Discussion topics from

Pandemic Influenza, 2nd Edition

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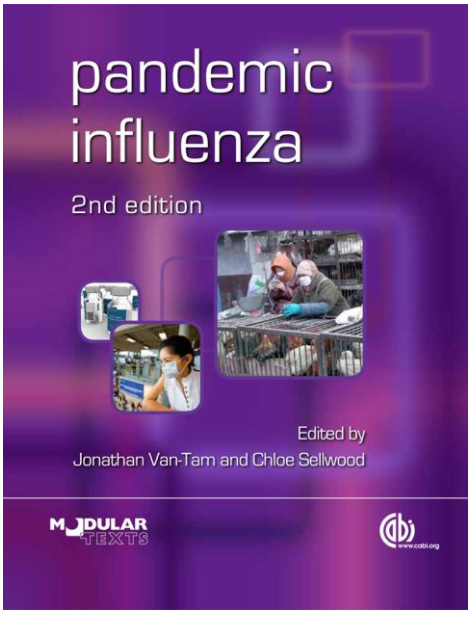

Pandemic Influenza, 2nd Edition

Edited by Jonathan Van-Tam and Chloe Sellwood

Pandemic influenza is a re-emerging disease with serious public health consequences. The A(H1N1) pandemic in 2009-10 and the continuing threat to humans from avian influenza A(H5N1) have both underlined the importance of preparedness at local, national and international levels. With a strong emphasis on practicality, this book offers comprehensive coverage of the science and operational application of influenza epidemiology, virology and immunology, vaccinology, pharmaceutical and public health measures, biomathematical modelling, policy issues and ethics, in preparing for and responding to pandemic influenza. Each chapter raises key questions and answers them in clear and concise sections, detailing relevant modelling studies and further reading. Comprehensively updated to incorporate major lessons from the 2009-10 pandemic, this second edition includes new contributions on surveillance, International Health Regulations, clinical management and local health service responses, illustrated with vibrant international case studies. Written in an easily accessible style by global experts, this is an essential text for students of public health and those involved in local, national and international pandemic preparedness and response.

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Introduction

Introduction to Pandemic Influenza was first published at the height of the 2009 pandemic. Since then, the editors have worked with international experts to update the text to reflect lessons from the events of 2009/10 across the globe.

Pandemic Influenza, 2nd Edition expands the themes from the first edition to incorporate important lessons and learning about preparedness and response from around the world. The twenty academic chapters are supported by seven country-specific case studies describing the impact of the pandemic in a range of international settings.

This short eBook contains material based on *Pandemic Influenza, 2nd Edition*, identifying key questions and providing detailed answers. The material has been included with the permission of the publishers.

Pandemic Influenza, 2nd Edition is available from the publishers with a 10% discount when ordered online. For further details and to order, please visit www.cabi.org/bookshop.

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1 Epidemiology and clinical features of interpandemic influenza

J Van-Tam and C Sellwood

What is the public health importance of interpandemic influenza?

Because of its recurrent nature, and its occurrence in short but intense epidemics the public health importance of interpandemic (or seasonal) influenza is considerable. It is estimated that in the relatively 'quiet' period between 1990 and 1999 in the USA, interpandemic influenza accounted for 36,000 deaths per annum. Short epidemic periods of intense activity also produce pressure on health services.

What is the relationship between pandemic and interpandemic influenza?

Pandemic viruses are, by definition, novel in humans. However they go on to become 'normal' interpandemic or seasonal viruses. The A(H3N2) viruses in current circulation are in fact no more than distant evolved relatives of the A(H3N2) virus that cause the 1968 pandemic. Influenza A(H1N1)pdm09 was classified as a pandemic virus in winter 2009/10 but as a seasonal virus in winter 2010-11.

What are the characteristic epidemiological features of interpandemic influenza?

Interpandemic influenza is characterized by distinct seasonality in the temperate zones of the world (winter activity), explosive epidemics typically lasting 6-8 weeks, and serological attack rates of 5-15% of whom perhaps one half become ill with symptoms.

Who carries the main burden of interpandemic influenza?

Paradoxically, interpandemic influenza is a disease of pre-school and school age children in whom the highest attack rates are recorded. However the burden of excess mortality and complications are concentrated in the very young (typically under 2 years of age), the elderly and people with underlying high-risk conditions such as diabetes, lung disease and heart disease.

"Interpandemic influenza is the technically more correct term for seasonal influenza'"

2 Influenza surveillance and pandemic requirements

J Watson and RG Pebody

What is the purpose of influenza surveillance?

Influenza surveillance provides an early warning of increasing disease activity in the population; it informs government, healthcare professionals and the wider community of the extent and severity of current and past activity, and provides information for treating, preventing and controlling influenza.

How is surveillance information used?

Information from coordinated international epidemiological and virological surveillance provides information about the potential threat to populations and the probable effectiveness of control measures. Healthcare professionals use surveillance information for individual patient management, and to organize health services to cope with epidemic periods. Surveillance gives the wider public an understanding of how likely it is that they will become ill, and businesses use the information to plan for work absences due to illness. During epidemics, surveillance data is used to estimate the impact of influenza on the whole population as well as on specific subgroups and measure the effectiveness of interventions - in particular influenza vaccine.

What are the different types of surveillance information?

There are many sources of influenza surveillance data including: consultations in primary care, hospital admissions, virological data, death registrations, laboratory virology data, sickness absence data, calls to health help lines and internet queries on influenza, and sales of over-the-counter cough, cold and flu remedies.

What are the key elements of pandemic influenza surveillance?

The key elements of pandemic surveillance are early identification of novel influenza virus activity, assessment of the epidemiological and virological characteristics of early cases of confirmed pandemic influenza, monitoring spread and impact, assessing severity and monitoring of countermeasures.

"Surveillance: the on-going systematic collection and analysis of data to inform action to prevent and control a disease."

3 Virology and immunology

L Haaheim and J Oxford

How do antibodies against haemagglutinin (HA) and neuraminidase (NA) differ in the way they interfere with the viral replication cycle?

Antibodies against HA will bind to the virus and prevent it binding to the host cell, i.e. the antibodies are neutralizing. Antibodies to NA will typically block or reduce the release of newly made virus particles from an already infected cell, i.e. these antibodies will dampen the replication of virus and thus reduce the clinical symptoms and how contagious an infected individual is to others.

How do the adamantane and neuraminidase-inhibitor drugs work?

The adamantane drugs interfere with the proton transport function of the M2 protein (the ion channel) located in the viral membrane (hence are known as M2-channel blockers). As a consequence, genetic material from the virus cannot enter the cell and take advantage of the cellular machinery, and the replication cycles come to a halt. The neuraminidase-inhibitor drugs block the function of the viral NA enzyme and thus inhibit the release of newly made virus particles from an already infected cell.

What role does cell mediated immunity play in combating influenza infection?

Cell-mediated immunity will not block the initial infection but rather destroy virus-infected cells. This is a reciprocal cooperation between the humoral (antibody generating) and cellular (cytotoxic T-cells) arms of the immune response, thus strengthening and modifying both.

What is immunological memory?

Immunological memory is the adaptive immunity's ability to respond quicker and stronger to a subsequent stimulation of foreign material. This foreign material can be a new infection with an identical or related virus. When we are 'primed', i.e. have experienced an earlier encounter with an infectious agent or a vaccine, the memory so generated will help us combat a subsequent infection much more efficiently.

"Cross-protective immunity: where immunity to one antigen provides partial or complete protection against similar antigens."

4 Influenza in birds and mammals

LA Reperant and ADME Osterhaus

What is the significance of influenza in wild and domestic birds?

Wild birds are the natural reservoir for influenza A viruses; avian influenza viruses encompassing virtually all possible combinations of the 17 haemagglutinin (HA) and nine neuraminidase (NA) types described to date have been isolated in wild aquatic birds. The degree of virus reassortment constantly taking place is immense. Coupled with favourable conditions for virus persistence in the immediate aquatic environment, conditions for the emergence of novel influenza viruses are almost ideal.

Why is influenza in the pig considered important?

Domestic (farmed) pigs appear susceptible to both avian and human influenza A viruses. As such they provide a "mixing vessel" for viruses and facilitate cross-species transmission of viruses from birds to pigs to humans, and vice versa.

Is avian influenza A(H5N1) still a threat to humans?

Highly pathogenic avian influenza A(H5N1) viruses have become endemic in domestic poultry in parts of South-East Asia, the Middle East and West Africa. Because of their known ability to cause severe disease in humans, they pose a sustained pandemic threat to humans. The occurrence of the last pandemic due to A(H1N1)pdm09 has neither reduced nor increased the threat posed by A(H5N1) and other avian influenza viruses, notably those of the A(H7) and A(H9) subtypes.

What are the major risk factors for zoonotic influenza transmission?

Major risk factors for zoonotic transmission of influenza to humans include: slaughtering, de-feathering, butchering and preparation of meat for consumption. There is serological evidence that occupational groups involved in close contact with poultry, swine and their raw products are at increased risk from cross-species transmission.

"Zoonosis: a disease that is passed from an animal to a human."

5 History and epidemiological features of pandemic influenza

A Monto and C Sellwood

Which influenza A subtypes caused the most recent pandemics?

The pandemics of the 20th century were caused by three different subtypes of influenza: A(H1N1), A(H2N2) and A(H3N2). The first pandemic of the 21st century was caused by an A(H1N1) virus different to the one in 1918. All varied in the age groups affected and numbers of deaths.

When was the worst pandemic?

The 1918 A(H1N1) pandemic was the worst pandemic on record. Cases occurred in three waves, with the second wave being the most severe in most countries, and an estimated 40 million deaths occurring worldwide. Young adults aged 20-40 were severely affected by the virus.

Have pandemics occurred in earlier history?

Pandemics appear to have occurred throughout history, the first being recognized in 1580; however we cannot be certain that pandemic events prior to 1889 were definitely attributable to the influenza. There is evidence of antigenic recycling of subtypes A(H1), A(H2) and A(H3).

What can we predict about the epidemiology of the next pandemic?

Reviewing previous pandemics can give an indication of what might be expected, however nothing is certain. It is impossible to predict the next pandemic virus or its impact, as demonstrated by the 2009 A(H1N1) pandemic.

"Antigen recycling: the sequential re-emergence of a limited number of influenza subtypes in humans."

6 Epidemiology of pandemic influenza A(H1N1)pdm09

J McMenamin and J Van-Tam

What were the main timelines of the 2009 pandemic?

The 2009 pandemic was officially declared on 11 June 2009. In reality, the first cases of A(H1N1)pdm09 occurred in Mexico between January and March 2009, followed shortly by early first waves in north America, the UK and across the southern hemisphere countries in spring 2009; and a second more widespread northern hemisphere wave in autumn/winter of the same year. Of note, many central and sub-Saharan parts of Africa did not experience appreciable pandemic activity until the early months of 2010. After the pandemic was declared over on 10 August 2010 there were effective 'third waves' of A(H1N1)pdm09 disease in both southern then northern hemispheres in the following winter seasons.

What were the characteristic epidemiological features of A(H1N1)pdm09?

Epidemiologically, the 2009 pandemic was characterized by highest attack rates in children (of whom at least one half had asymptomatic illness) and very substantial sparing of people born before 1956. Known risk factors for severe disease (underlying chronic illnesses and pregnancy) were confirmed along with new ones such as obesity. As in previous pandemics, a high burden of disease was noted in some indigenous populations.

What was the mortality impact of the 2009 pandemic?

Although generally mild with an estimated case fatality rate of 0.02%, and low impact on excess mortality, the age distribution of deaths due to A(H1N1)pdm09 imply that in terms of years of life lost, the impact of the 2009 pandemic was not dissimilar to the 1968 A(H3N2) pandemic.

What will happen next regarding the A(H1N1)pdm09 virus?

The influenza A(H1N1)pdm09 virus seems to have entirely replaced the old 'seasonal' A(H1N1) virus that circulated previously. However, in the immediate post-pandemic period it has not exerted clear dominance over A(H3N2) and influenza B, both of which continue to circulate alongside the new virus. What happens next is unknown, and simply cannot be guessed.

"Epidemiology: the study of the patterns of disease in populations."

7 Clinical features and treatment of pandemic influenza A(H1N1)pdm09

S Jain

What were the main presenting symptoms of A(H1N1)pdm09 infection?

Patients with A(H1N1)pdm09 presented with a wide variety of symptoms that were not readily distinguishable from those encountered with interpandemic or seasonal influenza, although vomiting and diarrhoea were both considerably more common.

Once infected, what was the likely prognosis?

Most patients experienced mild or asymptomatic disease, and only around 1% required hospitalisation. Once infected, the elderly and the very young carried the highest risk of complications and although rarely infected, case fatality rate was highest in the elderly. The prognosis was observed to be worse in patients with underlying conditions, pregnant women, and the morbidly obese.

What are the cornerstones of modern medical care for severe influenza?

The cornerstones of medical treatment for patients with severe disease are (according to need): supplemental oxygen, restoration of fluid balance, influenza antiviral agents, and antibiotics (for bacterial complications).

Were there any special features of A(H1N1)pdm09 infection?

In hospitalised patients, a notable and somewhat unexpected feature of A(H1N1)pdm09 was the very high proportion (15-20%) of patients who required management on an intensive care unit. For the first time, extracorporeal membrane oxygenation (ECMO) was deployed in well-resourced settings to manage the most gravely ill patients.

"A(H1N1)pdm09: the term used by the WHO to denote the virus which caused the 2009 pandemic."

8 Influenza transmission and infection control issues

J Enstone and B Killingley

What factors influence influenza transmission?

Many factors could influence the likelihood and routes of influenza transmission in a given setting. These include: environmental factors (e.g. temperature, humidity and ventilation); virus properties; the setting for human interactions (e.g. home, school, workplace, healthcare); symptoms, virus shedding and social behaviour of infected people; the age and immune status of those exposed.

Based on the available evidence, what can be said definitively about routes of transmission?

Whilst there is strong evidence for virus survival on touched surfaces, the evidence proving that this is a potent means of influenza transmission is lacking. The evidence for droplet and aerosol transmission is incomplete; both may play important roles but evidence is lacking to establish a clear hierarchy of importance between the two. It seems clear that influenza is spread by short distance transmission (3-6ft); there is little evidence to support long distance transmission.

What practical measures can be used to reduce influenza transmission in healthcare settings?

Until more data become available, sensible practical measures that can be recommended for reducing influenza in healthcare are: isolation; cohorted care for larger numbers of patients; 'standard' and 'droplet precautions' for close patient contact; and respirators for known or suspected aerosol-generating procedures.

Do face masks and respirators work in preventing influenza?

The evidence that facemask or respirators work to prevent influenza transmission remains inconclusive. This does not mean they should not be used in healthcare settings as precautionary measures. However in general settings, there is more evidence to support masking of the infected person (to prevent spread to others) than for masking to protect the wearer.

"Infection control measures: measures intended to reduce the risk of disease transmission from infected to uninfected people."

9 Pandemic preparedness

CS Brown and M Hegermann-Lindencrone

What are the most important features of national pandemic preparedness planning?

Key elements of national pandemic preparedness planning include: leadership; a coordinating framework (usually via a national multi-agency committee); flexibility and adaptability of arrangements; providing guidance and support for subnational planning; communication and coordination; command and control; building capacity and expertise from national down to local level; exercises and simulations; evaluation of response.

Did preparedness activities improve our response to the 2009 pandemic?

Although revealing problems and issues, national and international evaluations of the response to the 2009 pandemic, overall suggest that the intensive pandemic planning undertaken since 2004 proved worthwhile.

Which areas of pandemic preparedness need to be improved?

Areas of pandemic planning specifically identifiable as in need of improvement in the post-pandemic period include: increasing flexibility and adaptability of response at national level; planning for intensive care provision; communication with the public and healthcare workers, especially with regard to uncertainty and pandemic vaccines; and logistic arrangements for antiviral drugs and vaccines.

"Inter-operability: how countries and organisations might plan to act that is compatible with each other."

10 Emergency preparedness and business continuity planning

A Wapling and C Sellwood

How does pandemic influenza preparedness differ from more standard emergency preparedness?

Pandemic preparedness addresses a 'rising tide' event that lasts over an extended period of time with little scope for mutual aid, whereas more standard emergency plans are aimed at 'big bang' events where the duration of the incident is likely to be short-lived and mutual aid is more likely to be available.

What is the key aspect of pandemic preparedness planning?

Flexibility in planning a response is the most important aspect of pandemic preparedness to ensure that responders can meet the challenges of the real event.

What is the biggest challenge to the health sector in planning for and responding to a pandemic?

Pandemic preparedness and response in the health sector effectively considers two types of incident that must be managed concurrently. Not only is there an increase in patients with influenza and associated complications, but there may be fewer staff available due to increased sickness absence. The same number of emergency cases (e.g. cardiac patients, road traffic injuries, obstetric patients etc.) must still be managed, with potentially fewer staff

What is the role of business continuity planning (BCP) in pandemic preparedness?

An influenza pandemic will affect all sectors of society over an extended period of time. The impact of such extended interruption should be considered through generic BCP in the first instance. Issues which cannot be addressed through BCP should then be considered individually.

"Emergency preparedness: the process of identifying, assessing and addressing risks."

11 Pandemic exercises and simulations

J Simpson

What are the main types of exercises that can be used in pandemic influenza preparedness?

There are three main types of exercises that can be used towards pandemic preparedness: desktop or tabletop exercises, command post exercises and live exercises.

Why is it important that health sector pandemic influenza exercises involve partner organizations?

Pandemic influenza could generate many non-health issues (e.g. business continuity issues due to high levels of staff absence). The whole-of-society effect means exercises are much more valuable when they explore a coordinated, multi-agency approach.

Why is time a problem in the design of pandemic influenza exercises?

The extended length of time of an influenza pandemic wave means real-time exercising is appropriate only for exploring issues over a small part of the pandemic event. To address this, methodologies have been developed to allow coherent play across the time span of a pandemic wave such as the time-block methodology.

Why has the development of 'off-the-shelf' exercises been important in pandemic influenza preparedness?

There has been a great demand for exercises to explore pandemic influenza responses. The limited number of expert staff available cannot design and run exercises for every organization that wishes to run them, and have needed to concentrate on designing the more complex exercises with a wide scope. An 'off-the-shelf' package, designed by a specialist unit, allows organizations to run a more simple exercise design using their own staff resources and expertise.

"Exercise: a process of testing and refining plans through simulation."

12 Local health service response to A(H1N1)pdm09 pandemic influenza

M Regan and C Packham

What are the challenges to a local pandemic response?

The local pandemic response needs to be tailored to the characteristics of the virus, the local population's response to it, and the realities of health service delivery in a given locality. National strategy defines what is required regarding antiviral drugs, vaccination schedules, risk groups, and reporting and surveillance; but the local response is operationally focused – concerned with how things actually get done.

What were the key local functions of the initial response phase in the UK?

The initial local response phase saw activities aimed at assessment, surveillance and containment. This included rapidly detecting and responding to suspected cases and attempting to prevent community transmission through antiviral treatment and prophylaxis. Clinical epidemiological information was collated and shared to inform local and national actions and policy. There was intense planning in anticipation of the next phase, and constant local communication.

What were the key aspects of the UK's treatment phase?

The UK treatment phase saw the establishment of services to offer treatment antivirals to patients who met pre-defined symptomatic clinical criteria. The National Pandemic Flu Service (NPFS) was activated in England on 23 July 2009 to provide an online and telephone self-assessment service and local Antiviral Collection Points (ACPs). By the time of its closure on 11 February 2010, NPFS had supplied antiviral drugs to 1.2 million people.

How was primary and community care supported during the pandemic?

Primary care was supported through the provision of information about national, regional and local support services; provision of clinical and epidemiological information; and resilience and business continuity planning. Secondary care was supported through business continuity planning to address surges in demand at Emergency Departments, staff sickness, utilities and supply chain robustness, intensive care capacity, plans to stop elective care if needed. All of this was supported through multi-agency partnership working at local and regional level.

"Defence in depth: combinations of countermeasures that when taken together are likely to be more effective than single measures."

13 Bio-mathematical modelling and pandemic preparedness

P Grove

What is modelling and what is its role in pandemic preparedness?

Mathematical epidemiological 'modelling' is the construction of a simplified description of the transmission of disease in a population which can be analysed mathematically.

What can modelling tell us, and what can't it tell us?

Modelling can only be as good as the assumptions made in constructing the model and the parameters used in the numerical description. For a pandemic virus there are few data and a large range of plausible assumptions. We cannot, therefore, make forecasts of what *will* happen in a pandemic. The role of modelling before a pandemic is to tell us how bad a pandemic *might* be, and what countermeasures have a realistic possibility of having a significant effect across the large range of uncertainty about the nature and behaviours of the pandemic virus.

How does modelling actually work?

Modelling is not about simply building a model and then 'running it' to find the answer. Reliable results need to be based on a consensus of the views of different modellers using different models. Off the shelf (or 'off the internet' models) should be treated with caution.

What did modelling contribute towards the 2009 pandemic response?

Modelling was used extensively during the 2009 pandemic response. Although it was not possible to be precise in the early stages, as more information became available to feed into the models (e.g. serology data, and data from the southern hemisphere first wave) the accuracy with which the size of second wave in the northern hemisphere could be predicted improved dramatically.

"Real time modelling: short range forecasting based on current events to understand an evolving situation"

14 Pharmaceutical Interventions

J Van-Tam and WS Lim

What antiviral drugs are available to treat influenza?

M2 channel blockers and neuraminidase inhibitors (NAIs) are available for the treatment and prophylaxis of influenza. NAIs are vastly superior and have far fewer side effects

What will be their most likely public health benefits during a pandemic?

Although the effectiveness of NAIs against a future pandemic virus cannot be known in advance, it is likely that they will reduce the duration of symptoms, complications, hospitalisations, severe outcomes and mortality. Data from the 2009 pandemic are still being analysed but the advantages of early versus late initiation of therapy are already clear. The 2009 experience has demonstrated that NAIs can be used safely in a widespread fashion, and that they may be the only specific pharmaceutical intervention available for up to 6 months until vaccines are manufactured.

Which antiviral drugs should be stockpiled?

Although virus resistance to NAIs did not become widespread in 2009-10, this future possibility cannot be eliminated for a future pandemic virus; thus, a mixed stockpile of NAIs is recommended, including an intravenous formulation for patients with severe disease.

Is there a role for antibiotics in pandemic preparedness?

Antibiotics should be stockpiled in anticipation of secondary bacterial complications in 15% to 20% of pandemic influenza cases; broadly they should offer cover against *S. pneumoniae*, *S. aureus* and *H. influenzae* when used empirically. The precise choice of antibiotics should always be decided upon and reviewed regularly in the light of what is known about patterns of antibiotic resistance

"Neuraminidase inhibitors: drugs specific to influenza that block the release of new virus from infected cells."

15 Pandemic vaccines

P Carrasco and G Leroux-Roels

What is the relationship between seasonal and pandemic influenza vaccines?

Increasing the use of seasonal influenza vaccines will be decisive in manufacturing a pandemic influenza vaccine when one is needed. The manufacturing capacity and global demand for seasonal vaccines provides the infrastructure and a platform for switching rapidly to pandemic production. Public acceptance of and familiarity with seasonal vaccination is important in terms of subsequent acceptance of pandemic vaccination.

What were the biggest successes related to the manufacture and use of pandemic vaccine in 2009-10?

At the beginning of the 2009 pandemic, global pandemic vaccine production capacity stood at no less than 900 million doses per annum and possibly as much as 3 billion doses. From a standing start in late April 2009, most manufacturers had begun releasing pandemic vaccine in large quantities within 5-6 months. This was neither slower nor faster than anticipated, but emphasizes the need for new rapid manufacturing technologies and 'universal' influenza vaccines that can be stockpiled or given in advance.

What were the biggest challenges related to the manufacture and use of pandemic vaccine in 2009-10?

The biggest challenges related to pandemic vaccine in 2009-10 related to four main areas: a discordance between the appearance of the main pandemic wave and vaccine availability in many countries; global equity of supply; public acceptance of pandemic vaccine, often related to communication issues; and the logistics of vaccine delivery to frontline vaccinators.

"Pre-pandemic vaccines: vaccines that are produced in advance against a virus considered likely to cause a pandemic."

16 Public health measures

A Nicoll and V Lopez Chavarrias

What is meant by the term public health measures?

Public health measures can be defined as group actions taken that are intended to reduce human-to-human transmission of influenza and mitigate the adverse effects of a pandemic. Some actions are really individual actions designed to give personal protection (e.g. hand washing, mask wearing) or even treatment (e.g. taking of antiviral drugs and use of vaccines) but when taken en masse can result in overall reductions in transmission, and so have a public health benefit.

From the available data and analyses, what could be the value of public health measures in terms of health outcomes?

Many of the measures would have some impact in terms of reducing transmission although they are less than might be at first imagined, because even if influenza is stopped by one route or in one setting it may well encroach through another. The greatest impact may, therefore, be through using multiple measures 'in layers' or 'defence in depth'. Then the effects may be additive, but so will be the costs and disruption.

Can the same measure be applied in all circumstances?

The same measures should not necessarily be applied in all circumstances. Each pandemic studied so far has had some distinct features implying different responses. Nevertheless, there need to be default sets of recommended public health measures. Also, because of different circumstances in different countries, the measures will not be implementable equally or have the same effect in every country.

What suggested measures are likely to be the most helpful and which the least?

It is difficult to determine which of the suggested measures is likely to be most helpful and which the least, as this depends on the circumstances and the pandemic. Furthermore, there are some suggested measures for which the evidence of effectiveness is simply unknown. However, there are some that we know will not be effective in a pandemic or they are simply impractical – such as trying to screen people at borders (does not work), sealing borders (usually impractical), and mass case finding, contact tracing and PEP (exhausting and largely ineffective).

"Protective sequestration: when healthy people attempt to isolate themselves to reduce the risk of exposure to an infection."

17 Port Health and International Health Regulations

D Hagen

How rapidly can pandemic influenza spread between countries?

Dissemination from the epicentre to neighbouring countries will be extremely rapid. Many of the first cases of influenza A(H1N1)pdm09 in Europe were reported in travellers returning from Mexico or the USA within a few days of the outbreak being announced and cases rapidly emerged in countries as far away as New Zealand.

What are the International Health Regulations (IHR)?

The International Health Regulations (IHR) were first issued by WHO in 1951 as the International Sanitary Regulations specifically to prevent the spread of six quarantinable diseases. In 1969 they were renamed the IHR and were updated to reflect further public health issues. The current IHR are legally binding on 194 countries who have agreed to their adoption.

Could the spread of disease be interrupted by travel-related countermeasures?

Travel-related countermeasures such as border controls, screening and forced reductions in international travel are highly unlikely to interrupt or delay the spread of a pandemic, alone or in combination. A 90% delay on European air travel could delay the peak of the pandemic by less than two weeks. Restrictions on travel from specific locations would also be ineffective due to indirect passenger flows.

What does WHO advise as effective measures that can be undertaken at ports?

Provision of information to travellers (e.g. risks to avoid, symptoms to look for, when to seek care) is a better use of health resources than formal screening. Entry screening of travellers at international borders will incur considerable expense with a disproportionately small impact on international spread, although exit screening should be considered in some situations.

"Quarantine: applies to people who may or may not be infected but are not ill."

18 Socio-economic impact

T Szucs and P Blank

What are the potential socio-economic impacts of an influenza pandemic?

Socio-economic impacts include population mortality and morbidity; impacts on specific businesses such as pharmaceuticals, health and social care; impacts on wider business e.g. through staff absenteeism, disruption to supplies or markets; and wider societal impacts such as to schools and education.

How might pandemic influenza mortality and morbidity differ to patterns seen with seasonal influenza?

Seasonal influenza typically afflicts the very young, old and those with a weak immune systems or chronic disease. However the 1918 pandemic saw the greatest impact in working-age adults, while 80% of fatal cases in the 2009 pandemic were in people under 65 years of age.

How big could the financial impact of a pandemic be and where could it be felt?

Modelling indicates that the global financial costs of a pandemic could be up to several trillion US dollars. These costs could be felt across societies through increased healthcare requirements, loss of productivity, and early deaths, as well as through pandemic preparations (e.g. allocation of resources to pandemic preparedness over other health problems). Work place absenteeism will be dictated by the severity of the pandemic, but will be at least as bad as the clinical attack rate.

What aspects of business might be impacted by a pandemic?

A severe influenza pandemic could cause industrial output to decline to a level consistent with the recessions that have occurred since the end of World War II. Some sectors of the economy are likely to face bigger declines than others. In particular tourism, entertainment, mass transport, restaurants, large social gatherings and hotels. The insurance business would also suffer appreciably due to the morbidity and mortality of influenza cases. Conversely, other businesses may see a surge in demand: there may be an increase in online purchasing (especially for groceries) and there will inevitably be elevated demand for over-the-counter healthcare products and environmental cleaning/ disinfectant products.

"Excess mortality: the number of extra deaths due to influenza that would not have occurred anyway due to other factors."

19 Ethical issues related to pandemic preparedness and response

E Gadd

How should ethical issues be dealt with in preparing for, and responding to, pandemic influenza?

All decisions that affect people have an ethical dimension, so ethical issues need to be integrated into the preparations for, and response to, pandemic influenza.

Do health professionals have an unlimited obligation to care for patients regardless of the risk to themselves?

Health professionals have a strong duty to care, but it is not unlimited. Willingness to care is enhanced by recognising reciprocal obligations to health professionals (e.g. to consult them, provide protective equipment and keep them informed of developments).

In what circumstances can countries impose mandatory measures to control people's behaviour?

Mandatory measures can only be imposed if voluntary measures would be ineffective, and must meet certain legal criteria if they are to be legitimate.

How can prioritisation decisions be addressed in an ethical way?

Criteria for prioritisation decisions need to be subject to wide public discussion. Such criteria will involve a balance between ethical principles of utility and of fairness and must avoid unjustified discrimination

"Decisions concerning pandemic preparedness and response always have an ethical dimension."

20 Communications

T Abraham and D Pople

Why is proactive communication important?

The WHO states that proactive communication is important because it 'encourages the public to adopt protective behaviours, facilitates heightened disease surveillance, reduces confusion and allows for a better use of resources – all of which are necessary for an effective response'.

What are the challenges of pandemic communication?

A pandemic can be a long running event, and severity can change over its course. This can require rapid updating as well as being a challenge to hold public attention when a pandemic has been in progress for several months and complacency may have set in. The length and variability of a pandemic (e.g. how different groups of the population are affected) can also lead to public distrust of health authority advice.

What are the principles of pandemic communication?

The principles of pandemic communication are: maintaining trust, early announcement, transparency, and listening to and understanding the public.

How important is social media in pandemic communication?

The 2009 pandemic was the first influenza pandemic of the internet age. Websites and social messaging services (e.g. Twitter ® and Facebook ®) are a quick and efficient way to provide up to date information for the public. However, the internet can also rapidly transmit rumours and misinformation and health authorities need to know how to respond to this. The global nature of the internet means that public health authorities are faced with the challenge of responding to rumours that might originate anywhere in the world.

"Communication between the authorities, the public and other stakeholders is essential to a successful pandemic response."

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