England, the delivery was similar to the other vaccination programmes, such as the seasonal flu programme, on the basis that it was delivered through GPs' practices. Using GPs was straightforward for England as the majority of the initial at-risk groups would have already been accessing GPs routinely for seasonal flu vaccination and it would therefore have been easy to identify, contact and vaccinate eligible patients. A PCT is a Primary Care Trust (one hundred and fifty two PCT). They are health trusts that provide primary and community services, or commission services from other providers.
Some staff did not have experience of using multi-dose vials. The Department, together with the Health Protection Agency, the Royal College of Nursing and vaccine experts developed a DVD on vaccine administration to assist with staff training.
The large pack sizes of the GSK vaccine (500 doses per box) was too big for some GPs' surgeries. Some PCTs chose to break down the boxes and locally distribute smaller quantities in order to maximise the coverage. PCTs / GPs had to ensure they had appropriate cold storage to store the vaccine.

In Sweden the county councils are responsible for health care and therefore responsible for the vaccination campaign. Additionally to the places in the counties used for seasonal vaccination, others were opened (like vaccination centres). The National Board of Health and Welfare is committed to supporting county councils in their work with vaccinations (with recommendations and definitions of risk groups for example), as well as to devising models for how the vaccine should be allocated between county councils. When the vaccine became available, the media were used to spread the vaccination waves by priority groups

Portugal has a similar national health system to England's. The seasonal vaccine, available in pharmacies, is not free. People could go to different places to be vaccinated. The pandemic vaccine was delivered in primary care health centres and was free of charge for the targeted population. Nurses are able to do the vaccination in these centres. People with chronic disease needed a declaration from their Doctor prior to the injection.

Investigations are carried out to assess the pandemic vaccine effectiveness in all the countries. England, Hungary and Portugal took part in the same European study to monitor the pandemic vaccine effectiveness (I-MOVE Programme).
In England, the Health Protection Agency undertook work to measure the uptake of the H1N1 pandemic vaccination programme.
In Hungary, vaccine coverage was monitored during the pandemic at local, regional and national level.
Portugal is participating in international studies, where vaccine coverage is being evaluated according to target groups.

2.4 Communication related to the measures

2.4.1 Communication campaign

All the countries started a mass communication campaign for health staff, targeted groups and the general population. The channels used for the population were similar among the countries: web site, leaflets, TV/radio, newspaper, press release, telephone call services. Professionals could benefit from more specific channels such as conferences/meeting, training sessions, scientific articles. Governments used specific letters to professionals, except in Sweden, and Government health bulletin were established, except in Hungary (influenza newsletters at Governmental level).

Three countries (England, Portugal and Sweden) said that they were well prepared for a possible communication challenge.

- In England, a comprehensive programme were developed based on extensive pre-pandemic planning. It included a national leaflet door drop, paid advertising, partnership marketing, online information, social media monitoring and the Swine Flu information Line. Specific response measures such as Chief Medical Officer weekly press briefings and briefings for the National Health Service. Digital communications gave the public access to the latest information in a rapidly evolving situation. “Paid search” advertising generated over 5 million clicks to official online information and helped generate over 2,7 million National Pandemic Flu Service assessments.
Partnership was also key, for example with the National Health Service and the social care, with the media and professional bodies and third sector organisations, such as the Red Cross, plus commercial partners.

- In Portugal, the communication strategy was prepared before and a few key persons were designated to provide information on the situation.
Networks were developed during the containment phase at central and local levels with the use of internet, Doctor to Doctor phone line, meetings.

- In Sweden, local and regional stakeholders are responsible for producing the content of the information that is specific to their region but with support from the national authorities. National authorities are responsible for producing the content of the information which applies to a pandemic in general. Through pre-pandemic planning, activities and channels were established that county councils, municipalities and the county administrative board can use. Information films for television and the web have been prepared before the Pandemic. A web based training material for health care staff produced by the National Board of Health and Welfare was ready at the end of 2009. A network with communication officers in the national authorities and representatives from the county councils was implemented during the Pandemic in Sweden.

- In Hungary, the communication strategy was also prepared before, and few key persons were designated to provide information on the situation during the pre pandemic planning even if the communication plan was not detailed. Finally, during the Pandemic the information was more centralized.
Communicators network in EU and communicators network involving designated governmental organisations were implemented.

2.4.2 Main challenges or successes related to the Member States' communication during the Pandemic 2009

- In England, it is mentioned that transparent information was committed from the start. They emphasized on the latest scientific information and made it clear. Weekly public opinion tracking throughout the outbreak shows consistently high levels (above 80%) of public satisfaction with the level and quality of their communication.
A good achievement in health care workers pandemic vaccination coverage was mainly obtained to a dedicated “virtual” communication team.
- In Portugal, major challenges were mentioned to be the resistance to the vaccine and the role of the new communication media (e.g.you-tube..)
- In Sweden, information is produced in co-operation with various authorities resulting in a co-ordinated message to the public.
- In Hungary, the biggest challenge was to deal with the anti vaccination campaign, to which they were not prepared for. The successful part of the vaccination campaign was to almost double the vaccine coverage within one month, from November to December, and to reach a significant coverage before the peak of the pandemic (the increase of vaccine coverage is also due to increase of morbidity in Ukraine, death of the first pregnant women in Hungary)

2.4.3 Anti vaccination campaigns

Two countries (Hungary and Portugal) monitored the accuracy of the media.
- In Portugal, daily news about the pandemic vaccination in the media was analysed by the General Directorate of Health. The government responded to the anti vaccination campaign through the website and the media by disseminating information regarding the quality, efficacy and safety of the vaccine. They also mentioned that false information were mainly found on the web. The media gave great emphasis to the eventual safety problems of the vaccine, but did not exactly undertake an anti vaccination campaign.
- In Hungary, weekly internal press occurrences were analysed by the Office of the Chief Medical Officer. The country responded to strong anti vaccination campaigns by giving more accurate information, and tried to convince people to get vaccinated.

2.4.4 Pandemic vaccination compliance in the general population

Three countries (England, Portugal and Sweden) are undertaking formal surveys about the reasons why for people in their countries chose not to get vaccinated against the pandemic A/H1N1.
The main concern about the reasons are the lack of fear of the disease itself when the vaccination started, questions about vaccine safety, misconceptions about the risk benefit ratio of getting vaccinated. In Portugal, the reduced number of available vaccines at the beginning of the vaccination campaign is also said to have had a negative impact on the total vaccination population coverage.

In Hungary, the Health Committee of the Parliament released a statement about the importance of vaccination.

3 ANALYSIS

3.1 Analysis of the measures implemented related to the preparedness plans and the international or European recommendations

The countries organised their responses by pandemic phases which were updated in accordance to WHO's definition (72) but with specific implications at country level (own phases were detailed: e.g. outbreak outside of the country, few cases in the country...).

All the countries followed the preparedness plan. It is almost impossible to conclude which countries which were closer to the plan than others: much guidance was added throughout the pandemic according to international regulations or because of epidemiological data, and plans were constantly modified. Analysing the plans and comparing them would require more knowledge about each country's legal structure, more time, and was not the aim of the research. Moreover, the preparedness plan should be used as a framework for the countries.
For legislative purposes, there are possibilities in the countries, for applying what are known as “extraordinary” measures during a pandemic. The countries established their own legal acts according to the International Health regulation. Concerning the non-pharmaceutical measures, the legal basis for public gatherings and school closures, travel restrictions or ban travels in case of a pandemic exist but usually no specific trigger was included in the plan (early phase for two or three weeks in the Hungarian and Portugal plans).

On the whole, countries followed the WHO and ECDC recommendations for non pharmaceutical measures during the Pandemic.
The initial approach was different from North America's, where the AH1N1 virus was first detected, as the four countries started by attempting delaying. In the EU, the initiation phase started at the very end of the seasonal influenza period when influenza transmission was expected to be low. There was no formal recommendation from WHO in terms of delaying strategies. ECDC recommended delaying strategies for a few weeks to gain time when the final preparations had to be made. It is possible that the efforts made by the countries delayed the progression in May and June, but further evaluation needs to be done and it will probably be difficult to prove. In England, great effort was made to implement delaying strategies but we have to mention here the fact that they were the first to face the outbreak. Gaining more time for preparation and vaccine availability was a major issue. Again, the results of considered evaluations will take some times.

The countries didn't strictly follow the WHO recommendations for the antiviral agents use: prophylaxis were used in the delaying phases and in some cases during the mitigation.
England didn't follow the recommendation for antiviral treatment as all influenza symptomatic cases were targeted. Before the 2009 pandemic, countries decided at their own level on the amount of stockpile to purchase (the highest was in England where the vaccine was expected to be available later, the lowest in Hungary where the vaccine was expected to be available earlier).

Priority groups for vaccination were considered in the countries as it was recommended by WHO and ECDC but Sweden and England had their own strategy. Furthermore, since 2005, countries decided on the number of vaccine to purchase in case of a new pandemic as well as the coverage of the total population they wish to achieve. They all followed the recommendation when WHO declared that a pandemic has broken out (phase 6) and that the production of a new influenza A/H1N1 vaccine could start.

All assess the burden of influenza with the support of sentinel surveillance networks that report data to the European Influenza Surveillance Scheme.

3.2 Lessons learned

It's to early to conclude or even to give here more specific hypothesis about the impact of the measures used during the influenza A/H1N1 Pandemic. The overall number of illnesses, hospitalizations and deaths attributed to 2009 H1N1 virus is still difficult to ascertain based on the information available. Moreover, the conclusion about the impact of the pandemic vaccination could be difficult to give because of a low population coverage. Antiviral drugs were used but comprehensive studies of the effectiveness of antiviral treatment are not currently undertaken and their use among the population at the end is probably not enough to give relevant conclusions.

The major challenge during this pandemic in these four European countries was not any more the lack of vaccine production capacity but more the relatively low total vaccination population coverage rate. None of the countries reached their objectives. Even in Sweden where 70% of the population is vaccinated against influenza A/H1N1, young people were more doubtful about the vaccine safety and its necessity than it was expected. Pregnant women belong to first priority groups but the coverage is still too low in each countries.
It's important to underline here that even if the vaccine production capacity was good in the European countries, delivery was late and differed from one country to an other. Influenza A/H1N1 vaccination campaign started of course proportionally later than influenza seasonal vaccine and sometimes after the pandemic peak. Population support to public health measures may have decreased with time. People were globally less afraid with this virus when the vaccination campaign started.

Nevertheless, there are some strengths to point out:

International cooperation provided guidelines on time and Europe might have benefited from more preparedness time, the sharing of antivirals drugs and the availability of vaccine among high risk groups.

In Hungary, the choice of signing a contract with its own manufacturer may have resulted in earlier influenza A/H1N1vaccine availability and so in a better vaccination coverage among the population. Furthermore the possibility of having a single dose package for vaccines was easier for the physicians. In Sweden the relatively high vaccination coverage in the population is probably due in part to culture habits of collective awareness.
What worked well during the previous seasonal flu vaccination programme (Annexe 3) and which was used during this pandemic (majors players, mechanism of delivery, routine surveillance system, routine vaccination coverage collecting data) may have played a positive role in the 2009 pandemic vaccination programme implementation. For instance, England focused on the role of the GPs during the pandemic as they already played a major role for seasonal vaccination implementation and therefore reaches a high coverage in seasonal vaccination among oldest people.

In England, the public was very satisfied with the level and quality of government communication.
Frequent communication between physicians and the Public is recommended to disseminate information about the role that the public can play in limiting the spread of the disease. Adequate and transparent information from health care authorities and in collaboration with the media, business, and organizations may result in better outcomes. It would be interesting to get further information concerning England related to the communication during the Pandemic.

The national call centre in Portugal and England for assessment, advice and prophylaxis delivery during the delaying phase is under investigation but needs to be taken into consideration as the countries were satisfied with it.

3.3 Discussion

The information collected by the survey and exchanges with the countries have to be seen in the context: countries are probably more able to assess at a local level the impact of the pandemic influenza before sharing the data and further evaluation at European level. We couldn't always obtain the same type of information from the countries and we couldn't compare the different measures in a more relevant way. However, this work is a first step to clarify strategies and implementation of measures during the pandemic 2009 in Europe. Deeper studies to assess the severity of the pandemic and the impact of the strategies used during the pandemic should be undertaken. WHO is now re-evaluating its system of pandemic alert notification (severity of the pandemic as a new dimension of the warning system)(74). What worked during this pandemic at country or European level should be underlined to learn how the next pandemic, which could reveal more severe, or a decision making process during a health emergency situation should be addressed.

4 CONCLUSION

Countries followed the WHO and ECDC recommendations during the pandemic for non-pharmaceutical interventions, which are still playing a determinant role when pharmaceutical measures are not available. Their preparedness plans were a major tool to act during the pandemic. The objectives and strategies concerning pharmaceutical measures differed. The first agreements with manufacturers for vaccines and antiviral drugs to purchase were made with the threat of new human severe influenza pandemic. Countries differ in terms of their public health system, their customs and traditions and care seeking behaviour, but they all faced two major contemporary challenges: information via internet and legal interpretations of privacy and civil and constitutional rights (issues related to mass vaccination campaign). It was a relatively mild disease but further studies to assess the severity of the pandemic are needed. Still, conclusion about the impact of such measures during this pandemic would be difficult to draw, and thoughts about indicators to evaluate it in a future pandemic influenza could be useful: how is it possible to coordinate the response during a pandemic influenza without knowing the impact of the measures and their cost effectiveness? This project gives clarification of public health strategies among four European countries and could be worth being implemented in other European countries. Surveys aiming at studying the reason for people not to be vaccinated will be interesting, and a major topic for further research. Public health “marketing” is becoming a major challenge: how to convince people to get vaccinated? There is furthermore a short-term issue with the influenza trivalent vaccine campaign next year.

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ANNEXES

ANNEXE 1 : the questionnaire used for the survey

INTERVENTION STRATEGY AGAINST PANDEMIC FLU A – H1N1

"Pandemic" always refers to the **WHO definition**.

For the following multiple-choice question paper, just put a **X** (Except for "other, please specify ") and **more than one answer is possible**

Generic section

1 When was the last revision of your national or agency pandemic influenza plan?

2009	
2008	
2007	
2006 and earlier	
No revision	

2 Which governmental department or agency led your Member State response to pandemic influenza?

3 Were you able to monitor trends of Influenza like illness in a timely manner at local and/or national level?
Please specify how :

4 When did the move from delaying the spread to mitigation occur in your Member State(according to WHO definition)?

Date	
Information not available	

Non pharmaceutical measures

Community public Health measures

> Delaying measures

5 Did case-finding occur?

Yes | No

6 Did tracing contact occur?

Yes | No

7 If so, please specify and comment which kind of contact?

8 Modification(s) during the pandemic

yes | no

9 What kind of modification(s)?

10 Reason(s) (if several possibilities, then rank the reasons by priority where 1 is considered as the most important) :

Epidemiological, virological data	
Social context	
Economic context	
International guidance	
Cultural context	
Other reason, please specify	

Comment

> Distancing measures

11 School closure measures implemented?

No	
Pro active measures	
Re active measures	
Isolated measures(less than ten schools)	
Other	

12 If so, what were the criteria for school closure? Over which period of time?Measures start date,end:

13 Does your Member state have the legal basis to restrict public gathering?

Yes | No

14 Restriction of measures, concerning public gathering, implemented?

No	
Public gathering with specific guidance	
Cancellation of some public gathering	
Other, please specify	

15 Over which period of time? Start date,end:

16 Did your Member state implement voluntary quarantine?

Yes | No

17 Did your Member State implement compulsory quarantine?

Not implemented	
For Healthy people	
For symptomatic people	
For contact people	

18 Over which period of time? Start date,end:

19 Modification(s) of distancing strategies during the Pandemic?

Yes | No

20 If so, date(s) :

21 What kind of modification(s)?

22 Reason(s) (if several possibilities, then rank the reasons by priority where 1 is considered as the most important) :

Epidemiological, virological data	
Social context	
Economic context	
Cultural context	
International guidance	
Other reason, please specify	

> Restriction of travel

23 How did EU coordination assist your Member State on the issue of travel advices?

24 Did your Member State issue any travel advice or warnings about travel to an affected (according to ECDC criteria) area?

Yes | No

25 If so,where?

26 Over which period of time? Start date,end:

27 Which measures were put in place for travellers arriving from affected(according to ECDC criteria) areas?

No measures	
Temperature monitoring	
Influenza advice leaflets	
Prophylaxis administration	
Other reason, please specify	

28 Over which period of time?Start date ,end:

29 Did your Member State implement entry screening at the airport ?

No	
Temperature monitoring	
Self quarantine	
Other, please specify	

30 If so, over which period of time? Start date, end

31 Did your Member State implement exit screening at the airport ?

No	
Temperature monitoring	
Self quarantine	
Other, please specify	

32 If so, over which period of time? Start date, end

33 Majors modifications of travel related strategies during the Pandemic ?

Yes No

34 If so, date(s) :

35 What kind of modification(s)?

36 Reason(s) (if several possibilities, then rank the reasons by priority where 1 is considered as the most important) :

Epidemiological, virological data	
Social context	
Economic context	
Cultural context	
International guidance	
Other reason, please specify	

Personal Public Health measures/Hygiene guidance

37 Which personal Public Health measures were recommended to Healthy people not directly in contact with an H1N1 flu case?

No Health measures	
Self quarantine	
Face mask	
Hand washing/Good hygiene	
Antiviral prophylaxis	
Other, please specify	

38 Which personal Public Health measures were recommended to close contact of H1N1 case?

No Health measures	
Self quarantine	
Face mask	
Hand washing/Good hygiene	
Primary care consultation	
Antiviral prophylaxis	
Other, please specify	

39 Which personal Public Health measures were recommended to symptomatic people?

No Health measures	
Self quarantine	
Face mask	
Hand washing/Good hygiene	
Primary care consultation	
Other, please specify	

40 Did your Member state have specific recommendations concerning personal protective measures for Health professionals?

Yes No

41 If so, What kind of recommendations?

42 Did your Member State have specific recommendations for special target groups?(for children<1 year old, pregnant woman, risk groups..)

Yes | No

43 If so, what kind of recommendations and for whom?

44 Modifications of personal public Health guidance during the Pandemic?

Yes | No

45 If so, date(s) :

46 What kind of modification(s)?

47 Reason(s) (if several possibilities, then rank the reasons by priority where 1 is considered as the most important) :

Epidemiological, virological data	
Social context	
Economic context	
Cultural context	
International guidance	
Other reason, please specify	

Antiviral agents

Contract with suppliers

48 Which strategy did your Member state use for drugs stockpile?

Stockpile in place at the beginning of the Pandemic	
Contract/Agreement about future stockpile to supply	
Other, Please specify	

49 What proportion of the population did the national stockpile cover at the beginning of the Pandemic ?

Less than 10%	
From 10 to 20%	
From 20 to 40%	
More than 40 %	
Difficult to estimate	

Antivirals use objectives

50 How did your Member State define its antivirals use strategies?

Strategy based on WHO, ECDC antivirals use statement	
Member State antivirals use strategy with WHO, ECDC guidance	
Member State antivirals use strategy only	
Other, please specify	

51 For which objectives? Please, specify

Strategy for antivirals use/Targeted population

52 Treatment strategies for the targeted population

No treatment strategies	
For all influenza cases	
For severe influenza illness people(according to WHO criteria)	
For risk groups(according to WHO criteria)	
For other, please specify	

53 When was the treatment recommended to start :

No treatment strategies	
After clinical signs	
After clinical signs and during the first 48 hours except for the very serious disease	
After laboratory confirmation	
Other	

54 Did your Member State have an antiviral prophylaxis strategy?

Yes | No

If your answer is No, then go to question : 61

55 Priority of treatment over prophylaxis during the delaying phase?

Yes | No

56 Priority of treatment over prophylaxis during the mitigation phase?

Yes | No

57 Prophylaxis strategy for which targeted population during the delaying phase?

For Health care workers	
For other key workers	
For people in high risk	
For others people	
For close contact people of confirmed cases	
For close contact people of suspected cases	
Other, please specify	

58 Prophylaxis strategy for which targeted population during the mitigation phase?

For Health care workers	
For other key workers	
For unimmunized people in high risk	
For others non immunized people	
For immunized people in high risk	
For elderly immunized people	
For young immunized people	
For close contact people of confirmed cases	
For close contact people of suspected cases	
Other, please specify	

59 Geographical prophylaxis strategy :

In a specific area where specific cases occurred	
In a specific area where outbreak occurred	
Other, Please specify	

60 How did you identify the people who should be targeted for prophylactic treatment when a human case occur?

61 Did your Member State Monitor the use of antivirals?

Yes ☐ No ☐

62 If so, do you have an estimate of the stocked antivirals (pharmaceutical, Stockpile or other) which were used?

%

63 How were you able to control the use of antivirals according to the national priority for those target groups?

Logistical aspects

64 Which distribution policy was developed in your Member State for antiviral medicines when no sustained community transmission occurred?

Patient collects from family doctor, hospital or pharmacy	
Delivered to patient address by authorities	
Central call centre(s)with collection points	
Other, please specify	

65 Which distribution policy was developed in your Member State for antiviral medicines around the Pandemic peak?

Patient collects from family doctor, hospital or pharmacy	
Delivered to patient address by authorities	
Central call centre(s)with collection points	
Other, please specify	

66 Which information channels did your MS use for the Public to issue guidance on the effective use of antiviral medicines:

No guidance	
Website	
Individual letter	
Medical publication	
Mass distribution brochures	
TV/Radio/Newspaper	
Government Health Bulletin	
Other, Please specify	

67 Which information channels did your MS use for Health Professionals to issue guidance on the effective use of antiviral medicines:

No guidance	
Website	
Individual letter	
Medical publication	
Mass distribution brochures	
TV/Radio/Newspaper	
Government Health Bulletin	
Other, Please specify	

Assessment during the Pandemic

68 What kind of investigation(s) are carried out to assess the impact of the antivirals use?

Modification during the Pandemic :

69 Modification(s) of prophylaxis strategies

Yes No

70 If so, date(s) :

71 What kind of modification(s)?eg. Priority groups, logistics...

72 Reason(s) (if several possibilities, then rank the reasons by priority where 1 is considered as the most important) :

Epidemiological, virological data	
Social context	
Economic context	
Cultural context	
International guidance	
Other reason, please specify	

Comment

73 Modification(s) of treatment strategies? Yes No

74 If so, date(s) :

75 What kind of modification(s)?eg. Priority groups, logistics...

76 Reason(s) (if several possibilities, then rank the reasons by priority where 1 is considered as the most important) :

Epidemiological, virological data	
Social context	
Economic context	
Cultural context	
International guidance	
Other reason, please specify	

77 Comment

Vaccination

Contract with supplier

78 How has your Member state obtained vaccine supplies?

Did not source vaccine	
Direct from EU Supplier	
Own Member State manufacturer	
Via third party	
Made available from another country	
Other, please specify	

79 For which vaccine dose(s)?

One dose	
Two doses	
Two doses for some vaccine, please specify	

80 What kind of vaccine?

With adjuvant	
Without adjuvant	
Other, please specify	

81 If so, date(s)of contract(s) :

82 Was the contract(s)modified, if so when and reasons?eg. Vaccine dose(s)

83 Did your Member state have good and/or bad experiences with the contract(s)? Please, specify

84 Were initial arrangements made concerning the eventuality of surplus manufactured vaccine ?
If so, please specify

Vaccination objectives

85 How did your Member State define its vaccination strategies?

WHO, ECDC vaccination statement	
Member State vaccination with WHO, ECDC guidance	
Member State vaccination strategy only	
Other, please specify	

86 Population coverage objective:

a Maintain essential services yes [ ] no [ ]

b Protect vulnerable peoples yes [ ] no [ ]

c Limit the spread of infection / burden in the general population
yes [ ] no [ ]

87 What was your Member State population coverage rate objective(in %) when the first contract with the manufacturer(s) occurred?
% [ ]

Priority groups for immunisation/size

88 Priority groups when the vaccination started :
For the following priority grouping, it is possible to have the same priority for several groups.
Please fill in data even if some groups differ from the ones stated below (for example, if you grouped children from 6 months to 5 years old, then give the same info for both group)

	Priority (1 to 9) where 1 is considered as the most important	Estimated % of the total countries population	Estimated % of the targeted population to be vaccinated	Present % of the population vaccinated if data available
Health care staff				
Other providers of essential services				
Patients from 6 months old with risk factors				
Children from 6 to less than 24 months				
Children from 2 to less than 5 years old				
School children from 5 to 18 years old				
Healthy adults from 19 to 49 years old				
Pregnant women				
People over 60 (or over 65) years old				
Poultry workers				
Other group(s), please specify				

Please, specify if you have no data.

89 Did your Member State estimate the present total population coverage rate?
yes [ ] no [ ]

90 If so, last available coverage data(Please, specify the date) :
% [ ] date [ ]

91 Modification(s) of the priority during the pandemic
yes [ ] no [ ]

92 If so, date(s) :

93 What kind of modification(s)?

94 Reason(s) (if several possibilities, then rank the reasons by priority where 1 is considered as the most important) :

Epidemiological, virological data	
Social context	
Economic context	
Cultural context	
International guidance	
Other reason, please specify	

Comment

Logistical aspects of immunization

95 Pandemic vaccination start date

96 Was the supply sufficient to meet the demand coming from the targeted population?

yes no

97 Available free of charge for whom?

98 Please comment the bad and/or good experience(s) from the vaccine distribution
Were some logistical aspects similar or not to the seasonal influenza?

99 Who played a major rôle in community immunisation implementation ?

General Practitioner	
Nurses	
Other physicians	
Other	

100 Where was the immunization based ?

Vaccination centre	
Hospital	
School	
Primary care surgery	
Work places	
Other	

101 Did your Member State have any vaccination registers ?

No	
Local level	
Central level	

102 How did your Member State negotiate with the staff(Health services)?
Please, comment(specific contract, contract only for specific cases,previous contract, no contract..)

103 Modification(s) of logistical aspect during the pandemic?

yes no

104 If so, date(s) :

105 What kind of modification(s)?

106 Reason(s) (if several possibilities, then rank the reasons by priority where 1 is considered as the most important) :

Epidemiological, virological data	
Social context	
Economic context	
Cultural context	
Other reason, please specify	

Assessment of the impact

107 What kind of investigation(s) are carried out to assess the impact of the vaccination?

Communication during the Pandemic /Social and political issues

108 Did you Member state start a mass communication campaign?

Yes No

109 If so, for which target group(s)?

110 Which information channel(s) did your Member State use to communicate with the Public? please specify for which target groups.

111 Which information channel(s)did your Member State use to communicate with Health Professionals?

112 Regarding your Member State's communication (internal / external) during the Pandemic, please specify the most successful and / or the biggest challenges :

113 Did your Member State carry out any media monitoring for accuracy of the media reports during the vaccination campaign?

yes ☐ no ☐

114 If so, then please specify how :

115 How did your Country respond to the anti vaccination campaigns?

116 Did you evaluate, by formal survey, the reason(s)for the people in your country not to be vaccinated against Flu A/H1N1? If so, Please give the results

117 What is your concern about the reason(s)for the people in your country not to be vaccinated against Flu A/H1N1?

118 Did your Member State have the opportunity to get well prepared for a possible communication challenges?

Yes ☐ No ☐

119 If so, can you specify how?

120 Were networks implemented among key respond stakeholder(risk communicators, professionals groups, other government departments)

Yes ☐ No ☐

121 If so, can you specify what kind of networks?

122 How did the Media react to the vaccination campaigns in your country?

123 According to your opinion, how strong were the anti vaccination campaigns during the Pandemic in your country?

124 What kind of outputs were they between the Parliament and the Government for those vaccination strategies?

Seasonal National immunisation strategies

125 Describe your three Member State's most important steps to improve the programme :

ANNEXE 2 : Countries data 2007(OECD organisation for economic co-operation and development stat data)

	Popula-tion	Total expenditure on health, % GDP	LE(a)	PYLL(b) Females / Males	Diseases respiratory system Deaths/ 100000	Obesity % of total population	Diabetes mellitus Deaths/ 100000	Population aged 65 or over(%) 2007(d)
Hungary	10056	7,4	73,3	4032/9235 (2005)	45,2 (2005)	18,8 (2003)	24,8 (2005)	15,9
Portugal	10604	9,9 (2006)	79,1	2858/6024 (2003)	55,9 (2003)	15,4 (2006)	27,8 (2003)	17,3
Sweden	91480	9,1	81	2011/3191 (2006)	29,5 (2006)	10,2	11,4 (2006)	17,4
United Kingdom	60975	8,4	79,5 (2006)	2564/4220	69,7	24,0 (c)	6,2	16

	Population under 65 with one or more risk morbidities(e) (%)	Practising physicians density per 1000 population	Practising nurse density per 1000 population	Birth/1000 population in 2007
Hungary	8,3	2,78(c)	6,12	9,66
Portugal	8,3	3,51	5,11	10,59
Sweden	8,3	3,58	10,83 (2006)	10,2
United Kingdom	8,3	2,48	10,02	10,67

a: Life expectancy, Total population at birth, years

b: potential years of life lost, all causes, years lost/100 000 (females or males), aged 0-69 years

c: differences in methodology

d: Eurostat data

e: Based on methodology by Fleming and Eliot, 2006 (Fleming DM, Elliot AJ. Estimating the risk population in relation to influenza vaccination policy. Vaccine 2006;24:4378-85.): source ECDC, Guidance, August 2008, Priority risk groups for influenza vaccination.

ANNEXE 3: Seasonal influenza vaccination in UK, HU, PT, SW.

Source: VENICE project/ National seasonal influenza vaccination survey in Europe, 2007.

Vaccination recommendation

	Age groups without risk factors	Occupational setting for workers	Risk indication
United kingdom	> or =65 years old	Hospitals , long term care facilities	chronic pulmonary disease, cardiovascular˙(except HTA)disease, Renal disease, Hematological or metabolic disorders, immunologic disorders, hepatic disease, HIV , Residents of long term care facilities
Hungary	> or =60 years old	Hospitals , long term care facilities,out patient care clinics, Essential services, Poultry industries	chronic pulmonary disease, cardiovascular˙(except HTA)disease, Renal disease, Hematological or metabolic disorders, immunologic disorders, HIV, Residents of long term care facilities, Long term aspirin use(after 18 years)
Portugal	> or =65 years old	Hospitals , long term care facilities,out patient care clinics	chronic pulmonary disease, cardiovascular˙(except HTA)disease, Renal disease, Hematological or metabolic disorders, immunologic disorders, hepatic disease, HIV , Residents of long term care facilities, Long term aspirin use(after 18 years),, Pregnancy, other condition that can compromise respiratory function
Sweden	> or =65 years old	None	chronic pulmonary disease, cardiovascular˙(except HTA)disease,For the other just if it is a chronic disease the vaccination can be considered

Vaccination coverage

Monitoring

	Target groups for which mechanisms to monitor vaccine coverage exist	Population/denominator data available to assess vaccination coverage.
United Kingdom	all targeted groups	Medical category data available, Hospital personnel, Poultry industry personnel
Hungary	>or = 60 years old, hospital, essent services, military, chronic pulmonary, cardio vascular, renal disease, haematologic disorders, long term aspirin use	Medical category data available, Hospital personnel, Longterm facilities personnel, Outpatient care clinics personnel , Military personnel, Poultry personnel, Essential services personnel
Portugal	>or = 65 years old, hospital, long term care facilities, among their entire population without regard to risk	Hospital personnel, long-term facilities personnel, Outpatient care clinics
Sweden	>or =65 years old	

Vaccination coverage in targeted groups

	For oldest people >65	Health care workers	Clinical risk groups
United kingdom	73,9% in 2006/2007	14% in 2006/2007	42,1% in 2006/2007
France	68% in 2006/2007	48% in 2004/2005	35% in 2006/2007
Hungary	34,1% in 2006/2007	23,7% in 2006/2000	32,9% in 2007/2008
Portugal	50% in 2006/2007	40% in 2006/2007	Unknown
Sweden	56% in 2006/2007	Unknown	Unknown

Payment and administration for vaccines

Cost to persons being vaccinated.

	Elderly	Occupational groups	Chronic illness
United Kingdom	free for all recipients	Vaccine and administration free for all recipients	Free for all recipients
Hungary	free for all recipients	Vaccine and administration free for all recipients	Free for all recipients
Portugal	Partial subsidy for vaccine and administration, (below cost to recipient) for all recipients	Partial subsidy for vaccine and administration (below cost to recipient) for all recipients	Partial subsidy for vaccine and administration, (below cost to recipient) for all recipients
Sweden	subsidies vary by county, Around two-thirds of the counties give free vaccinations to those aged 65 years and older. Those that charge have varying prices.	Full vaccine and administration cost paid by all Recipients	Missing data

Seasonal National immunisation strategies: most important steps to improve the programme (question included in the survey cf annexe 1)

-Portugal: Improvement of communication; easy access to prescription with long term validity; active search for particularly vulnerable groups (e.g. older people in long term care facilities)

-Hungary: local level plans to increase coverage, launching a programme monitoring influenza vaccine effectiveness yearly, stepwise increase of amount of free-of-charge vaccine available for vaccination target groups

-SE- not at present

-UK- Pursuit of the steady improvement in vaccination of those in clinical risk groups aged under 65 years (should reach 60% by 2011/12). National Health Service trusts remain responsible for achieving the target levels of seasonal influenza vaccination uptake in older people and clinical risk groups, in front-line health and social care workers, in poultry workers and, for the 2010/11 programme, in pregnant women also.