D3.5

Guidance for Using WHO Threat Index

2nd Reporting period
WP3 Developing New Communication Strategies

Responsible Partner: HU
Contributing partners:

Due date of the deliverable: 30th May 2014
Actual submission date: 14th July 2014

Dissemination level: PU

TELL ME - **Transparent communication in Epidemics: Learning Lessons from experience, delivering effective Messages, providing Evidence.**
Project co-funded by the European Commission within the 7th Framework

PROJECT FULL TITLE	**Transparent communication in Epidemics: Learning Lessons from experience, delivering effective Messages, providing Evidence.**
PROJECT ACRONYM	**TELL ME**
	Collaborative Project funded under Theme HEALTH.2011.2.3.3-3 "Development of an evidence-based behavioural and communication package to respond to major epidemics outbreaks"
GRANT AGREEMENT	**278723**
STARTING DATE	**01/02/2012**
DURATION	**36 months**

Document Management

D3.5 "Guidance for using WHO threat index

Task: 3.5

Leader: HU

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Executive Summary

Background

Efficient communication between various stakeholders is essential to mitigate the spread of epidemics. In order to prevent or minimize harm from emerging infectious diseases in the future, it may be necessary to develop a mutual language between various players. This encouraged the World Health Organization (WHO) to revise their influenza phase system. However, there are still many questions that remained unanswered regarding the effectiveness of the revised influenza phase system.

Objectives

Building on the products of WP1 and WP2, WP3 focuses on the implementation of conclusions and recommendations presented in previous reports to construct "new communication strategies for health professionals/ agencies to engage with vaccine-resistant groups" (TELLME DoW, 2011). WP3 is designed to integrate knowledge on actor involvement and dissemination of information between stakeholders to effect behaviour at an individual and national level. The main outcome of WP3 should be an integrated, evidence based, communication work package for outbreak communication. After defining and designing a framework model for outbreak communication, we will look into the conceptualization and implementation of different systems that measure the risk during epidemics. Specifically, T3.5 critically examines different revisions of the WHO threat index, from its first version in 1999 until its most recent modification in 2013. We define each threat scale in terms of its meaning, its rationale, the way it is used, to what extent it can confuse, and most importantly its implications for outbreak communication. Subsequently, we focus on the 2009 H1N1 Influenza outbreak as a case study both as a first 21st century pandemic and as the first pandemic since WHO produced pandemic preparedness guidance (GIP). Our discussion highlights the intersection between WHO, the threat index and the media, by analyzing the H1N1 2009 pandemic timeline in terms of WHO Emergency Committee's official declarations concerning influenza phases and its subsequent media coverage. Following this, we draw upon lessons learned from the application of the six-phase influenza threat index during 2009. We test the effectiveness of the threat index on three levels: its accessibility, its relevance to individual risk perceptions and its effect on public trust towards health authorities. On the basis of this discussion, we present three alternative threat indexes: the WHO revised pandemic phases (2013), the CDC

Pandemic Severity Index (2007) and Sandman's risk Scale (2007), in order to develop evidence-based practical guidance integrating existing knowledge to an effective outbreak communication threat index.

Methods

Selection of literature

Published articles were obtained using *PUBMED* and *Google Scholar* computerized databases from _ to _ searching the following words: pandemic, threat, index, phase(s), interpandemic, alert, pre-pandemic, severity, spread, risk communication, preparedness, response, imminent, plan, outbreak, stage(s), risk. Subsequentially, we conducted a similar search in all official WHO documents from the *WHO Document Centre.* The following selection criteria were applied: the study population included research and official documents that specifically mentioned the WHO or the press in the context of influenza preparedness plan or influenza phases. Our final sample consisted of 58 published research articles and 28 official documents.

Analysis of Literature

After constructing a corpus of articles, we conducted a systematic literature review which focused on two separate dimensions of analysis. First, we analysed the evolution of the WHO threat index from a syntagmatic point of view, focusing on the changes the WHO phase system underwent from its initial formation to its recent modification. In other words, the first axis deals with the formation of the threat index. Second, we analyzed the paradigmatic axis in the development of the threat index, searching for gaps and 'grey areas' in the phase system. This sort of two dimensional analysis is aimed at painting a broader picture of the development of the threat index emphasized its different transformations from a chronological and conceptual point of view.

Findings

Based on lessons learned from H1N1 2009 pandemic, we presented three alternative risk communication scales; WHO revised pandemic phases (2013), CDC Pandemic Severity Index (2007) and Sandman's risk Scale (2007). The potential of each scale to construct effective channel with different stakeholders is discussed; from the level of the Member State to the level of the individual. Most importantly, we stressed the complementary nature of these scales.

In summary, we recommend to connect the three scales to a united integrative pandemic communication phase's threat index. The integrated threat index phases will be designed to consider geographical threat, severity and public risk perception. This comprehensive index might be the solution for the shortcomings of the current WHO threat index, that does not defects its many advantages. It offers the most practical tools for outbreak communication with different stakeholders, and it takes into consideration international, national and local risk assessments.

Introduction

The first documented influenza pandemics and epidemics occurred during the Middle Ages, when a virus invaded Europe from Africa in the summer of 1510 and proceeded northward to involve all of Europe and the Baltic States (Taubenberger & Morens, 2009). By this time, the first seeds of the Print Revolution were already sown and Gutenberg's invention of mechanical movable type allowed a practical system of mass media production. However, it would take an Industrial Revolution before mass media would become a major player in the process of outbreak containment. The 20th century pandemics demonstrated the cardinal role mass media would come to play in outbreak management - using newspapers to distribute information in 1918 and demonstrating Asian flu symptoms on prime-time TV during 1957. Nevertheless, it was 2009 Swine flu, the first 21st century pandemic, which became the Rubicon of the World Health Organization's ability to harness the media in order to communicate with the public.

Historical Framework

The WHO Influenza Pandemic Plan - 1999

Although the H1N1 pandemic had cemented the concept of a 'threat index' as an important tool to assess the risk of an emerging new influenza virus subtype, the influenza phase system was introduced ten years earlier. Interestingly, the original plan published by WHO in 1999 was relevant both for aspects of outbreak communication and for the medical response to an emerging threat. The 1999 *"Influenza pandemic plan: The role of WHO and guideline for national and regional planning*" clearly stated:

> "Even in the absence of a pandemic, as was seen in the US in 1976 and in Hong Kong SARS in late 1997, there can be a rapid build-up of public fear about even the possibility of a pandemic when a few cases of infection in humans with a new virus sub-type occur. Such fears about the existence of a dangerous new form of influenza virus create major challenges for health authorities and national leaders, even while epidemic spread of a new virus remains unconfirmed. To better cope with 'false alarms' resulting from intensive surveillance, a series of **Preparedness Levels** have been defined that can be applied before the beginning of a pandemic is declared. This should assist WHO to report on novel virus infection of humans and initiate precautionary responses, without creating unnecessary panic. Such a need is particularly important in an age when information is so rapidly shared by electronic means." (WHO, 1999)

More than anything, this contingency plan represented the pre-SARS and pre-H1N1 reality. When the collective memory has to stretch for more than half a century to recall the 1918, 1957 and 1968 influenza pandemics, WHO tried to establish a framework that is both capable of a medical response and can effectively deal with the mass media. The five-phase index published in 1999, begins with WHO confirming the existence of a new influenza strain in a human case and ends after WHO officially reporting the end of a pandemic period. Another important characteristic of the original threat index was its allocation of responsibility between the WHO and the national health authorities. It had to deal more with co-ordination, encouragement and promotion of the role of the national health authorities and its planning committees in deciding on vaccination strategies, and ensuring pharmaceutical supplies than handling the communications aspect of pandemic. Surprisingly, while acknowledging the high demand for information both from health professionals and the general public, the plan did not go into details regarding the specific responsibilities and guidelines for health authorities when dealing with communication.

In light of the experience with the human infections with an influenza virus subtype (H5N1) and the severe acute respiratory syndrome (SARS) in 2003, a new paradigm of global and national action plan was constructed.

WHO Global Influenza Preparedness Plan of 2005

Unlike the plan published in 1999, the preparedness plan of 2005 dealt more with recent history than with potential and sometimes hypothetical threats. The H5N1 influenza virus in poultry from 2003 onwards and the 2002 SARS epidemic, that within weeks spread from Hong Kong to infect individuals in nearly 40 countries, causing 8,273 cases of infection and 775 deaths, called for a redefinition of the five-phase threat index (CDC, 2013, April 26). Other important reasons that led to the revision of the preparedness plan had to do with recent scientific developments in virus biology and novel techniques of vaccine development. Another crucial change was the revised International Health Regulations 2005 (WHO, 2008) that gave much more emphasis to WHO as the global health authority. The notion of the WHO as an international health regime has promoted the understanding that a pandemic plan in the 'global age' has less to do with physical borders and more with global surveillance. Finally, the inability of source limited countries to construct and implement an efficient strategy based on the 1999 preparedness plan, led to the need of a new and detailed global threat index.

Six Phases of an Influenza Pandemic

This part focuses on the official description of each phase, its rationale, planning and coordination that are associated with each stage and the communicational aspects that distinguish a specific period.
Figure 2 sums the 2005 WHO threat index.

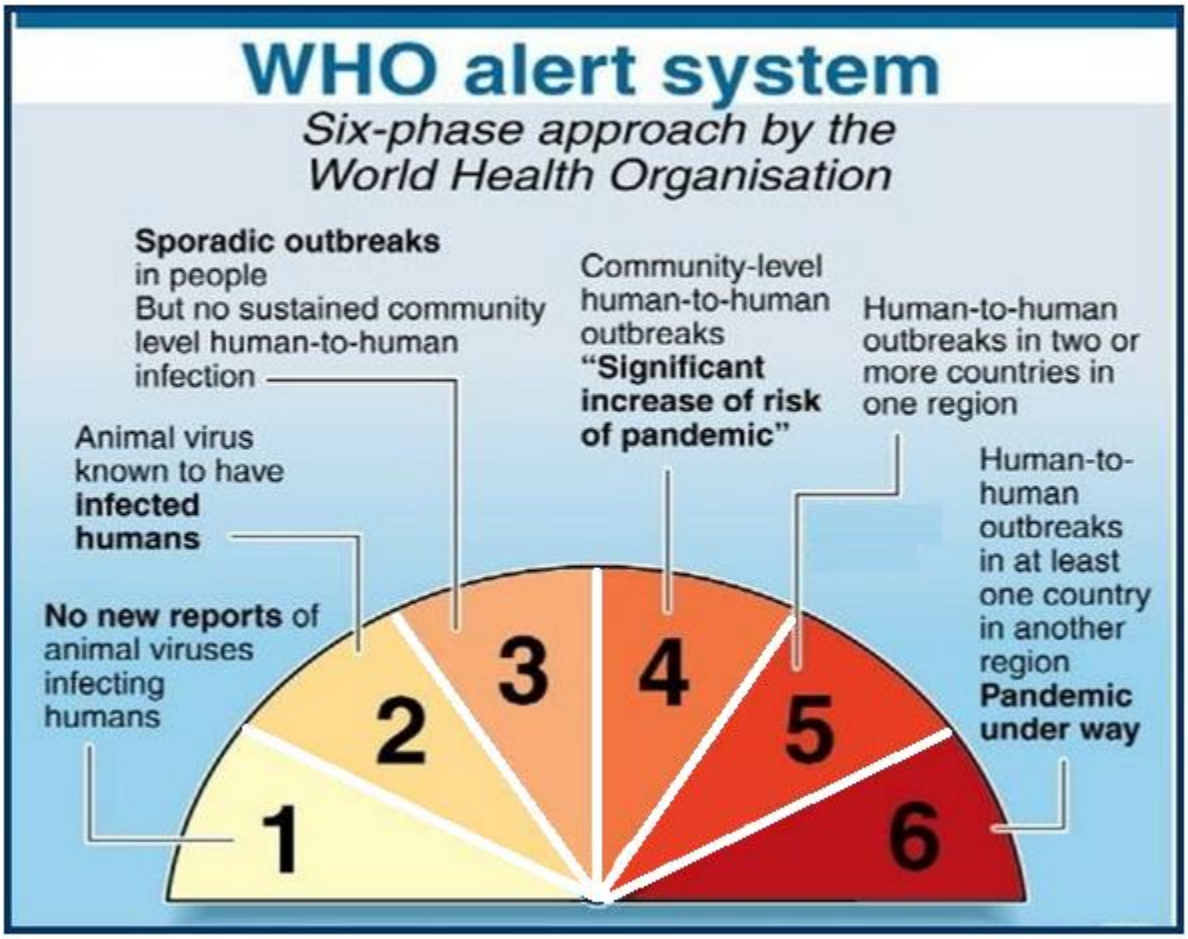

Figure 1- WHO six phase threat index (2005)

Phases 1 – 3 constitute the pre-pandemic preparedness plan. The first phase is characterized by a situation where there is no information regarding an animal influenza virus circulating that might infect humans. Although it might seem odd that such a situation is described as a influenza pandemic phase, it is important to note that lack of recognized human infections does not mean that no action is needed. In fact, as any potential healthcare crisis, efficient preparedness requires planning and action in advance. It is the stage to develop, revise and update national preparedness and response plans. From a surveillance point of view, phase 1 is the time to monitor and develop collaborations with animal health authorities. From an informational point of view, outbreak communication should focus on planning and establishing channels to communicate real and potential risks.

Phase 2 advances the potential risk to a scenario where there is an animal influenza virus subtype that can pose a threat to humans. In this situation, there is a substantial risk to human health

and it is thus necessary to take measures to protect the human population. Although there are no specific guidelines for outbreak communication, the potential risk of a pandemic has increased, meaning that healthcare systems must scale-up.

Phase 3 increases the degree of risk perception as there are several cases of disease in people that are caused by a new influenza virus. There is not yet evidence of human-to-human transmission (or at most, the spread is a result of very close contact). At this stage, there is a higher chance that the virus will adapt to become transmissible among humans. As a result, measures are taken to prevent the spread of disease. It is the time to promote cautious behaviour among people that are in close contact with animals.

In phase 4 there is sustained human-to-human transmission, leading to community level outbreaks. The fact that effective human-to-human effective transmission has been verified means that that there is a need to direct and coordinate rapid containment activities to limit the spread of the infection. It is a crucial time because the virus has increased transmissibility, even though it is not well adapted to humans and remains localized. Hence, the spread can still be effectively contained. From a communication point of view, health authorities should promote interventions to reduce potential risk. These public health campaigns need to be coordinated with WHO in order to produce effective messages.

Phase 5 suggests that the virus is increasingly adapting to humans, but is not yet fully transmissible. Although there are higher rates of infection, the spread is still localized. This is the time for a massive global intervention, to contain the pandemic. It is the time for WHO to provide resources to mitigate the societal and economic impacts. Healthcare authorities should continue to issue updates to the public and all level stakeholders.

Phase 6 describes an intensification of the previous stage. It is characterised by an increased transmission among the general population. This stage calls for a massive response strategy, as pandemic risk is imminent for all countries. From a communication aspect, the designation of phase 6 will indicate that a global pandemic is under way. Illness is widespread and all level stakeholders are actively working to minimize the spread of the disease. This is the peak period of the pandemic.

The post-peak period is characterized by the decline of the influenza pandemic in most countries. This period marks an opportunity to plan for additional future pandemic waves. Obviously,

the potential threat is high thus health authorities proceed with surveillance efforts to detect subsequent infections. The media continues to regularly update the public on any changes to the status of the pandemic.

The post-pandemic period means that the levels of influenza activity have returned to the normal seasonal flu status. An intensive phase of recovery and evaluation is required. It is the time to review and reflect along with the international community. Regarding communication, it is the chance to publicly acknowledge contributions of all communities and sectors. Also on a public level, it is important to stress the lessons learned and incorporate them into communication activities, for the next public health crisis. Figure 3 exemplifies the different phases by their perceived level of alert.

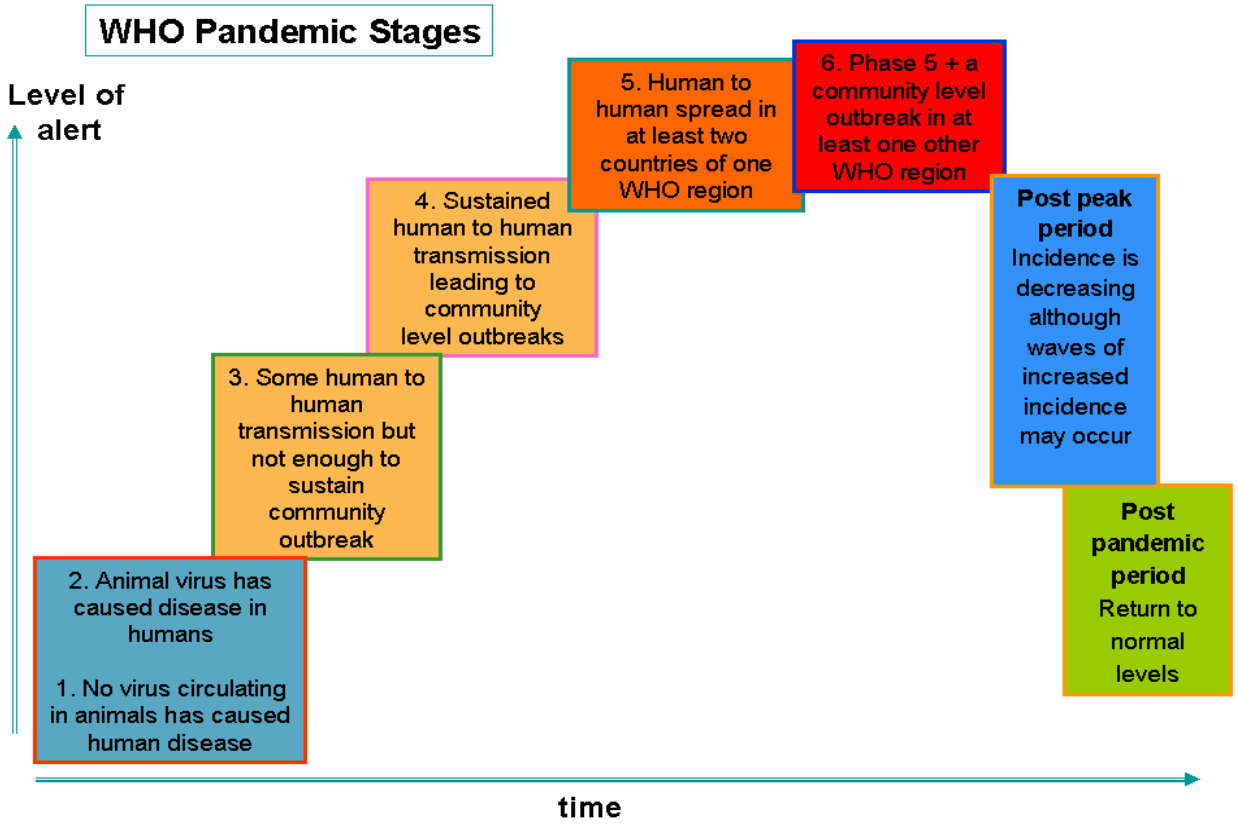

Figure 2- WHO 2005 threat index by level of alert

The summary of the major changes to the 1999 WHO plan:

1. Redefinition of pandemic phases based on the need for changes in public health action, by:
   (a) Addressing human health risks posed by infection in animals;
   (b) Using a risk assessment considering multiple factors as the basis for moving between phases;
   (c) Providing for downscaling of phases to reflect decreased public health risks.
2. Focus on early phases when rapid intervention might contain or delay the spread of a new influenza virus subtype in humans. Such measures would include enhanced surveillance and use of non-pharmaceutical public health interventions and consideration of deployment of a possible global early intervention.
3. Provide more specific objectives and activities at each phase for WHO and national authorities.
4. Provide for the harmonization of the recommended measures with the revised IHR 2005.

Figure 1 summarises the changes between the threat index as published by WHO in 1999 (WHO, 1999) and the revised threat index of 2005 (WHO, 2005).

PHASES AS PUBLISHED BY WHO IN 1999	NEW PANDEMIC PHASES	ADDITIONAL NATIONAL SUBDIVISIONS OF NEW PHASES
Interpandemic period **Phase 0**	**Interpandemic period** **Phase 1.** No new influenza virus subtypes have been detected in humans. An influenza virus subtype that has caused human infection may be present in animals. If present in animals, the risk[a] of human infection or disease is considered to be low.	
	Phase 2. No new influenza virus subtypes have been detected in humans. However, a circulating animal influenza virus subtype poses a substantial risk[a] of human disease.	Affected or extensive travel/trade links with affected country.
		Not affected.
Phase 0. Preparedness level 1: human case.	**Pandemic alert period** **Phase 3.** Human infection(s) with a new subtype, but no human-to-human spread, or at most rare instances of spread to a close contact.	Affected or extensive travel/trade links with affected country.
		Not affected.
Phase 0. Preparedness level 2: limited human transmission.	**Phase 4.** Small cluster(s) with limited human-to-human transmission but spread is highly localized, suggesting that the virus is not well adapted to humans.[b]	Affected or extensive travel/trade links with affected country.
		Not affected.
Phase 0. Preparedness level 3: spread in general population.	**Phase 5.** Larger cluster(s) but human-to-human spread still localized, suggesting that the virus is becoming increasingly better adapted to humans, but may not yet be fully transmissible (substantial pandemic risk).[b]	Affected or extensive travel/trade links with affected country.
		Not affected.
Pandemic period **Phase 1.** Multiple countries.	**Pandemic period** **Phase 6.** Pandemic phase: increased and sustained transmission in general population.[b]	Not yet affected.
Phase 2. Multiple regions.		Affected or extensive travel/trade links with affected country.
Phase 3. Subsiding in initially affected countries but not in other countries.		Subsided.
Phase 4. Next wave.		Next wave.
Postpandemic period **Phase 5.** Return to phase 0.	**Postpandemic period** Return to interpandemic period.	Return to interpandemic period.

Figure 3- phases published in 1999 and phases published in 2005

When looking into the characteristics of the preparedness stage in the 1999 publication, we see that the 'rule of thumb' for the confirmation of a pandemic is a new subtype virus that is beginning to

cause several outbreaks in at least one country, and have spread to other countries with consistent patterns. Moreover, the document states that "serious morbidity and mortality is likely [to occur] in at least one segment of the population (WHO, 1999)". In other words, everything that does not meet this criterion would be considered as an 'Inter-pandemic period'. In contrast, the 2005 document is much more inclusive, clearly stating that any scenario with "human infection(s) with a new subtype" (WHO, 2005) will be considered as a 'Pandemic alert'. Another clear distinction happens at the inter-pandemic period where the revised document deals with the risk assessment of human infection as a result of a circulation of an influenza subtype in animals. It is important to note that the broader focus on potential risk stemming from animal viruses proved to be extremely effective in containing potential threats at their preliminary stage (specifically in the case of H7N9). The fact that the threat index considers viruses that are circulating within animals as a potential pandemic threat (since the virus strain might mutate to make the transfer to a human virus) is an important statement which supports the spirit of the revised IHR 2005.

However, if the main focus of this report is the place of outbreak communication in conceptualizing the threat index. It is safe to say that the revised version of 2005 brings with it a positive change. Corresponding with the technological and social changes that occurred in the period between 1999 and 2005, communication has taken a central part in the conceptualization of the threat index. A good indicator of this change is the fact that the 1999 original document contained only 9 references to communication while a close reading of the revised version yields almost 50 references to communication. In summary, although so much remains uncertain, the 2005 threat index goes into specifications that turn the revised phase system into a much clearer and better defined document (Osterholm, 2009).

Threat Index Implementation during 2009 H1N1 Pandemic

In order to evaluate the contribution of the influenza pandemic threat index to outbreak communication, we will focus on the first global case study that called for the full implementation of the six-phase system. Or in the words of WHO Assistant Director-General during the 2009 pandemic, Keiji Fukuda, "What is the value of these phases? There is nothing like reality to tell you whether something is working or not" (Cohen, 2009).

In this discussion, we will focus less on the medical aspects of the 2009 flu pandemic and more on the intersection of WHO, media and pandemic. As such, our timeline begins at early March, 2009 when the early cases of a "respiratory illness of unknown provenance" were identified in Mexico and the US (Youssef, 2009). Later, on 24 April, the cases in America were confirmed by the WHO, acknowledging that the H1N1 virus subtypes "have not been previously detected in pigs or humans" (WHO, 2009). Although the WHO had advised its Member States to increase epidemiology activities and laboratory diagnosis, there was no reference to specific alert phases that day. 24 hours later, after a special meeting of the Emergency Committee, WHO Director-General , Dr Margaret Chan, has issued a formal statement emphasizing the risk of the novel virus suggesting that we are dealing with a "public health emergency of international concern" (WHO, 2009 April 24). Nevertheless, this growing concern was not translated to any changes in the phase system suggesting that further information is needed before the Committee could officially declare a phase 4 threat. Moreover, no travel or trade restrictions were recommended. It seems that the discrepancy between the semantic aspect ("emergency of international concern") and lack of any official guidelines were rather confusing for the media and the public.

Two days later, on April 27, the second meeting of the WHO Emergency Committee resulted in the elevation of the pandemic alert from phase 3 to phase 4. The change to a higher level was based primarily on epidemiological data (human to human transmission and community level outbreaks) and from a European point of view, the first confirmed case in Spain, and thus the first case in the European Region (WHO, 2009 April 27). Although, WHO did not issue any official travel guidelines, the European Union advised Europeans not to travel to Mexico and the US. Interestingly, as the report by *the Guardian,* from that day, demonstrates, the media (and the public as well) were rather confused by the change in the pandemic alert phases; citing Dr Keiji Fakuda, WHO assistant Director-General, saying that a change in the alert level is "a significant step towards pandemic influenza…however, we are not there yet". Further, the article stressed the lack of additional measures to control the outbreak such as lack of recommendation regarding shifting global vaccine development, border closures or travel restrictions (Nasaw, McGreal & Tuckman, 2009, April 27).

Following a rapid evolvement of the outbreak, WHO issued an official update indicating that seven countries have officially reported on cases of swine influenza. Although the official guideline on April 28 did not suggest any restriction on travel, border closure or pork products, only one day later,

the WHO decided to raise its pandemic alert level from phase 4 to phase 5. Raising the alert level to phase 5 indicated that the virus has become established in at least two Member States. However, even at this stage, WHO did not suggest any travel restrictions. Nevertheless, as was published by *Reuters* it was the EU Foreign Relations Commissioner, Benita Ferrero-Waldner, who suggested that that the EU are "considering halting all travel to Mexico…due to the global flu outbreak" (Reuters, 2009, April 29). Strangely, the only official advice that WHO has issued regarding personal behaviour was to "was hands thoroughly with soap and water on a regular basis". Furthermore, although the WHO continued to update the press several times a week, the reports did not contain any practical recommendations that people might implement to their daily routine in order to reduce the risk of infection (other than basic hygiene). This gap seems perplexing, considering that the official threat index documents suggest that phase 5 is characterised by a higher involvement of the media and the public (WHO, 2005).

On June 11, during an emergency meeting, the WHO Director-General, Dr Chan declared a global flu pandemic, raising the alert level to phase 6. Although Chan's statement was planned not to cause fear, suggesting that the escalation of pandemic phases did not mean the virus was causing more severe illness or more deaths, we can generally suggest that the coverage of the event caused more alarm that it had intended to (Lynn, 2009, June 11). First, the juxtaposition of the 2009 flu pandemic with past pandemics (especially the 1968 pandemic that killed about one million people) did not fit with Chan's description of a "moderate and causing mild illness virus" (Lynn, 2009, June 11). While even the UN Secretary General Ban Ki-Moon tried to down play the significance of the declaration of phase 6, stressing that it is "a formal statement about the geographical spread of the disease…it is not in itself a cause for alarm"(Ki-Moon, 2009, June 11), the dissonance between the phase (the highest health emergency possible) and the official effort to calm the public has promoted lack of clarity among the public (Osterholm, 2009, May 4).

Another problematic aspect of the pandemic declaration had to do with the criticism surrounding the possible exaggeration of the threat. While the Emergency Committee raised the threat index to phase 6, scientific journal such as *Nature* and *BMJ*, and respected new outlets such as *the Washington Post* were pointing out to a possible conflict of interest of the people in the WHO committee and pharmaceutical industry (Nature, 2010, June 24; Stein, 2010, June 4). From a communication point of view, it was suggested that the declaration has primed unjustified scares and fears about health risks faced by the European public at large.

On August 10, 2010, the WHO officially declared that the H1N1 pandemic was over, remarking that “pandemics are unpredictable and prone to deliver surprises” (WHO, 2010 August 10). Based on the assertion that the virus had run its course, the official report remarks that “we are now moving into the post-pandemic period” (WHO, 2010, August 10). On the same day, the WHO published a briefing note with official recommendations for the post-pandemic period (WHO, 2010, August 10). While the briefing addressed questions of surveillance, monitoring and vaccination, questions of communication were not addressed (other than the use of data transmission using routine surveillance systems). Interestingly, as early as in mid-February, 2010, the WHO pondered to move to post-peak pandemic phase, however this decision was never issued, and this phase was skipped (Pandemic UN, 2010, August 10). As we can learn from transcripts of the virtual press conference with Dr Keiji Fukuda, on February 18, the Emergency Committee was holding discussions as to whether to end the pandemic phase and declare a post-peak period but this phase was not officially reached (Fukuda, 2010, February 18). Figure 4 illustrates the official threat index phases declared during 2009 flu pandemic.

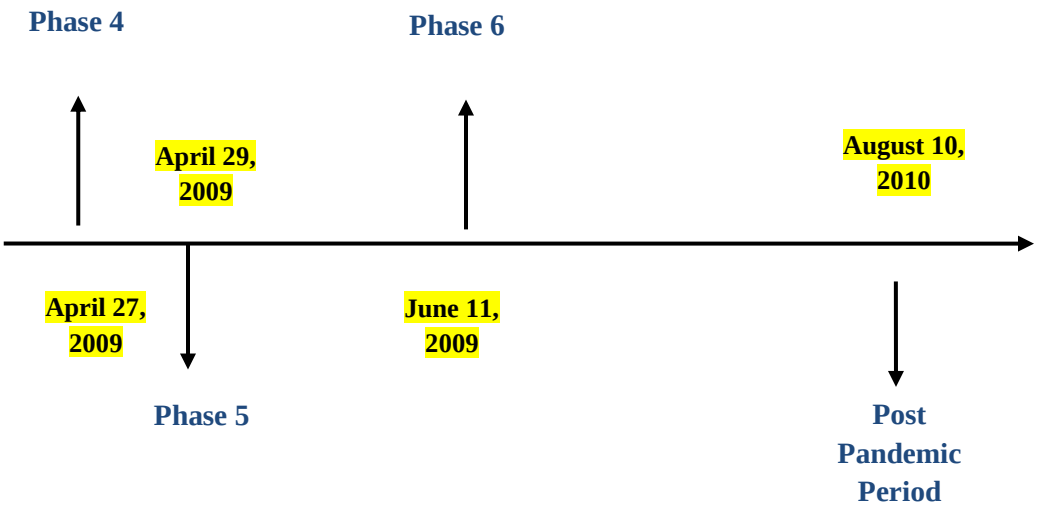

Figure 4- timeline of official threat index phases declared during 2009 pandemic

Lessons Learned from 2009 A(H1N1)

The influenza A(H1N1) 2009 pandemic was both the first of the 21st century and the first since WHO had produced pandemic preparedness guidance (GIP). This experience provided WHO with a chance to examine its cooperation with Member States during times of crisis, using revised preparedness guidance (2005). Although by their nature pandemics are unpredictable, they are recurring crisis with tremendous consequences for global public health. Hence, it should be beneficial to draw upon gaps and 'grey areas' in the preparedness guidance that must be filled in the case of a future pandemic. Specifically, this report is interested in the lessons learned from the application of the six-phase influenza threat index. Although the problems with the implementation of the threat index from a medical and ethical point of view are well documented (Nature, 2010; Stein, 2010, June 4), most notably dealing with distinguishing spread from severity, and conflicts of interest in the official Emergency Committee, there was almost no attention to the effect of the threat index on the communication aspects of this health crisis. Surprisingly, while communication has proved to be of critical importance during each phase of the 2009 swine flu outbreak, questions dealing with the effect the implementation of the 2005 threat index had on the public are yet to be addressed. This part focuses on the threat index in 2009 as a tool of disseminating critical information to the public, asking whether the six-phase system was able to

communicate the state of the influenza to the public and promote appropriate behavior at each stage. To answer this question, we will test the implementation of the threat index on three levels: its accessibility, its relevance to individual risk perceptions and its effect on public trust towards health authorities.

Though every official WHO update, from the phase 4 declaration in April 2009 to the post-pandemic declaration during August 2010, has contained the subsequent sentence; “further information on the situation will be available on the WHO website on a regular basis”, the emphasis on professional and medical language damaged the likelihood of a direct interaction between WHO and the public. Likewise, the six-phase system that is directed to establish coordination between different sectors such as government ministries, businesses and civil society to mitigate potential impacts of a pandemic failed to speak in a language that the public understands. To demonstrate this point, we can examine the differences between the official descriptions of phase 5 and phase 6:

Phase 5: “the same identified virus had caused sustained community level outbreaks in two or more countries in one WHO region”.

Phase 6: “the same virus had caused sustained community level outbreaks in at least one other country in another WHO region”.

To the professional, the differentiation between the two periods on the basis of potential spread makes sense, but to large portions of the public it remains perplexing. Even such an essential term as ‘pandemic’ or ‘influenza’ seem to have different connotations altogether with the general public (Doshi, 2011). Obviously, most people do not visit official websites of health authorities to learn about the meaning of different influenza phases. Sadly, this is the case in society, where the digital and economic divides only widen the knowledge gaps (references). The problem of high reliance on professional language is evident throughout the index. Epidemiological terms such as ‘pandemic threat’, ‘reassortant virus’, ‘community-level outbreaks’, ‘adequate surveillance’ and ‘peak levels’ heavily dictate the rhetoric. De facto, this emphasis on professional language creates a situation where people become highly reliant on mass communication as a mediator and spokesmen of health authorities. Naturally, we must ask ourselves how the threat index, which is first and foremost directed at shaping public behavior to suit a potential risk, loses this capacity due to technical and jargoned messages.

Another important gap, that stresses the difference between the formal definition of the threat index and its implementation during 2009 pandemic, was the lack of coincidence with the public risk perception. As stated before, the six-phase threat index does not relate to the criterion of severity but solely to the geographical likelihood of disease occurrence. Although this criticism was broadly addressed and documented on an epidemiological level (WHO, 2013), from the aspect of public risk perception, it became a cause of great confusion and unnecessary fear. A close reading of the official declaration of phase 6 reveals the lack of correlation between the threat index definition and the risk perception. In the words of Dr. Chan: "we have evidence to suggest we are seeing the first pandemic of the 21st century" but "moving to pandemic phase six does not imply we will see increased in deaths or serious cases" (BBC, 2009, June 11). If it is not confusing enough, she added that it was important to get the right balance between complacency and vigilance. Later, UN Secretary General Ban Ki-Moon concluded by stressing that "this is a formal statement about the geographical spread of the disease…it is not in itself a cause for alarm" (Ki-Moon, 2009, June 11). This sounds contradictory and even ironic remembering that these statements were issued in the context of raising emergency level to the highest in almost four decades.

Obviously, among the public there is an expectation that a higher threat index has some indication as to how many sick people there will be, or at least what are the chances of an individual to get sick. In fact, the escalation of risk on the six-phase system during 2009 pandemic bears little relevance to risk perception on a national/ local level. Namely, the phase system did not take into consideration that the national and individual actions should be in line with the current emergency level. Simply put, our everyday reality should reflect, in some way, the risk that is communicated by national and international healthcare organizations. Another source of confusion was the fact that no matter what was the official phase of the pandemic, public guidance from WHO did not go further than very basic hygiene recommendations, so that the expectation that there will be a closing of borders or travel restrictions (WHO, 2009), never came true. "The phased approach to pandemic alert was introduced by WHO in 1999, to allow WHO to gradually increase the level of preparedness and alert without inciting undue public alarm. In reality, it had the opposite effect" (Doshi, 2011). This way, most people found out that the criteria by which WHO declares a phase 6 pandemic, has little relevance to their daily routine.

The third effect can be seen as an unfortunate outcome of the first two. Namely, the lack of accessibility and relevance of the six-phase index to the intensity of the level of public concern led to

growing mistrust towards health authorities at general and WHO particularly. As Fiona Godlee, the editor of the *BMJ,* has suggested, "[as a result of declaring a pandemic] for WHO, its credibility has been badly damaged" (Stein, 2010, June 4). It seems that any shift in phases upon the index puts WHO in a very delicate situation. While there is a very small chance to perfectly predict the severity of a virus, WHO are left to make estimations that by their nature can either be under or above the final number. Analogous to Captain Yossarian, the protagonist in Joseph Heller's satirical novel, Catch-22, WHO are left to choose between two choices that have the same inherent logical problem. This is the public health paradox; "failure to move aggressively in the early stage of pandemic influenza can have catastrophic consequences, actions that prove to have been unnecessary will be viewed as draconian and based on hysteria (Gostin, 2004). Simply put, at the stages of preparedness and response, every pandemic can either be underestimated or overestimated and WHO must choose the best assessment. Obviously, it is better to exaggerate than underestimate. However, from a public opinion aspect, the result is bound to be harmful. Sadly, all problems dealing with the implementation of the six-phase scale during the 2009 pandemic seem to be inherent in the 2005 threat index. Thus we move away from it to discuss three potential risk communication scales - WHO revised pandemic phases (2013), CDC Pandemic Severity Index (2007) and Sandman's risk Scale (2007).

WHO revised pandemic phases (2013)

In direct response to lessons learnt from the 2009 pandemic, WHO introduced a new approach to the influenza threat index, as a part of the pandemic influenza revised risk management document 2013. As early as May 2009, Keiji Fakuda, WHO's assistant director-general, suggested that several Member State representatives had criticized the six-phase system, which relies solely on geographic spread without any acknowledgement to the severity of disease (Cohen, 2009, May 22). At the heart of the criticism lay the notion that the current threat index proved itself inflexible and confusing. What was revolutionary in the suggested revision was the fact that the WHO called upon external scientists and public health experts to consider whether to change the phase definitions (Roos, 2009, May 26). With the independent expert group revision and input, the WHO released its interim guidance. The plan is to finalize the revised guidance, so that the new threat index would eventually replace the current six-phase index.

The focus of the new four-phase system is to encourage national authorities to develop tailored made risk management plans, which consider the situation at a local level. Put differently, the revised plan leaves much more breathing space to Member States to base their messages and actions on timely assessments. Although local actions would be synchronized with the global risk assessment (dictated by the Emergency Committee), the threat perception should be derived from local considerations.

The pandemic phases work on two complementary axes - the global phases and the local risk-based phases. The global phases - interpandemic, alert, pandemic and transition, similar to the six-phase system, describe the spread of the new influenza subtype. Hence, this global risk assessment derives directly from WHO surveillance efforts. However, Member States are advised to develop their own national-level risk assessment which is based on local threat index. These risk-based phases are represented in figure 5 as a continuum of preparedness, response and recovery. This is an important step that takes into account cultural differences and different communication needs on a national level.

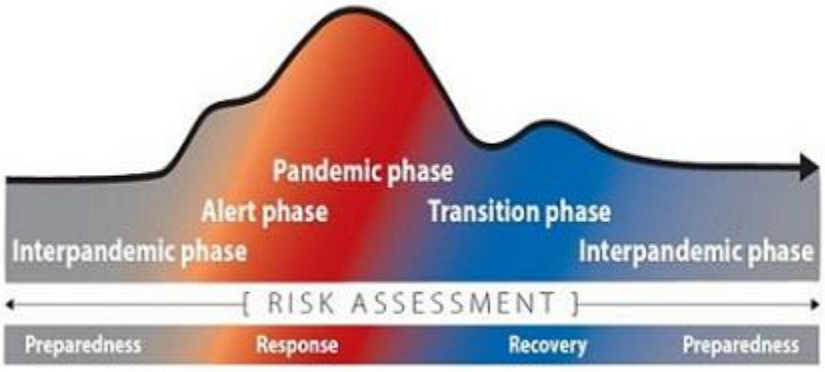

Figure 5- the 2013 WHO four-phase threat index

- **Inter-pandemic phase -** the period between influenza pandemics. It is the best time to develop and enhance emergency risk capacities.
- **Alert phase -** the period when influenza subtype has been identified in humans. This is the time for careful risk assessment on all levels. Using open channels with Member States, activating networks of information, think tanks to conduct global risk assessment under the revised IHR (2005).
- **Pandemic phase -** the period of global spread of human influenza caused by a subtype virus. The movement between the phases is primarily based upon virological, epidemiological and

clinical data. The time to officially declare a pandemic, provide support and response on all levels.

- **Transition phase -** the period after a pandemic that is characterized by return to routine, depending on national level risk assessments. The time to minimize response and consider entering an inter-pandemic phase.

Another interesting element of the revised WHO threat index is its emphasis on communication as a tool to understand public perception and develop an appropriate risk assessment. In the words of the document, risk assessment "should use the principles of risk communication to build the capacity to understand and anticipate public concerns and develop effective and responsive dialogue mechanisms. This can be achieved through an emergency communication committee that has developed and tested standard operating procedures to ensure streamlined, expedited dissemination of information for decision-making and public communication" (reference). For instance, among preparedness activities to be considered, the threat index suggests "public health education campaigns, including creating messages and feedback mechanisms targeted towards hard-to-reach, disadvantaged or minority groups". In the phase of response, the revised index suggests to "initiate public health education campaigns in coordination with other relevant authorities on individual-level infection control measures". On the recovery level, the communication strategy suggests to "publicly acknowledge the contributions of all communities and sectors to the pandemic effort".

CDC Pandemic Severity Index

To answer the need to communicate specific information to different level stakeholders (states, communities, businesses and schools), the CDC developed a pandemic severity index (PSI). As can be understood from its title, this threat index considered the severity of the potential pandemic and translates it to specific guidelines for individuals and communities. Adopted from an index that used to categorize hurricanes (the Saffir-Simpson Hurricane Scale), the PSI builds upon the knowledge of past pandemics to forecast the severity level of future pandemics based on mathematical models (Public Health Alert, n.d.) . Namely, this threat index focuses less on the geographical spread and more on the severity of the virus which is the fatality ratio, the percentage of deaths out of the total reported cases.

As we can see from figure 6, unlike WHO's threat index, the PSI is relevant only to a situation of a pandemic, the equivalent of phase 6 in the current phase system (or phase 4 in the revised index 2013).

The scale which is presented as an arrow, introduces a classification of pandemics based on their severity, meaning that category 1 is the most mild (something like a seasonal flu) and category 5 is the most severe pandemic (equivalent to the 1918 influenza).

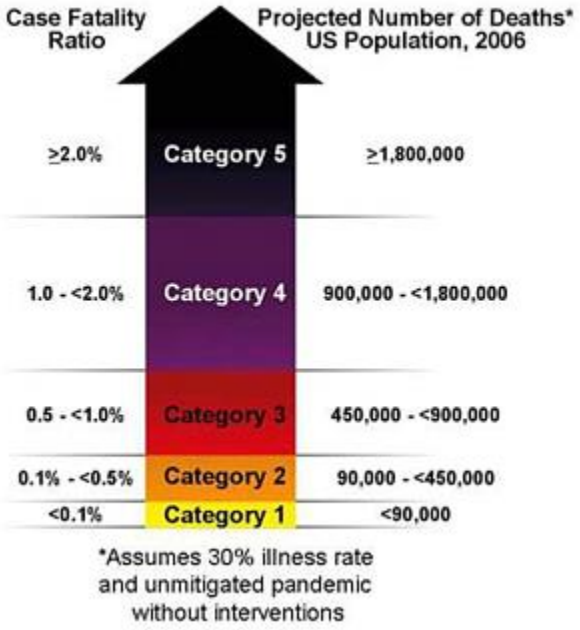

Figure 6- CDC pandemic severity index

However, the most significant feature of this threat index, is not necessary its phase classification but rather the guidance that follow each category. This guidance are extremely relevant for outbreak communication as they frame the specific actions individuals and community should consider during a pandemic. “In order to help authorities determine the most appropriate actions to take, the guidelines incorporate a new pandemic influenza planning tool for use by states, communities, businesses, schools and others. The tool, a Pandemic Severity Index (PSI), takes into account the fact that the amount of harm caused by pandemics can vary greatly, with that variability having an impact on recommended public health, school and business actions” (CDC, 2007, February 1). Figure 7 demonstrates PSI individual and community guidelines by pandemic severity.

	Pandemic Severity Index		
Interventions by Setting	**1**	**2 and 3**	**4 and 5**
Home			
Voluntary isolation of ill at home (adults and children); combine with use of antiviral treatment as available and indicated	Recommend	Recommend	Recommend
Voluntary quarantine of household members in homes with ill persons (adults and children); consider combining with antiviral prophylaxis if effective, feasible, and quantities sufficient	Generally not recommended	Consider	Recommend
School			
Child social distancing –dismissal of students from schools and school-based activities, and closure of child care programs	Generally not recommended	Consider: ≤ 4 weeks	Recommend: ≤ 12 weeks
–reduce out-of-school contacts and community mixing	Generally not recommended	Consider: ≤ 4 weeks	Recommend: ≤ 12 weeks

	Pandemic Severity Index		
Interventions by Setting	**1**	**2 and 3**	**4 and 5**
Workplace/Community Adult social distancing			
–decrease number of social contacts (e.g., encourage teleconferences, alternatives to face-to-face meetings)	Generally not recommended	Consider	Recommend
–increase distance between persons (e.g., reduce density in public transit, workplace)	Generally not recommended	Consider	Recommend
–modify, postpone, or cancel selected public gatherings to promote social distance (e.g., stadium events, theater performances)	Generally not recommended	Consider	Recommend
–modify workplace schedules and practices (e.g., telework, staggered shifts)	Generally not recommended	Consider	Recommend

Figure 7- PSI intervention guidelines

This guidance was developed through a collaborative process that included public health officials, mathematical modelers, researchers, and stakeholders from government, academia, private industry, education and civic and faith-based organizations (CDC, 2007, February 1). The biggest advantage of these guidelines is their simplification which does not damage their potential effectiveness as a non-pharmaceutical intervention. It seems that such focus on details that can save lives is evidently missing from WHO threat index. Nevertheless, it is important to note that the real test to such guidelines is their level of implementation at an early stage of the pandemic. The problematic aspect of PSI is its emphasis on pandemic phase, which highlights its dependence on external threat scales (such as WHO's index) to declare the pandemic by monitoring also the earlier stages. It seems that this sort of specification could have been beneficial also during the preparedness stages.

Risk Communication Phases

While both WHO revised pandemic phases (2013) and CDC influenza severity index have some evident advantages upon the current six-phase pandemic system from an outbreak communication perspective, they both lack a very important ingredient. Simply put, while WHO focus mainly on Geographical location and CDC focuses on influenza severity, their phases do not take into an account the public concern. This variable might prove itself as the Rosetta Stone of establishing a threat index which will be at once useful to health authorities but also practical to the public. In 2007, Peter Sandman, a scholar of risk communication had proposed a complementary phase system that is grounded in public concern as well as in the location of the disease (Sandman, 2007 April 19).

Unlike other public health risk systems that use colour code to connote the risk assessment, Sandmen's threat index uses a temperature code. This system highlights the importance of teachable moments as a vehicle to focus public attention towards effective messages. Figure 8 shows a graphical representation of Sandman's risk communication index.

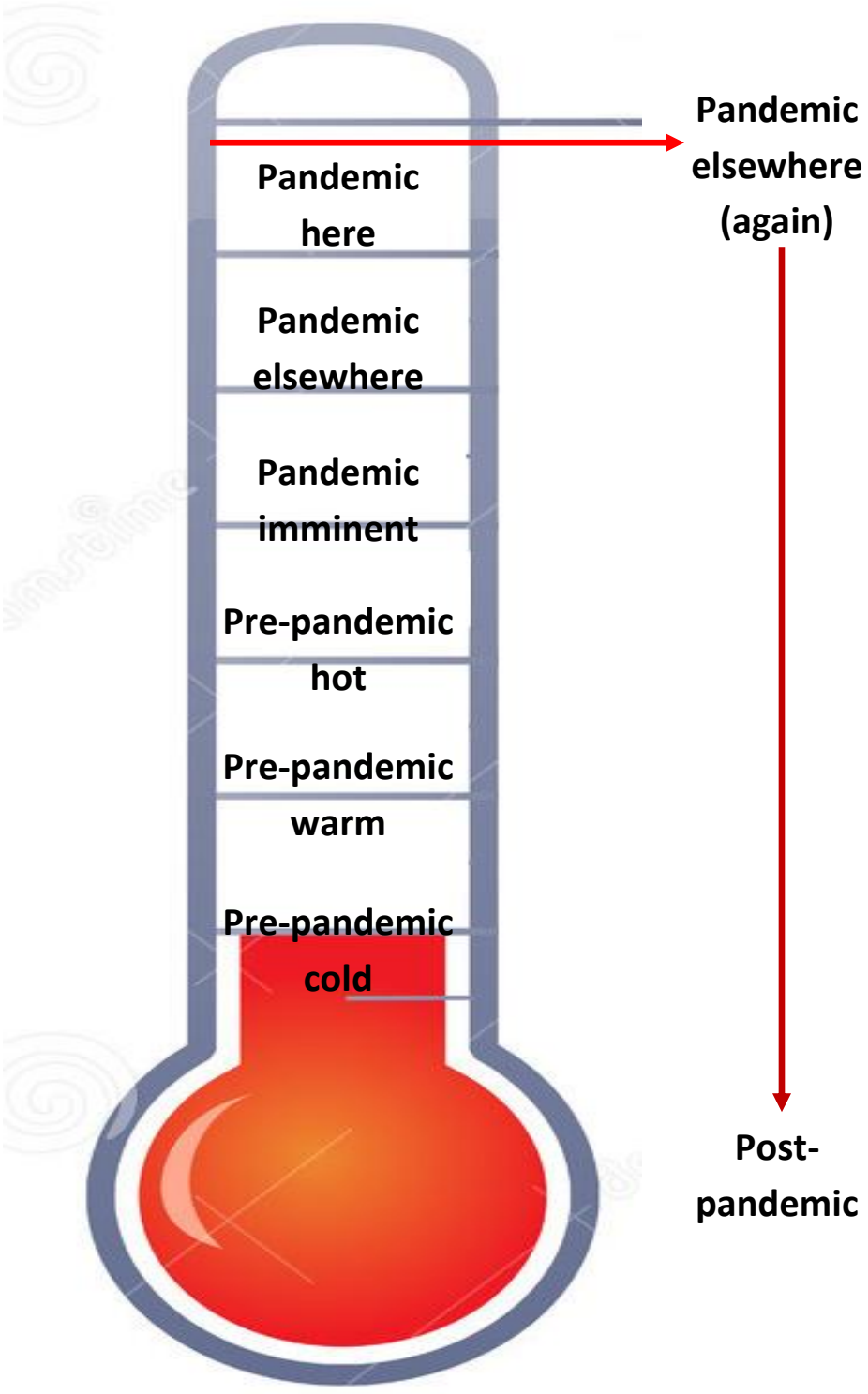

Figure 8- Sandman's risk communication index (2007)

- **Pre-pandemic cold -** is a quiet phase when the risk perception is very low so there is no possibility to act on a communicational level, simply because the level of interest is very low.
- **Pre-pandemic warm -** is the period to start communication the potential risk, stressing the human-to-human infection or the new subtype virus danger. Sandman stresses the phase as a teachable moment for raising pandemic preparedness through posters and other means of advertisement.
- **Pre-pandemic hot -** arrives and brings with it several opportunities of teachable moments, such as official declarations (WHO is contemplating phase 4) or special media events with healthcare authorities (such as TV interviews). It is a great opportunity to educate people and initiate involvement in the potential emergency.
- **Pandemic imminent -** it is a time of great uncertainty, with the pendulum moving from a severe pandemic to a mild one. However, this is a critical moment from the aspect of risk communication; people are paying attention thus it is the time to issue preparedness messages. Sandman suggests that the tone of communication should shift from arousing concern to validating people's rising fear, and guiding them through it.
- **Pandemic elsewhere -** is the phase when the data is much more evolved, meaning that there is a better prediction regarding the severity of the pandemic. Optionally, it seems like a good time to integrate CDC PSI so that different level pandemics could be addressed with different messages.
- **Pandemic here -** it is the time when there is an inflation of information that should be translated into specific instruction for different level stakeholders. At this stage, the messages should emphasis on the heroes of the crisis but also on the victims.
- **Pandemic elsewhere (again) -** the pandemic wave moves away and it is a time to regroup .
- **Post-pandemic -** it is the phase when communication becomes crucial to help recover. Messages should illustrate different scenarios regarding the development of the next pandemic (that might arrive sooner than expected).

Integrative WHO Threat Index

In general terms, while the principal aim of the previous sections was to accumulate knowledge about different transformations of the WHO threat index, its implementation and alternative influenza threat

scales, now we turn to offer an integrated threat index that is able to connect between the epidemiological and the communicational aspect of a public health crisis. Interestingly, though each presented threat index aims is comprehensive, considering the practical tools they offer, their alert phases are very much oriented to different aspects. Namely, The WHO's risk assessment of influenza virus with pandemic potential are directed to updates based on the geographical spread of the threat, CDC pandemic index is severity based and its updates are directed to specific measures individuals and community should undertake to minimize their risk, and Sandman's communicational phases emphasize mass communicational as an educating tool in times of crisis. Subsequently, these three phase systems do not overlap but rather complement each other. In fact, they can be seen as one hybrid threat index which focuses on spread, risk and communication. Figure 9 demonstrates the complementary nature of Sandman's threat index with WHO six-phase influenza system and CDC pandemic severity index.

Pandemic communication phases		
Communication phase	**WHO pandemic phase**	**CDC pandemic severity**
1. Pre-pandemic cold	**1 or 2**	
2. pre-pandemic warm (little public attention)	**3**	**1**
3. pre-pandemic hot (teachable moment)	**3 or 4**	**1**
4. pandemic imminent	**4 or**	**2 or 3**
	5	**2 or 3**
5. pandemic elsewhere	**6**	**4**
6. pandemic here	**6**	**5**
7. pandemic elsewhere (again)	**6**	**4**
8. post-pandemic	**1 or 2 or**	**1**
	3 or even 4 (for different strain)	

Figure 9- Integrated WHO Threat Index

Most importantly, these three phase systems have unique objectives and different target populations. The immediate recipients of the WHO threat index are the Member States that under the

revised IHR 2005 are affected by these phases in terms of border closures, trade restrictions and other global regulations. The global phases (inter-pandemic, alert, pandemic and transition) describe the spread of the new influenza subtype, taking account of the disease it causes, around the world (UN, n.d.). However, as pandemic emerges, countries and communities face different risks at different times. In other words, by their definition, WHO's phases are global thus they cannot account for the local circumstances, taking into consideration, above all, international threat assessments. This gap should be filled with CDC pandemic severity guidelines which constitute for the local and individual alert levels. These are more flexible phases that call for actions that could save lives by taking measured preventive steps. Furthermore, as it was described in previous sections, CDC's index focuses on pandemic on a higher resolution, differentiating between mild and severe pandemics. Though these differences have direct impact on individual countries (for example, during the 2009 swine flu pandemic, ECDC official reports show that Israelis had suffered much more deaths from the H1N1 subtype virus, than Austrians, although Austria has a higher populations than Israel) they are not accommodated in the phases.

Finally, Sandman's communication phases are directed towards news outlets and various other public and media interactions, including social media. This index is a practical tool to establish a channel with the public as it distances itself from professional definitions of threat and risk, to adopt a more common language which addresses different types of risk perception. Moreover, it is not merely a guideline that helps to construct effective messages but also an important tool that tries to predict the most suitable episodes during a crisis, which can serve as teachable moments. This approach is especially important if we consider outbreaks not merely as an immediate threat but also as an opportunity to educate people, and maybe help prevent or mitigate the next potential pandemic.

Conclusions

This report has outlined the concept of a threat index as a practical tool and set of guidelines for actors involved in the outbreak communication process. The general aim, as defined in WP3, was to "develop the TELL ME Communication Kit that will offer an **integrated, participatory model for crisis communication**, on the basis of which messages can be produced for **different sub-populations** in **different countries**, addressing new and emerging communication challenges". Specifically, the aim of D3.5 was to critically examine the WHO threat scale; what it means, how it is used, to what extent it can

confuse, and on the basis of the framework model and previous tasks, to develop guidance for its practical usage.

From its first formulation in 1999 the five phase threat index has considered outbreak communication as an integral part of public health crises. However, while WHO's role as a global health authority was achieved, the documents did not go into details to consider the specific communication aspects of a potential pandemic. To some extent, these gaps were closed in the 2005 WHO Global Influenza Preparedness Plan. Communication became not only a central part of the declarative part of the document but also a central ingredient was the Preparedness Plan, going into specifics regarding different level stakeholders and their communication needs. This Global Influenza Preparedness Plan 2005 and its six phase threat index were fully implemented during 2009 H1N1 Pandemic. As we demonstrated, the six phases and their definitions had a crucial role in cultivating the pandemic to the general public, through the mass media. This process has revealed certain problematic aspects of the WHO threat index when trying to distribute important information to the public. Simply put, the six phases proved to be somewhat inaccessible, irrelevant and they produced a boomerang effect on public trust towards health authorities.

Based on lessons learned from H1N1 2009 pandemic, we presented three alternative risk communication scales; WHO revised pandemic phases (2013), CDC Pandemic Severity Index (2007) and Sandman's risk Scale (2007). The potential of each scale to construct effective channel with different stakeholders was discussed; from the level of the Member State to the level of the individual. Most importantly, we stressed the complementary nature of these scales.

In summary, our most important conclusion and its subsequent recommendation is to connect the three scales to a united integrative pandemic communication phases threat index. The integrated threat index phases will be designed to consider geographical threat, severity and public risk perception. This comprehensive index might be the solution for the shortcomings of the current WHO threat index, that does not defects its many advantages. It offers the most practical tools for outbreak communication with different stakeholders, and it takes into consideration international, national and local risk assessments.

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