

Are we prepared to help low-resource communities cope with a severe influenza pandemic?

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Recent research involving lab-modified H5N1 influenza viruses with increased transmissibility and the ongoing evolution of the virus in nature should remind us of the continuing importance of preparedness for a severe influenza pandemic. Current vaccine technology and antiviral supply remain inadequate, and in a severe pandemic, most low-resource communities will fail to receive adequate medical supplies. However, with suitable guidance, these communities can take appropriate actions without

substantial outside resources to reduce influenza transmission and care for the ill. Such guidance should be completed, and support provided to developing countries to adapt it for their settings and prepare for implementation.

Keywords Developing countries, influenza, nonpharmaceutical interventions, pandemic, preparedness, public health.

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The low virulence of the 2009 H1N1 pandemic may have contributed to complacency, as good outcomes were achieved without the need for an effective public health response.¹ However, the highly pathogenic avian influenza (HPAI) H5N1 virus remains a pandemic threat, and preparedness for a severe pandemic should remain a public health concern, as recently noted by the Cabinet Office of the United Kingdom.² Nearly 60% of the approximately 600 human H5N1 cases confirmed since 2003 have resulted in death,³ and the continuing evolution of the virus, which remains endemic in poultry in several countries, raises the concern of potential adaptation to humans.

Two recent studies of lab-modified H5N1 viruses that showed increased transmissibility between ferrets (considered the best animal model for studying human influenza) led to controversy concerning biosafety of such research,⁴ delaying publication of both studies.⁵ In the first of these studies to be published, four mutations and H5N1 reassortment with pandemic H1N1 led to droplet transmission between ferrets.⁶ In the second study, H5N1 viruses which achieved respiratory transmission between ferrets had five mutations in common, leading the authors to conclude that, 'our findings indicate that HPAI A/H5N1 viruses have the potential to evolve directly to transmit by aerosol or respiratory droplets between mammals, without reassortment in any intermediate host, and thus pose a risk of becoming pandemic in humans.'⁷ Some have noted that

the controversy over biosafety should not detract from the larger concern over global preparedness for a severe influenza pandemic and that timely production of sufficient vaccine remains the biggest challenge.⁸

Although a well-matched pandemic vaccine is potentially the most important public health intervention, the time required to produce vaccine after pandemic onset has led to too little vaccine, too late, on a global scale, during each of the last three pandemics. For example, even in the United States in 2009, an ample supply of vaccine was not available until after the second wave of the H1N1 pandemic had subsided in October, and the 78 million doses of vaccine distributed to 77 developing countries by the World Health Organization (WHO) also reached these countries only after the second wave.⁹ Current vaccine technology requires effective influenza vaccines to be matched to specific strains of the virus, which means that production of pandemic vaccine can commence only after the emergence of a pandemic. High rates of immunization coverage with a long-lasting universal influenza A vaccine could substantially reduce the pandemic threat, but such a breakthrough is years away.¹⁰ In the meantime, capacity for antiviral production also remains inadequate to meet global needs, and even when available, antiviral drugs may be compromised by the development of antimicrobial resistance, as occurred with the seasonal H1N1 virus prior to the recent pandemic. Thus, the *Review on the Functioning*

of the *International Health Regulations in Relation to Pandemic H1N1*, adopted by the World Health Assembly in May 2011, concluded that the world is ill-prepared for a severe influenza pandemic and that such an event could lead to the death of tens of millions of people.¹¹

A severe pandemic would have substantial social and economic consequences,^{12,13} calling for a 'whole-of-society' approach to preparedness and response,¹⁴ including business continuity planning, to the extent this is feasible. However, we believe that it is also important to look at preparedness and response from the perspective of the low-resource communities in which *Save the Children* works around the world, and ask:

1. What kind of actions is it realistic to hope that these communities should be able to take during a severe wave of pandemic influenza?
2. What kind of support will these communities need to take these actions?
3. Are developing country governments and organizations around the world prepared today to provide this kind of support?

The US government anticipates substantial disruption of critical services and delivery of essential commodities, such as chlorine for water purification, gasoline, food, and medical supplies in a severe pandemic.¹⁵ In many low-resource communities in which we work, such disruptions occur even in the best of times, and health services remain frail. Shortages of skilled health workers, medical supplies, and other resources mean that many mothers and children are not reached with lifesaving services. In a severe pandemic scenario, when all countries around the world and all responding organizations are themselves struck or preparing to be struck, most low-resource communities will fail to receive adequate medical supplies, and their health services will be more stressed than they are today. However, these communities, and families can, by following well-directed and scientifically based measures, play an important role in slowing transmission and caring for those not severely ill, thereby reducing the burden on health services.¹⁶ Furthermore, most people in these communities have access to local volunteers, community health workers, radio, or mobile phones, from which they could receive guidance about such measures.

As noted by Taubenberger and Morens¹⁷, in spite of the extraordinary number of global deaths in the 1918 pandemic, most influenza cases (over 95% in most locales in industrialized nations) were mild and essentially indistinguishable from seasonal influenza today. Thus, even in a severe pandemic, appropriate care for most of those ill with influenza can likely be provided in the home, if families receive guidance. Home-based care can address hydration, fever, nutrition, safe use of available medications, and when to seek outside help.¹⁸ However, accounts of the 1918 pan-

demic in Alaska, Connecticut, and Philadelphia include reports of substantial challenges and increased mortality when all caretakers in families were ill at the same time and unable to care for other family members.^{19–21} As in 1918, such households will need help from others in the community.

Nonpharmaceutical interventions (NPIs) to reduce influenza transmission at the household level may include keeping a distance from others, washing hands, covering one's cough, and isolation of the ill.²² However, several of these NPIs may not be very feasible in some settings, such as those with poor access to water or where many families live in small one-room dwellings. Experience during the 2009 pandemic indicates that communication materials, such as those encouraging the practice of these NPIs, need to be adapted, tested, and approved for local use ahead of time. The absence of standardized, pretested messages was a challenge in 2009.²³

NPIs at the community level may include dismissal of students from schools and colleges, along with social distancing to reduce out-of-school mixing of children, closure of childcare programs, cancellation of large public gatherings, measures to reduce crowding on public transportation, and alteration of workplace environments and schedules to decrease social density without disrupting essential services. These community-level NPIs go beyond the health sector and may involve legal issues. (See Table 1.)

Nonpharmaceutical interventions can decrease influenza transmission and illness by reducing contact between infectious and susceptible individuals, thereby reducing the burden on health services and the impact of a pandemic on society. In 1918, with little or no time to prepare, and a lack of expert consensus on what to do, cities in the United States made very different decisions about which NPIs to implement and when to do so. Analyses of data from over 40 of these US cities show statistically significant associations between the early use of multiple NPIs and reductions in peak death rates and modest reductions in overall death rates.^{26–28} Although convincing and consistent evidence of the effectiveness of most individual interventions is lacking,^{29–33} mathematical modeling also suggests that pandemic mitigation strategies utilizing multiple NPIs may decrease transmission substantially.³⁴ Thus, WHO, the European Center for Disease Prevention and Control (ECDC), the US CDC, and the UK Department of Health recommend using a combination of these partially effective measures to help mitigate a severe pandemic.^{29,34–36}

Some measures, such as travel restrictions and quarantine of communities, are not recommended in most situations³⁵ because of their likely ineffectiveness or substantial negative consequences. However, even appropriate community-level measures may have negative social consequences,

Table 1. Basic public health measures to mitigate pandemic influenza in low-resource settings

Family/Household Level	Community/District Level (Depending on severity of pandemic wave)
<p>Prevention</p> <ul style="list-style-type: none"> • Keep your distance. • Wash your hands. • Cover your coughs and sneezes. • Isolate your ill (including cleaning, masks, and household members minimizing interaction with others if pandemic is severe). 	<ul style="list-style-type: none"> • Educate families on prevention. • Limit public crowding, gathering, mixing, and contacts, including: <ul style="list-style-type: none"> ◦ Closing schools and child care centers. ◦ Advising on travel and transport. • Train community workers in infection control.
<p>Care</p> <p>Care for those ill with influenza-like illness:</p> <ul style="list-style-type: none"> • Fluids • Fever • Nutrition • Rest • Medications • Care seeking 	<ul style="list-style-type: none"> • Educate families on home care. • Assist the neediest/sickest households (including care, food, and water). • Community case management (including antibiotics for pneumonia) if feasible.²⁴ • Continuity of care for selected conditions (such as medication for HIV and TB) if feasible.²⁵
<p>Communication on Cross-Cutting Issues:</p> <ul style="list-style-type: none"> • What is pandemic influenza?/Symptoms/Transmission. • Keeping communities informed (numbers and location of cases, severity of wave, and best sources of information and guidance). • Addressing community perceptions and concerns. 	

For in-country adaptation. Health Working Group, Humanitarian Pandemic Preparedness [H2P] initiative, December 2008.

such as increased absenteeism from work related to child-minding if schools dismiss students (for as long as 3 months) and childcare programs close. The feasibility, effectiveness, and negative effects of different NPIs will depend on local social and economic conditions. While some measures appropriate for rural districts may not work in densely populated areas, even crowded urban communities would likely benefit from planning to focus on feasible interventions, including selected family-level measures, and to avoid detrimental approaches. Thus, implementing locally appropriate interventions, requiring specific actions by individuals, employers, schools, local government, and civil society organizations, in a timely and coordinated fashion, will require advance planning.

In a severe pandemic scenario, the imperative to respond may lead many communities to attempt mitigation measures without prior planning or expert guidance on the best choice of interventions, how and when to implement them, and how to limit any negative consequences. The effectiveness of these efforts will likely be less – and negative effects greater – than if plans had been made in advance. In a severe pandemic, many communities may also be challenged by contradictory guidance, as in Connecticut in October 1918, when communities received precisely the opposite recommendations from federal and state health officials on closing schools, theaters, and other places of public gathering.³⁷ Planning for public health measures before pandemic onset may reduce the risk of

such contradictory guidance. Thus, we believe in preparing in advance so leaders in low-resource communities, supported by the organizations working with them, can take appropriate actions to mitigate the effects of a severe influenza pandemic in the absence of substantial outside resources.³⁸ Such preparedness could also aid in responding to other kinds of outbreaks, particularly those involving respiratory transmission, a short serial interval (short generation time, unlike SARS), and high mortality.

Some of the necessary global guidance has been completed and country-level planning commenced, but much remains to be carried out. The US Agency for International Development has supported preparation of detailed guidance for municipalities in Latin America and the Caribbean,³⁹ while the *Humanitarian Pandemic Preparedness* (H2P) initiative engaged civil society and United Nations agencies with governments on country and district planning for mitigation measures to be rolled out during the weeks most communities would have before being struck.^{40,41} (Preparing for rapid roll-out requires advance planning at country level, and testing in selected districts and communities, but may not require advance planning in numerous jurisdictions throughout a country.) In late 2009, WHO issued detailed guidance specific to the ongoing non-severe H1N1 pandemic, on reducing influenza transmission in schools⁴² and on considerations for mass gatherings.⁴³ In 2011, WHO published detailed guidance appropriate for low-resource settings in a severe pandemic on home-based

care and reducing transmission at household level.²⁴ In its 2011 *Comparative Analysis of National Pandemic Influenza Plans*, WHO concluded that NPIs are crucial to an effective overall response and may in some cases be the only means of delaying the spread of a pandemic. Although approximately two-thirds of all national plans had considered NPIs, most plans did not outline practical operational considerations, such as triggers for undertaking and ceasing such measures.⁴⁴ One reason for inadequate preparedness for community mitigation may be the continuing lack of authoritative guidance for low-resource settings.

We believe that detailed authoritative guidance for resource-poor settings on NPIs to reduce influenza transmission at community level in a severe pandemic should be developed. In addition, support should be provided to governments in developing countries to adapt this and other important guidance to their settings and plan to roll it out if needed. We are not aware of ongoing efforts of this kind, but believe that this should be an urgent priority. We are concerned about this apparent gap in the most basic kind of preparedness for a severe pandemic.

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