TECHNICAL REPORT

Guide to public health measures to reduce the impact of influenza pandemics in Europe: 'The ECDC Menu'

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Glossary

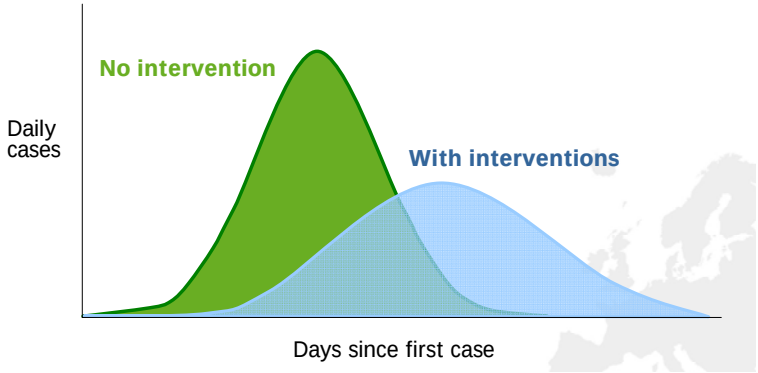
Asymptomatic infections:	Infections that do not cause any symptoms.
Boundary issues:	Deciding how to divide populations into those receiving and not receiving a treatment. E.g. who is and who is not a social contact of a case.
Case fatality rate (CFR):	The proportion of people infected that die as a consequence of their infection.
Infection control:	A collection of measures intended to reduce the risk of transmission from an infected person to uninfected persons (e.g. hand and respiratory hygiene, masks and respirators, disinfection).
Interoperability:	An imprecise term applied to a bundle of ideas as to how countries might plan to act before and during a pandemic (Table 3). It is recommended to consider each of these ideas separately.
Isolation:	Applies to people experiencing illness, meaning separation or restriction of movement of ill persons with an infectious disease to prevent transmission to others.
Non-pharmaceutical interventions:	Measures that do not include pharmaceutical products such as vaccines and drugs.
Personal protective measures:	Infection control measures that individual people can undertake, e.g. hand-washing.
Presymptomatic infections:	Infections early in the incubation period that have not yet caused clinical symptoms.
Protective sequestration:	A term used to describe when healthy people attempt to isolate themselves to reduce the risk of exposure to an infection.
Quarantine:	Applies to people exposed, who may or may not be infected but are not ill. It means separation or restriction of movement of exposed persons who may become infectious to others.
Reproductive number or R_0:	The average number of people that one person with influenza will infect (usually meaning in the absence of applying countermeasures).
Respirators:	Specialist masks that can prevent the transmission of very small particles, e.g. infectious organisms transmitted in aerosols.
Respiratory hygiene:	Use and disposal of tissues to cover mouth and nostrils when coughing and sneezing and their proper disposal.
Secondary effects:	The costs, risks and consequences of applying the Public Health Measures.
Social distancing:	An imprecise term often applied to the collection of measures intended to decrease the frequency of contact among people, therefore possibly reducing influenza transmission. It is considered by most authorities better to describe specific measures.
Surgical masks:	Masks worn when undertaking surgical procedures, mostly intended to prevent droplet transmission of respiratory infections from the wearer. This type of mask is not able to protect against infections in aerosols.
Work quarantine:	This has two different meanings: 1) When quarantine is observed or special measures taken by health or social care workers who have been exposed and who work in a setting where influenza is especially liable to transmit (or where there are people at higher risk from infection). Examples would be people working in old people's homes and nurses in high risk settings (e.g. neonatal care nurseries, intensive care units). 2) Another meaning is from the time of SARS, when some healthcare workers chose to stay away from their families when off-duty so as not to carry the infection home, a practice seen earlier among nurses at the time of Spanish Influenza.

Executive summary

Application of public health measures (see Summary Tables) will, to some extent, reduce the number of people who are infected, need medical care and die during an influenza pandemic. They will probably also reduce the numbers affected by severe epidemics of seasonal influenza. By lowering and perhaps delaying the peak of a pandemic curve (Figure 1) the measures could also mitigate the secondary consequences of pandemics that result when many people fall sick at once, i.e. the impact of mass absenteeism on key functions such as delivering healthcare and maintaining food supplies, fuel distribution and utilities, etc. Public health measures may even delay the peak of the epidemic curve of a pandemic until nearer the time a pandemic vaccine starts to become available, thereby possibly also reducing the total numbers affected. In addition, theoretically, they may delay the peak until influenza transmission declines naturally in the summer months.

Figure 1. Objectives of applying public health measures during a pandemic

- Delay and flatten epidemic peak
- Reduce peak burden on healthcare systems and threat to other essential systems through high levels of absenteeism
- Somewhat reduce total number of cases
- Buy a little time



A range of measures have been suggested (see Summary Tables), including personal actions, like hand-washing and mask-wearing, and pharmaceutical interventions such as antivirals, human avian influenza vaccines (also called pre-pandemic vaccines) and, late in the pandemic, specific vaccines, as well as community social distancing measures. It is thought by many that combinations of measures will be even more effective than single measures, so called 'defence in depth' or 'layered interventions'. Both modelling work and common sense suggest that early interventions will be more effective than waiting until a pandemic is well advanced.

It is hard to imagine that measures like those within the category of social distancing would not have some positive impact by reducing transmission of a human respiratory infection spreading from human to human via droplets and indirect contact. However, the evidence base supporting each individual measure is often weak. It is also unclear how a number of them will interact. Specifically, will the effect of social distancing measures be cumulative? In some cases this lack of clarity is due to a lack of research (see Section 'Research implications'). More often it is because the measures are hard to evaluate with any experimental approach and when measures have been implemented in real situations they have been used in combination. Hence the absolute positive effect and relative strengths of different measures are extremely hard to judge. Also, the strength of effect could quite reasonably vary with the characteristics of the pandemic. For example, interventions targeting children might have been quite effective during the 1957 pandemic where transmission in younger age groups seems to have been especially important, but they would have been less effective during the 1918–19 and 1968 pandemics. Hence it will not be possible to have fixed plans that fit every pandemic. Furthermore, the effectiveness, feasibility and costs of social distancing measures will presumably vary among European countries or even within countries (for example, dense urban areas compared with rural areas).

The experience of previous pandemics and related events like SARS shows that to some extent public health measures are applied according to local customs and practice. In the United States during the 1918–19 pandemic these were organised and often proactive (Markel 2007), while in Europe during pandemics and during SARS they were more often reactive (see list of tables, from page 36).

Hence there are good arguments that there should be default plans (plans that have been tested during exercises to be implemented in the absence of other information). Indeed there is WHO guidance to that effect and many European countries have been developing plans. However, given the above considerations, these plans should have considerable flexibility and command and control structures that will allow changes to be made quickly in the light of new data and experience.

All public health measures have costs and many also have secondary effects. The secondary effects of most measures can be considerable and many will require careful consideration. The more drastic societal measures that have been suggested (e.g. proactive school closures and travel restrictions) have significant costs and consequences that will themselves vary by their setting. These are also difficult to sustain. Hence for ordinary seasonal influenza or a mild pandemic their application, and especially their early application, could be more damaging than just allowing the infection to run its course and treating those with more severe illness.

Some of the measures are relatively straightforward to implement and are already recommended for even mild seasonal influenza (e.g. regular hand-washing and early self-isolation when developing a febrile illness). These also have the advantage of empowering individuals and giving them useful advice at a difficult and worrying time. Others are going to be difficult to implement or are too costly (e.g. timely mass use of antivirals by those becoming sick) and others are potentially highly disruptive to societal functions and difficult to sustain (e.g. border closures, internal transport restrictions). Therefore all the measures require Planning, Preparation and Practice.

The point about costly and disruptive measures is crucial. During a pandemic with lesser severe disease and of fewer falling sick, such as those seen in 1957 and 1968, some possible community measures (proactive school closures, home working, etc.), though probably reducing transmission, can be more costly and disruptive than the effects of the pandemic itself. Hence such measures may only have a net benefit if implemented during a severe pandemic, for example one that results in high hospitalisation rates or has a case fatality rate comparable to that of the 1918–19 'Spanish flu'.

For these reasons, early assessment of the clinical severity of a pandemic globally and in European settings will be crucial. Though early implementation of measures is logical, application of the more disruptive interventions too early will be costly and may make them hard to sustain.

A number of European countries are now considering their policy options for these measures. Because of Europe's diversity, no single combination of measures will suit every European setting: one size will not fit all. However, common discussions on the measures will be helpful and make for a more efficient decision-making process. Further, some countries have already undertaken considerable relevant scientific work, some of which this document draws upon, but which all European countries could benefit from along with thinking from other countries.

Purpose: In the light of the above considerations, and given that ECDC's mandate is to give scientific advice rather than prescribe actions, the intention with this document is to present a menu of possible measures, giving public health and scientific information on what is known or can be said about their likely effectiveness, costs (direct and indirect), acceptability, public expectations and other more practical considerations. This is to help European Member States and EU institutions, individually or collectively, decide which measures they will apply. That said, there are some measures which are either so self-evident or so ineffective that simply laying out the evidence should make for easy policy decisions.

Audience: The primary intended audience is those who develop policy and decision-makers, though secondary audiences are all those concerned with influenza, the public and the media. The understanding by the latter of the measures and their limitations will be crucial to their successful application in a pandemic.

Scope: When the pandemic is spreading in Europe in WHO phases 5 or 6 of a pandemic. This document also applies when there are epidemics of seasonal influenza. It does not address the different circumstances of phase 4, the unique needs of the first emergence of a putative pandemic strain (the WHO Rapid Containment Strategy), nor the complex planning and policy issues that arise over how to sustain key services during a pandemic (so-called business continuity planning for a pandemic). The latter is, in any case, outside the remit of ECDC.

The document should be read along with previous guidance that ECDC has published on personal protective measures. This is summarised in the text and tables. Relevant scientific guidance concerning human avian influenza (pre-pandemic) H5N1 vaccines has been published and is referenced within the text. The guidance should be read with the current (2005) WHO guidance, which is reproduced in the Annex, with permission from WHO's 2005 pandemic plan and the new WHO Guidance on countermeasures (to be published later in 2009).

Please note that this is an interim guidance as there will be further research findings and it is possible that new countermeasures will emerge. Therefore the menu will continue to be updated at intervals.

Summary Tables: Characteristics of potential interventions to reduce transmission during phase 6 of a pandemic/severe epidemic of seasonal influenza (see pages 18 to 34 for detail and evidence)

International travel (border closures, entry restrictions, travel advice)

Intervention	Quality of evidence[1]	Effectiveness (benefits)	Direct costs	Indirect costs and risks[2]	Acceptability in Europe	Practicalities and other issues
1. Travel advice	B	Minimal	Small	Massive	Good	International travel will probably decline massively anyway
2. Entry screening	B, Bm	Minimal	Large	Large	May be expected by resident population	International travel will probably decline anyway
3. Border closures or severe travel restrictions	B, Bm	Minimal unless almost complete	Massive	Massive	Variable but may be expected by some in the resident populations	International travel will probably decline anyway

Personal protective measures

Intervention	Quality of evidence	Effectiveness (benefits)	Direct costs	Indirect costs and risks	Acceptability in Europe	Practicalities and other issues
4. Regular hand-washing	B	Probably reduces transmission	Small	Nil	Good, but compliance is unknown	Moderate[3]
5. Good respiratory hygiene (use & disposal of tissues)	B	Unknown but presumed	Small	Small	Good, but compliance is unknown	Small
6. General mask-wearing outside the home	C, Cm	Unknown	Massive	Small	Unknown but little culture of mask-wearing in most countries	Massive – difficulties of training, supply and types of masks, disposal and waste. May be perverse effects from misuse and re-use
7. Mask-wearing in healthcare settings[4]	C	Unknown	Moderate	Small	Generally practiced extensively already	Moderate – difficulties of training, defining high risk situations, supply and types of mask, especially respirators
8. Mask-wearing in other high risk situations[5]	C	Unknown	Moderate	Small	Unknown but makes sense	Moderate – difficulties of training, defining high risk situations, supply and types of mask
9. Mask-wearing by those with respiratory infections	C	Unknown but presumed	Moderate	May permit those ill and infectious to still circulate and infect others	Unknown but makes sense. Extends current hospital advice into home and public settings.	Difficulties in defining those who should comply and supplying the masks. Also compliance for those with restricted breathing due to respiratory infection
10. Early self-isolation of ill people[6]	C	Unknown but presumed	Moderate	Moderate[7]. Increased risk to carers and they will be off work	Already standard advice in many countries	Need to train and equip home carers, who will be at risk. Issue of compensation for lost wages and agreement of employers
11. Quarantine[8]	C	Unknown	Massive	Massive, due to lost productivity	Unclear	Very hard to make work equitably and issue of compensation for lost wages

[1] Evidence of effectiveness: A, B and C represent strongly, reasonably and poorly evidence-based recommendations, respectively.
Grade A: Systematic reviews where there are diverse primary studies to draw from (not primarily modelling), well-designed epidemiologic studies or especially experimental studies (randomised controlled trials).
Grade B: Represents evidence based on well-designed epidemiologic studies, substantial observational studies or experimental studies with 5 to 50 subjects, or experimental studies with other limitations (not having influenza as an endpoint, for example). The code Bm indicates modelling work, with emphasis on studies that have good quality primary data available. Hence quality can be both Bm & C.
Grade C: Represents evidence based on case reports, small poorly controlled observational studies, poorly substantiated larger studies, application of knowledge of mode of transmission, infectiousness period etc. Cm refers to modelling with few or poor quality primary data.

[2] Sometimes called second order and third order effects – e.g. closing borders resulting in disruption of trade and movement of essential supplies and workers.

[3] Need to make frequent hand-washing far more available in daily settings, e.g. in public places, fast-food outlets, etc.

[4] Persons having face-to-face contact with many members of the public.

[5] Persons having face-to-face contact with many members of the public, in crowded travel settings.

[6] Usually in the home of a person who is starting to feel unwell and feverish.

[7] Person requires care at home and they and their carers are off work.

[8] Isolation at home for some days of apparently healthy people considered to have been exposed to infection.

Social distancing measures

Intervention	Quality of evidence	Effectiveness (benefits)	Direct costs	Indirect costs and risks	Acceptability in Europe	Practicalities
12. Internal travel restrictions	Cm, C	Minor delaying effect suggested	Major	Massive, including social disruption[9]	Unknown	Key functions threatened. Issue of liability and legal basis[10]
13. Reactive school closures	Bm, C	May have greater effect than other social distancing	Moderate	Massive, because of children needing to be cared for at home[11]	Unknown, it does not happen often in Europe	Children out of school need to be kept away from other children. Issue of liability and legal basis [10, 12] Difficulties of timing, sustainability and re-opening
14. Proactive school closures	Bm, C	May have greater effect than other social distancing and be better than reactive	Moderate	As above[11]	As above	As above, but even more difficulties of timing (may close to early), sustainability and re-opening[10,12]
15. Reactive workplace closures	Cm	Unknown[9]	Major	Major	Unknown compensation issue crucial[10]	Issue of liability, compensation and legal basis, also sustainability & re-opening. Not possible for key functions[13]
16. Home working and reducing meetings	Cm,C	Unknown	Moderate	Moderate	Likely to be acceptable	Less possible for key functions[13]
17. Cancelling public gatherings, international events, etc.	C	Unknown	Massive[10]	Massive[10]	Probably depends on compensation issue and if insurance applies[9]. May be expected by the public	Issue of liability and legal backing. Difficult to define what is a public gathering or an international meeting, and when to lift bans

Use of antivirals: early treatment

Intervention	Quality of evidence	Effectiveness (benefits)	Direct costs	Indirect costs and risks	Acceptability in Europe	Practicalities
18. All those with symptoms	A (transmission and duration of illness only), Bm	Expected to be moderate but evidence on this is weak[14]	Massive	Moderate	Expected by the public in most of the countries	Considerable logistical costs and difficulties in deciding who has influenza, delivering to all those who might benefit in a timely manner (under 24 or 48 hours) and managing stocks equitably[15]
19. Health and social care or exposed key workers	A	Small[15]	Major	Small	Considered part of staff protection and important for staff staying at work	Difficulties in defining who are health workers or exposed key workers[15]

[9] An advantage of this and some other interventions is that it brings forward in a planned way what will probably happen anyway with time.

[10] Issue of who provides compensation if there is economic loss because of public (government) action.

[11] Child requires care at home and their carers are off work.

[12] Interventions targeted at children often assume they play an especially significant role in transmission, which may not be the case in every pandemic.

[13] There is a complex process of distinguishing what are and are not *key functions*, which is important but beyond the scope of this document.

[14] The evidence from trials is that, with seasonal influenza, early treatment reduces duration of illness by one or two days and also reduces transmission. Estimates of the positive effect on hospitalisation and mortality are observational, limited and far weaker.

[15] There are a series of major practical problems, deciding who has influenza, how to deliver the antivirals, etc.

Use of antivirals: prophylaxis following a case

Intervention	Quality of evidence	Effectiveness (benefits)	Direct costs	Indirect costs and risks	Acceptability in Europe	Practicalities
20. Family	B, Bm	Moderate	Massive	Moderate	Probably acceptable	Difficulties about case finding, defining families, speed of delivery, security and handling of stockpiles[16]
21. Family and social contacts	B, Bm	Moderate	Massive+	Moderate	Unknown but problem of people seemingly denied treatment	As above, with problems of defining group boundaries
22. Family and geographical contacts	B, Bm	Moderate	Massive+	Moderate	Unknown but problem of people seemingly denied treatment	As above, with even more problems of defining group boundaries

Use of antivirals: continuous prophylaxis

Intervention	Quality of evidence	Effectiveness (benefits)	Direct costs	Indirect costs and risks	Acceptability in Europe	Practicalities
23. Health or social care or key workers	C	Moderate	Massive	Moderate	Unclear – health workers may not use them at all, or not stay on them	Difficulties in defining who are health workers or key workers. Issue of how long can keep offering antivirals

Vaccines: human avian influenza vaccine16

Intervention	Quality of evidence	Effectiveness (benefits)	Direct costs	Indirect costs and risks	Acceptability in Europe	Practicalities
24. Whole population	B, Bm	Unclear depends on antigenic type of pandemic[17]	Massive	Major[16,18]	Unknown[19]	Issues over which groups should be prioritised
25. Health or social care workers or key workers	B, Bm	As above	Massive	As above	As above, plus unclear that these groups will accept	Difficulties in defining who are health workers or key workers
26. Children vaccinated first	B, Bm	As above	Massive	As above	Unclear whether parents will accept, especially if disease is milder in children and benefit is for others. Safety profile not well established[20].	Needs pre-planning

Vaccines: specific pandemic vaccine

Intervention	Quality of evidence	Effectiveness (benefits)	Direct costs	Indirect costs and risks	Acceptability in Europe	Practicalities
27. Pandemic vaccine	B, Bm	Minimal in first wave	Massive and requires prior investment	Small	Probably highly acceptable[20]	Difficulty of deciding on initial priority groups[16]

[16] There is a need to consider how early reports of plausible side effects will be quickly and effectively investigated.

[17] Assumes that the next pandemic is based on an H5 antigen. Benefit can be inferred from experimental serological responses however observational data and trials against the pandemic strain cannot be done before transmission starts and Phase 3. Trials may then be considered unethical.

[18] Financial risk that the next pandemic involves an antigenic strain not the current highly pathogenic avian influenza (A/H5).

[19] No country has ever tried to offer vaccination with such a low expected efficacy vaccine to its population, hence major communication challenges.

[20] There is a need to consider how early reports of plausible side effects will be quickly and effectively investigated.

Introduction

Purpose and scope

The purpose of this document is to present to European Member States, the EU institutions and others a detailed guide or 'Menu' of the many public health measures that have been proposed for reducing the transmission of human pandemic influenza when the pandemic is spreading in Europe – that is, in WHO Phase 5 or 6. The guide provides qualitative public health and scientific information on what is known or can be said about their likely effectiveness, the direct costs, the risks and secondary consequences associated with their use, their likely acceptability, the probable public expectations and practical considerations. The findings are summarised in the Summary Tables, but the reader is encouraged to consult the relevant parts of the text. The Guide does not provide information on important measures that will reduce illness and death but do not affect transmission (e.g. antibiotics and secondary care). That is more concerning clinical care, therefore is both outside the scope of the document and is less within ECDC's mandate.

Unlike some national guides or WHO's Annex One of its 2005 Pandemic Plan (which is included in this document, see Annex) and WHO's anticipated 2009 guidance on countermeasures, no explicit judgements or recommendations are made in this document, as this would be beyond ECDC's mandate, which is to advise but not prescribe. However, for a number of measures described here, the facts speak for themselves.

The content is intended to help European Member States, individually or preferably collectively, decide on which measures they may plan to apply and in what circumstances. The document specifically addresses the situation of a pandemic of human influenza. However, many of the same considerations will apply to severe epidemics of seasonal influenza, which occur some winters, and so the information is also pertinent to that situation.

The guidance has been subject to review by ECDC's Advisory Forum and a public consultation, but is still labelled interim as there will be further research findings concerning effectiveness and cost-effectiveness of the various measures that might change current advice. Therefore, the Guide will continue to be updated at intervals.

Audience

The primary audience for this document is those who develop health, healthcare and social policy, and decision-makers. This extends beyond the health sector as pandemic preparedness does not include only Ministries of Health, therefore this concerns other parts of governments, commercial sector and civil societies. Secondary audiences are all those concerned with influenza, the public and the media. The understanding by the latter of the measures and their limitations will be crucial to their successful application in a pandemic.

How to use this document

This document can be used in a number of ways. Most simply, by using the 'WHO 2005 pandemic plan guidance on public health measures' (Annex), countries can apply those for a number of the Measures. Alternatively, it can be used as a resource for informing scientific development of international, national or local policy on the Measures. If so, readers are encouraged to read first the General Considerations (pages 12–17). The Menu is designed to be self-standing but it is supported by other ECDC documentation, such as that on personal protective measures, antivirals and human H5N1 vaccines.

Definitions

A glossary of the major terms used is available on page 35.

Rationale

Human influenza is a viral respiratory infection spreading from person to person by direct and indirect contact. Direct contact spread is primarily through large direct person-to-person contact involving mouths or noses or respiratory droplets produced when infected people cough and sneeze near other people without covering their mouth and noses. Indirect spread is when respiratory secretions settle on objects which are then touched by uninfected people, who then touch their own faces. It is therefore self-evident that reductions in the transmission spread of pandemics and severe influenza epidemics (mitigation or damage limitation) may be accomplished using a variety of pharmaceutical and non-pharmaceutical countermeasures (Summary Tables).

Objectives

The primary objective of the measures is to reduce transmission, and therefore to reduce the overall number of cases, of severe illness cases and, especially, of deaths.

Secondary objectives are:

- flattening the epidemic peak and reducing the peak burden on healthcare and other key systems (utilities, transport, food and fuel supply, etc.) through absenteeism;
- pushing the epidemic curve back into the warmer months, when influenza transmission normally declines, and also buying some time for finalising preparations and developing and starting production of pandemic vaccines.

These desired impacts are shown graphically in Figure 1.

The most effective countermeasure against a pandemic virus will be a specific pandemic vaccine available for the whole population. However, vaccines that match the pandemic strain of influenza virus cannot be developed, produced and available in any quantity until some months after the pandemic begins. Also, even in the EU, demand may exceed global supply. Though there are developments that may overcome some of these issues, specific vaccines are at present unlikely to be available for the first wave of a pandemic strain in Europe. That said, it is possible to imagine circumstances where these would make a real difference in second and subsequent waves and there are strong reasons for making preparations for their acquisition, prioritisation and deployment.

Public health measures

Many public health measures (PHMs) have been proposed (see Summary Tables). In this guide, these measures are categorised into:

- travel measures;
- personal protective measures;
- social distancing measures;
- antivirals; and
- vaccines.

Other classifications and definitions are possible, for example, some other guides focus on social distancing (United States, 2006) and the 2005 WHO Guide (Annex) did not include personal measures or antivirals.

This wide definition means that the measures range from actions taken by individuals (e.g. regular hand-washing and early self-isolation) to others that require extensive preparation by communities (e.g. closing schools). A number of them are controversial as their implementation could have major societal costs and consequences (Inglesby 2006, Institute of Medicine 2006). Many of the personal protective measures are simply those of good personal hygiene. These and the social distancing measures were for many years the only mass public health measures that could be used. Their use varied from one country to another during the three pandemics of the 20th Century, with their greatest use in North America and other areas that were affected after Europe in the Spanish Influenza pandemic of 1918–19 (Potter 1998; Kilbourne 2006; Markel 2006, 2007). There is already a range of measures recommended by the World Health Organization for phases 4 to 6 of a pandemic (WHO 2005a, WHO 2005b, Annex). New guidance on countermeasures is expected to accompany the WHO 2009 editions (WHO 2009a).

More recently, pharmaceutical interventions have become available. These include early use of antivirals by people developing symptoms and their contacts, and human avian influenza vaccines (Moscona 2005a, Hayden 2004, Halloran 2006, ECDC 2006b, WHO 2006c). These are the subject of separate ECDC background documents and the conclusions of these are drawn on through this document. Antivirals can be used for both clinical and public health purposes. They are intended to both protect and treat the individual and to reduce transmission to others. However, as will be explained, antivirals alone cannot protect Europe's populations. Many consider they are only effective when started within 24 or 48 hours after onset of illness for treatment of ill persons, or post-exposure prophylaxis of exposed persons (Halloran 2006, Moscona 2005, Monto 2006a). Starting antiviral treatment later than that may have little clinical effect and no effect on transmission (ECDC 2009a). Prophylaxis may make more sense in public health terms, but in many countries antivirals will be in limited supply and their effective use poses challenges for timely diagnosis and dispensing. Also, the effectiveness of these drugs against a pandemic virus is unknown since it could be resistant to the drugs, or resistance could develop (Moscona 2005b, Meijer 2009, Joint WHO/ECDC Writing Committee 2009).

Human avian influenza vaccines have been developed to try to anticipate the type of influenza virus that was most likely to cause the next pandemic (they were all built around influenza A(H5N1) – the bird flu virus) with the hope that they will, at least partially, match the pandemic virus and offer some protective effect (WHO 2006c). Two

scientific reports were published by ECDC in 2007 to answer questions about these vaccines and the reader should refer to the reports to find advice on avian influenza and pandemic vaccines. See 'Expert Advisory Groups on Human H5N1 Vaccines: Public Health and Operational Questions' (see http://ecdc.europa.eu/en/publications/Publications/Forms/ECDC_DispForm.aspx?ID=291) and Expert Advisory Groups on Human H5N1 vaccines: Scientific Questions (see http://ecdc.europa.eu/en/publications/Publications/Forms/ECDC_DispForm.aspx?ID=294).

Limitations

This document deals schematically with some issues that are the responsibility of bodies outside the health sector: schools, transport, mass gatherings, etc., only to the extent where these are required for public health purposes. However, it does not address the many issues that will need to be considered in preparing non-health sector institutions for a pandemic. This document also does not deal with the unique circumstances of the first emergence of a pandemic strain[21] or suggested scenarios before Phases 5 and 6 with less efficiently transmitting viruses, when case finding, contact tracing and containment may be effective.

Acknowledgements

The information and arguments in this document represent the distilled information arising from ECDC programme of joint self-assessments of EU and EEA countries, which is mirrored by a similar programme of WHO's European Region. The basis of all the work is the European Commission Communications of 2005 and WHO's 2005 and 2009 Pandemic Planning Guidance (European Commission 2005a, European Commission 2005b, WHO 2005, WHO 2009). ECDC is also grateful for detailed comments that arose from an earlier round of consultation with EU Member States and others through its Advisory Forum in mid-2007 and comments from experts in a number of organisations. ECDC has also benefited greatly from being involved in the work on public health measures led by WHO. However, ECDC is responsible for the content of this document.

[21] There is a WHO protocol (http://www.who.int/csr/disease/avian_influenza/guidelines/draftprotocol/en/index.html) for this to which ECDC has contributed.

General considerations

A. What will happen naturally

Based on what happened in the 1957 and 1968 pandemics and modelling, it is possible to suggest what is likely to happen in future pandemics, should they start in East Asia or another part of the world away from Europe. Some epidemiological assumptions for this are listed in Table 1 (page 36 – tables and figures are at the end of this document). However, there are many caveats mentioned in the Important Variations and described in sections C and D below. It can be presupposed that following the emergence of a pandemic strain in another part of the world there will be spread to Europe after an interval of 1–3 months (in the absence of seasonality – in high summer spread may be slower). Up to one third of Europe's population would eventually become ill (how ill would depend on the severity of the strain), there would be up to 15% absenteeism of the working population at peak, and in any one country the first wave would be over approximately three months after the country became affected.

B. Scientific evidence and experience

The scientific evidence on the effectiveness of the public health measures (PHMs) contains more gaps than certainties (WHO 2004b, WHO 2006a, WHO 2006b, Inglesby 2006, Institute of Medicine 2006). There are also significant holes in our knowledge about the basic characteristics of influenza transmission (Table 1). Until recently neither have been the subject of much research attention nor funding. Attempts to further examine existing data (data-mining) or examining historical information (what interventions seemed to work in the three pandemics of the 20th Century) have revealed important and interesting observations, but they can only generate hypotheses and suggestions. The evidence base for the use of the measures against influenza is limited and primarily comprises anecdotal observations and systematic analyses of observations from previous influenza pandemics and seasonal outbreaks, plus inferences from other scenarios and other respiratory infections, especially the SARS outbreaks in 2003 (Lo 2005, WHO 2003, WHO 2006a, WHO 2006b).

There have been virtually no field studies or trials of PHMs during a pandemic or even during seasonal epidemics to evaluate their likely effectiveness and possible adverse secondary effects (WHO 2006a, WHO 2006b). Some purists insist that only randomised control trials (RCTs) or randomised placebo controlled trials (for pharmaceutical measures) provide proof of effectiveness and, therefore, if there are no definitive trials, the measures should not even be applied (Institute of Medicine 2006). Certainly, good RCTs provide the best evidence for any measure and there could be more trials carried out on seasonal influenza, for example, on personal protective measures and antivirals. However, the trials that have been undertaken of late on personal measures have experienced major problems of compliance and so given results that have been difficult to interpret (Cowling 2008a, Macintyre 2009).

It is possible to become paralysed by the lack of trials and some interventions simply cannot be trialed (Smith 2003). Consider the use of multiple partially-effective interventions ('defence in depth' or 'layering of measures') intended to limit transmission or spread of a pandemic strain. It would be impossible to perform studies prospectively in the absence of a pandemic and such trials would be very difficult to enact during a pandemic. Certainly there could be no use of placebos. In the light of this, mathematical models have been used to investigate what happened retrospectively in the United States, where social distancing interventions were applied extensively during the Spanish Influenza (Bootsma 2007, Hatchett 2007, Markel 2006 & 2007). These historical analyses are reaching some kind of consensus, namely that the social distancing interventions had some impact, that they worked better if they were put into effect early in the pandemic, but that they were often abandoned too early and pandemic infection returned. Another approach has been to apply reasonable assumptions and project the possible impact of the interventions (Ferguson 2006, Germann 2006, Glass 2006, Wu 2006, Glass 2007). Again, these studies have some form of consensus but the most impressive studies find the effects, especially of individual interventions (such as school closures), more modest than hoped for (Ferguson 2006, Germann 2006, Glass 2007, Cauchemez 2008).

Modelling studies are essential to investigate possible mechanisms and suggest what is more or less likely to happen. Their major role is thus to map out the range of possible risks and to suggest which responses to pandemic influenza are robust and most likely to work, given the underlying uncertainties. The most complex models cannot start to approach the complexity and diversity of even quite simple human societies. Hence phrases like 'modelling has clearly shown that...' need to be viewed with caution. Modelling work is particularly constrained by uncertainty and variation in the assumptions for values that have to be fed into models (Table 1). For example, assumptions like 'influenza transmission is equally divided between the home, workplaces & schools and public places' are often just that — assumptions. Hence, in its Summary Tables, this document makes a distinction

between modelling studies that have available stronger primary data for their assumptions (Type Bm) and those that have to rely on less strong data (Type Cm).

C. Diversity in the characteristics and severity between pandemics

Pandemics are not standard. In particular, those of 1918–19, 1957 and 1968 differed in:

- the type of influenza viruses causing them;
- their severity – the proportion of infections that result in severe disease or death;
- the infectivity and reproductive number R_o;
- the prior immunity, and hence the groups most affected and experiencing the most transmission; and
- whether there was a single or multiple waves.

These are crucial variables. The severity of a pandemic, whether it is mild, moderate or severe, will determine how drastic the public health measures that can be justified are (WHO 2009b). Measures like proactive closures of schools (public health measure 14 – PHM 14, see page 27) and cancellation of public events (PHM 17, page 28) might be considered for a severe pandemic like that of 1918–19, but would probably be excessive for the milder pandemics of 1957 and 1968 (United States 2006, SGDN France 2007, DH UK 2007).

Similarly, if transmission is focused in one age band (as it was in 1957, in younger people), it may be worthwhile to focus on measures for that age group. However, this would not have been so useful in 1968, when transmission was spread across all age groups, and in 1918–19, transmission seems to have been most intense in young adult age groups (Figure 2).

This fact emphasises the need for:

- early evaluation of the characteristics of pandemics;
- flexibility in the actions planned;
- national command and control structures that will allow rapid tailoring or even changing of strategies; and, when possible,
- early evaluation of the effectiveness and impact (positive and negative) of the countermeasures.

A further complication is that the characteristics of pandemic are not static. Pandemics change with time and as they spread, generally becoming less severe over time. This is because these RNA viruses constantly evolve and immunity rises in the population. Hence, even if severity is measured elsewhere and is found to be high, it will be important to repeat the measurements when the pandemic reaches Europe. Early measuring of the characteristics is the subject of an ECDC project in collaboration with the WHO, see 'Surveillance and studies in a pandemic in Europe', available from http://ecdc.europa.eu/en/publications/Publications/0906_TER_Surveillance_and_Studies_in_a_Pandemic_in_Europe.pdf).

D. Diversity within the pandemic

Influenza never affects all localities in the same way at the same time. This was observed each year through the European Influenza Surveillance Scheme with seasonal influenza and will be equally true with a pandemic. Even if most places are eventually badly affected, this will not happen at the same time, and a pandemic is best seen as a series of overlapping local epidemics. This feature has advantages and disadvantages.

Given the patterns of spread seen with seasonal influenza in Europe (most commonly from West to East and South to North), it may be possible to give more warning to places in the North and East. Similarly, within countries with centralised command and control structures, it may be possible to move some healthcare resources (key staff, antibiotics and antivirals) around to relieve the most badly pressed areas.

However, there are dangers and issues arising from the diversity of the pandemics and Europe (see next item). Firstly, proactive measures may be started too early. Secondly, it will be a challenge for communicators to explain why certain measures are being enacted in one place but not another. Then, with measures involving limited resources (antivirals, masks, etc.) care will be needed to ensure that supplies are not expended in the areas first affected, leaving other populations with none when they are affected later.

E. The diversity of Europe

It is self-evident that Europe is a highly diverse region with varying population densities, social and legal frameworks, both between and within countries. Hence the 'one size will fit all' rule will not apply to some public

health measures. Consider proactive early school closures (PHM 13 and 14). These may make particular sense in some dispersed rural areas and secondary schools where the schools are important foci for the mixing of young people from scattered communities. However, they may make less sense and actually be counterproductive in dense urban areas where many parents may have to take time off work to care for children and where it will be difficult to stop children mixing anyway (Inglesby 2006, Glass 2007, Cauchemez 2008, Cauchemez 2009).

F. Isolated communities

Some places in Europe are so isolated that they may not be affected by a pandemic. This was seen for a few places in the 1918–19 pandemic (Markel 2006a, Markel 2006b). The places that achieved this were exceptional and relatively self-sufficient. Europe has become far more interconnected of late and it is unlikely that more than a few per cent of its citizens live in communities that could self-isolate in this way. However, there are some such communities and they might reasonably make different arrangements.

G. Secondary, social and perverse effects

This concept, essentially looking at what the costs, risks and consequences of applying the Measures themselves, is crucial. Measures, especially those in the Social Distancing group (PHMs 11 to 16), almost certainly would have major secondary and unintended effects. Though they might reduce influenza transmission, they might, on balance, be judged negative or unacceptable, certainly if there has not been planning to overcome the secondary effects. For example, consider Internal Travel Restrictions. This might slow or reduce transmission, but if the restrictions mean that in highly interdependent European societies food or fuel supplies would break down, they would not be regarded a success. Similarly, if schools are closed (PHMs 12 & 13), it must be determined who will look after the school children? Perhaps important staff (notably, healthcare workers) would be operationally lost because they have to take time off to look after their children. It is especially difficult to predict how populations will respond socially to a pandemic though there are reported attempts to do so in a few countries, but few published reports (Keystone 2007, Cauchemez 2008, Cauchemez 2009). Finally, there are areas where the evidence is lacking in order to predict what will happen and whether there would be perverse effects, i.e when a measure expected to have one effect results in something else. For example, specialists differ in their view over whether general use of simple masks by the general public would increase or reduce transmission[22] (Institute of Medicine 2006).

H. Timing of use, triggering and sustainability

It is a general principle that early prevention is best with infectious diseases. This is sometimes called the 'getting ahead of the curve' principle. It means that public health measures, if they are effective, will need to be introduced early. For example, if it is decided to close schools to reduce transmission, it would be more effective to do so as the pandemic is approaching (Proactive Closure) and not wait until cases are confirmed in one particular school (reactive closure) (Glass 2006, Germann 2006, United States 2006).

However, things may not be that simple because of the uncertainty of movement of influenza, secondary effects and sustainability. Some of the measures will be difficult to sustain because of their secondary effects. It should be recalled that an early use of the phrase 'getting ahead of the curve' was by a US president authorising the production of the ill-fated swine flu vaccine of 1976. If measures are introduced too early, they may break down as people get tired and enthusiasm wanes. Then transmission will still take off. There is historical evidence of this happening in the United States in the 1918–19, when a number of big cities attempted social distancing measures (Inglesby 2006, Bootsma 2007, Markel 2006 & 2007).

I. Dealing with the first outbreaks in a European country

A difficult issue is what to do when the first outbreak occur in a country during global Phases 5 or 6. Based on what is recommended to be done at the first emergence of a pandemic strain in the world (Longini 2005, Ferguson 2005, WHO 2007a), some European countries have plans for trying to stifle first infections using large amounts of antivirals. In exercises a number of authorities have tried to contain the first outbreaks using conventional measures (contact tracing) and distributing large amounts of antivirals. The scenarios that have been played though are generally ones where the measures have failed and the virus has escaped. This is what modelling exercises predicted, though in reality it is not at all clear what would happen and it is possible that an exceptional pandemic virus with low infectivity might be containable. Similarly, there are some isolated places in

[22] It is suggested that people may reuse contaminated masks and that constantly adjusting masks may result in more contamination of hands with virus.

Europe that receive few visitors, where even a normal pandemic strain might be containable. However, in the exercises, more normal viruses and usual European settings attempts at containment have resulted in significant human and antiviral resources being expended and public health staff being exhausted before the pandemic has properly started. There have also been difficulties in explaining the switch of antiviral strategy to professionals and the public (ECDC 2009a).

J. Complete or partial protection?

Many of the measures are not expected or even intended to give complete protection. They will reduce but not eliminate risk. This approach aims at reducing the impact on the population overall. This is especially important with the measures that have significant secondary effects where complete implementation may on balance be unacceptable. That is why some authorities intend to apply not one but a number of measures (see the next item Multiple layered measures – defence in depth) (United States 2006, SGDN France 2007, Department of Health & Cabinet Office UK 2007).

K. Multiple layered measures — 'defence in depth'

Current thinking is that the impact of any single public health measure will be limited. This is both because they do not work perfectly and because they are hard to enact. The thinking is that, by applying a number of measures simultaneously, there will be a cumulative effect on transmission. Some have argued that given the relatively low infectivity of pandemic influenza it may be possible to prevent transmission chains building up or to interrupt transmission (Figure 3) (United States 2006, German 2006, SGDN France 2007, Department of Health & Cabinet Office UK 2007). However, that is assuming a cumulative effect of the measures which is a reasonable but still theoretical concept. There is some encouragement for this view from the experience when SARS took place in Hong Kong. Multiple measures were enacted by the authorities (closing schools, forbidding public events) or just happened because they made sense to the citizens (staying home and wearing masks when people went out) (Wu). Though this was not thought to be what controlled SARS, there was a coincidental significant impact on influenza incidence as reflected in laboratory reports (Donnelly 2003, WHO 2003). However, there are also important considerations of cumulative costs and secondary effects with multiple measures (Inglesby 2006).

L. The necessity of intersectoral planning and preparation

Intersectoral planning and preparation is crucial for many of the Public Health Measures. For example, if regular hand-washing (PHM 4) is considered important, facilities in schools, public places, food outlets, etc. to allow this are needed (Figure 4). If it is thought that masks will be needed for some workers (PHM 8), these will need to be ordered by employers. Actions involving schools (PHMs 13 & 14) will need preparation not just by educational authorities, private and public schools, but also other sectors and industry and civil society. Parents will have to seek alternative care for their children if schools are closed, otherwise the effects of the closures will be undermined (Glass 2007). If they have to take time off work, is it agreed that they will be paid? (Cauchemez 2008).

M. Legal issues, liability and ethics

Enacting some of the public health measures require legal powers and obviously this has to be planned for. There is also the complex area of who is liable for any financial loss that can be said to be due to the measure rather than the pandemic. This is very difficult area where there are varied systems and traditions in different European countries. For example, if its thought that an international or national meeting should be cancelled, should this be a decision by the authorities, who may then be financially liable, or is it better to wait until it is clear that many people are cancelling coming in, in which case the organisers will have to cancel the event themselves? These considerations can prevent early action even when that is desirable. Ethical issues arise whenever it is necessary to ration measures, or with issues like giving treatments or vaccines to children for the benefit of other age groups (PHM 24). WHO has produced a document on this, as have some individual European countries (WHO 2007b). It is advisable for every country to have a mechanism whereby ethical issues arising from pandemic planning can be considered by a independent but pragmatic group. Some countries have simply used existing national ethics committees. Others have established a special group. Both mechanisms can be made to work but it is essential to have them ready to deal with unanticipated issues in the heat of a pandemic (Gostin 2006).

N. General versus selective measures

General measures (everyone wearing masks, everyone taking antivirals) are simple and fair. However they may not make sense to people who perceive obvious variation in risk and, therefore, they can be less acceptable than

selective measures for those at higher risk (e.g. people exposed to the general public wearing masks). Selective measures allow more possibilities for ensuring quality in the application of the measure and can allow more efficient use of supplies. However, the recurrent issues with selective measures are so-called boundaries issues and policing. Deciding, and subsequently communicating, who should practice measures and who should not is challenging and it will be very difficult to prevent people feeling left out of benefiting from measures, or getting anxious and annoyed that some people are perceived to be breaking the rules.

O. Early recognition and diagnosis

A number of measures (e.g. early use of antivirals) will require early recognition and diagnosis of influenza, as infectivity is considered greatest within a day after onset of symptoms and children and people with disabilities will need special consideration. It must be appreciated that this will not be done by laboratory testing. There will not be enough time, laboratories will be too busy and the point of use (bedside) tests may not work with the new pandemic strain of virus. Hence much of the diagnosis will be presumptive by signs and symptoms alone.

P. Planning, preparation and practice

General emergency planning, in both general and pandemic planning in particular, consists of the 'Three Ps':

- Planning
- Preparedness
- Practice (exercises)

Some of the more difficult public health measures are especially challenging to plan for and plans that look reasonable on paper break down when attempts are made to enact them. For example, early treatment and/or prophylaxis with antivirals (PHM 18 to 23). One of ECDC's most difficult local acid tests is 'Can local services robustly and effectively deliver antivirals to most of those that need them within the time limit of 48 hours since start of symptoms?' (ECDC 2006d). Some European countries have devised plans for the distribution of antivirals, tried it out in desktop or field exercises, and then found that they had to think again. Hence there is no substitute for a programme of small and larger scale exercises to try out the plans, to get familiar with them and see if they are really likely to work. This is an essential step for moving from plans to actual preparedness and there is no room for assuming 'it will be alright on the night'. Some exercises will need to involve decision-makers, including politicians, so that they can understand the issues, make decisions which require resources, get used to the uncertainties and especially appreciate that there are no easy answers.

Q. Communications

The importance of communications for the public health measures cannot be overemphasised. All the measures require close cooperation with the public, professionals, decision-makers, etc. Communication materials explaining them will need to be prepared ahead of time, pre-tested and probably rewritten. Similarly, there will need to be surge capacity in communication specialists for the pandemic as there is for other key staff. Finally, documents like this need to be disseminated amongst the media and communication specialists.

R. Special groups — special considerations

There will be a number of groups who will find it especially difficult to comply with measures. In some cases, numbers will be substantial. Planning will need to take this into account. Some candidate groups are listed in Table 2.

S. Protective sequestration — children and adolescents

It was suggested by some authorities that early in a pandemic children and adolescents should be prevented from congregating in groups through closing childcare facilities and schools and requiring them to stay at home for the local duration of a pandemic (three months) (Glass 2006). This might be possible in some settings but not in most and after some thought no countries seem to have considered this as a serious option on a mass scale (Institute of Medicine 2006).

T. European interoperability

This multifaceted term has a number of meanings, both negative and positive (Table 3). It can mean European Member States or regions considering the impact of their enacting public health measures on their neighbours. For

example, closing borders (PHM 3) could stop movements of essential workers. Because of modern communications, there can also be indirect effects through the media if one Member State is seen by others unexpectedly enacting certain measures such as screening entrants (PHM 2) or mask-wearing (PHMs 6–9). Even if EU countries undertake the same measures, problems will arise as they do this at different times, if there was no preparation. Hence there are many advantages to EU Member States agreeing beforehand on the same or similar actions, the so called 'planning presumptions', and on enacting these in similar timing, especially as there are a number of potential measures in which pros and cons do not point to clear-cut decisions (e.g. school closures and mask-wearing, but also see D, E and Q).

There are other potentially very positive aspects of European interoperability. For example, if a few work for all. There is a strong tradition of this in the influenza field, with four WHO Collaborating Centres doing specialist virology work for the world. Work such as measuring the likely antiviral resistance, determining case fatality rates, the effectiveness of antivirals, etc., could be efficiently spread around Europe rather than duplicated in all 27 Member States. Also, there has been careful thinking about the Public Health Measures in a number of Member States. If more of this can be done collectively on particular policy areas, knowledge and work can be shared and conclusions can emerge from a common understanding of what is known and not known. Even if Member States eventually come to different decisions (e.g. whether to purchase human H5N1 vaccines (PHM 24–25) and whether and when to close schools proactively (PHM 14)), at least it will be done on a common basis.

U. Research implications

There is a considerable amount of research on influenza being funded by DG Research at EU level (DG Research 2007). Much of this is 'bottom-up' research suggested by the research communities. However, there is also need for more directed research and specific questions, like it is being done in the United States (ECDC Influenza Team 2007).

The menu of measures

The following measures are considered.

Travel measures: restrictions on international travel
1 Travel advice
2 Entry screening
3 Border closures

Personal protective measures
4 Regular hand-washing
5 Respiratory hygiene
6 General mask-wearing outside the home
7 Mask-wearing in healthcare settings
8 Mask-wearing in high-risk situations
9 Mask-wearing by people with respiratory infections
10 Early self-isolation of ill people
11 Quarantine measures

Social distancing measures
12 Internal travel restrictions
13 Reactive school closures
14 Proactive school closures
15 Reactive workplace closures
16 Home working and reducing meetings
17 Cancelling public gatherings, international events, etc.

Antivirals: Early treatment
18 All those with symptoms
19 Healthcare or exposed key workers

Antivirals: Prophylaxis following a case
20 Family
21 Family and other social contacts
22 Family and geographical contacts

Antivirals: Continuous prophylaxis
23 Healthcare and key workers

Vaccines: Human H5 vaccines:
24 For the whole population
25 For children
26 For healthcare workers

Vaccines: Specific pandemic vaccines
27 Specific pandemic vaccines

For each measure the entry considers:

- The objective and rationale
- The evidence of effectiveness or what is considered to be the likely effectiveness and benefits
- The direct costs of the measure
- The secondary effects: indirect costs, risks, and potential adverse effects
- Likely acceptability and expectations in Europe
- Practicalities, experience and other issues
- Standing WHO Policy from Annex One of the 2005 Global Influenza Preparedness Plan (Recommendations for non-pharmaceutical public health measures, pages 42-46) http://www.who.int/csr/resources/publications/influenza/WHO_CDS_CSR_GIP_2005_5.pdf

To reduce repetition, please refer back to General Considerations. The information is also summarised in the Summary Tables.

Travel measures: Restrictions on international travel

1. Travel advice

Objective and rationale:
To reduce the number of people who are infected during a trip abroad, perhaps to countries where transmission is higher, through advising against international travel during the pandemic, unless travel is essential. A second objective is to reduce transmission among people who are travelling (in airports queues, on planes, etc.) by insisting that people with febrile illnesses should not travel until they have recovered.

Evidence of effectiveness: Minimal
While there is no objective evidence, it is believed that when people travel they meet more people than usual and are less able to protect themselves from infectious diseases. The role of formal (official) versus informal travel advice (from the media) is not entirely clear-cut. During the SARS crisis of 2003, international travel to affected areas declined steeply well before formal travel advice was issued. However, the net number of influenza infections that are likely to be prevented is small compared to the total of all infections. Modelling studies suggest that the effect on stopping international spread is small unless there is near 100% adherence, though there may be a small delaying effect (Cooper).

Direct costs: Small
The costs of issuing the advice.

Secondary effects: Large
There will be considerable impact on the travel industry, though the experience of SARS suggests it will be impossible to determine what was due to the advice versus people applying common sense (WHO 2003). Given this, complex issues of liability may well arise and be costly to resolve, irrespective if costs are borne by individuals, companies, insurance or the public purse.

Likely acceptability and expectations: Unknown
There are considerable concerns that some European residents abroad will attempt to get home despite the advice and perhaps put themselves at greater risk than if they stayed where they were. Some citizens may also expect to be evacuated from home. Additionally, people may try to leave Member States for other EU countries or non-European countries.

Practicalities and experience:
It will be important to prepare and test messages ahead of time and to ensure that citizens living abroad make plans for what they would do in a pandemic. Evacuation of apparently healthy or sick citizens in any numbers is unlikely as this will usually be impractical given the number of people with influenza. One difficulty is the diversity of situations that EU residents will face abroad, so advice will not be able to cover all eventualities. A particular difficulty that occurred during the SARS outbreak is to persuade multiple airlines to accept that people who are sick with febrile illness should not lose their tickets if they follow advice not to travel. An additional confusion may be added by Member States issuing conflicting advice, so a citizen will not know whether to follow the advice issued by their own country or the by the country where they are located.

— WHO policy (2005). Global Influenza Preparedness Plan.

2. Entry screening

Objective and rationale:
The objective of this intuitive measure is rather unclear. Presumably it is to reduce the number of people entering a country with infection, focusing on those coming from countries that are first experiencing Phases 5 or 6.

Evidence of effectiveness: Minimal
Experience from the SARS outbreak showed that both entry and exit screening was quite ineffective in preventing spread (WHO 2003). Application of what we know about the natural history of influenza suggests that attempts to screen out infected persons will be equally unsuccessful because many infectious people may be presymptomatic or asymptomatic (see Glossary). That is also the conclusion of modelling exercises (Cooper).

Direct costs: Large
Based on the SARS experience, the staff costs are considerable as are the opportunity costs in that this ties up healthcare staff who would probably be better employed elsewhere (Health Canada 2003).

Secondary effects: Moderate
These are considerable, especially the issues over what to do with people who are detected as being febrile on entry, their investigation, diagnosis and care (Health Canada 2003).

Likely acceptability and expectations:
A difficulty is that, following from the experience of SARS, there is likely to be an expectation among the public, the media and decision-makers that there will be some kind of entry screening. This requires some preparation, perhaps by exercises, to explain to decision-makers as to why this is not desirable and anticipated to be ineffective.

Practicalities and experience:
It will be important to prepare the ground among the public and decisions-makers and explain why this measure will not be desirable. An important point to make is that the implementation of this measure has major costs. Not only will this measure be ineffective, but it will also probably tie up public health or clinical staff better employed on other tasks. A difficulty during SARS was that a few European countries with small amounts of direct international travel seemingly enacted the measures visibly, but it was not appreciated that many more people will enter those countries via large European hubs and then travel on to the country through internal European flights.

— WHO policy (2005 and 2009) Global Influenza Preparedness Plan.

3. Border closures

Objective and rationale:
To prevent influenza coming into the country.

Evidence of effectiveness: Minimal unless almost complete and rapidly implemented
The experience is that, unless there is little international travel to a country and almost complete cessation of travel, the attempts of border closure will be unsuccessful in preventing entry. That is also the strong suggestion of modelling exercises (Cooper).

Direct costs: Massive
For most settings in Europe, the direct costs of trying to close borders would be huge.

Secondary effects: Massive
In Europe there is so much essential day-to-day travel across borders that the idea of closing most borders is inconceivable.

Likely acceptability and expectations:
Despite the above considerations, there is still likely that the public and some decision-makers may wish to close borders during a pandemic. This requires some preparation, perhaps by exercises, to explain to decision-makers as to why this is not desirable.

Practicalities and experience:
Usually border closures would be both undesirable and/or impossible. However, there are some circumstances where it would be conceivable, though for public order rather than public health purposes. One example of this is if there is pressure on a country with antivirals or other services from people coming in from a neighbouring country with few antivirals. For these countries, temporary border closures may be considered for public order purposes. This could be especially the case for EU countries with borders on the edges of the EU, thought there may also be some internal EU borders where this applies. Also there are a few settings in Europe which are so isolated that they could cut themselves off (see General Considerations, F. Isolated communities).

— WHO policy (2005). Global Influenza Preparedness Plan.

Personal protective measures

4. Regular hand-washing

Objective and rationale:
To reduce transmission from person to person by indirect contact.

Evidence of effectiveness:
Though there have been some trials of hand-washing on respiratory infections in general (which have mostly shown a positive impact) and other related research, there has never been a published trial of the effects of hand-washing on influenza (Schumann 1983, Roberts 2000, Ryan 2001, WHO 2006a, WHO 2006b, ECDC 2006c). It is also unclear how much transmission of influenza takes place through indirect transmission by hands (Brankston 2007, ECDC 2007b). That said, it is self-evident that there will be benefits that will extend to other infections spread through indirect contact (Ryan 2001, White 2003).

Direct costs: Moderate
In many settings it is quite difficult to wash hands regularly and to increase the amount of hand-washing would require considerable investment in schools, fast-food settings and public places, notably with dispenser of alcohol-based gels. (Figure 4).

Secondary effects: None

Likely acceptability and expectations:
The major limiting factor to acceptability is the availability of facilities for hand-washing. If it is easy for people to wash their hands, they will do so.

Practicalities and experience:
The international experience shows that the level of hand-washing can be increased if the easiness of hand-washing is increased. There is no consensus on the duration, frequency or type of hand-washing (soap and water versus alcohol gels) and an evidence-based review concluded both were effective (Grayson 2009). Street dispensers of alcohol gels are effective in inactivating influenza and other respiratory viruses.

— WHO policy (2005). Global Influenza Preparedness Plan.

5. Respiratory hygiene (proper use and disposal of tissues)

Objective and rationale:
To reduce transmission from person to person by droplet transmission.

Evidence of effectiveness:
There have never been trials of respiratory hygiene on either respiratory infections generally or specifically influenza (WHO 2006a, WHO 2006b).

Direct costs: Small
These are modest.

Secondary effects: Small
The only major costs are the purchase or tissues and the disposal of significant amounts of contaminated paper.

Likely acceptability and expectations:
Respiratory hygiene would be expected in a pandemic, and probably well accepted. This also empowers people and gives them a practical measure to enact.

Practicalities and experience:
Supplies of materials (disposable tissues) are available. Educational programmes may be needed, but these can be implemented during ordinary seasonal influenza seasons.

— WHO policy (2005). Global Influenza Preparedness Plan.

Masks

There are many issues around masks including the following:

- *Types:* Range from the simplest or even home-made masks to surgical masks and complex respirators (essentially masks with filters) which need 'fit testing' and are produced in many different sizes to fit all the population. This gives major problems over storage and supplies. There are considerable discussions over the types of masks that are recommended with a few authorities recommending the more demanding and expensive respirators in all circumstances and most others suggesting that simpler masks are sufficient (Tellier 2006, Brankston 2007).
- *Training:* People cannot simply be supplied with masks. Some training in use and disposal is essential and the evidence is that, though people can be supplied with masks and respirators, they will often not use them correctly, especially the more demanding respirators (Cummings 2007).
- *The evidence:* There is hardly any experimental or observational evidence for or against the use of masks by the public in relation to influenza or other respiratory infections. There is limited, but controversial, evidence from their use during SARS, which suggests some protection from another rather different virus (Donnelly 2003, WHO 2004). However, there are some anomalies in these data, for example, apparently showing protection from mask-wearing in public places when it was not confirmed that there was any transmission. The US CDC is sponsoring some trials that were intended to throw light on this important topic. However, preliminary results have proved frustrating because of poor compliance with the interventions (Cowling 2008a, Macintyre 2009).
- *Secondary effects*: Some specialists have suggested that there could be perverse effects, with mask-wearing increasing indirect transmission as it would allow those with symptoms to feel they can appear in public places, go to work, etc. Another argument is that the constant touching and adjusting of wet masks with the hands would actually increase direct transmission.

6. General mask-wearing outside the home

See discussion on masks (page 21) and General considerations N (General versus selective measures).

Objective and rationale:
To generally reduce the transmission in public places, workplaces and schools.

Evidence of effectiveness:
There have been no trials. Mask-wearing in public is common in some societies in Asia. It has not been remarked that infection rates are any lower there. There are some authorities who argue that there could be perverse effects because people may reuse contaminated masks and the constant adjustment of masks may result in more contamination of hands with virus.

Direct costs: Massive
Even though the unit cost (the cost per mask) is low, considering two or more masks per citizen a day when they are outside home, over the three to five month period of a pandemic the supply costs are huge. There would also need to be considerable planning to ensure supplies.

Secondary effects: Small
These are few.

Likely acceptability and expectations:
This is unknown. There is little tradition of mask-wearing in the EU. However, one or two European countries have announced they would purchase masks for their residents, which is likely to be raising expectations.

Practicalities and experience:
Proper use of masks is not that easy, so there are massive implications for training and communication. It is unclear whether simple masks should be seen as something that the authorities or health providers should supply along with some instructions, or a commodity that residents would purchase commercially. Supply will be a major problem. Early attempts at marketing masks during influenza seasons have not proved easy in Europe. While there is no evidence of effectiveness, it would be fair to point out that there is also no evidence that masks would be ineffective. It is possible to conceive a risk-based approach identifying people at special risk (e.g. workers with high frequency of face-to-face contact with unselected public) or higher risk settings (e.g. public transport). It is hard to declare that masks must not be worn in those circumstances.

— WHO policy (2005). Global Influenza Preparedness Plan. Permitted but not recommended.

7. Mask-wearing in healthcare settings

See discussion on masks (page 21) and General considerations N (General versus selective measures).

This refers to mask-wearing by people who are at higher risk through possible or probable exposure to infectious persons in healthcare and domestic setting.

Objective and rationale:
The prime objective is to reduce transmission in higher risk settings, but another is to allow persons in key activities to continue to work while giving them some protection. Respirators would be used in high risk settings when aerosols may be generated.

Evidence of effectiveness:
There is no trial and few other data. Hence the effectiveness in reducing transmission is unknown, though often presumed in healthcare settings (Brankston 2007, Canada 2006).

Direct costs: Moderate
The costs of supply and training.

Secondary effects: Small

Likely acceptability and expectations:
This is likely to be good as there is a tradition of mask-wearing in healthcare settings in the EU. It is quite likely that representatives (trade unions) could request or insist that their members have higher level of protection in all circumstances.

Practicalities and experience:
In the healthcare setting there are more high-risk circumstances, and this is where most use of respirators will take place, though a balance will need to be established, as operational studies in the EU have shown that people wearing respirators find it considerably harder to carry our practical tasks (HPA 2007). There will be boundary issues and issues around communication, training and disposal of used masks. There are some suggestions that masks could be cleaned or sterilised and reused.

— WHO policy (2005). Global Influenza Preparedness Plan.

8. Mask-wearing in other high-risk situations

See discussion on masks (page 21) and General considerations N (General versus selective measures).

This refers to mask-wearing by people who are at higher risk through possible or probable exposure to infectious persons. It is helpful to consider three scenarios and groups:

- people providing care for sick people with presumed pandemic influenza in the home;
- crowded public places (internal travel); and
- occupations with face-to-face contact with the public.

Objective and rationale:
The prime objective is to reduce transmission in higher risk settings, but another is to allow persons in key activities to continue to work while giving them some protection.

Evidence of effectiveness:
There is no trial and few other data. Hence the effectiveness in reducing transmission is unknown, though often presumed in healthcare settings (Brankston 2007, Canada 2006).

Direct costs: Moderate
The costs of supply and training.

Secondary effects: Small

Likely acceptability and expectations:
This is unknown. There is no tradition of mask-wearing in the EU. However one or two European countries have announced they would purchase masks for their residents. It is quite likely that representatives (trade unions) could request or insist that their members have protection in certain circumstances.

Practicalities and experience:
Some authorities consider that certain workers, such as First Responders and people working at counters and check-outs, will expect to be supplied with masks if they are to continue working. There will be issues around communication, training and disposal of used masks. There are some suggestions that masks could be cleaned or sterilised and reused. While there is no evidence of effectiveness, it would be fair to point out that there is also no evidence that masks would be ineffective. It is possible to conceive a risk-based approach identifying people at special risk (e.g. workers with high frequency of face-to-face contact with unselected public) or higher risk settings (e.g. public transport). It is hard to declare that masks must not be worn in those circumstances.

— WHO policy (2005). Global Influenza Preparedness Plan. No policy, but UN staff guidance states that staff should to be equipped with a limited supply of simple masks.

9. Mask-wearing by people with respiratory symptoms

See discussion on masks (page 21) and General considerations N (General versus selective measures). This is an extension of what is now practice in some healthcare setting of insisting that all those people with symptoms wear masks. This may be the best use of limited amounts of masks.

Objective and rationale:
To reduce transmission from people known or presumed to be infected and infectious.

Evidence of effectiveness:
There is no trial and few other data. Hence the effectiveness in reducing transmission is unknown, though often presumed in healthcare settings.

Direct costs: Moderate
The supplies required per person would be considerably more than for other mask-wearing, as the masks would presumably be contaminated very quickly and require changing.

Secondary effects:
Some authorities have suggested perverse effects could result if mask-wearing was seen as an alternative to Early self-isolation of ill people (PHM 10).

Likely acceptability and expectations:
This may be better accepted than some mask-wearing as it makes sense and is an extension of practice in some healthcare settings. It may also make Early self-isolation in home settings more acceptable.

Practicalities and experience:
There is little experience outside of healthcare settings. People who are very ill find it hard to wear masks, which is accepted practice in Asia, but this is less of a problem for people with mild illness. See discussion on masks (page 21) and General considerations N (General versus selective measures).

— WHO policy (2005). Global Influenza Preparedness Plan.

10. Voluntary isolation of cases not requiring hospitalisation

Ill persons likely to have influenza and not needing hospital care would be requested to voluntarily remain in a single, dedicated room through the duration of symptoms. This would usually be in their own homes, but could be elsewhere.

Objective and rationale:
To reduce transmission by reducing contact between cases in their most infectious phase and uninfected persons.

Evidence of effectiveness:
No published evidence from trials (trials have not been attempted) but this measure makes very good sense. Modelling studies have suggested that cumulative attack rates would be reduced somewhat by this measure (Germann 2006, Ferguson 2006).

Direct costs: Moderate
There can be financial and practical disincentives if the person will lose wages or they are needed to care for others, e.g. children and spouses. There will also need to be many other preparations (see Practicalities and experience).

Secondary effects: Moderate
People in the home of the person may be put at risk of infection and there are other possible adverse clinical outcomes that may result for persons who do not receive adequate care and support while isolated, especially the elderly or persons who live alone. There would be issues of people not being available for work, including caregivers – although many sick persons and caregivers would be absent from work anyway, even without a specific isolation policy. If case isolation and infection control within homes is not effectively applied, home care may increase transmission and those in homes with sick people will feel put at risk.

Likely acceptability and expectations:
Acceptability is considered high as this is an extension of advice during seasonal influenza. However acceptability will vary by circumstance (see Practicalities).

Practicalities and experience:
This is one of the measures where prompt recognition of illness will be important. (See General Considerations O) There will need to be planning concerning support of financial, social, physical, and other needs of the patient and caregivers, e.g. allowing paid time off work for ill persons and caregivers. Training and supplies will be essential for infection control for household members providing care for the ill person. There will be some people for whom this is impossible, including persons in crowded households (who cannot have their own room); people who become ill while travelling, people in institutions, migrants and the homeless. During the SARS outbreaks of 2003, there was a generally good degree of voluntary compliance with this measure in a number of affected centres, though people seemingly not complying did cause problems in one or two countries (Health Canada 2003).

— WHO policy (2005). Global Influenza Preparedness Plan: Recommended at all pandemic phases and for seasonal influenza.

11. Voluntary quarantine of household contacts (including protective sequestration)

Household contacts of a person with proven or suspected influenza before the sick person was isolated might be asked to remain at home for a defined period (e.g. one incubation period, three days) after the last exposure. If symptoms of illness occur, they would then self-isolate themselves and seek medical advice. This follows the observation that the group at highest risk of acquiring influenza is those who are household contacts of a case. Also, since infectivity is high early in illness, quarantine of household contacts before they became ill may help prevent their infecting others before they can isolate themselves. This measure might be combined with home treatment with antivirals (PHM 20). An extreme variant of this is protective sequestration (see Glossary). Modelling studies have suggested that cumulative attack rates would be reduced somewhat by this measure though less than might be thought intuitively (Germann 2006, Ferguson 2006). Another more feasible variant is work quarantine (see Glossary for different definitions), in which quarantine is only observed in those working in settings where there is high risk of chains of transmission or there are people at high risk of disease (e.g. nursing staff).

Objective and rationale:
To reduce transmission by attempting to prevent the escape of the influenza virus from household settings.

Evidence of effectiveness:
No published evidence from trials (trials have not been attempted). However, this measure makes sense for application of infectious disease control.

Direct costs: Massive
This will result in a significant number of people being off work.

Secondary effects:
With a large number of people staying at home, the costs and adverse effects will be similar to those of early self-isolation only in a greater scale. There is likely to be particular legal problems of paying wages or compensation to apparently healthy people.

Likely acceptability in Europe:
This is unknown, but probably low and compliance might be especially difficult with a measure for which no personal benefit is perceived and the community benefit is unclear.

Practicalities and experience:
This needs rapid and effective identification of cases in the household and then voluntary compliance by household contacts and an ability to provide support to households that are under quarantine plus information on infection control in the home. Otherwise, the practicalities are similar to isolation of ill persons (see PHM 10). Sequential illnesses among people in the same household would result in contacts remaining in quarantine for considerable time. Experience from previous pandemics and the SARS episodes is variable but often negative in communities with cultural similarities to Europe (Canada and in the 1918–19 pandemic) (WHO 2006a, WHO 2006b, Digiovanni 2004). Lack of compliance or abuse (real or perceived) by some people undermined confidence in the measure and there would be particular problems with special groups (Table 2).

— WHO policy: Not recommended in Phase 6[23].

Social distancing measures

This term should be used cautiously. It is a collective term covering a number of quite distinct and different measures that are best considered individually on their merits. Vague policy recommendations, such as increase social distancing, are not recommended.

12. Internal travel restrictions

Objective and rationale:
To prevent or slow extension of the transmission.

Evidence of effectiveness: Minor delaying effect
This makes theoretical sense and there are some observations that this measure was successful in a few settings during previous pandemics. However, these were unusual and rather isolated settings in which there was very limited travel anyway (Markel 2006a, Markel 2006b).

Direct costs: Major
The costs to the transport system through loss of revenue are considerable though internal travel is likely to decline anyway. Other direct costs are on travel-dependent industry and trade.

Secondary effects: Massive
In most European settings this measure would result in huge social costs as many functions, like food distribution and fuel supply, break down.

Likely acceptability and expectations:
Acceptability is unknown in Europe though reduction in non-essential travel is likely to be good.

Practicalities and experience:
During the 1918–19 pandemic, in places where travel was frequent, these measures proved to be ineffective and quickly broke down when put in practice (2006a, 2006b).

— WHO policy (2005). Global Influenza Preparedness Plan: Not recommended in Phase 6[24].

[23] It is recommended in Phase 4, when dealing with a small and manageable number of localised cases.

[24] This is recommended to an extent in the very different circumstance of the very first emergence of a pandemic strain anywhere in the world – the Rapid Containment Strategy (WHO 2007).

Educational setting and day care-based interventions

These are felt by some authorities to be especially important for two reasons. Firstly, respiratory infections are always observed to spread easily in day care and school settings, and secondly, one of the three pandemics of the 20th century (that of 1957) showed a particular focus of transmission in children (see General Considerations B and Fig 3). Also, during some pandemics schools have closed 'naturally' and it is felt that it may be better to do so in a controlled and planned way. Certainly all schools and day care institutions should have a plan for how they could close in a crisis, and parents and carers would need to be involved in this planning so they can make their own arrangements. Schools and educational authorities would also need to agree on plans for reopening.

At least three major difficulties arise: 1) the need to define and measure during a crisis what is the level of severity and the focus of transmission in children to justify closures; 2) the secondary effects will probably be massive as the children have to be cared for, especially if they are not to simply mix and transmit virus outside school; 3) in many settings, schools perform special social functions providing social care, meals and pastoral care, as well as education (Cauchemez 2009).

13. Reactive school and day care closures

This is the planned closure of schools when it is seen that there is transmission taking place in a school.

Objective and rationale:
To reduce the anticipated amplification of influenza transmission in schools.

Evidence of effectiveness:
There are some observational analyses that suggest some positive effect when seasonal influenza outbreaks or pandemics coincide with school holidays or unrelated school closures (WHO 2006a, WHO 2006b). However, the effects are smaller than it might be predicted by modelling studies, perhaps because children also mix outside schools (Inglesby 2006, Cauchemez 2009 Cowling 2008b). Another model is what happens when school-age children are immunised (Jordan 2006). A major concern is that if there is any delay in appreciating that transmission has started in children, then there may be little effect, as the damage will already have been done. Hence the preference stated by some for proactive closures.

Direct costs: Moderate
The costs of the planning and logistics of school closures (Table 4) are considerable.

Secondary effects: Massive
The costs and disruption of school closures are considerable, especially for European societies that have no tradition of school closures outside holiday seasons. In some European countries, a significant proportion of healthcare workers has school-age children and so would need to have time off work to supervise or care for their children (Cauchemez 2009). This raises issues similar to those that arise under voluntary quarantine (PHM 10).

Likely acceptability and expectations:
This is not well known since there is limited tradition of school closures in Europe. However, some EU countries are planning such closures, especially in more severe pandemics.

Practicalities and experience:
There are huge practicalities but one that would need to be faced is the likelihood that, during any pandemic, schools will close anyway (Table 5). Major difficulties can be experienced and some countries will be seen to be closing schools while others will not, or will close schools at a later stage. This will require preparation of communication strategies. Some authorities make a distinction between school closures and class dismissal (meaning a school stays open but the pupils are sent home). The latter is preferable, as it makes re-opening and support of vulnerable children and families easier (Cauchemez 2009).

— WHO policy (2005). Global Influenza Preparedness Plan: Consider school closures.

14. Proactive school and day care closures

This means the early planned closure of schools when it is judged that influenza transmission is approaching a school but before it starts in the school itself.

Objective and rationale:
To prevent the amplification of influenza transmission in schools.

Evidence of effectiveness:
See last item, Reactive school closures. The advantage of proactive closures is that they can be done before any transmission has taken place in schools. The disadvantage is the difficulty of timing it and the intervention may be implemented too early, then becoming exceptionally costly and difficult to sustain.

Direct costs: Moderate
The costs of the planning and logistics of school closures (Table 4) are considerable.

Secondary effects: Massive
The costs and disruption of school closures are immense, especially for European societies that have no tradition of school closures outside holiday seasons. See PHM 13.

Likely acceptability and expectations:
See PHM 13.

Practicalities and experience:
See PHM 13 and Table 4.

— WHO policy (2005). Global Influenza Preparedness Plan: Consider school closures in Phase 6.

Measures in the workplace and public places

These are measures that attempt to reduce transmission. Decisions are often made difficult due to the lack of objective information on the level of influenza transmission that takes place in the workplace, on transport going to and from work and in other public places. Modelling studies sometimes make assumptions on the proportion of transmission in workplace and public settings, however, there are few, if any, empirical data underpinning these assumptions and the published figures should be approached with caution (German 2006, Ferguson 2006). Generally there have been no plans for proactive workplace closures because of the lack of certainty that there are large amounts of transmission in workplaces, therefore that is not considered as a measure.

15. Reactive workplace closures

Objective and rationale:
To reduce workplace transmission.

Evidence of effectiveness:
There is hardly any information on this and no studies. It is noticeable that there are few, if any, reports of influenza transmission and outbreaks in workplace settings.

Direct costs: Major
These depend on the workplace, however since most work is productive there would be some significant costs of closure for any period of time, especially if it is considered necessary to close for much of the three months that a pandemic would affect a local area.

Secondary effects: Massive
As for the direct costs, there would be major economic costs. In addition, in the highly interdependent societies of Europe there would be very significant effects in organisations dependent on the organisation that was closing. For example, the closure of a factory would affect both its suppliers and those that receive its output.

Likely acceptability and expectations:
Some organisations are used to closing, or at least scaling activities down, during holiday seasons but not for extended periods. There would be major anxieties by staff about security of wages and employment.

Practicalities and experience:
Though some organisations close or scale down in holiday seasons, they do not close for this period of time. The practicalities would be major and it is doubtful that planning for this eventually would have any priority compared to PHM 15 changing patterns of work and a business continuity planning (coping with 30% of staff being off for extended periods). Some businesses will need to increase operations in a pandemic (e.g. healthcare supplies).

— WHO policy (2005). Global Influenza Preparedness Plan: Not mentioned.

16. Home working, reducing meetings, safety in the workplace

This could be part of a package of measures to reduce risk in the workplace, on the way to and from work and in public places. There would be many advantages to all organisations and businesses having a programme of education and some potential components are shown in Table 5.

Objective and rationale:
To reduce transmission outside home and educational settings.

Evidence of effectiveness:
There is hardly any information on this and no studies. It is noticeable that there are few, if any, reports of influenza transmission or outbreaks in workplace settings.

Direct costs: Variable to moderate
These depend on the extent of the measures (see Table 5).

Secondary effects: Variable to moderate
These depend on the extent of the measures.

Likely acceptability and expectations:
Some companies have already started on this planning with a business continuity planning.

Practicalities and experience:
A candidate package of measures is suggested in Table 5. The selection from this will depend on the company and the type of work.

— WHO policy (2005). Global Influenza Preparedness Plan: No mention.

17. Cancelling public gathering, international events, etc.

Decisions are made difficult because of the lack of objective information on the level of influenza transmission that takes place in the workplace, on transport going to and from work and in other public places. Modelling studies make assumptions on the proportion of transmission in workplace and public settings however there are few if any empirical data underpinning these assumptions and they should be recognised as such.(WHO 2006a, WHO 2006b)

Objectives and rationale:
To reduce transmission and dissemination of influenza through large gathering. To reduce the risk to people travelling to events and becoming sick away from home.

Evidence of effectiveness:
Common sense would suggest that large meetings, conferences and international events could be important in spreading infectious diseases. However, there are actually few reports of this. This is in contrast to other infections, for example, gastrointestinal illnesses, of which explosive spread following small or large gatherings are reported quite commonly. SARS provides an interesting model: the international dissemination from one hotel in Hong Kong, but dissemination was not related to any specific meeting.

Direct costs: Major
Any decision to cancel all events over a period would be controversial and costly. The issue of financial liability and meetings insurance would be crucial.

Secondary effects: Major
Similarly to direct costs, there would be many secondary effects on those who service meeting and events.

Likely acceptability and expectations:
The public may expect this to happen.

Practicalities and experience:
Meetings and events are often cancelled and most large organisers will have procedures for this. The issue of who is liable is crucial – although there is insurance for this, the insurance policy frequently states that it does not apply when the cancellation is due to another body's action. There will be boundary issues over what is a large enough public gathering to warrant cancelling.

— WHO policy (2005). Global Influenza Preparedness Plan: No mention.

Antivirals and other medications

Much reliance is being put on the use of antivirals (mostly oseltamivir) in Europe for prophylaxis or early treatment for the pandemic influenza strain. The evidence base for use as prophylaxis in reducing transmission is limited but the results are good if medicines are given early enough following exposure or development of symptoms (Hayden 1996, Hayden 2004, Halloran 2007). Essentially, a seminal re-analysis of four randomised placebo-controlled trials of oseltamivir and zanamavir found that both were effective in preventing infection and disease in low-risk (young adults without symptoms) contacts of low-risk cases with laboratory-confirmed infections with human seasonal influenza. Similarly for early treatment, both drugs were effective in reducing but not eliminating the experience of symptoms (Halloran 2007, Jefferson 2006). While there was a significant reduction in the proportion of subjects experiencing symptoms, in absolute terms the symptoms experienced were mild and the reduction in duration of those treated was only of one or two days.

Effect on severe disease and death?
There is as yet only limited information about the effect of early treatment with oseltamivir on reducing the risk of severe disease and death. Trial data are unlikely to be helpful, as trials are always too small to investigate what are usually rare events. Also, there is the problem that the observed effects to date can only be on seasonal influenza. The evidence is of some benefit from early treatment against H5N1 (WHO 2007). The existing observational data suggests some benefit, though it is not clear if the benefit is as great as some of the assumptions that have been made (for example, that early treatment will reduce hospitalisations by 50%) (Gani 2005). The limited work to date is summarised in a separate paper by ECDC (other references are Kaiser 2003, McGeer 2006, Nordstrom 2005). Antivirals are little used in Europe for influenza and the experience of Japan, the one country that has used oseltamivir extensively against seasonal influenza, requires further analysis (Kawai 2005). Finally, all that experience may or may not apply against the novel pandemic strain. It is, however, possible to say with more certainty that early treatment is essential in any influenza. There is no firm 'cut-off' (though it is common to read a time of 48 hours since the start of symptoms), but trial data demonstrate that 24 hours are better than 48 hours (Moscona 2006a).

Adverse effects
It is known, by experience with older antivirals, that severe side effects are rare. However, it is not clear if oseltamivir and zamanivir have rare and severe side effects because they have not been used much in Europe. Reports of an association with rare neuropsychiatric events in Japan may be the results of coincidence but are the subject of investigations at present.

Logistical difficulties
In applying the ECDC Acid Tests on early antiviral treatment (http://ecdc.europa.eu/en/healthtopics/pages/pandemic_influenza_acid_tests.aspx), there are substantial logistic difficulties in delivering large quantities of antivirals to many people, when and where they need them, within 24 or 48 hours (ECDC 2006d). The experience of operational modelling and some exercises has also revealed considerable difficulties in handling the antivirals in a pandemic. Some countries that have devised systems for delivery have had to redesign their systems as a consequence. The simplest solution of allowing or encouraging home stocks is undesirable on a number of grounds (Table 5) (Brett 2005). The same is true for dispersal of stockpiles to local healthcare providers because of the probable uneven need in a pandemic. Antivirals will need to be distributed through conventional primary care or parallel systems. Therefore, practicalities will revolve around the pre-existing systems or alternatives that are being devised. Storing stocks as powder is now considered to be inconvenient and many of those stocks are being converted to more manageable capsules.

Presumptive treatment
Most of the treatment will need to be done without confirmation of a diagnosis. There will not be human or laboratory resources and there will certainly not be time before treatment must start. Depending on the level of other circulating viruses, it is possible that a great deal of antivirals will be used for other, perhaps trivial, infections, seasonal influenza, respiratory synctial virus, etc. Hence there may be considerable 'wastage' in the use of antivirals.

Use of antibiotics
It is appreciated that treatment with antibiotics may improve the prognosis of infected persons whose condition is deteriorating and may have significant impact on influenza-related mortality and morbidity due to secondary infections. While this will do nothing for reducing transmission, it could reduce pressure on hospitals. However, this means that stockpiles of antibiotics will also need to be developed.

Early treatment with antivirals

18. Early treatment of all those with symptoms

See general antivirals discussion above.

Objective and rationale:
To reduce the risk that people infected will progress to severe disease or death.

Evidence of effectiveness:
No direct evidence. Small effect inferred from trials against seasonal influenza.

Direct costs: Massive
With countries acquiring large national stockpile, investments are considerable.

Secondary effects:
Aside from the competing costs (monies spent on antivirals cannot be used for other things), there is the unclear risk of possible rare but severe side effects.

Likely acceptability and expectations:
It is thought that acceptability by professionals and patients will be high and the expectations are beyond what some countries can deliver. It is a common belief that having an antiviral stockpile is a solution in itself. Antivirals are an essential tool but not sufficient.

Practicalities and experience:
Major logistical difficulties discussed above. Additionally, the proportion of stockpiles like oseltamivir and M2 inhibitors, the amounts in capsules versus in powder and paediatric suspensions.

WHO Policy: No policy on antivirals.

19. Healthcare or other exposed key workers

See general antivirals discussion above. Some countries are considering it important to protect healthcare workers and perhaps others who may be put in danger through their work and to ensure they have early treatment if develop symptoms.

Objective and rationale:
To protect persons whose work makes them exposed to influenza in a pandemic.

Evidence of effectiveness:
No direct evidence. Small effect inferred from trials against seasonal influenza.

Direct costs: Major
Because there is a substantial number of healthcare workers, the costs of having treatment for all of them through a pandemic is substantial. Only those that become ill will need to be treated, though there will be a case for testing to see if the person has influenza. There are also some concerns about the safety and acceptability concerning long term prophylaxis (see PHM 23).

Secondary effects:
Unclear risk of possible rare but severe side effects.

Likely acceptability and expectations:
Acceptability by professionals is expected to be high.

Practicalities and experience:
Major logistical issues discussed above.

WHO Policy: No policy on antivirals.

Antiviral prophylaxis following a single case

20. Given to family (household) members of influenza cases

See general antivirals discussion above. This is based on the observation of the high risk of transmission in households.

Objective and rationale:
To prevent secondary and subsequent cases.

Evidence of effectiveness:
No direct evidence. Moderate effect inferred from trials against seasonal influenza.

Direct costs: Massive
These could be massive. One calculation has suggested that stockpiles for at least 100% of the population (one course per person) would potentially be required, in case the drugs are not highly successful initially and/or there are repeated introductions of the pandemic strain (Wu 2007).

Secondary effects: Moderate
Unclear risk of possible rare but severe side effects. Development of antiviral resistance may be sped up.

Likely acceptability and expectations:
It is thought that there could be significant abuse if this measure is perceived as a way of obtaining family stocks of antivirals.

Practicalities and experience:
Major logistical issues discussed above. Giving prophylaxis for the family when starting early treatment of a case would be logistically attractive, if it was not for the very large stockpiles that might be needed. Another difficulty will be boundary issues, deciding who is in a household. Prophylactic antivirals are only effective as long as they are being taken; therefore, once the prophylaxis is completed, a second member of the household could become ill with influenza from a different external source, thus counteracting the rationale for the previous prophylaxis.

— WHO policy (2005): No policy on antivirals.

21. Family and social contacts

See general antivirals discussion. This is an extension beyond PHM 20 to include other social contacts.

Objective and rationale:
To prevent secondary and subsequent cases.

Evidence of effectiveness:
No direct evidence. Moderate effect inferred from trials against seasonal influenza.

Direct costs: Massive
These could be huge.

Secondary effects: Moderate
Unclear risk of possible rare but severe side effects. Spread of antiviral resistance may be accelerated.

Likely acceptability and expectations:
It is thought that there could be significant abuse if this measure is perceived as a way of obtaining family stocks of antivirals.

Practicalities and experience:
Major logistical issues discussed above. Giving prophylaxis for the family when starting early treatment of a case would be logistically attractive, if it was not for the very large stockpiles that might be needed. Another difficulty will be 'boundary issues' (who is and is not in the family).

— WHO policy (2005): No antiviral policy.

22. Family and geographical contacts

See general antivirals discussion. This means prophylactic use in the workplace or classroom once a case has been diagnosed.

Objective and rationale:
To prevent secondary and subsequent cases.

Evidence of effectiveness:
No direct evidence. Moderate effect inferred from trials against seasonal influenza.

Direct costs: Massive
These could be huge.

Secondary effects: Moderate
Unclear risk of possible rare but severe side effects. Development of antiviral resistance may be sped up.

Likely acceptability and expectations:
It is thought that there could be significant abuse if this measure is perceived as a way of obtaining family stocks of antivirals.

Practicalities and experience:
Major logistical issues discussed above. Giving prophylaxis for the family when starting early treatment of a case would be logistically attractive, if it was not for the very large stockpiles that might be needed. Another difficulty will be boundary issues.

— WHO policy (2005): No antiviral policy.

Continuous prophylaxis

See general antivirals discussion.

23. Healthcare workers or other key workers

Objective and rationale:
There are two possible objectives: 1) to protect healthcare workers who are likely to be exposed (a variant of PHM 19); 2) there are benefits in keeping some particular key workers healthy through the pandemic until a pandemic vaccine is produced and available.

Evidence of effectiveness:
No direct evidence. Moderate effect inferred from trials against seasonal influenza.

Direct costs: Massive
This depends on the objective. The costs would be massive for all healthcare workers given the size of this workforce. For the key workers, it depends on the size of the population.

Secondary effects: Moderate
Unclear risk of possible rare but severe side effects. Development of antiviral resistance may be sped up.

Likely acceptability and expectations:
It is not entirely clear that continuous medication will be well accepted in the face of real or suspected side effects. It also depends on the perceived risk. Experience with other prophylactic treatments shows that a significant proportion of those who start long courses come off them after a while.

Practicalities and experience:
Presently, the time period for which antivirals are allowed to be given is limited. There could be stockpile difficulties if there were delays in a pandemic vaccine becoming available and, of course, the protective effect will stop as soon as treatment ceases. There are expected 'boundary issues', namely who is and is not a healthcare worker.

— WHO policy (2005): No policy on antivirals.

Vaccines – Human avian influenza vaccines (pre-pandemic vaccines)

See also ECDC Guidance on the human H5N1 vaccines (two separate documents) – answering scientific questions and public health and operational questions.

24. Whole population

Objective and rationale:
If available and stockpiled in advance, to lessen the impact of the pandemic while waiting for a specific pandemic vaccine to become available.

Evidence of effectiveness:
No direct evidence is available as it is not possible to determine in advance what influenza virus will cause the next pandemic. In addition, the evidence available so far refers to the effectiveness of vaccines in determining an immunological response against the currently circulating strains of influenza A(H5N1) viruses, while an hypothetic H5 pandemic virus would more likely be an evolved strain. However, detailed scientific studies suggest that there would possibly be some protective effect against an H5-based pandemic even if the pandemic strain had changed somewhat from the current H5N1 viruses circulating in birds. Modelling work have suggested that the strategy of having a stockpiled vaccine (and possibly deploying it in advance), even if incompletely matched to the pandemic virus, may prevent more infections and deaths than waiting for specific 'true' pandemic vaccines (Ferguson 2006, Germann 2006). In this perspective, the evidence available on effectiveness, level of cross-reactivity and safety of H5N1-based vaccines become more relevant. For a comprehensive literature review and answers to some of the most important questions regarding the possible use of such vaccines, see the two ECDC technical reports on human H5N1 vaccines available online (Report 1: Scientific Questions; Report 2: Public Health and Operational Questions).

Direct costs:
Massive if Member States plan to stockpile an H5N1 vaccine to cover the entire population and if the shelf life of the stockpiled vaccine is short. Costs would also depend on the immunisation strategy used (i.e. two doses versus one dose, or just priming part of the population). Details on these issues are given in the ECDC technical report on human H5N1 vaccines (Report 1; Scientific Questions, pages 14–15).

Secondary effects:
In principle similar to those reported for seasonal vaccines. However, there is a possible increased risk of adverse events due to the likely presence of adjuvants (see ECDC technical report on human H5N1 vaccines Report 1: Scientific Questions, pages 17–18). Additional theoretical concerns rise from the risk of immunological mal-reaction or 'dengue effect'. This issue is specifically addressed by the ECDC technical report on human H5N1 vaccines Report 1: Scientific Questions, pages 15–16.

Likely acceptability and expectations:
Variable according to the public perception of the imminence of a pandemic. Acceptability is likely to be low until Phase 6 of the pandemic is declared by WHO or until the pandemic reaches Europe. Issues such as the detection and management of adverse events following immunisation and subsequently reports of vaccine failures need to be accurately dealt with in order to avoid them affecting acceptability of vaccination in later stages, when a specific pandemic vaccine becomes available.

Practicalities and experience:
There are studies on different animal models and initial results from phase I trials on healthy volunteers. Practical issues to support Member States in deciding whether, when and how to stockpile and administer H5N1 vaccines are addressed in the ECDC technical report on human H5N1 vaccines previously mentioned.

— WHO policy (2005). Global Influenza Preparedness Plan: no definite guidance on the use of H5N1 vaccines is given. However, strong advocacy to increase vaccine production capacity has been provided through the WHO – Global Pandemic Influenza Action Plan to Increase Vaccine Supply.

25. Health or social care workers or key workers

Objective and rationale:
To offer initial protection to categories of workers at higher risk of professional exposure to the pandemic virus. To reduce the impact of the pandemic on key workers so as to limit disruption of essential services.

Evidence of effectiveness:
Same as described in PHM 24 (Whole population).

Direct costs:
Lower than vaccinating the whole population, but still massive.

Secondary effects:
Same as described in PHM 24 (Whole population).

Likely acceptability and expectations:
Probably higher than the general population because of higher awareness of the risks and likelihood of professional exposure.

Practicalities and experience:
Same as described in PHM 24. Particular difficulties arise from the need to define who are healthcare workers and/or key workers.

— WHO policy: This is under development (Summer 2009).

26. Children vaccinated first

Objective and rationale:
To reduce the impact of the pandemic on children. Hypothetically, this could reduce the transmission to other population groups.

Evidence of effectiveness:
Same as described in PHM 24, but fewer studies are conducted in children.

Direct costs: Massive
Same as described in PHM 24.

Secondary effects:
Same as described in PHM 24.

Likely acceptability and expectations:
Unclear whether parents would accept vaccinating their children if the disease is milder in children and benefit is for others, and safety profile is not well established.

Practicalities and experience:
Same as described in PHM 24, needs pre-planning.

— WHO policy (2005): This is under development (Summer 2009).

27. Pandemic vaccine

Objective and rationale:
To reduce pandemic-associated morbidity and mortality (the vaccine will probably only be available during any second or subsequent wave).

Evidence of effectiveness:
No direct evidence can be available ahead of the pandemic though it is likely that a vaccine developed from the pandemic strain will be effective. Availability will be minimal during the first pandemic wave as it can take months to develop a vaccine. Effectiveness will be similar to that of seasonal vaccines although two doses might be needed due to the immunological naivety of the population.

Direct costs:
Massive and requires previous investment.

Secondary effects:
Same as described in PHM 24.

Likely acceptability and expectations:
Same as described in PHM 24.

Practicalities and experience:
There are major issues in deciding who should receive the first supplies of this vaccine as it becomes available. This should be decided ahead of any pandemic (Staetemans 2007). Other issue is how to rapidly deploy the vaccine. It also needs to be considered that demand will massively exceed supply and that, as in any applied biological process, there are considerable uncertainties and some risks. For example, a viral strain that grows well will need to be found and any adverse effects will need to be watched for carefully as there will be no time for ordinary trials.

— WHO policy (2005): Rapid development and deployment of specific pandemic vaccines is inherent to WHO's pandemic strategy.

Tables

Table 1: Human influenza: characteristics for the transmission and control

The following parameters are known to apply to seasonal influenza. It is often assumed that they would apply to a new pandemic strain and they are reasonable default positions. However, it needs to be appreciated that the parameters could be very different and need to be rapidly investigated early in a pandemic.

Person-to-person transmission	Primarily by the respiratory route through large droplets over short distances (beyond one metre risk falls considerably) with some transmission also by contact with respiratory secretions such as on hands and surfaces[25] (Brankston 2007).
Aerosol transmission	Occurs but seems to be uncommon under usual circumstances; it may be made more likely by some medical procedures (e.g. intubation, bronchial lavage) (Tellier 2006, Brankston 2007).
Incubation period	The period between infection and onset of symptoms is a mean of 2–3 days (range 1–4 days)..
Peak infectivity	Early in illness, with infectivity directly correlated with the severity of fever and symptoms[26] (Foy 2005).
Period of communicability	Typically up to five days after symptom onset in adults and seven days in children[27].
Infectivity	Each case will infect on average between 1.4 and 1.9 other people in the absence of interventions (i.e. R_0 =1.4 to 1.9) (Hall 2007).
Prevention	Influenza viruses are easily made inactive by washing with soap, alcohol-based hand sanitisers, and cleaning with normal household detergents and cleaners (Bean 1982, Shurmann 1983).
Methods to reduce transmission	Barrier methods such as proper use of tissues and simple masks are thought to reduce transmission from infected persons but the evidence base for this is weak (see http://www.eurosurveillance.org/ew/2007/070510.asp#1).
Children	In seasonal influenza and some pandemics children seem to account for a disproportionately large number of transmissions.

Important variations:
There are some important parameters that are known to have varied significantly in the three pandemics that have been well studied (see http://ecdc.europa.eu/en/Health_Topics/Pandemic_Influenza/stats.aspx). These are:

- Severity of disease – the case fatality rate.
- Age groups most affected and where transmission has been concentrated.

In addition, the severity of disease will change over time so that the case fatality rate needs to be monitored.

[25] Human influenza viruses can survive on environmental surfaces, especially on hard non-porous materials (up to 48h).

[26] The virus may be detected in secretions of infected but pre-symptomatic persons, but there is only limited evidence of transmission from pre-symptomatic individuals. Transmission can take place from persons without symptoms, but this seems to be unusual.

[27] Virus excretion may be more prolonged in immunocompromised patients.

Table 2: Some groups requiring special planning

Group	Special difficulties
The elderly, especially those living alone	Will be less able to care for themselves at home, but may not need hospitalisation when ill.
Children	May not readily know what to do if they develop symptoms and may be less likely to comply with measures.
Homeless people	Will be unable to care for themselves, but will not need hospitalisation when ill.
Recent immigrants legal and illegal	Are much less likely to have good access to services, relevant literature and the media. Often language issues. Illegal immigrants may not be acknowledged as a responsibility for the health and social services
Special minority groups e.g. Roma, Sami	May not have good access to services, relevant literature and the media. May have language issues. May not be acknowledged as a responsibility for the health and social services
People travelling, 'caught' in a European country	Will be unfamiliar with the country, systems and language.
Physically handicapped people	May be less able to care for themselves at home, but may not need hospitalisation when ill.
People with learning difficulties	May not readily know what to do if they develop symptoms and may be less likely to comply with measures.
People with special communication needs[28]	Will not receive information or will not understand.
People in institutions including prisons	More likely to be in crowded circumstances where infection control will be difficult.
People living in poverty	More likely to be in crowded circumstances and more limited access to healthcare.

Table 3: European interoperability and pandemic planning

Negative	Positive
1. I do something in my State that impacts negatively directly on your State E.g. closing borders, if that stops daily commuting for work.	3. A few of us work for all. Actions that can be undertaken most efficiently in a few Member States rather than in all, but for the benefit of all. E.g. monitoring the development of antiviral resistance.
2. I do something in my State that raises questions in another State – especially if it is done without warning. E.g. starting public screening of people coming off flights.	4. All of us share thinking and analyses on particular policy areas so that conclusions emerge from a common understanding of what is known and not known. E.g. whether and when to close schools proactively.
	5. Some of us move from actions described in 4 above to agreeing on certain joint measures.
	6. We share our experience and development while recognising the diversity across Europe (one size will not fit all), i.e. a Member-State-to–Member-State approach on measures enacted in one State that will potentially cause some confusion in others. E.g. mask-wearing.
	7. I talk specifically with my neighbours in relation to all the above.
	8. I warn all others as to what we plan to do in our Member State in a pandemic (Pandemic Presumptions).
	9. ECDC and WHO develop common mechanisms and tools for preparing and dealing with pandemics. E.g. the assessment tool.

[28] Those with hearing difficulties, visually impaired, or not speaking the national languages.

Table 4: Some practicalities arising from school closures

1. Educating, supervising and entertaining the children out of day care and school.
2. Negotiating leave (preferably paid) for parents/carers to enable them to be off work in order to care for children who are not sick.
3. Additional stress on those having to cover the work of those who are staying home with children.
4. Continuity of pastoral care and social programmes administered through schools.
5. The complexity of schools and school systems (public and private, State and religious-based).
6. Defining the trigger points and timing for closure and re-opening of schools and geographic areas that would be involved given that a national system may not be desirable (see General considerations C, Diversity in the pandemic).
7. Defining practices for tertiary (University sector) education institutions with halls of residence, students whose homes are elsewhere in the country or even abroad, and who may be 'trapped' at their college setting.
8. Communication with the staff, student body and families.
9. Meeting the needs of special groups (see Table 2)

Table 5: A candidate package of measures for workplace and public settings

Staff protection	• Educating staff on personal protective measures; • Ensuring early exclusion of sick workers, especially those developing illness in working hours with masks for their safe travel home; • Promotion and support of hygiene measures in the workplace; • Planning no-cost or low-cost flu leave policies to allow employees to stay at home in isolation or caring for ill family members; • Shift working to reduce overlap at work and reduce crowding on transport; • Where permitted, specific social distancing measures will differ by industry. For example, telecommuting may be more difficult for production than service sectors. Some measures may interact with community social distancing measures, such as staggering shifts to reduce social contact while commuting. Such interventions, and the altered business operations to facilitate them, would be one of many components in business continuity of operations planning.
Business continuity planning	• Planning for loss of up to 30% of staff for an extended period.
Goals	• Reduce workplace contacts by 50%; • Promote a safe environment and promote confidence in the workplace; • Maintain business continuity, especially for critical infrastructure.

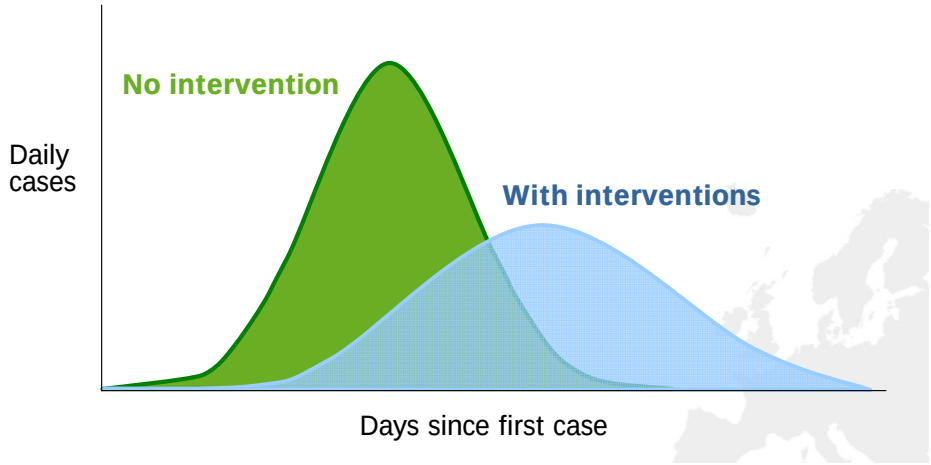
Table 6: Some operational disadvantages arising from home stockpiles of antivirals (Brett 2005)

1.	National stockpiles automatically have to be more than 100% of populations on equity grounds.
2.	Stocks cannot be moved around the country to where they are most needed.
3.	There is likely to be early use and exhaustion of stocks.
4.	The likelihood of early development of antiviral resistance increases.

Figures

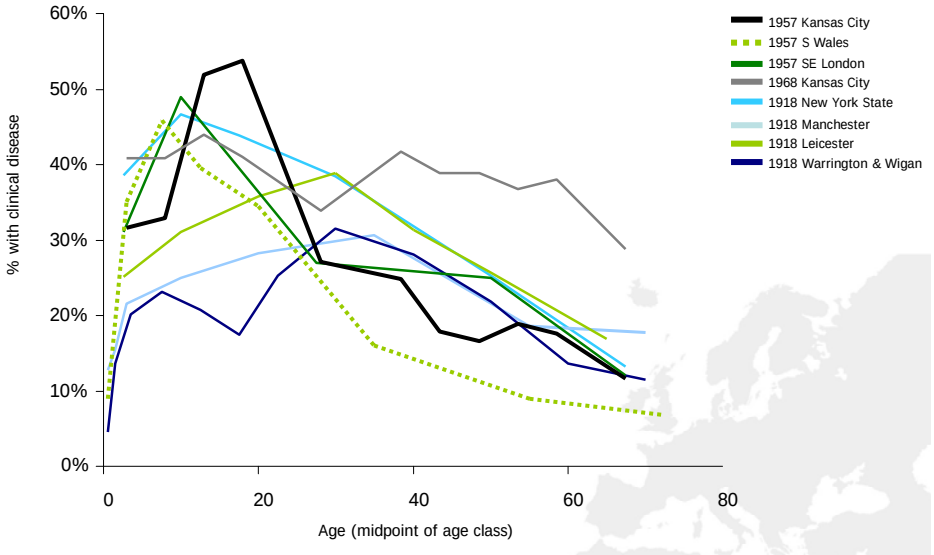
Figure 1: Objectives of applying public health measures during a pandemic

- Delay and flatten epidemic peak
- Reduce peak burden on healthcare systems and threat to other essential systems through high levels of absenteeism
- Somewhat reduce total number of cases
- Buy a little time



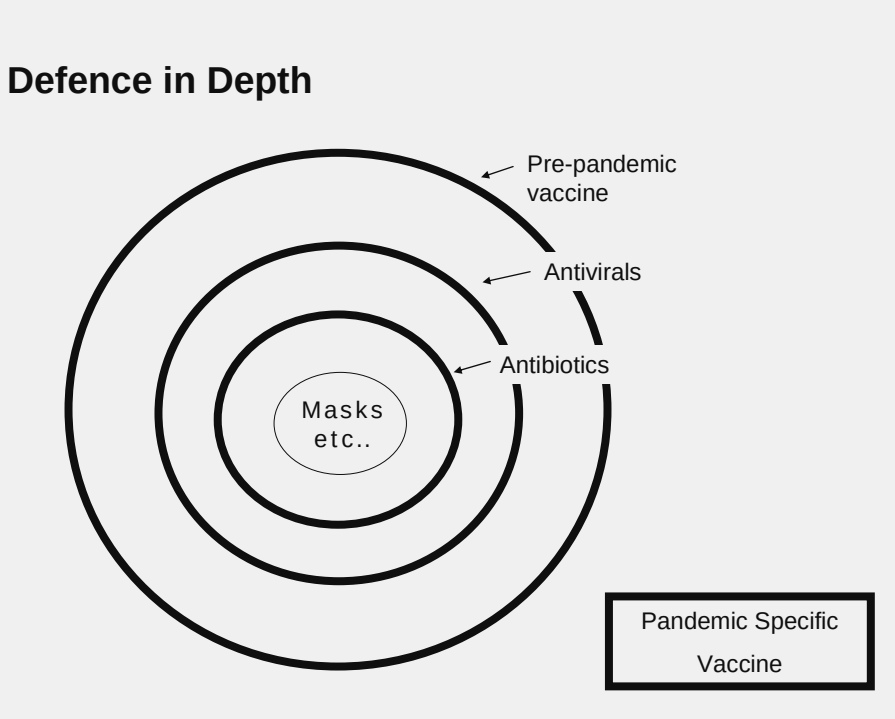
Source: Based on an original graph developed by the US CDC, Atlanta

Figure 2: Estimated age-specific transmission ratios of the previous pandemics



With thanks to Peter Grove, Department of Health, London, UK, and the Health Protection Agency

Figure 3: Multiple measures diagram



Source: Grove P: Antivirals – the impact of combined strategies. Available from: http://www.dh.gov.uk/en/PandemicFlu/DH_076566

Figure 4: Public hand-washing facility in a shopping area (Hong Kong, China)

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Annex

WHO global influenza preparedness plan: The role of WHO and recommendations for national measures before and during pandemics

[Extract from WHO Global Preparedness Plan; recommendations for non-pharmaceutical public health interventions (Annex 1 of original document). Reproduced with kind permission of the world health organization]

WHO/CDS/CSR/GIP/2005.5
Department of Communicable Disease
Surveillance and Response
Global Influenza Programme

Recommendations for non-pharmaceutical public health interventions

Measures at the national level[29] (for persons living or travelling within an affected country)

Measures	Pandemic alert period[a]		Pandemic period[a]	Comments
	Phase	Phases	Phase	
	3	4 and 5	6	
Public health information, communication				
Information for public on risks and risk avoidance (tailored to target population)	Y	Y	Y	
Information for professionals	Y	Y	Y	
Advice on universal hygiene behaviour	Y	Y	Y	
Preparatory information on next phase	Y	Y	Y	
Measures to reduce risk that cases transmit infection				
Confinement: • Confine cases (mild and severe) as appropriate to local situation; provide medical and social care	Y	Y	Y	Need to plan for large numbers of severe cases
Face masks:[b] • Symptomatic persons	Y	Y	Y	Logistics need to be considered.
• Exposed persons: undertake risk assessment considering: evidence of human-to-human transmission; closeness of contact; frequency of exposure	C	C	C	Consider recommending masks based on risk assessment.
• Persons seeking care (respiratory illness) in risk area (waiting room),	Y	Y	Y	Need more data, especially on use by well persons.

[29] Source: WHO consultation on priority public health intervention before and during an influenza pandemic. Geneva, World Health Organization. (Document WHO/CDS/CSR/RMD/2004.9)

Measures	Pandemic alert period		Pandemic period	Comments
	Phase	Phases	Phase	
	3	4 and 5	6	
Measures to reduce risk that contacts transmit infection (continued)				
Tracing and follow-up of contacts.	Y	Y	N	Not feasible once pandemic starts.
Voluntary quarantine (such as home confinement) of healthy contacts with health monitoring; provide medical and social care,	N	Y	N	Voluntary quarantine should also apply to contacts of known cases undergoing antiviral prophylaxis, as efficacy not known.
Self-health monitoring and reporting if ill but no restrictions on movement.	Y	C	Y	Not relevant for contacts in quarantine.
Advise contacts to reduce social interaction	N	NR	N	Not relevant for contacts in quarantine, see also measures to increase social distance.
Advise contacts to defer travel to unaffected areas.	N	NR	Y	Not relevant for contacts in quarantine. Precautionary principle when unclear whether human-to-human transmission is occurring; see also travel measures.
Provide contacts with antiviral proplylaxis.[c]	Y	Y	N	Principle of early aggressive measure to avert pandemic
Measures to increase social distance				
Voluntary home confinement of symptomatic persons	Y	Y	Y	Measures needed to reduce risk of transmission to other household members.
Closure of schools (including preschool, higher education) in conjunction with other measures (limiting after-school activities) to reduce mixing of children	N	C	C	Depends on epidemiological context – extent to which these settings contribute to transmissions.
Population-wide measures to reduce mixing of adults (furlough non-essential workers, close workplaces, discourage mass gatherings).[d]	N	C	C	Consider in certain circumstances – extent to which unlinked community transmission and transmission in workplaces occurs.
Masks in public places.	N	N	N	Not known to be effective; permitted but not encouraged.
Measures to decrease interval between symptom onset and patient isolation				
Public campaign to encourage prompt self-diagnosis.	Y	Y	Y	
Urge entire population (affected area) to check for fever at least once daily	N	N	N	
Set up fever telephone hotlines with ambulance response.	N	C	N	
Set up fever clinics with appropriate infection control.	N	C	N	
Introduce thermal scanning in public places.	N	N	N	Not effective based on experience, also requires individual and public health action for identified febrile persons.
Disinfection measures				
Hand-washing	Y	Y	Y	
Household disinfection of potentially contaminated surfaces	Y	Y	Y	
Widespread environmental disinfection.	N	N	N	
Air disinfection.	N	N	N	
Measures for persons entering or exiting an infected area within the country				
Advise to avoid contact with high-risk environments (such as infected poultry farms, live-poultry markets).	Y	Y	Y	
Recommended deferral of non-essential travel to affected areas.	N	Y	Y	If significant areas of country remain unaffected.
Restrict travel to and from affected areas.	N	N[e]	N	Enforcement of travel restrictions considered impractical in most countries but likely to occur voluntarily when risk appreciated by the public.
Cordon sanitaire.	N	N	N	Enforcement considered impractical.
Disinfection of clothing, shoes or other objects of persons exiting affected areas.	N	N	N	Not recommended for public health purposes, but may be required by veterinary authorities to prevent spread of infection to animals.

Measures at the international level

Measures	Pandemic alert period		Pandemic period	Comments
	Phase	Phases	Phase	
	3	4 and 5	6	
Measures at borders for persons entering or exiting a country				
Information to travellers				
• Outbreak notice.	Y	Y	Y	Message must be tailored to phase. While travel would remain a matter of personal choice, transparency must be ensured in order to allow for informed decision-making. Consequences for the traveller may include personal risk to health and economic harm.
• Recommend that travellers to areas experiencing outbreaks of highly pathogenic avian influenza avoid contact with poultry farms and live animal markets	Y	Y	C	
• Recommend deferral of non-essential international travel to affected areas.	N	Y	Y	
• Recommend deferral of non-essential international travel from affected areas.	N	Y	Y	
	See Screening Tables			
Measures at borders for international travellers coming from or going to affected areas				
Health alert notices to travellers to and from affected areas.	N	Y	Y	WHO negotiates with appropriate organizations (e.g. International Air Transport Association) to ensure that health alert notices are distributed; WHO facilitates shared notice formats among countries.
Medical surveillance				
• Daily self-checking for fever:				
– travellers from affected area;	N	Y	Y	
– travellers to affected area.	N	N	Y	
• Self-reporting if symptoms appear in travellers from affected areas.	Y	Y	Y	Contacts of confirmed cases should be encouraged to monitor health. Quarantine may be indicated. Persons on affected conveyance should be traced and similarly advised.
• Advice on how to behave if ill after travel in affected areas (seek healthcare, give travel history, receive influenza laboratory test); if pandemic virus detected, patient should be isolated and public health officials, including WHO, notified.	Y	Y	Y	

Measures	Pandemic alert period		Pandemic period	Comments
	Phase	Phases	Phase	
	3	4 and 5	6	
Entry screening for travellers coming from affected areas.				Due to lack of proven health benefit, practice should be permitted (for political reasons, to promote public confidence) but not encouraged. Travellers should receive health alert notices instead.
• Screening for symptoms (visual detection of symptoms).	N	N	N	Entry screening may be considered where host country suspects that exit screening (see below) at traveller's viewpoint of embarkation is suboptimal.
• Screening for at-risk travelers (health declaration, questionnaire).	N	N	N	
• Thermal screening.	N	N	N	
• Medical examination	N	N	N	
Entry screening for geographically isolated infection-free areas (islands), using the options above.	N	Y	Y	Feasible, may prevent entrance of pandemic virus. May also be relevant where country's internal surveillance capacity is limited.
Exit Screening for all travellers from areas with human infections				More feasible than entry screening for detecting early cases.
• Screening for symptoms (visual detection of symptoms).	N	N	N	Not feasible due to passenger volume.
• Screening for at-risk travellers (health declaration, questionnaire).	N	Y	Y	
• Thermal scanning or ear-temperature measurement.	N	Y	Y	Thermal scanning less sensitive and specific but may be more practical than ear-temperature scanning.
• Stop-list of isolated or quarantined persons	N	N	N	May be feasible in certain countries, but generally not encouraged.
• Recommend that ill persons postpone travel	Y	Y	Y	
• Medical examination for travellers at risk or with fever	N	N	N	Not feasible to implement at borders.
Measures for countries with porous borders (including informal or illegal crossing points) adjoining affected areas				
Raise awareness among healthcare providers and general public to facilitate surveillance and response measures, such as social distancing, quarantine or isolation.	N	Y	Y	WHO to post relevant guidelines on web for use by countries in developing posters, mass-media messages and similar measures. Possible benefits include rumour control.

Measures	Pandemic alert period		Pandemic period	Comments
	Phase	Phases	Phase	
	3	4 and 5	6	
Measures for travellers on board international conveyances from affected areas				
Recommend self-reporting if influenza-like symptoms appear.	N	Y	Y	
Separate sick travellers (if possible) on board.	N	Y	Y	On flights from affected areas, masks should be offered to all passengers upon boarding.
Advise health authority at countries of traveller's embarkation, destination and transit that a person on board is ill (airline is responsible to notify destination only).	Y	Y	Y	Established requirement for destination, but not uniformly observed in practice.
Share epidemiological information for contact tracing with national public health authorities	N	Y	Y	Countries to share this information directly with others, as appropriate.

a Y = yes, should be done at this phase; N = no, not necessary at this phase; C = should be considered; NR = not relevant.

b Quality and type of mask depend on risk group. Cases: surgical mask; healthcare workers; N95 or equivalent; others: depends on risk.

c Implementation depends on adequate supplies and may require a global stockpile with a prenegotiated targeting and delivery strategy to ensure availability in the area where a potential pandemic virus emerges. Prophylactic use will depend on evidence of effectiveness. Targeted use is required because of potential for drug resistance, side-effects and limited supplies. Targeted use might consider: public prevention; protection of healthcare workers; protection of other essential service providers; individual treatment.

d Given a pandemic strain causing significant morbidity and mortality in all age groups and the absence of a vaccine, authorities should seriously consider introducing population-wide measures to reduce the number of cases and deaths. Decisions can be guided by mathematical and economic modelling. If modelling indicates a reduction in the absolute numbers of cases and deaths, decisions to introduce measures involving multiple government sectors will then need to balance the protection of priority functions against the risk of social and economic disruption.

e Could be considered as an emergency measure to avert or delay a pandemic.