

# Pandemic influenza: Public health measures

Physicians can provide much-needed support for public health recommendations by explaining to patients why some measures will be essential during a pandemic (hand washing) and others of less use (wearing a mask in public).

**ABSTRACT: Public health measures such as isolation of influenza patients, quarantine of contacts, closure of schools, cancellation of mass gatherings, restrictions of travel, and the use of masks in public may conflict with individual freedoms. Therefore, the potential harms and benefits of each intervention must be carefully weighed if the intervention is to be used in an attempt to limit pandemic influenza. Since pandemic influenza is a community-based epidemic, any public health measure must be sustainable in multiple settings for many months. Because the only strategies supported by strong evidence of effectiveness are voluntary self-isolation of symptomatic people and frequent hand washing, these are the strategies that will be promoted throughout any pandemic. Familiarity with the rationale behind these and other public health strategies will allow individual physicians to address their patients' concerns and provide support for recommendations.**

**W**hen an influenza pandemic is declared in future, it is unlikely that a vaccine for the pandemic strain, the only definitive intervention, will be immediately available. Public and political pressure to “do something” may well mount rapidly, especially if the pandemic virus causes clinically severe illness. At such a time, people will try to reduce exposure to the pandemic virus by avoiding crowds and improving personal hygiene. People may also expect authorities to impose restrictions to limit exposure of the public through isolation, quarantine, infection control measures, school and border closures, and restriction of mass gatherings. Some of these interventions will not be implemented at all, others will be considered under certain circumstances, and still others may be implemented initially and later discontinued. Understanding the rationale for imposing or, more importantly, for *not* imposing certain restrictions, will allow family physicians to better explain the public health response to their patients.

## Public health goals and strategies

In the absence of a vaccine, public health measures alone cannot contain

a pandemic. However, public health measures can delay the introduction and slow the spread of pandemic influenza virus in a community. A delay in introduction or spread is most likely to benefit the health care system if it gives us time to deliver the definitive intervention (vaccine) or a temporizing intervention (antivirals). The health care system may also benefit from slower spread, which would allow us to cope with a moderately increased demand for a longer period rather than with a very high demand for a shorter period.

In the event of a pandemic in BC, the medical health officers in each health authority, with guidance from the provincial health officer and the Public Health Agency of Canada, will make decisions about community-based public health interventions. There will be regional variations, depending on community needs and characteristics. The decisions made will rely on evidence of effectiveness, feasibility, public acceptability, availability of vaccine or antiviral medications, and the phase of the pandemic.

---

Dr Gustafson is a medical health officer with Vancouver Coastal Health and an instructor in the Department of Health Care and Epidemiology at the University of British Columbia.

Evidence for the effectiveness of public health measures during pandemic influenza is very limited, and comes from observations during previous pandemics and yearly epidemics of influenza, from small controlled studies in specific settings, and from mathematical modeling. The most compelling observation is that pandemic influenza affects communities in waves: periods of high disease activity separated by weeks or months of low disease activity. Since infection requires exposure of a susceptible host, and initially susceptibility is universal, those who are infected in the second wave must have avoided exposure during the first wave. Therefore, limiting exposure could, in theory, limit the overall number of cases. The World Health Organization Writing Group reviewed the available evidence for effectiveness of public health measures; this article relies heavily on the reviews.<sup>1,2</sup>

We know from past experience that the severity of illness caused by the next pandemic will affect both the effectiveness and acceptability of public health measures. Both compliance and public acceptance of restrictions on individual freedoms can be expected to increase with more severe illness.

If antivirals are widely available and effective against the pandemic strain, or if a pandemic vaccine is available, public health measures may be used as temporizing strategies to allow time for distribution of vaccines and antivirals.

Recommendations will change as the pandemic progresses. The majority of recommended public health measures are intended for use early on in the pandemic, before there is sustained transmission in the community. The rationale for early implementation comes from mathematical modeling studies, which indicate that public health measures may prevent progres-

sion from limited outbreaks to worldwide epidemic.<sup>3,4</sup> Both the sustainability and effectiveness of some measures will diminish once pandemic influenza is well established. We will need to communicate changing recommendations effectively to ensure that the public and the health care community maintain confidence in the public health system.

### Isolation and quarantine

Isolation and quarantine are often confused. Isolation is the physical separation of *symptomatic* individuals from well individuals during the *infectious period*. Quarantine is the physical separation of *asymptomatic* exposed persons from unexposed persons for the duration of the *incubation period*. Therefore, isolation prevents transmission from symptomatic infectious individuals, and quarantine prevents transmission from those who may be incubating a disease that is infectious before symptoms start.

Isolation and quarantine are known to be effective for influenza control in closed settings such as long-term care facilities and dormitories.<sup>2</sup> However, mandatory isolation and quarantine in the community have proven to be remarkably ineffective during previous pandemics.<sup>3</sup> Recent mathematical modeling provides evidence that quarantine and isolation, supplemented by antiviral treatment of index cases and prophylaxis of contacts, could contain an *emerging* pandemic in rural Thailand.<sup>2,3</sup> In other words, quarantine and isolation may be one of the strategies used if we are able to observe the emergence of the next potential pandemic strain at its geographical source.

Influenza viruses currently circulating among humans have short incubation periods (1 to 3 days), and are transmissible from 24 hours before and up to 1 week after symptom onset. Infectiousness is much greater after

the onset of symptoms. Although the pandemic strain may differ from usual influenza viruses, and will need to be characterized early in the pandemic, the differences are not expected to be substantial.

Public health will strongly recommend voluntary self-isolation of those with fever and cough. This recommendation will need support from employers, physicians, and the public. During the pandemic, fever and cough will be highly predictive of pandemic influenza, and voluntary self-isolation will need to be relatively brief. Therefore, self-isolation is expected to be both feasible and effective.

In contrast, quarantine will *not* be used once influenza is circulating in the community. The short incubation period of influenza means that there will simply not be enough time to find exposed individuals before they become symptomatic. Once there is transmission in the community, people will be exposed in multiple settings, and the definition of a "contact" will become meaningless.

### School closures and restriction of mass gatherings

Observational evidence indicates that crowding increases the incidence of influenza and that children play an important role in amplification of influenza epidemics. During yearly epidemics, school closures may reduce overall incidence of respiratory illnesses.<sup>5</sup> But school closures during past pandemics of influenza have had no appreciable effect on disease rates in the community.<sup>2</sup> There are no controlled studies evaluating the effectiveness of closing schools to control epidemics or pandemics of influenza.

Closing schools for prolonged periods has obvious drawbacks for children and their working parents. Therefore, the closure of schools will

only be considered if morbidity and mortality are high among children, the pandemic is severe, and evidence mounts that closing schools has an effect. School closures can only reduce incidence if implemented early and if aggregation of children outside of school can be limited.<sup>6</sup> Therefore, school closures may be more feasible and effective in rural communities.

The cancellation of mass gatherings has also not been evaluated and

about pandemic activity inside and outside of Canada. This information will help physicians in British Columbia assess the risk of pandemic influenza in their patients based on their travel history. It will also allow individuals to choose to defer nonessential travel to areas with pandemic activity to limit their own exposure. During the pandemic alert period, if a potential pandemic strain is causing localized outbreaks, travelers returning from

vast majority of cases, travel restrictions did not work. Some very isolated communities in Alaska did escape pandemic influenza, but others did not. Some island countries enacted strict maritime quarantines resulting in occasional delay or prevention of pandemic influenza. The impact of travel restrictions on economies would be great with little, if any, benefit accruing. With today's mobile populations, travel restrictions would need to be almost instantaneous and complete in order to have any effect in delaying the introduction of infection to a community. Most countries are not considering travel restrictions as a potential public health measure. Australia, an island nation, is a notable exception.

**Most countries are not considering travel restrictions as a potential public health measure. Australia, an island nation, is a notable exception.**

may not be sustainable for the duration of the pandemic. Therefore, it is not recommended as a broad-based public health intervention. Instead, public health messages will encourage individuals to avoid crowded situations using strategies such as cancellation of nonessential gatherings and recommendations to do errands on-line, by phone, or during nonpeak hours, and, when possible, to work from home.

**Travel and border-related measures**

Travel and border-related measures may include entry or exit screening, travel advisories, and restriction on domestic or international travel. Updated travel advice will be provided throughout the pandemic. The Public Health Agency of Canada, in conjunction with the BC Centre of Disease Control and local public health, will post information

affected areas may be asked to self-monitor for symptoms and report to public health if symptoms develop. These travel-related measures will cease once local transmission is occurring.

Entry and exit screening during the 2003 SARS epidemic was instituted in many countries but was found to be insensitive and not cost-effective. Exit screening is somewhat more sensitive and less labor-intensive and may reduce transmission on aircraft. Therefore, if feasible, exit screening may be considered in a pandemic. Since asymptomatic persons shed virus, it is not possible to halt a pandemic of influenza on the basis of symptom screening.

Evidence does not support restrictions on either domestic or international travel. During the 1918–19 pandemic, travel restrictions were imposed on many communities; in the

**Wearing masks in public**

The wearing of masks in public is a controversial and unresolved issue. Although surgical masks are not designed to protect the wearer, they do provide some protection from large droplets, and therefore may reduce the risk from *any single* exposure. However, the benefit of limiting a single exposure when influenza circulates in the community is questionable. No controlled studies assessing mask use in public exist. During the SARS epidemic, isolation of *all* respiratory viruses in Hong Kong decreased in association with a large number of people wearing masks in public.<sup>2</sup> Since multiple measures were implemented, the use of masks could not be independently evaluated. During the 1918–19 pandemic, wearing masks in the community was considered unhelpful, but in closed settings may have had some benefit. Recommending masks in public, however, may do harm. Removing a mask can contaminate hands. Wearing a mask can give a false sense of security and encourage individuals to be out when symptomatic or in crowded situations rather than avoiding these

situations altogether. Children will be unlikely to wear masks properly or for prolonged periods. A recommendation to wear a mask may create inequities for those unable to access them.

An important public health message will be that masks *may* reduce the risk of infection from a single exposure, but they should only be used as a supplement to other, more effective protective measures such as hand washing and self-isolation when ill. Since droplets that carry influenza virus generally fall to the ground within 1 m, keeping a greater distance from others in public may also be of benefit.

If available, masks will be recommended for symptomatic individuals who must leave home. This underscores the main purpose of masks, which is to protect others from the wearer. WHO has recommended that mask use by the public should be based on risk, including frequency of exposure and closeness of contact with potentially infectious persons. However, even if masks are available, wearing them for prolonged periods is both ineffective and impractical, and common sense will have to prevail.

### Hygiene and disinfection

Frequent hand washing has long been recommended to reduce illness. The effectiveness of hand washing as an intervention to reduce both diarrheal and respiratory illness was demonstrated in a randomized controlled trial published in the *Lancet* in 2005.<sup>7</sup> Frequent hand washing and appropriate cough etiquette have few if any negative effects. Therefore, hand washing and respiratory hygiene/cough etiquette should be routine for all and will be strongly encouraged in public health messages. School boards and

employers will be asked to consider provision of hand-washing facilities as a priority during any pandemic.

### Summary

Public health measures may be used cautiously during a pandemic to delay the introduction of influenza and slow the spread or reduce the impact of the virus. Evidence to support effectiveness of interventions is limited and many strategies have substantial drawbacks. The most important public health intervention will be to encourage ill persons to stay at home and practise frequent hand washing. Isolation of cases and quarantine of contacts may be of value during the emergence of a potential pandemic strain, but will become unsustainable and ineffective once pandemic influenza is circulating in the community. School closures and travel restrictions may be considered, but only under very limited circumstances. Wearing masks in public will not be encouraged.

Public health will need to communicate the rationale for initiating, not initiating, or discarding any one measure. In particular, the public will need to be aware that influenza is a community-based infection, and that this makes it inappropriate to focus on any one setting such as a workplace, a school, or an airport. Public health measures will need to be evaluated throughout the pandemic. In particular, their effectiveness in combination with the use of antiviral medications and vaccines will need to be understood. As the pandemic evolves, our knowledge about the pandemic virus will increase. One of our greatest challenges will be to communicate changing recommendations effectively.

---

### Competing interests

None declared.

### References

1. World Health Organization Writing Group. Nonpharmaceutical interventions for pandemic influenza, international measures. *Emerg Infect Dis* [serial on the Internet] 2006 Jan. [www.cdc.gov/ncidod/EID/vol12no01/05-1370.htm](http://www.cdc.gov/ncidod/EID/vol12no01/05-1370.htm) (accessed 10 May 2007).
2. World Health Organization Writing Group. Nonpharmaceutical interventions for pandemic influenza, national and community measures. *Emerg Infect Dis* [serial on the Internet] January 2006. [www.cdc.gov/ncidod/EID/vol12no01/05-1371.htm](http://www.cdc.gov/ncidod/EID/vol12no01/05-1371.htm) (accessed 10 May 2007).
3. Ferguson NM, Cummings DA, Cauchemez S, et al. Strategies for containing an emerging influenza pandemic in Southeast Asia. *Nature*. 2005;437:209-214.
4. Longini IM Jr, Nizam A, Xu S, et al. Containing pandemic influenza at the source. *Science* 2005;309:1083-1087.
5. Heymann A, Chodick G, Reichman B, et al. Influence of school closure on the incidence of viral respiratory diseases among children and on health care utilization. *Pediatr Infect Dis J*. 2004;23:675-677.
6. Haber MJ, Shay DK, Davis XM, et al. Effectiveness of interventions to reduce contact rates during a simulated influenza pandemic. *Emerg Infect Dis* [serial on the Internet]. Apr 2007. [www.cdc.gov/EID/content/13/4/581.htm](http://www.cdc.gov/EID/content/13/4/581.htm) (accessed 10 May 2007)
7. Luby SP, Agboatwalla M, Feikin DR, et al. Effect of handwashing on child health: A randomised controlled trial. *Lancet* 2005; 366:185-187. **BMJ**