gets and grants is fierce. The pharmaceutical industry and the media only reacted to this welcome boon. We therefore need fewer, not more "pandemic preparedness" plans or definitions. Vertical influenza planning in the face of speculative catastrophes is a recipe for repeated waste of resources and health scares, induced by influenza experts with vested interests in exaggeration. There is no reason for expecting any upcoming pandemic to be worse than the mild ones of 1957 or 1968,[7] no reason for striking pre-emptively, no reason for believing that a proportional and balanced response would risk lives.

The opposite of pre-emptive strikes against worst-case scenarios are adaptive strategies that respond to emerging diseases of any nature based on the evidence of observed virulence and the effectiveness of control measures. This requires more generic capacity for disease surveillance, problem identification, risk assessment, risk communication and health-care response.[1] Such strengthened general capacity can respond to all health emergencies, not just influenza. Resources are scarce and need to be allocated to many competing priorities. Scientific advice on resource allocation is best handled by generalists with a comprehensive view on health. Disease experts wish to capture public attention and sway resource allocation decisions in favour of the disease of their interest. We referred previously to the principles of guidance on health by the British National Institute for Health and Clinical Excellence (NICE),[2] cited as "We make independent decisions in an open, transparent way, based on the best available evidence and including input from experts and interested parties."[8] Support from disease experts is crucial in delivering opinion, scholarly advice and evidence to a team of independent general scientists. But this team should independently propose decisions to policy-makers and be held accountable for them.

The key to responsible policy-making is not bureaucracy but accountability and independence from interest groups. Decisions must be based on adaptive responses to emerging problems, not on definitions. WHO should learn to be NICE: accountable for reasonableness in a process of openness, transparency and dialogue with all the stakeholders, and particularly the public.[9] ■

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The classical definition of a pandemic is not elusive

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Doshi argues cogently that the definition of pandemic influenza in 2009 was elusive but does not refer to the classical epidemiological definition of a pandemic.[1] A pandemic is defined as "an epidemic occurring worldwide, or over a very wide area, crossing international boundaries and usually affecting a large number of people".[2] The classical definition includes nothing about population immunity, virology or disease severity. By this definition, pandemics can be said to occur annually in each of the temperate southern and northern hemispheres, given that seasonal epidemics cross international boundaries and affect a large number of people. However, seasonal epidemics are not considered pandemics.

A true influenza pandemic occurs when almost simultaneous transmission takes place worldwide. In the case of pandemic influenza A(H1N1), widespread transmission was documented in both hemispheres between April and September 2009. Transmission occurred early in the influenza season in the temperate southern hemisphere but out of season in the northern hemisphere. This out-of-season transmission is what characterizes an influenza pandemic, as distinct from a pandemic due to another type of virus.

Simultaneous worldwide transmission of influenza is sufficient to *define* an influenza pandemic and is consistent with the classical definition of "an epidemic occurring worldwide". There is then ample opportunity to further *describe* the potential range of influenza pandemics in terms of transmissibility and disease severity. The emerging evidence for A(H1N1) is that transmissibility, as estimated by the effective reproduction number (R, or average number of people infected by a single infectious person) ranged from 1.2 to 1.3 for the general population but was around 1.5 in children (Kathryn Glass, Australian National University, personal communication). Some early estimates of R for pandemic influenza H1N1 2009 may have been overestimated.[3]

Severity, as estimated by the case fatality ratio, probably ranged from 0.01 to 0.03%.[4–6] These values are very similar to those normally seen in the case of seasonal influenza.[7,8] However, the number of deaths was higher in younger people, a recognized feature of previous influenza pandemics.[9]

It is tempting to surmise that the complicated pandemic definitions used by the World Health Organization (WHO) and the Centers for Disease Control and Prevention of the United States of America involved severity[1,10] in a deliberate attempt to garner political attention and financial support for pandemic preparedness. As noted by Doshi, the perceived

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need for this support can be understood given concerns about influenza A(H5N1) and the severe acute respiratory syndrome (SARS). However, conflating spread and severity allowed the suggestion that 2009 A(H1N1) was not a pandemic. It was, in fact, a classical pandemic, only much less severe than many had anticipated or were prepared to acknowledge, even as the evidence accumulated.

In 2009 WHO declared a pandemic several weeks after the criteria for the definition of a classical pandemic had been met. Part of the delay was no doubt related to the nexus between the formal declaration of a pandemic and the manufacture of a pandemic-specific vaccine. If a classical pandemic definition had been used, linking the declaration to vaccine production would have been unnecessary. This could have been done with a severity index and, depending on the availability and quality of the emerging evidence on severity, a pandemic specific vaccine may have been deemed unnecessary. Alternatively authorities may have decided to order vaccine in much smaller quantities.

The response to A(H1N1) has been justified as being precautionary, but a precautionary response should be rational and proportionate and should have reasonable chances of success. We have argued that the population-based public health responses in Australia and, by implication, elsewhere, were not likely to succeed.[11] Similarly, the authors of the draft report on the response to the International Health Regulations during the 2009 pandemic note that what happened during the pandemic reflected the activity of the virus and, by implication, not the interventions.[10]

Risk is assessed by anticipation of severity and precaution should be calibrated to risk. As Doshi has argued, we need to *redefine* pandemic influenza. We can then *describe* the potential severity range of future pandemics. Finally, we need to use evidence to assess severity early to anticipate risk. ■

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Living forwards, understanding backwards

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It has been said that pandemics are lived forwards and understood backwards. The 2009 influenza pandemic is no exception. The identification of the new influenza virus strain in the United States of America coincided with many media reports describing a very severe pneumonia affecting young Mexican adults – echoes of 1918! Hard data were sparse and quoted case fatality rates ranged from 0.3% to 2.5% of confirmed cases as late as September 2009. With the benefit of hindsight it is easy to say that the disease caused by the virus was in fact mild for most people and that this action or that action should have been taken. However, in real time with little reliable data on the effects of the virus on individuals and communities and faced with the need to make time-critical decisions, sovereign nations across the world responded differently. It is important to remember that the World Health Organization (WHO) remit is to help governments determine the level of interventions required as part of their response to threats to international health.

Unfortunately, the fact that WHO issued revised pandemic guidance just as the pandemic was starting generated confusion. Under the new guidance,[1] pandemic phases 4 to 6 differed significantly from the 2005 guideline document,[2] and this made communication difficult.

Individuals have made great play of the change to the wording of one sentence that was part of a 60-page document before phase 6 (the so-called start of the pandemic) was declared. In fact, in several places the WHO 2009 guidance document describes phases 5 to 6 as the pandemic period and clearly states that "during phases 5–6 (pandemic) actions shift from preparedness to response at a global level." From this it can be argued that the pandemic was actually declared on 29 April 2009, five days before the quoted change in definition.

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