Contesting a Pandemic

Contesting a Pandemic:
The WHO and the Council of Europe

Abstract

Contemporary risks are often understood as fundamentally uncertain. This uncertain status can be mobilized within political debates surrounding risks. Such a challenge serves to destablise scientific claims. The World Health Organisation's (WHO) management of the 2009/10 spread of the H1N1 virus became a site of one such contestation. Debate within the Council of Europe particularly served to criticize the action of the WHO. This resulted in a definitional and policy contestation between the two institutions. The WHO accounted for its actions through allusions to (seemingly stable) scientific facts, using epidemiological evidence of influenza and its management based on normal science. In contrast, in criticising public expenditure and panic, the Council of Europe critics problematised the stability of the science employed by the WHO. This included fundamental aspects of scientific knowledge such as the measurability of morbidity and mortality caused by H1N1 and the effect of vaccination against influenza viruses. This criticism relied upon the ability to destabilise the WHO's scientific knowledge, a process made possible through understandings of the uncertain nature of the science of risk (post-normal science). The case study illustrates that potential for previous-established and seemingly stable scientific facts to become destablised and problematised during contestations of risk management.

KEY WORDS: contestation, influenza, World Health Organization, Council of Europe, sociology

Introduction

The World Health Organisation's declaration of the start of the 2009 H1N1/A Influenza Pandemic led to the implementation of national pandemic preparedness plans and alerted publics worldwide to the risk of pandemic. The labelling of H1N1 as a 'pandemic' was accompanied by public and media interest, and became of focus of policy and political concern. In addition, the declaration resulted in the change of day-to-day routines (for example, influenza awareness and hygiene campaigns in the workplace, or issues around biosecurity and air travel). As events unfolded, and the pandemic event was perceived by some publics and political actors as relatively mild in nature, the World Health Organisation's characterisation of the risk posed by H1N1 became contested. The WHO's recommendation of mass vaccination – and the government spending that went into implementing this – became a particular point of contention. One of the prominent political actors to contest the WHO's position was the Council of Europe. The ensuing debate surrounding the WHO's actions served to highlight the problem of defining the risk posed by highly transmissible epidemic disease.

Having arisen at a period of heightened interest surrounding the potential for the next big pandemic (Lazzari and Stohr 2004; Webby and Webster 2003; Webster 1997), H1N1 represented an important test of the WHO's newly implemented pandemic-management strategies. The WHO's announcement on 11th June 2009 that H1N1 was a pandemic event was the first official pandemic declaration in over 40 years (Cohen and Enserink 2009). This triggered a range of pandemic risk management policies at the global, national, and local levels (WHO 2009). The role of the WHO is fundamental to the management of (potential) pandemic agents, and the WHO was a pivotal actor in forming the reaction to H1N1. However, critically for the WHO, the H1N1 Pandemic did not become the severe and widespread disease event that it had (from the WHO's perspective) threatened to be. Worldwide, by the WHO's own account, H1N1 had produced only 18,500 laboratory-confirmed deaths by the declaration of the Post-Pandemic Period (WHO 10/08/10), rendering the event relatively mild in comparison with previous experiences of pandemic influenza (Cox and Subbarao 2000; Nguyen-Van-Tam and Hampson 2003; Taubenberger and Morens 2006).

The WHO had officially declared H1N1 to constitute a pandemic, and this declaration had precipitated the worldwide implementation of pandemic management strategies, the WHO was subsequently held liable for the consequences. In particular, some national governments decried the widespread expenditure of public monies and resources on planning for a pandemic event that proved to be mild in impact. First and foremost amongst these critics was the intergovernmental organization of the Council of Europe, which, following a series of discussions and debates, concluded that the WHO's actions had caused both undue panic and excessive expense (Council of Europe 2010). In making these claims, the Council of Europe mobilised its own narrative of the science of H1N1 to contradict the WHO's policy-making and actions.

In understanding the varying positions of the World Health Organization and the Council of Europe actors the following questions arise:

- What were the particular points of tension or difference between the WHO's and the Council of Europe's accounts of managing H1N1?
- What different ways of knowing underpin these contrasting accounts of risk?
- Can these competing accounts be indicative of different understandings of the relationship between scientific knowledge and the management of H1N1?
- How can discussions of post-normal science, focusing on the intersection between knowledge and risk management policy, aid in explaining the contestation?
- What is the relationship between post-normal science and the management of risk?

The paper outlines the Council of Europe's criticism of the role and actions of the WHO in managing H1N1, particularly in relation to the use of vaccines as a preventative strategy. This primary conflict over management policies frames the deeper contestation over the science surrounding the event, including the identification of influenza as a distinct and measurable disease, and the specific nature of the H1N1 virus. As the Council of Europe's contestation focused upon the dispute of previously stable scientific knowledge (the nature of the influenza virus and the epidemiology surrounding these viruses). This highlights the fact that political challenges can serve to destabilise taken-for-granted scientific claims.

Analytical perspectives

The science surrounding risks can be conceptualised in a number of ways.. Traditional means of scientific discovery around risks take the form of 'normal science'. Using Kuhn's original definition, normal science refers to "research firmly based upon one or more past scientific achievements, achievements that some particular scientific community acknowledges for a time as supplying the foundation for its further practice" (Kuhn 1962:10). Normal science is conducted by discipline-based communities of scientists, producing knowledge surrounding questions of their own construction. When the knowledge produced by normal science becomes transformed into stable and consistent sets of facts, having received scientific closure (Latour and Woolgar, 1979), it can become packaged into the seemingly unproblematic black boxes of 'ready-made science' (Latour 1987: 4) to be unproblematically applied when considering new problems. If institutions rely upon taken-for-granted risk management strategies (see the WHO and vaccines below), they are applying normal science in understanding the risk.

Normal science was always incomplete. However, these problems were resolved by the scientists themselves, a Now, as risk analysis becomes a central t use of scientific knowledge, the uncertainties of science have moved out of the esoteric circle of scientists and into the wider circle of risk management policy. Thus science has become overtly political and uncertainty now provides leverage to challenge science on its own grounds. In this context erstwhile taken for granted aspects of normal science (in this case the use of vaccinations for infectious disease control) become questioned and destabilized so that they lose their status as scientific objects.

This form of science is strongly integrated/strongly contextualised science, where "knowledge production becomes part of a larger process in which discovery, application and use are closely integrated" (Gibbons et al. 2010:46). Strongly contextualised science is often applied where uncertainty is part of the research problem. This is because in such cases there is a need to

interact with non-scientists (e.g. policy-makers), and because human actions (e.g. in transmitting disease or undertaking social distancing strategies) form part of the problem (Nowotny et al. 2001). Under these conditions, the evidence that is produced is itself uncertain and often contradictory. This is because the (necessarily) limited knowledge surrounding risks, and their fundamentally future orientation, produces diverse explanations of them. Under such conditions black-boxed scientific artefacts (Latour 1987) can become problematized; the contents of normal science become open to uncertainty and transdisciplinary reconstruction.

While contrasting facts are often mobilised in response to political agendas, this is most clear where there is a high level of scientific uncertainty underpinning the policy issue. This is evident where there is contestation surrounding (for example) environmental (Carolan 2008; Saloranta 2001) or health (Brown 2000) controversies (see also Guston 2001; Jasanoff 1987; Pohl 2008). Such contestation is particularly notable in response to risk management, where "the scientific side of the work must be complemented by other considerations, deriving also from its policy aspects" (De Marchi and Ravetz 1999: 743). In such examples, there is a tendency for actors and institutions with a particular perspective or policy agenda to seek out experts who will reiterate the policy position (Carolan 2008; Freudenburg 2005). Institutions thus reinforce a favoured viewpoint through scientific means, associations with authority, and seeking out experts who will serve to legitimate the policy position, where "[i]n practice, the problem is resolved institutionally, but by the clients [here the risk managing institution] rather than the community of experts" (Funtowicz and Ravetz 1994: 1883).

The contestation over H1N1 demonstrates the political malleability of scientific knowledge in the face of such risks. In particular, the concept of post-normal science is useful here, in referring to contemporary relationships between risk, politics and governance. Post-normal science is often used to denote a marked departure from the previous practices of normal science (Funtowicz & Ravetz 1993; Funtowicz & Ravetz 1994; Jasanoff 2004a; Lenhard et al. 2006; Ravetz 2004), in that scientific knowledge is not taken as a self-determining form of inquiry, but rather, seen as moulded and produced in relation to societal/political goals (Nowotny 2003a). Post-normal science acknowledges that uncertainty is implicit in the study of risk or safety. This is due to the future-oriented and novel nature of risks, which means that science surrounding risks is often speculative. "The post-normal science (PNS) approach clearly shows that inevitably various sorts of uncertainty and value-commitments enter into any decision on risk" (De Marchi and Ravetz, 1999:743). This contrasts with normal models of science which sees science set apart from society as an autonomous rational authority, and where scientific knowledge it understood as cumulative in nature. Implicit in the application of normal science to policy is the idea that uncertainty can be eliminated and/or controlled through the collection of definitive evidence. In contrast, uncertainty is understood as inherent in the post-normal form.

Normal and post-normal science are used here as analytical categories, referring to potential orientations to the problem of knowledge surrounding risks, rather than normative models of good science. This contrasts from the way the term post-normal science is utilised by some theorists (see: Funtowicz and Ravetz 1991), who argue a post-normal model is preferable where knowledge can be democratised. Rather, the idea of post-normal science aids in the explanation of one set of actors' ability to deconstruct and fundamentally contest the knowledge claims surrounding the identification and management of risk. Many authors argue that post-normal science predominates within policy-making (Jasanoff 2004a; Jasanoff 2004c; Nowotny 1993, 2000; Nowotny, Scott, and Gibbons 2001; Ravetz 2004; von Schomberg 1993a). It is particularly important in terms of policy production surrounding risks, where "the facts are inevitably uncertain, the values in dispute" (Ravetz 2003: 351) and the responsible institution must be concerned with "the management of a reality that has irreducible complexities and uncertainties" (Funtowicz and Ravetz 1994: 1882).

Methods

Qualitative textual analysis was used to provide an understanding of the WHO and Council of Europe's representation of H1N1. The WHO is responsible for the definition, declaration, and global management of pandemic events, as outlined by the 2005 International Health Regulations and the Pandemic Preparedness Guidance document (WHO 2008). This paper is drawn from a wider study which examines the construction and management of the H1N1 Pandemic within global health. In examining the WHO's response, this included the collection and analysis of all publicly available documentation and statements produced by the WHO from the initial detection of the virus (March 2009) to the declaration of the 'post-pandemic period' (August 2010). This includes textual analysis of epidemiological statements (published daily, and then weekly, through the course of the pandemic), policy documents, and public statements (such as press statements made by WHO representatives).

The Council of Europe was among the first and most vocal institutions to come out in criticism of the WHO's response to H1N1. The contrasting narratives of the Council of Europe critics highlight contentious aspects of the WHO's account and demonstrate the potential for alternate perspectives on the issue. Documents produced by the Parliamentary Assembly, and its subsidiary Committees, are analysed here. The documents range between December 2009 and June 2010, the period in which the Council of Europe investigated and debated the WHO's handling of H1N1. This includes parliamentary motions, expert testimony at parliamentary committees, transcripts of parliamentary and committee debates, and reports and other documentation. As with the WHO texts, the research included all publicly available texts that were produced within the period of study. The study focused upon the public representation of

H1N1 produced by the two institutions, and ways in which science was mobilised within these representations.

The WHO and Council of Europe documents were reviewed through the use of qualitative textual analysis, focusing on keys themes and narratives occurring in these texts (Silverman 2004). The documents were treated as narrative texts, which allowed for the identification of ideological and discursive constructions (Dijk 2001; Lupton 1994). The analysis of texts is important in understanding representations of disease, as narrative texts employ language to both present and constitute cultural interpretations of reality. The analysis focused upon the institutional attempts to construct the threat of the H1N1 pandemic. Recurring narratives surrounding ideas of risk, knowledge and science were extracted from the texts, paying particular attention to the differences and tensions in the narratives produced by the two institutions.

Background to the Institutional Conflict

The H1N1 Pandemic was a particularly important event in the WHO's recent institutional history. From the WHO's perspective, its role is defined by the coordination of emergency and international events. Historically, this role in vertical (and particularly infectious) disease management has been pivotal to the organization's influence and prestige. Horizontal and chronic disease management strategies have been given secondary (and only more recent) attention (Beigbeder 1998; Corrigan 1979; Fidler 2001). The management of events such as influenza pandemics is central to the WHO's efforts within the contemporary climate of global public health. As such, the contestation surrounding H1N1 spoke to the core of the WHO's organizational goals and structure (Brown, Cueto, and Fee 2006; Fidler 2001).

The WHO took a central role in the declaration and management of the H1N1 Pandemic. This reflected the organization's interests and perceived strengths, as well as its stated roles and responsibilities in relation to the revised International Health Regulations (2005). For the WHO, the collection of epidemiological evidence surrounding H1N1 was vital to its organizational role within the contemporary structures of global health management. This was facilitated through the Global Outbreak Alert and Response Network (GOARN), the surveillance network of institutions monitoring infectious disease events of potential international concern. Member countries are required to report to the WHO around any Public Health Emergency of International Concern (PHEIC), and the WHO acts as a central coordinator, communicator and repository of this scientific evidence. During the H1N1 Pandemic, surveillance networks produced a vast amount of epidemiological data, which was fed through local and national governments to the

WHO. This epidemiological data (combined with virological data achieved from laboratory analysis of the H1N1 virus) underpinned the claims made by the WHO (and was later utilised in the contesting claims of the Council of Europe).

The H1N1 Pandemic was seen as a key test of the WHO's capabilities. The WHO representatives reinforced the primacy of such campaigns as a part of the organization's function:

> …this is our business really, and WHO mobilises to handle sudden emergencies. We do this very often, whether this is Ebola (haemorrhagic fever) in Africa or the Tsunami spread over a very wide area. Some countries fortunately can deal with a crisis once in a century. …[W]e [the WHO] deal with 250 events a year. And that isn't just reporting an event, that is responding to an event. (Ryan [WHO Director of Global Alert and Response] 02/05/09)

Such statements, along with others (for example: Fukuda [Special Advisor to the WHO Director-General on Pandemic Influenza] 30/04/09; 04/05/09; 07/05/09), emphasised that the WHO saw the problem of H1N1 as fundamental to its role within global public health. For this reason, the WHO's actions were a potent site of political critique.

The Council of Europe mounted the most prominent and first organizational and political voice of criticism against the WHO. By late 2009/early 2010, the Council emphasized the mildness of H1N1 in criticizing the WHO's management. In doing so, the critics both used evidence produced or communicated by the WHO itself and, more fundamentally, problematized areas of scientific knowledge that had previously been taken-for-granted as fact.

One of the loudest voices of criticism of the actions of the WHO came from the German epidemiologist/physician and Council of Europe parliamentarian Wolfgang Wodarg. Wodarg was the first institutional critic of the WHO's handling of H1N1, and emphasized what he described as the undue influence of pharmaceutical manufacturers upon the WHO's actions. His voice was prominent in the Council of Europe's discussion of the events. In addition, key expert witnesses (most notably, the epidemiologists Ulrich Keil and Tom Jefferson) were deployed by the Council of Europe to testify to the scientific evidence surrounding the case. These experts were central to the Council of Europe's account and were characteristic of the use of evidence surrounding H1N1. Within the post-normal model, experts maintain considerable authority and credibility (Nowotny 2003a, 2003b), but are also democratized in the sense that they must voice opinions on risks that are not necessarily areas of direct expertise (since risks, as described above, are interdisciplinary in nature). These experts must react to real-world and policy implications (Lynch 2004; Shackley and Wynne 1996; von Schomberg 1993a), as has clearly occurred in the case of the Council of Europe experts. As demonstrated below, the Council of Europe account heavily

relied on this form of expertise in contesting the WHO's narrative of H1N1, and in constructing their own narrative of the events.

The Council's criticisms revolved around the wider critique of the WHO as an organization incapable of managing crisis situations. This contrasted with the WHO's own portrayal of its role, and dominant accounts of the WHO's history (Bhattacharya 2008; Brown, Cueto, and Fee 2006; WHO 2007), which emphasise the organization's responsibility and function in dealing with emergency cases (e.g. HIV/AIDS, SARS, humanitarian disasters) and particularly infectious disease events (Beigbeder 1998; WHO 2007). In decrying the WHO's policy and actions surrounding H1N1, the critics within the Council of Europe emphasised the WHO's lack of skill in these areas:

> The WHO was an excellent organization but it was notable that its long-term work was very good while its efforts to deal with emergencies were poor. (Huss [representative for Luxembourg] in Council of Europe Parliamentary Assembly 24/06/10)

Such critiques fed into the broader challenge of the WHO's management, characterising the WHO as inadequate to the task of policy creation in response to acute emergencies.

The Council of Europe's criticisms of the WHO revolved around the WHO's emphasis on vaccine use in its policy surrounding H1N1. For the WHO, vaccines represented the greatest tool in combating the pandemic:

> Why are we so interested in vaccines against this new virus? It is because we all know that vaccines are an extremely effective public health tool and in addition, vaccines against seasonal influenza are protective against the disease – in severe disease – of millions of people every year. So, therefore, it is generally recognized and accepted that it would be critically important to have a vaccine if you want to stop the pandemic that might be coming with this virus. (Fukuda 01/05/09)

The use of vaccines mirrored a historical tendency to favour vaccines as a purportedly effective preventative and defensive technique against infectious agents (Beigbeder 1998; Kitler, Gavinio, and Lavanchy 2002; Turnbull 1989). This was emphasised by the WHO as best practice in managing the pandemic. Such statements were outlined throughout the WHO's management of H1N1 (see for example: Kieny [Director of the Initiative for Vaccine Research] 24/09/09; Fukuda 5/11/09; 03/12/09; 06/12/09), and the usefulness of vaccines was reiterated throughout the WHO's pandemic policies.

This strategy became the focal point of the Council of Europe's criticisms of the WHO. While the WHO presented vaccine use as pivotal to the successful management of pandemic disease, the Council of Europe argued that the WHO's recommendation of vaccines was a result of its capture by the interests of pharmaceutical corporations. The WHO took for granted the utility of vaccines in managing infectious threats. The Council of Europe account served to destablise this assumption and tie the WHO's mobilisation of the science to financial interests. This contestation surrounding vaccines was the political impetus underpinning the wider deconstruction of the WHO's representation of H1N1. For the Council of Europe:

> It seems that the exaggeration of the pandemic was perhaps neither a mistake nor a coincidence. The pharmaceutical industries that earned a fortune from the pandemic had their people in the WHO, which had the power to declare the pandemic and thereby oblige a number of countries to buy large supplies of products from those industries. (Flynn [Council of Europe rapporteur on the issue] 23/03/10:4)

The Council of Europe's primary concern revolved around the use of pharmaceuticals. Key members (and member states) of the Council were unsettled by the cost and panic associated with the WHO's pandemic declaration and management actions. The WHO was concerned with fostering relationships between diverse global health actors, including corporate actors, as is understood by the WHO's role within the structures of contemporary global health (Brown, Cueto, and Fee 2006; Keane 1998; Taylor 2005). Though the WHO argued that its strengths lay in its ability to facilitate cooperative action between a variety of global health actors (Brown, Cueto, and Fee 2006; Buse and Walt 2000; Fidler 2004), the Council of Europe alleged that the WHO was susceptible to influence by outside factors, particularly pharmaceutical corporations, who were cast not as cooperative partners but as vested interests.

Vitally, the Council of Europe critics asserted that the WHO had manipulated scientific evidence in order to facilitate the use of vaccines against the H1N1 virus. The science surrounding vaccines was represented as malleable and it was suggested that the WHO mobilised interpretations of the science that relied upon political decisions (instead of the realities of the event). Rather than vaccine science highlighting the appropriate policy position (WHO's account) the evidence itself was political and interpretable (Council of Europe's account). This reflects the potential for the disruption of knowledge and evidence that occurs in the case of contemporary risk, as asserted by theories of post-normal science (Funtowicz and Ravetz 1994; Ravetz 2004). In this way, the critics suggested that the WHO had manufactured the risk:

> On the eve of the declaration of the pandemic, the WHO declared that the majority of cases were benign. So the cases were benign, the virus was benign, and nevertheless on the 11th

> of June the pandemic was declared, alert level 6. What I wondered about when looking at these facts, is the unfolding of this all. Even when we look at the WHO notifications we have a feeling that the WHO deliberately staged the events. (Rivasi 29/03/10)

At the heart of this 'staging' was the idea that the WHO had mobilised epidemiological evidence in an unscientific manner, to amplify and exaggerate the risk posed by the H1N1 virus.

> Exactly a year ago, a very bad decision was taken by the World Health Organization that now seems unscientific and irrational. The result of that decision was that the whole world became scared that a major plague was on its way – a new pandemic that would have been as bad, according to the reports, as the flu pandemic of 1918. There seems to have been no scientific basis for that decision. (Flynn in Council of Europe Parliamentary Assembly 24/06/10)

The WHO's actions were thereby held by the Council of Europe critics to be fundamentally political.

This deconstruction of the science employed by the World Health Organization was underpinned by the problematization of the use of vaccines against the H1N1 virus. Jefferson, the epidemiologist who provided expert testimony as evidence in the Council of Europe's investigation, suggested that:

> ...it is clear that the performance of vaccines in healthy adults is nothing to get excited about. On average, perhaps 1 adult out of a 100 vaccinated will get influenza symptoms compared to 2 out of 100 in the unvaccinated group. ...However [in addition], our Cochrane review found no credible evidence that there is an effect against complications such as pneumonia or death. (Jefferson 29/03/10)

In fact, it was alleged by the Council of Europe that pharmaceuticals against influenza as a general category of disease were not an efficaciou public health measure. Again, Jefferson cited statistical evidence to support the assertion that such techniques are ineffectual:

> ...vaccines and antivirals have a weak or non-existent evidence base against influenza. The quality of influenza vaccine studies is so bad that our systematic review of 274 vaccine studies which had [been] published between 1948 and 2007 found major discrepancies between data presented, the conclusion and the recommendation made by the authors of these studies. (Jefferson 29/03/10)

The science surrounding this public health technique was problematized in the Council of Europe's account, propounded by scientific experts who contested claims surrounding the efficacy of vaccines. This fed into, and was reinforced by, the problematization of the wider scientific knowledge surrounding H1N1.

As the quotes above serve to demonstrate, criticism of the WHO's mobilisation of evidence and knowledge was central to the Council of Europe's contestation of the WHO's management. In criticising public expenditure and panic, the Council of Europe critics contested the WHO's actions through a fundamental dismantling of the facts of H1N1 Pandemic. This included the specific nature of the H1N1 virus, and a contestation of the idea of influenza itself. The evidence was represented as a tool for political decisions, contradicting the WHO's account of the widely-understood utility of vaccines.

Scientific evidence was used as a means through which the truth of H1N1 could be understood (Braun and Kropp 2010; Gieryn 1999), with the WHO and the Council of Europe each constructing different interpretations of the role of this evidence within this policy debate. The World Health Organization made reference to the epidemiological evidence produced by the makers of normal science (Jasanoff 2004b; Ravetz 2004; von Schomberg 1993b), where disciplinary-bound sets of anonymous scientific actors worked to produce knowledge that is privileged as grounded in an autonomous rational authority. However, given that the contemporary science of risks is uncertain, and open to challenge (Funtowicz and Ravetz 1993; Jasanoff 2004a; Nowotny, Scott, and Gibbons 2001), the WHO's account became susceptible to investigation and interrogation. As such, the Council of Europe's allusions to science suggests a more mutable and unstable form, where basic knowledge can be interrogated. The politics of scientific knowledge come to the fore.

Contestation of Influenza as a Distinct Disease

The Council of Europe's contestation of the science surrounding H1N1 problematized the prevailing understanding of the nature of the influenza pandemic events. Pivotal here was the representation of influenza as a diagnosable pathology. That influenza is a distinct and measurable disease was taken for granted in the World Health Organization's account. as Also assumed was the idea that pandemic influenza strains are epidemiologically measurable, and are likely to cause severe disease. For the WHO, these orientations towards influenza counted as established scientific knowledge, as the normal science (Latour, 1987) which could be applied to the situation. All of these assumptions were contested by the Council of Europe critics. The critique of the WHO's actions surrounding H1N1 were bound by a fundamental problematisation

of the science and evidence, underpinned by the difference in models of science employed by the two institutions.

For the World Health Organization, the idea that pandemics are caused by novel influenza strains was a taken-for-granted reality. Influenza was seen as a distinct disease, and influenza agents were known to cause pandemics:

> Influenza pandemics are caused by a virus that is either entirely new or not known to have circulated among humans in recent decades. This means, in effect, that nearly everyone in the world is susceptible to infection. It is this almost universal vulnerability that makes influenza pandemics so disruptive. (Chan [WHO Director-General] 04/05/10)

It is clear that the World Health Organization understood novel influenza viruses, in this case H1N1, as the infectious agent behind pandemic events. This was an affirmed reality which underpinned the WHO's management decisions.

In contrast, the Council of Europe critics problematized these fundamental scientific assumptions to contest that WHO's actions. For the critics, the term influenza was an ambiguous misnomer, and a subjective and ill-defined disease entity. Here the Council critics argued that the WHO was tracking the more amorphous category of influenza, not the specific H1N1 virus. The Council of Europe critics asserted that the category of influenza covered a wide range of illnesses, and that this should more accurately be termed 'influenza-like illnesses' (ILIs), comparable to the set of diseases the general public would refer to (incorrectly) as flu. They argued that the WHO based its management decisions upon the purported presence and spread of H1N1 influenza, whereas in fact the WHO was monitoring only ILIs. In this way, the Council of Europe critics suggested that it is impossible to manage influenza as though it was a distinct and measurable disease. They asserted that the WHO purposefully conflated the influenza virus with the general category of ILIs in characterising the risk of pandemic. As such:

> ...the confusion between influenza and influenza-like illness ("the flu") has led to an obsession with a single agent (the influenza virus) which is not based in any sound evidence and, as I hope you now realize, is potentially dangerous and misleading... (Jefferson 29/03/10)

The primary source of this danger, as we will explore further below, was the use of vaccines against the threat. Since pandemic influenza was, according to this account, indeterminable, the WHO's choice of (strain-specified) vaccine as a management technique was scientifically discredited. In this way, the primary presumptions which underpinned the WHO's actions (that the disease being monitored was caused specifically by the H1N1 influenza virus, and that

influenza itself is a distinct disease) were undermined in the Council of Europe's account of the event.

Associated with the argument that influenza was not a distinct disease, was the assertion (made by the Council of Europe critics) that influenza cannot be scientifically measured. The WHO's actions against H1N1 rested upon the presumption that the spread and severity of the virus could be scientifically measured. In respect to H1N1, surveillance and the collection of scientific information was emphasised by the WHO:

> …[an] area we are focusing pretty heavily on, is what is the science. And when we are dealing with a new disease we can look at how things develop, we can describe what is going on, but we really want to understand why, because it is the "why" which is going to give us a handle on how do we manage this better, how do we treat it in a really scientific way, but science does not come overnight. (Ben Embarek [WHO Food Safety Scientist] 04/05/09)

In this way, the uncovering of (objective, definitive and reliable) scientific information (i.e. normal science) was seen as pivotal to the WHO's management of H1N1. In understanding the virus, the WHO hoped to be better able to react to the spread of pandemic disease. In fact, at times, the WHO congratulated itself on the amount of epidemiological information that was collected by and through them.

> One of the interesting things about this whole situation is that the amount of information available on what is unfolding is really probably unprecedented. There is more information available about the epidemiology, about the viruses, than has ever been … (Fukuda 14/05/09)

The collection of epidemiological information surrounding the H1N1 virus, was presented by the WHO as being pivotal to effective action surrounding the disease. It was understood that epidemiological information was obtainable, and that this would provide objective and concrete information through which to make decisions.

For the Council of Europe critics, since it was (according to their account) impossible to distinguish the pandemic strain from other ILIs, it was equally impossible to measure specific influenza strains. What is being measured, asserted the critics, was not even influenza as a general category, but rather all ILIs. The WHO influenza surveillance mechanisms were therefore ineffectual:

> Influenza surveillance programmes in different places appear to report on the presence and degree of threat of influenza but what they are really looking at are influenza-like illnesses/flu.
>
> [In fact] we cannot say for certain how much influenza is circulating, as influenza is an unknown portion of an unknowable whole (influenza-like illness/flu). (Jefferson 29/03/10)

In this way, the Council of Europe critics argued that the measurement of the specific H1N1 virus was impossible, and that the WHO had based its actions upon unscientific evidence. The notion of (good) science was therefore central to the claims of both the WHO (policy based upon the scientific knowledge achieved through global surveillance) and the Council of Europe (evidence as a tool of the WHO to make politically and economically expedient decisions). It is clear that the Council of Europe's mobilisation of science reflects a more malleable form, where the fundamental facts of an influenza pandemic become open to interrogation, and science becomes politicised. The World Health Organization's account, while acknowledging the underlying uncertainty of the pandemic, defers to observable evidence and pre-existing knowledge of influenza in explaining the actions they have taken; that is, the WHO is relying upon ready-made science. Both organizations utilised similar types of evidence (e.g. the epidemiological statistics produced through WHO surveillance, but mobilised these evidences into contrasting ways of knowing H1N1. The (same) data was employed with different logics. The WHO perceived clear scientific evidence as underpinning policy. The Council of Europe critics saw inaccurate scientific claims used to support political decisions.

The potential to measure and survey influenza strains, a centrepiece of the WHO's pandemic detection and management strategies, was problematic for the Council of Europe. It was asserted that a truly objective and scientific understanding of specific influenza strains was impossible.

> …the currently available evidence does not allow us to know in a reliable way how many cases of influenza there are, nor its impact in terms of death and disability with any degree of certainty. (Jefferson 29/03/10)

Here, the expert testimony of Jefferson helped to frame the evidence utilised by WHO as inaccurate and disingenuous. Not only was the WHO constructing the risk posed by the H1N1 Pandemic through the use of erroneous evidence, but the WHO could not but be aware of its (mis)use of epidemiological information in that manner. In this way, the Council of Europe critics stated that the WHO inappropriately mobilised scientific data in a way that magnified the severity

of the H1N1 Influenza virus. They argued that the statistics forwarded by the WHO were misleading. For example:

> With regard to such an overstatement [of risk], the rapporteur would notably like to point out that, in many countries, no clear distinction had been made between patients dying *with* swine flu (i.e. showing symptoms of swine flu whilst having died of other pathologies) and patients dying *of* swine flu (i.e. swine flu being the main lethal cause). (Flynn 23/03/10:3 [emphasis in original])

The critics asserted that the incidence of H1N1 was immeasurable, and that therefore, the WHO did not have an accurate basis for measuring the risk, rendering the WHO's representations of the risk of pandemic flawed.

This representation of the nature of influenza was pivotal to arguments around the use of vaccines. In characterising influenza as an amorphous entity, the Council of Europe critics argued that (strain-specified) vaccines were an inefficacious management technique. This was because the vaccines:

> …could only effect **at the most** (i.e. if they had 100% efficacy) some 7-15% of the annual flu burden, since this is the proportion of people with flu who truly have influenza. …But, if you really think about it, it is a wonderful utopian policy against a syndrome as unspecific as this….In my opinion, the lack of logic in this thinking is stunning. (Jefferson 29/03/10 [original emphasis])

This is linked in with the argument that influenza, and specific influenza variants, are impossible to measure:

> …vaccination programmes are directed against what surveillance systems worldwide call "influenza" but in reality are influenza-like illness/flu. Surveillance systems cannot distinguish the two and provide reliable estimates of impact. This point is key to understanding what comes next. The false equation "influenza-like illness/flu = influenza" has misled some of the research on the effects of influenza vaccines and (most of all) the interpretation of such evidence. (Jefferson 29/03/10)

These assertions built the argument that the threat posed by the H1N1 virus was exaggerated by the WHO in order for commercial actors to profit from the sale of vaccines.

The Council of Europe critics asserted that the WHO had incorrectly mobilised the scientific evidence surrounding H1N1. This was due to a deeper problem within these facts. Specifically, the critics asserted that the influenza virus is indistinguishable from other respiratory agents (ILIs). This meant that the monitoring of the specific influenza A/H1N1 strain was impossible, and that the WHO data was therefore inappropriately used to charaterise the risk posed by the pandemic. Here, the fundamental scientific knowledge surrounding pandemic influenza came under contestation – the reality of influenza as a distinct disease, the ability to distinguish specific influenza strains, and the ability to monitor and measure influenza. In contesting the WHO's management of H1N1, the Council of Europe went beyond the critique of public health decisions into the contestation of the underlying facts surrounding pandemic events. While the WHO alluded to (previously stable) scientific knowledge in its decision-making surrounding H1N1, the Council of Europe account viewed these same facts as interpretable pieces of evidence mobilised within political structures. The Council of Europe critics reconstructed the same pieces of evidence to show why their critical interpretation of the WHO's actions was a similarly valid interpretation of the event.

The representation of scientific knowledge was key to the events surrounding H1N1, as scientific facts were employed as rhetorical devices, and evidence in support of particular policy positions, by both the WHO and the Council of Europe. What is particularly notable was the Council of Europe's questioning of underlying knowledge and the existence and measurement of the disease. The attempted scientific closure (Latour and Woolgar 1979) surrounding the concept of pandemic influenza was disrupted by the Council of Europe. Furthermore, it was not the scientifically uncertain aspects of the pandemic (e.g. the likely spread of the virus, the likely termination of the pandemic threat) that were under contestation, but the more scientifically well-evidenced positions (the fact of influenza and its measurability Ready-made scientific artefacts (Latour 1987) became problematized through their contestation/opening; the contents of normal and fixed science became open to uncertainty and transdisciplinary reconstruction by the experts of the Council of Europe.

H1N1 as a Pandemic-Causing Agent

In addition to contesting the fundamental understanding of influenza, the Council of Europe critics contested the WHO's interpretation of the science surrounding the specific strain of H1N1. The criticism centred upon the assertion that the World Health Organization had misused scientific evidence in its public statements and policy surrounding H1N1. Flynn suggests that:

> When looking at the still very moderate expression of the pandemic almost one year after its outbreak (May 2010), the interpretation of scientific and empirical evidence can be seriously questioned. For some experts, it seemed obvious from a relatively early stage that the new sub-type of influenza virus was doing less harm to persons infected than other forms in previous years. (Flynn 07/06/10:8)

In this way, the Council of Europe critics problematized the WHO's stance towards the H1N1 virus, and in particular, the Organization's interpretation and communication of evidence surrounding the viral strain. The Council of Europe criticised all aspects of the WHO's interpretation of H1N1, including the idea of the H1N1 virus as a pandemic-causing agent, the level of risk posed by H1N1, and the novelty of the viral strain.

The Council of Europe critics contested the WHO's explanation of scientific evidence on a number of counts. Firstly, the WHO argued that the H1N1 virus represented an important threat because of the swift spread of the virus. The WHO asserted that this spread was an important characteristic of the risk of H1N1, since "…the H1N1 virus spread very easily from person to person, spread rapidly within a country once it establishes itself, and is rapidly spreading to new countries" (Chan, 11/06/09). In contrast, the Council of Europe argued that this rapid spread was an innate characteristic of influenza (and other ILIs), and was in no way indicative of increased risk:

> Given the fact that the influenza virus is always a very contagious disease which spreads very rapidly and leads to a greater number of cases, it is surprising to see the extent to which attention was focussed on that flu [H1N1] after the reporting of only hundreds of cases. (Wodarg 26/11/10)

Here, Wodarg argues that the WHO characterised H1N1 as a high risk far before any conclusive scientific evidence was available through which to make that judgement. Further, influenza is characterised as innately a disease of rapid spread. This spread is not necessarily highly risky or notable.

The WHO also referred to the viral novelty in representing the risk posed by H1N1. The WHO argued that H1N1 represented a significant threat due to the fact that the virus was entirely new, and therefore that human immune systems had not been exposed to it before.

> Influenza pandemics are caused by a virus that is either entirely new or not known to have circulated among humans in recent decades. This means, in effect, that nearly everyone

> in the world is susceptible to infection. It is this almost universal vulnerability to infection that makes influenza pandemic so disruptive. (Chan 04/05/09)

Here, and in other instances (see: Chan 29/04/09, Fukuda 26/05/09), the WHO emphasises the novelty of the H1N1 as a pandemic threat. However, in contrast, the Council of Europe's account challenges these arguments of novelty. For the Council of Europe, H1N1 was a known virus of little relevance.

> …the WHO declared…that this was an entirely new virus. Now what here we see on the 22nd of May in 2009, we see that 10% of the under-60s and 30% of the over-60 age bracket already have an immunity against this virus. So we say "well, why stage things in this way, why manipulate things in this way?" when the virus is used this way. (Rivasi 29/03/10)

Again, the Council of Europe critics dispute the WHO's account of the science surrounding H1N1, and in doing so, imply that the WHO has manufactured the threat for political purposes. The Council of Europe argued that H1N1 was not a novel virus, and therefore did not have the unique capacity to cause a pandemic – undermining the WHO's reading of the scientific evidence.

The WHO claimed that in its use of the scientific evidence, and its communication of the threat posed by H1N1, it had been objective and moderate in its decision-making. The WHO suggested that pandemics are extremely tempestuous events, which are difficult to predict and account for (see Chan 04/05/09; 15/05/09; 11/06/09; Fukuda 26/04/09 for some notable instances). While uncertainty was accounted for in the WHO's claims, this uncertainty (and therefore risk) was thought to be manageable through the collection of further epidemiological evidence. In contrast, the Council of Europe disputed the WHO's management of the pandemic. They argued that the WHO had miscommunicated the evidence surrounding H1N1 to magnify the sense of threat and need for action.

> In the statement made at the very beginning of 2010, WHO insisted that the world was facing a real pandemic, the future course of the pandemic was uncertain, that situation was neither overplayed nor underplayed, and the objective had always been a precautionary approach. In the same statements, WHO claimed that it was too early to say whether the pandemic was over and that another significant wave could still be expected… (Flynn 23/02/10:6)

While the WHO emphasised the inherent uncertainty of the situation, the Council of Europe criticisms mobilised scientific evidence in a contrary manner, one which highlighted the flaws in the WHO's management style and strategy and spoke to more data which was open to (multiple)

interpretation(s). The uncertain nature of the situation highlighted for the Council of Europe the political underpinnings of the WHO's role.

In addition to contesting the fundamental science surrounding the nature of influenza, then, the Council of Europe also contested the WHO's specific use of the epidemiological evidence surrounding H1N1. The Council of Europe argued that the WHO had magnified the threat presented by the H1N1 virus, and misled governments and publics in respect to the disease. This mis-definition of H1N1, according the Council of Europe, allowed for the widespread use of vaccines as a pandemic management strategy (which was the issue at the heart of the debate).

The management of pandemic threats is central to the World Health Organization's role within global health. The contestation surrounding the management of H1N1 was therefore highly problematic for the WHO. Following criticisms made by the Council of Europe and other actors, the WHO investigated its handling of the event, including specific references to the claims made by critics. While the WHO found no evidence of claims of capture by pharmaceutical corporations, aspects of the Organisation's communication of risk were found to be problematic. This included problematizing the Organization's methods of gathering scientific information surrounding pandemic threats. Tellingly, the investigation found that frequent requests for data from affected countries was counter-productive in terms of useful information in managing the disease. Also found lacking were clear definitions of the category of pandemic and ways in which to measure severity of disease (WHO, 2011). The continued calls for further epidemiological facts that had occurred during the pandemic is particularly indicative of the WHO's orientation towards this risk; it was thought that further evidence would underpin good policy decisions. While uncertainty was fundamental to the threat, the WHO sought a stable frame of scientific evidence.

Conclusion

This paper has examined the way in which the contesting actors of the World Health Organisation and the Council of Europe represented the risk posed byf H1N1. The WHO based its actions on epidemiological evidence and pre-established scientific facts in managing the virus and preventing its impacts. In contrast, the Council of Europe argued that the WHO misinterpreted the evidence surrounding H1N1, and mismanaged the event in emphasising the use of vaccines as a management strategy. Through the use of expert testimony, the Council of Europe asserted their own interpretation of the science surrounding the H1N1 pandemic, and highlighted the instability of some of the WHO's account of the disease.

The Council of Europe problematized fundamental assumptions made by the WHO, such as the nature of H1N1 and the definition and monitoring of influenza. In this way, the fluidity surrounding (appropriate ways to interpret) scientific evidence was highlighted (Gibbons, et al, 2010). Post-normal was of understanding towards science – including the attendant destabilisation of evidence and linking of science with policy – was apparent in analysing the critics' accounts (Nowotony, 2001). In re-formulating and contesting the idea of 'influenza' as a disease, the Council of Europe critics argued that the WHO was unable to track the specific influenza agent of H1N1, and was therefore exaggerating the morbidity and mortality figures. In problematizing the concept of H1N1 as a severe and risky viral strain, the WHO's strategy of vaccine use was criticised. This case study, then, highlights the mutability of scientific knowledge within cases of policy contestation around risk, and the particular form of partial and contestable knowledge that surrounds politically-charged risk management (Nowotny 1993; Nowotny et al. 2001). Institutional decision-making, and institutionally-based orientations to the risk in question, are fundamental to the treatment of both the risk and the science surrounding it.

The WHO took the outputs of epidemiological investigation, combined with existing ready-made science, as tools through which to base policy decisions. In contrast, reacting to the distress caused by mass public expenditure and panic, the Council of Europe actors mobilised interdisciplinary experts to contest the WHO's claims, representing the science as far more malleable, inherently political and fundamentally constructed (Nowotony, 2003a). This demonstrates the way in which post-normal accounts of risk – in highlighting the fragility of evidence surrounding these threats – can explain the contestation of risk policy. Here, previously ready-made science – e.g. the use of vaccines as a tool to manage the spread of influenza - is problematized and transformed into a site of scientific instability. Scientific knowledge becomes destabilised during contestations between institutions with different political positions on risk management.

This case study shows that the WHO and the Council of Europe engaged in policy contestation through competing interpretations of scientific evidence. These divergent positions framed the two organisations' ways of knowing and reacting to the spread of H1N1. The WHO was concerned with the collection of comprehensive epidemiological evidence, and related this evidence to pre-existing scientific facts to underpin policy decisions. In contrast, the Council of Europe critics perceived (often the same) evidence as inherently unstable, and based on inaccurate assumptions around the nature of influenza. Instead of merely criticising the policy decisions made by the WHO, the Council of Europe critics deconstructed previously taken-for-granted facts surrounding influenza, the concept of a pandemic, and the characteristics of the H1N1 virus. The policy conflict was framed through highlighting the unstable nature of the science itself, a process made possible through post-normal orientations towards risk. While much of the literature on

post-normal science tends to focus on emerging problems and technologies, this case shows that more seemingly stable scientific issues can become destabilised through political challenges to risk construction.

References

Bauman, Z. (1999), Post-Modernity and its Discontents, Cambridge, Polity Press.

Beck, U. 1992. *Risk Society: Towards a New Modernity*. London: Sage.

Beigbeder, Y. 1998. *The World Health Organization*. Vol. 4, *International Organizations and the Evolution of World Society*. The Hague: Martinus Nijhoff.

Bhattacharya, S. 2008. "The World Health Organization and global smallpox eradication." *Journal of Epidemiology and Community Health* no. 62 (10):909-912. doi: 10.1136/jech.2006.055590.

Braun, K, and C Kropp. 2010. "Beyond Speaking Truth? Institutional Responses to Uncertainty on Scientific Governance." *Science, Technology & Human Values* no. 35:771-782.

Brown, P. 2000. "Popular Epistemology and Toxic Waste Contamination: Lay and Professional Ways of Knowing." In *Illness and the Environment: A Reader in Contested Medicine*, edited by S Kroll-Smith, Phil Brown and V. J. Gunter. New York: New York University Press.

Brown, T. M., M. Cueto, and E. Fee. 2006. "The World Health Organization and the Transition from "International" to "Global" Public Health." *American Journal of Public Health* no. 96 (1):62-72.

Buse, K, and G. Walt. 2000. "Global Private-Public Partnerships: Part II - What are the Health Issues for global Governance." *Bulletin of the World Health Organisation* no. 78 (5):699.

Carolan, M. S. 2008. "The Bright- and Blind-Spots of Science: Why Objective Knowledge is not Enough to Resolve Environmental Controversies." *Critical Sociology* no. 34 (5):725-740. doi: 10.1177/0896920508093365.

Cohen, S, and M Enserink. 2009. "After Delays, WHO Agrees: The 2009 H1N1 Pandemic Has Begun." *Science* no. 324 (5934):1496-1497.

Corrigan, P. 1979. *The World Health Organization*. Hove (East Sussex): Wayland Publishers.

Council of Europe. 2010. *Faked Pandemics - A Threat to Health*. Vol. Doc. 122110. Motion of a Recommendation by the Parliamentary Assembly of the Council of Europe: Strasbourg, Council of Europe.

Cox, N. J., and K. Subbarao. 2000. "Global Epidemiology of Influenza: Past and Present." *Annual Review of Medicine* no. 51 (1):407-421. doi: doi:10.1146/annurev.med.51.1.407.

De Marchi, B. and Ravetz, J. R. (1999) "Risk Management and Governance: A Post-Noraml Science Approach." Futures 31:743-757

Dijk, T.A.van. 2001. 'Critical Discourse Analysis', in Schiffrin, D., Tannen, D. and Hamilton, H.E. (eds.), *The Handbook of Discourse Analysis.* Malden, Mass.: Blackwell Publishers.

Fidler, D. P. 2004. "Germs, Governance, and Global Public Health in the Wake of SARS." *Journal of Clinical Investigation* no. 113 (6):799-804.

Fidler, David P. 2001. "The Globalization of Public Health: The First 100 years of International Health Diplomacy." *Bulletin of the World Health Organization* no. 79 (9):842-849.

Freudenburg, W. R. 2005. "Seeding Science, Courting Conclusions: Reexamining the Intersection of Science, Corporate Cash, and the Law." *Sociological Forum* no. 20 (1):3-33. doi: 10.1007/s11206-005-1896-1.

Funtowicz, S O., and Ravetz, J. 1994. "Uncertainty, Complexity and Post-Normal Science." *Environmental Toxicology and Chemistry* no. 13 (12):1881-1885. doi: 10.1002/etc.5620131203.
Funtowicz, S., and Ravetz, J . 1993. "The Emergence of Post-Normal Science." In *Science, Politics and Morality: Scientific Uncertainty and Decision Making*, edited by Rene von Schomberg. Dordrecht: Kluwer.
Gibbons, M. Limogs, C., Nowotny, H., Schwartzman, S., Scott, P. and Trow, M. (2010). *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*. London: Sage
Giddens, A. 1999. "Risk and Responsibility." *Modern Law Review* no. 62 (1):1-10.
Gieryn, T F. 1999. *Cultural Boundaries of Science: Credibility on the Line*. Chicago: Chicago University Press.
Guston, D. H. 2001. "Boundary Organizations in Environmental Policy and Science: An Introduction." *Science, Technology, & Human Values* no. 26 (4):399-408.
Irwin, A. (2013). *Sociology and the Environment.* Cambridge: Polity Press
Jasanoff, S. 2004a. "The Idiom of Co-Production." In *States of Knowledge: The Co-Production of Science and Social Order*, edited by S Jasanoff, 1-12. London: Routledge.
———. 2004b. "Ordering Knowledge, Ordering Society." In *States of Knowledge: The Co-Production of Science and Social Order*, edited by S Jasanoff, 13-45. London Routledge.
Jasanoff, S. 2004c. "Science and citizenship: a new synergy." *Science and Public Policy* no. 31 (2):90-94.
Jasanoff, S. 1987. "Contested Boundaries in Policy-Relevant Science." *Social Studies of Science* 17 (2):195-230.
Keane, C. 1998. "Globality and Constructions of World Health." *Medical Anthropology Quarterly* no. 12 (2):226-240.
Kitler, M. E., P. Gavinio, and Lavanchy, D. 2002. "Influenza and the Work of the World Health Organization." *Vaccine* no. 20:S5-S14.
Kuhn, T. (1962). *The Structure of Scientific Revolutions.* Chicago: University of Chicago Press
Lash, S. 2005. "Risk Culture." In *The Risk Society and Beyond*, edited by B Adam, U Beck and J Van Loon, 47-63. London: Sage.
Lash, S. Szerszynski, B. and Wynne, B. 1996. R*isk, Environment and Modernity: Towards a New Ecology*. London: Sage
Latour, B. 1987. *Science in Action: How to Follow Scientists and Engineers through Society*. Cambridge, MA: Harvard University Press.
Latour, B, and Woolgar, S. 1979. *Laboratory Life: The Social Construction of Scientific Facts*. Beverley Hills: Sage Publications.
Lazzari, S, and Stohr, K. 2004. "Avian Influenza and Influenza Pandemics." *Bulletin of the World Health Organisation* no. 82 (4):242-242A.
Luhmann, N. 2002. *Risk: A Sociological Theory*. New Brunswick, NJ: Transaction Publishers.
Lupton, D. 1994. *Moral Threats and Dangerous Desires: AIDS and the News Media.* London: Taylor and Francis.
Lynch, M. 2004. "Circumscribing Expertise: Membership Categories in Courtroom Testimony." In *States of Knowledge: The Co-Production of Science and Social Order*, edited by S Jasanoff, 161-180. London: Routledge.
Nguyen-Van-Tam, J. S., and Hampson, A. W. 2003. "The Epidemiology and Clinical Impact of Pandemic Influenza." *Vaccine* no. 21 (16):1762-1768.
Nowotny, H. 2003a. "Democratising Expertise and Socially Robust Knowledge." *Science and Public Policy* no. 30 (3):151-156.

———. 2003b. "Re-thinking Science: From Reliable Knowledge to Socially Robust Knowledge." In *Entangled Histories and Negotiated Universals: Centres and Peripheries in a Changing World*, edited by Wolf Lepenies, 14-31. Fankfurt: Campus.
Nowotny, H., P Scott, and M Gibbons. 2001. *Re-Thinking Science: Knowledge and the Public in an Age of Uncertainty*. Malden: Polity Press.
Nowotny, H. 1993. "A New Branch of Science, Inc." In *Science, Politics and Morality: Scientific Uncertainty and Decision Making*, edited by Rene von Schomberg, 63-84. Dordrecht: Kluwer.
———. 2000. "Transgressive Competence." *European Journal of Social Theory* no. 3 (1):5-21. doi: 10.1177/136843100003001001.
Pinch, T. J., and Bijker, W E. 1984. "The Social Construction of Facts and Artefacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other." *Social Studies of Science* no. 14 (3):399-441.
Pohl, C. 2008. "From Science to Policy through Transdisciplinary Research." *Environmental Science & Policy* no. 11 (1):46-53.
Ravetz, J. 2004. "The Post-Normal Science of Precaution." *Futures* no. 36 (3):347-357.
Ravetz, J. 2005. "The post-normal science of safety." In Leach, M., Scoones, I. & Wynne, B. *Science and Citizens: Globalization and the Challenge of Engagement*. London, Zed Books, p. 43-53.
Saloranta, T. 2001. "Post-Normal Science and the Global Climate Change Issue." *Climatic Change* no. 50 (4):395-404. doi: 10.1023/a:1010636822581.
Shackley, S. and Wynne, B. 1996. "Representing Uncertainty in Global Climate Change Science and Policy: Boundary-Ordering Devices and Authority." *Science, Technology & Human Values* no. 21 (3):275-302.
Silverman, D. 2004. I*nterpreting Qualitative Data: Methods for Analysing Talk, Text and Interaction*. London: Sage.
Taubenberger, J. K. , and D. M Morens. 2006. "1918 Influenza: The Mother of all Pandemics." *Emerging Infectious Diseases* no. 12 (1):15-22.
Taylor, A. L. 2005. "Governing the Globalization of Public Health." *Journal of Law, Medicine & Ethics* no. Fall 2004:500-508.
Turnbull, D. 1989. "The Push for a Malaria Vaccine." *Social Studies of Science* no. 19 (2):283-300. doi: 10.1177/030631289019002004.
von Schomberg, R. 1993a. "Controversies and Political Decision Making." In *Science, Politics and Morality: Scientific Uncertainty and Decision Making*, edited by Rene von Schomberg, 7-10. Dordrecht: Kluwer.
———. 1993b. "Introduction." In *Science, Politics and Morality: Scientific Uncertainty and Decision Making*, edited by Rene von Schomberg, 1-6. Dordrecht: Kluwer.
Webby, R. J., and R. G. Webster. 2003. "Are We Ready for Pandemic Influenza." *Science* no. 302 (5660):1519-1522.
Webster, R. G. 1997. "Predictions for Future Human Influenza Pandemic." *Journal of Infectious Diseases* no. 176:514-519.
WHO. 2007. *Working for Health: An Introduction to the World Health Organization*. Genveva: World Health Organization.
———. 2008. *International Health Regulations (2005)*. Geneva: World Health Assembly, World Health Organisation.
———. 2009. *Pandemic Influenza Preparedness and Response: A WHO Document*. Geneva: Global Influenza Programme, Health Security and Environment Cluster, WHO.

WHO. 2011. *Implementation of the International Health Regulations (2005): Report of the Review Committee on the Functioning of the International Health Regulations (2005) in Relation to Pandemic (H1N1) 2009.* Report to 64th World Health Assembly, Report number A64/10

Cited Data Sources

Ben Embarek, P. 04/05/09. *WHO Press Briefing 04/05/09,* available at: http://www.who.int/mediacentre/multimedia/swineflupressbriefings/en/index.html

Chan, M. 15/05/09. *Sharing of Influenza Viruses, Access to Vaccines and Other Benefits*, Opening Remarks at the Intergovernmental Meeting on Pandemic Influenza Preparedness, Geneva, Switzerland, [online] available at: http://www.who.int/dg/speeches/2009/pandemic_influenza_preparedness_20090515/en/index.html

———. 11/06/09. *World Now at the Start of 2009 Influenza Pandemic* Statement to the Press by WHO Director-General, [online] available at: http://www.who.int/mediacentre/news/statements/2009/h1n1_pandemic_phase6_20090611/en/index.html

———. 11/06/09b. *WHO Press Briefing 11/06/09,* available at: http://www.who.int/mediacentre/multimedia/swineflupressbriefings/en/index.html

———. 29/04/09. *WHO Press Briefing 29/04/09b,* available at: http://www.who.int/mediacentre/multimedia/swineflupressbriefings/en/index.html

———. 04/05/09. *H1N1 Influenza Situation*, Statement made at the Secretary-General's Briefing to the United Nations General Assembly in the H1N1 Influenza Situation, [online] available at: http://www.who.int/dg/speeches/2009/influenza_a_h1n1_situation_20090504/en/index.html

Council of Europe Parliamentary Assembly. 24/06/10. *Verbatim Report – Twenty-Sixth Sitting of the Parliamentary Assembly of the Council of Europe.* [online] available at: http://assembly.coe.int/Main.asp?/Documents/Records/2010/E/10062441500.htm

Flynn, P. 23/03/10. *Memorandum: The Handling of the H1N1 Pandemic: More Transparency Needed.* [online] available at: http://www.assembly.coe.int/CommitteeDocs/2010/20122329_MemorandumPandemic_E.htm

———. 07/06/10. *The Handling of the H1N1 Pandemic: More Transparency Needed.* [Doc no. 12283 – Passed by the Council of Europe 24/06/10]

Fukuda, K. 26/04/09. *WHO Press Briefing26/04/09,* available at: http://www.who.int/mediacentre/multimedia/swineflupressbriefings/en/index.html

———. 26/05/09. *WHO Press Briefing 26/05/09,* available at: http://www.who.int/mediacentre/multimedia/swineflupressbriefings/en/index.html

———. 14/05/09. *WHO Press Briefing 14/05/09,* available at: http://www.who.int/mediacentre/multimedia/swineflupressbriefings/en/index.html

———. 30/04/09. *WHO Press Briefing 30/04/09,* available at: http://www.who.int/mediacentre/multimedia/swineflupressbriefings/en/index.html

———. 04/05/09. *WHO Press Briefing 04/05/09,* available at: http://www.who.int/mediacentre/multimedia/swineflupressbriefings/en/index.html
———. 07/05/09. *WHO Press Briefing 07/05/09,* available at: http://www.who.int/mediacentre/multimedia/swineflupressbriefings/en/index.html
———. 01/05/09. *WHO Press Briefing 01/05/09,* available at: http://www.who.int/mediacentre/multimedia/swineflupressbriefings/en/index.html
———. 03/12/09. *WHO Press Briefing 03/12/09,* available at: http://www.who.int/mediacentre/multimedia/swineflupressbriefings/en/index.html
———. 05/11/09. *WHO Press Briefing 05/11/09,* available at: http://www.who.int/mediacentre/multimedia/swineflupressbriefings/en/index.html
Jefferson, T. 29/03/10. *Speech – Dr. Tom Jefferson, The Cochrane Collaboration.* [online] available at: mms://coenews.int.vod/100329_w01_w.wnv
Kieny, M-P. 24/09/09. *WHO Press Briefing 24/09/09,* available at: http://www.who.int/mediacentre/multimedia/swineflupressbriefings/en/index.html
Rivasi, M. 29/03/10. *Speech – Michele Rivasi*. [online] available at: mms://coenews.int.vod/100329_w01_w.wnv
Ryan, M. 02/05/09. *WHO Press Briefing 02/05/09,* available at: http://www.who.int/mediacentre/multimedia/swineflupressbriefings/en/index.html
Wodarg, W. 26/01/10. *Hearing on "The Handling of the H1N1 Pandemic" More Transparency Needed?"* [online] available at: http://www.coe.int/t/DC/Files/PA_session/jan_2010
WHO. 10/08/10.. *WHO Recommendations for the Post-Pandemic Period.* Pandemic (H1N1) Briefing Note 23, [online] available at: http://www.who.int/csr/disease/swineflu/notes/en/index.html