BMZ Federal Ministry for Economic Cooperation and Development

Future-Makers.
Building the future.
Let's join forces.

Be prepared!

Germany's contribution to partner countries' pandemic preparedness

Published by giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Acronyms and Abbreviations

BMZ	Federal Ministry for Economic Cooperation and Development, Germany
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
H1N1	a strain of influenza A; popularly known as ‚swine flu'
H5N1	a strain of influenza A; popularly known as ‚avian flu'
IHR	International Health Regulations
IVAC	Institute of Vaccines and Medical Biologicals, Vietnam
NADMO	National Disaster Management Organization, Ghana
PPI	Pandemic Preparedness Initiative
UNICEF	United Nations Children's Fund
WHO	World Health Organization

Be prepared!

Germany's contribution to partner countries' pandemic preparedness

Acknowledgements

The German Federal Ministry for Economic Cooperation and Development (BMZ) would like to thank the many partner organizations which have worked to improve global health security under the auspices of the German Pandemic Preparedness Initiative (PPI). While this publication features only a selection of the approaches supported under the PPI, the BMZ is grateful to all its partners for the close and fruitful working relationships which have been built and for the commitment they have shown to the topic of pandemic preparedness.

The World Health Organization (WHO) has played an important role in making the PPI a success. Special thanks are due to WHO personnel at the global, regional and country levels who have supported and furthered the PPI's approach. Thanks also go to the UN System Influenza Coordination for its role (along with the US Agency for International Development) in creating Towards a Safer World, an important platform for making disaster and pandemic preparedness experiences available to both professionals and practitioners around the world.

Many people have contributed to the preparation of this publication. The staff of the Pandemic Preparedness Initiative, based at the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH in Eschborn, provided significant assistance in conceptualizing and developing this document. Special thanks go to Ute Jugert, PPI Team Leader, and the members of her team – Karolin Herzog, Regina Meissner, Julia Schmidt and Caroline Schollmayer – for the technical inputs they provided and for their comments on successive draft versions.

Final thanks go to Karen Birdsall, the writer of this publication, and to Anna von Roenne, who provided editorial support and managed the publication process.

Executive Summary

In 2009, following the outbreak of a global pandemic of influenza A (H1N1), the World Health Organization (WHO) called upon member countries to assist one another to be better prepared to address public health emergencies of international concern. Spreading rapidly across international borders and eventually causing an estimated 284,500 deaths worldwide (Dawood et al., 2012), the H1N1 pandemic underscored the urgent need for countries to strengthen their core capacities to detect, assess and respond to threats to public health as outlined in the International Health Regulations (2005), the legally binding WHO convention which serves as a framework for managing such events.

As one part of its contribution to strengthening global pandemic preparedness, the Federal Republic of Germany allocated €13.5 million to an innovative bilateral assistance programme, the German Pandemic Preparedness Initiative (PPI). The PPI, which was implemented between 2009 and 2013 by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, was designed as a temporary, demand-driven initiative to provide rapid and flexible technical support to partner countries to strengthen their pandemic readiness, in line with the International Health Regulations.

Proposals submitted by organizations in German Development Cooperation partner countries showed that assistance was primarily needed in four areas:

- supporting the development of national pandemic preparedness plans;
- improving risk communication and health promotion;
- strengthening diagnostic capacity and surveillance; and
- increasing vaccine manufacturing capacity.

In response to received proposals the PPI awarded more than €9.8 million in grants to organizations in 20 countries in Africa, Eastern Europe and Central Asia, and Southeast Asia.

All measures supported by the PPI had two traits in common. First, they contributed to building the capacity of countries' national health systems. In line with German Development Cooperation's focus on health systems strengthening in its global health programmes, the PPI recognized that effective, resilient health systems are needed if public health emergencies are to be prevented or controlled. Second, the PPI promoted intersectoral cooperation and a 'whole-of-society' approach to pandemic preparedness. Supported interventions engaged actors from beyond the health sector and from different parts of society – including the private sector and civil society – with the understanding that effective responses to crises must mobilize a broad range of stakeholders.

This publication documents the PPI's approach to strengthening pandemic preparedness in low- and middle-income countries. It features examples of the measures it has supported in the thematic areas of planning, risk communication, surveillance and vaccines and outlines lessons which have been learned in each of these. The publication concludes with reflections on the PPI approach and some recommendations for other public and private organizations that may consider investing in the timely and relevant area of pandemic preparedness:

- concentrate on planning as the essential core of pandemic preparedness;
- support integrated approaches to disease surveillance which rely upon a common infrastructure;
- pay greater attention to risk communication and health promotion as core capacities for pandemic preparedness;
- continue technology transfers as a way to expand vaccine manufacturing capacities in low- and middle-income countries; and
- focus attention beyond the health sector and promote intersectoral collaboration in all pandemic preparedness measures.

Why the world needs to be prepared for pandemics

In today's interconnected world, the outbreak of an easily transmittable infectious disease has the potential to turn into a pandemic[1] affecting tens of millions of people. With more than two billion passengers travelling by air annually, disease outbreaks which go unnoticed or are not stopped at their point of origin can spread to multiple locations, quickly eclipsing the possibility of containment. When large numbers of people are infected, or are suspected of being infected, a cascade of effects can follow: health facilities become overwhelmed, sensationalistic media reports seed widespread alarm, absenteeism at schools and workplaces skyrockets, and response measures cause disruptions in trade, travel, economic activity and normal patterns of public life. Something that begins narrowly, as a 'health issue,' can unleash a series of shock waves whose social and economic effects are felt around the world.

'Pandemic preparedness' refers to a country's state of readiness to prevent, detect, report and respond to disease outbreaks. Advance planning is the key to preparedness: experience over the past century has shown that the most serious threats to human existence are likely to emerge without warning (WHO, 2007). While the world has not experienced another pandemic as deadly as the 'Spanish flu' of 1918, many public health events in recent years remind us of the dangers of complacency. The emergence of severe acute respiratory syndrome in 2003, the repeated outbreaks of 'avian flu' since 2003, the 'swine flu' pandemic of 2009 and outbreaks of acute viral diseases such as Ebola are all reminders of our shared vulnerability to disease and newly emerging health threats. Most scientists agree that the emergence of another, potentially severe pandemic of influenza is 'a matter of when, not if' (WHO, 2007).

In the era of globalization, there is not a single country that is in a position – on its own – to protect itself against international public health threats. As vulnerability to disease, and to other public health emergencies, is universal, global public health security has gained importance as a topic for international cooperation. Being prepared is no longer about enacting a passive defense against threats, but about the proactive management of risks. Doing this requires country-level preparedness in the areas of surveillance, reporting, assessment and response, on the one hand, and transparent and trust-based communication and collaboration at an international level to deal with emergent outbreaks, on the other.

In the era of globalization, there is not a single country that is in a position – on its own – to protect itself against international public health threats.

Pandemic preparedness also requires a renewed focus on strengthening national health systems, whose ability to cope with a sudden increase in service demand is fundamental for minimizing mortality and morbidity caused by a pandemic. In low- and middle-income countries and regions, the lack of access to medical services, high population density and poor hygiene, and a greater likelihood of co-infection with endemic diseases[2] all increase the likely magnitude and severity of a pandemic. Estimation models developed by researchers have shown a strong negative correlation between per capita income and mortality associated with pandemic influenza. It is therefore of utmost importance to support these countries in their efforts to strengthen the resilience of their health systems and to protect their populations.

[1] A pandemic is defined as an epidemic so widely spread that vast numbers of people in different countries are affected; an epidemic is defined as a widespread occurrence of an infectious disease in a community at a particular time (Martin, 2012).

[2] In relation to diseases, endemic refers to those that are generally or constantly found among people in a particular region or population (Martin, 2012).

Pandemics can lead to high rates of absenteeism at schools and workplaces. Pupils at a school in Kathmandu wore masks and distanced themselves from one another during the 2009 influenza A (H1N1) pandemic.

Promoting global health security

The first international framework designed to prevent the spread of disease across international borders was adopted in 1951, shortly after the establishment of the World Health Organization (WHO). At that time, international travel was predominantly by ship and countries put in place measures at points of entry to protect against a handful of quarantinable diseases, including cholera, yellow fever and smallpox.

Since that time, profound and consequential changes have taken place in the relationship between humans and the natural environment. Rapid population growth and urbanization, new farming practices, the settlement of previously uninhabited area, environmental degradation and the heavy use of antibiotics have 'disrupted the equilibrium of the microbial world,' according to the World Health Report 2007. From the 1970s new diseases began emerging at a rate of one per year (WHO, 2007). The globalization of trade, passenger travel, and food production and distribution presented myriad opportunities for pathogens to spread rapidly across borders.

Towards the end of the last century, it became clear that existing regulations were no longer suitable to the transformed global landscape; in 1995, an intergovernmental process was launched to revise and update them for the new century.

The International Health Regulations

The International Health Regulations (2005) – hereafter referred to as IHR – represent a framework for the management of events that may constitute a 'public health emergency of international concern.' Under this framework an emergency encompasses any extraordinary event that could spread across international borders and which might require a coordinated response. This could include disease outbreaks, outbreaks of foodborne illnesses, natural disasters, chemical or nuclear events, or the accidental or intentional release of pathogens (e.g. bioterrorism). This broad understanding of emergencies is described as an 'all-hazards' approach.

The aim of the IHR is to ensure that such events are detected early and are stopped at their source. One of only two legally binding WHO conventions, the IHR requires that all states develop, strengthen and maintain 'core capacities' to detect, report and respond to events with international repercussions for health (see Box 1.). By maintaining these designated core capacities, individual countries are not only protecting themselves, but are also contributing to the security of the international community as a whole.

Countries were given five years from the time the IHR went into effect, in 2007, to build the core capacities outlined in the agreement. For many, this represented a significant challenge: the successful implementation of the IHR at national level depends upon functioning health systems and strong intersectoral collaboration (for example, between ministries of health, agriculture, trade and tourism). By December 2012, 107 of 194 state parties to the IHR had applied for and received two-year extensions to the original implementation deadline (WHO, 2012a).

Box 1. National Core Capacity Requirements

Under the IHR, countries need to develop and maintain eight core capacities which are necessary for detecting, assessing, notifying and reporting events which pose a threat to public health:

- National legislation, policy and financing
- Coordination and National Focal Point communications
- Surveillance
- Response
- Preparedness
- Risk communication
- Human resources
- Laboratory

The above capacities – as well as events at Points of Entry – are needed to detect and respond to four potential human health hazards:

- Zoonotic
- Food safety
- Chemical
- Radiological and nuclear

Nurses provided people in Mexico City with information and rapid influenza tests following the initial outbreak of influenza A (H1N1) in 2009.

Testing worldwide preparedness: the 2009 influenza A (H1N1) pandemic

The IHR had been in effect less than two years when an outbreak of the influenza A (H1N1) virus became the first test case of the new framework. Popularly known as 'swine flu,' the first cases of a new variant of the H1N1 virus occurred in Mexico during February and March 2009. By the end of April, Austria, Canada, Germany, Israel, New Zealand, Spain, the United Kingdom and the United States had all confirmed cases (WHO, 2011b). On June 11, with approximately 30,000 cases and over 100 deaths having been reported in 74 countries, the Director-General of the WHO declared a pandemic.

Infections continued to spread globally over subsequent months, eventually affecting people in 214 countries and territories. Despite being of moderate severity – most infected individuals experienced mild symptoms and made a full recovery – by the time the pandemic subsided in August 2010 there were more than 18,000 laboratory-confirmed deaths (WHO, 2011b) and millions of people had been hospitalized. Later studies estimated that the actual number of deaths was up to 15 times higher than this, with just over half of deaths occurring in Southeast Asia and Africa (Dawood et al., 2012).

The 2009 influenza A (H1N1) outbreak brought the potential impact of a serious pandemic into sharp focus. It also underscored how ill-prepared the international community was to confront the challenges of a sustained pandemic. Moreover, it exposed that many countries – especially low- and middle-income countries, where the final death toll appears to have been the greatest – were not ready to deal with the challenges of even smaller disease outbreaks, let alone a pandemic.

> *The 2009 influenza A (H1N1) outbreak exposed that many countries were not ready to deal with the challenges of even a smaller disease outbreak.*

One of the lessons drawn from the H1N1 pandemic was that global public health security is truly a mutual responsibility. Given the resource and capacity constraints faced by many developing countries, international cooperation can play a critical role in providing financial and technical assistance to strengthen pandemic preparedness measures and to enhance societal resilience. The next section of this publication describes Germany's contribution to these efforts.

The German Pandemic Preparedness Initiative

Following the 2009 pandemic, the WHO called on partners to support measures to strengthen pandemic preparedness, especially in low- and middle-income countries where the need was greatest and the potential effects were likely to be most severe. Many international agencies, organizations and governments answered this call (see Box 2.).

For its part, the government of the Federal Republic of Germany made a commitment of €27.5 million to support pandemic influenza preparedness, with a particular focus on sub-Saharan Africa. Of this, €14 million was provided directly to the WHO to support the H1N1 Global Response Plan and WHO Vaccine Deployment Initiative in developing countries (see Box 3.), and €13.5 million was allocated for the German Pandemic Preparedness Initiative (PPI).

The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH implemented this initiative on behalf of Germany's Federal Ministry for Economic Cooperation and Development between September 2009 and June 2013, in close cooperation with the WHO. The aim of the PPI was to enable government, civil society and private sector partners in partner countries to effectively prepare for, respond to, and recover from public health emergencies and to strengthen preventive measures.

The PPI was designed as a temporary demand-driven initiative which responds to partner countries' specific needs by providing technical support for the development and implementation of national pandemic plans, as well as supporting examples of implementation measures which could be taken up by governments and mainstreamed into their health systems strengthening efforts.

From the outset, the PPI was guided by two main principles:

- **Enhancing health systems strengthening.** All pandemic preparedness measures supported through the PPI should align with and contribute to the capacity of national health systems. It is widely acknowledged that many recent public health emergencies could have been prevented or better controlled if national-level health systems had performed more effectively. By situating pandemic preparedness support in the context of health systems strengthening, the PPI also complemented German Development Cooperation's focus on health systems strengthening in its health programmes worldwide.

Box 2. International support for pandemic preparedness

Since 2009, many institutions have joined the international effort to enhance pandemic preparedness. Examples of contributions at a global level include:

The **UN System Influenza Coordination** has been coordinating influenza efforts across United Nations agencies and has encouraged effective collaboration with partners in the private, public, non-governmental and media sectors.

Towards a Safer World – a joint initiative of UN System Influenza Coordination and the US Agency for International Development – has examined recent successes and weaknesses in disaster and pandemic preparedness and developed resources to support better planning, coordination and response to disasters of all types.

The **United States Centers for Disease Control and Prevention** has focused its expertise and resources on the on-going surveillance of human and animal influenza risks, assessments of influenza viruses with pandemic potential, and the development of preparedness tools for public health practitioners.

The **International Federation of Red Cross and Red Crescent Societies** has launched a large-scale Humanitarian Pandemic Preparedness Programme which prepares vulnerable communities to mount rapid, coordinated and effective responses to pandemics.

- **Promoting intersectoral cooperation and a whole-of-society approach.** The PPI should strengthen a whole-of-society approach by supporting proposals that enhance linkages across government, the private sector and civil society. Recent public health emergencies have shown that the response to crises must mobilize sectors beyond the health community in order to mitigate the economic, social and humanitarian costs. However, in practice, intersectoral cooperation has remained weak. The PPI sought to work with a range of actors with an interest in global public health security, recognizing that successful pandemic preparedness benefits a broad set of stakeholders, from business leaders to politicians, across multiple sectors.

The approach

The PPI was modeled on the successful German BACKUP Initiative,[3] a flexible funding mechanism which has been assisting partner countries to access and use funds from the Global Fund to Fight AIDS, Tuberculosis and Malaria since 2002. Like BACKUP, the PPI offered a quick, flexible and comprehensive approach. Organizations in German Development Cooperation partner countries could submit proposals for activities across a range of thematic areas.

The PPI's services and approach were widely publicized through a range of channels, beginning with existing German Development Cooperation and GIZ networks in Africa, Asia and Eastern Europe. The PPI also worked closely with the WHO and UN System Influenza Coordination to disseminate information about its services. In September 2010 the PPI convened a large international meeting on pandemic preparedness in low- and middle-income countries which brought together interested partner organizations and technical experts and helped to strengthen working relationships. Beyond this initial phase of intensive outreach, the PPI continued to present its work and initial results at conferences and meetings worldwide, helping to build awareness of its activities and to share state-of-the-art approaches.

Between 2009 and 2012 the PPI issued grants totaling more than €9.8 million to partners in 20 countries in sub-Saharan Africa, Eastern Europe and Central Asia, and Asia. Partner organizations included ministries of health and education (and their subordinate agencies), universities, research institutes and non-governmental organizations. The PPI worked closely with the existing structures of German Development Cooperation – particularly health programmes – in partner countries, thus ensuring that funded projects were implemented in a timely, coordinated and effective manner.

[3] Information about the German BACKUP Initiative is available at www.giz.de/Themen/en/4356.htm.

Box 3. Germany's Direct Support to WHO's Global Response to the 2009 H1N1 Pandemic

On June 11, 2009 the WHO raised the worldwide pandemic alert level to Phase 6, its highest level, thereby confirming that a global pandemic of novel influenza A (H1N1) had begun. The German government responded quickly to the call put out by the Secretary General of the United Nations and the Director-General of the WHO for the international community to assist in strengthening the readiness and response capacity of health systems in countries worldwide and to ensure a more equitable distribution of pandemic vaccine.

In addition to the German Pandemic Preparedness Initiative described in this publication, Germany contributed €14 million to support the WHO's H1N1 Global Response Plan, with a particular focus on activities in developing countries, and the Pandemic (H1N1) Vaccine Deployment Initiative.

Strategic guidance for national preparedness measures

The WHO's H1N1 Global Response Plan provided direct technical support for health readiness and mitigation activities in countries around the world. Through the Global Outbreak Alert and Response Network, a global partnership of over 190 technical institutions, consultants were deployed to work directly with countries on strengthening their pandemic preparedness plans and readying their health systems to face the effects of the pandemic. Institutions in the network provided technical experts, including epidemiologists, laboratory scientists, clinicians, infection prevention and control experts, outbreak logisticians, and communications experts, in response to requests for assistance from ministries of health and WHO country offices.

Numerous workshops and training modules were organized to build preparedness capacity at regional and sub-regional levels, including a community health worker training module for home-care, health education, and case management of influenza-like-illnesses; a district hospital training package for management of severe respiratory diseases; and a pandemic influenza clinical management training curriculum for health-care professionals.

Action to ensure the equitable distribution of pandemic influenza vaccine

Given an anticipated shortage in pandemic influenza (H1N1) vaccine, the Pandemic Influenza A (H1N1) Vaccine Deployment Initiative was called into existence to mobilize vaccine donations, to coordinate their rational distribution and to supply countries in need. The WHO's goal was to provide sufficient doses of H1N1 vaccine to immunize 10 % of the total population of each eligible recipient country. These doses were to be administered to recommended target groups, including health care workers, pregnant women, and persons with chronic diseases as well as children and other groups as prioritized by countries in their national deployment plans.

Between December 2009 and December 2010, 17 different donors, governments, private sector organizations and technical agencies worked together through the Vaccine Deployment Initiative to deliver over 78 million doses of vaccine to 77 countries. With support from the Initiative, 82 countries developed and completed national deployment plans, 11 pandemic influenza (H1N1) vaccines were prequalified by the WHO, and over $50 million was raised for global and in-country operations.

Germany's support for these two WHO initiatives contributed to the strengthening of national health systems and ensured that resource-constrained countries were able to receive donations of pandemic H1N1 vaccine, thereby reducing the number of lives that would have been lost as a result of lack of resources to purchase and deploy the vaccine to target populations.

Strengthening pandemic preparedness: examples of interventions

The PPI supported a wide range of pandemic preparedness interventions in response to specific requests for assistance from organizations in partner countries. Proposals submitted to the PPI showed that countries primarily needed assistance in four thematic areas: supporting the development of national pandemic preparedness plans; improving risk communication and health promotion; strengthening diagnostic capacity and surveillance; and increasing vaccine manufacturing capacity. This section of the publication introduces the key issues in each of these thematic areas, presents examples of projects which were undertaken in response to these challenges, and describes the main lessons that were learned.

Developing national pandemic preparedness plans

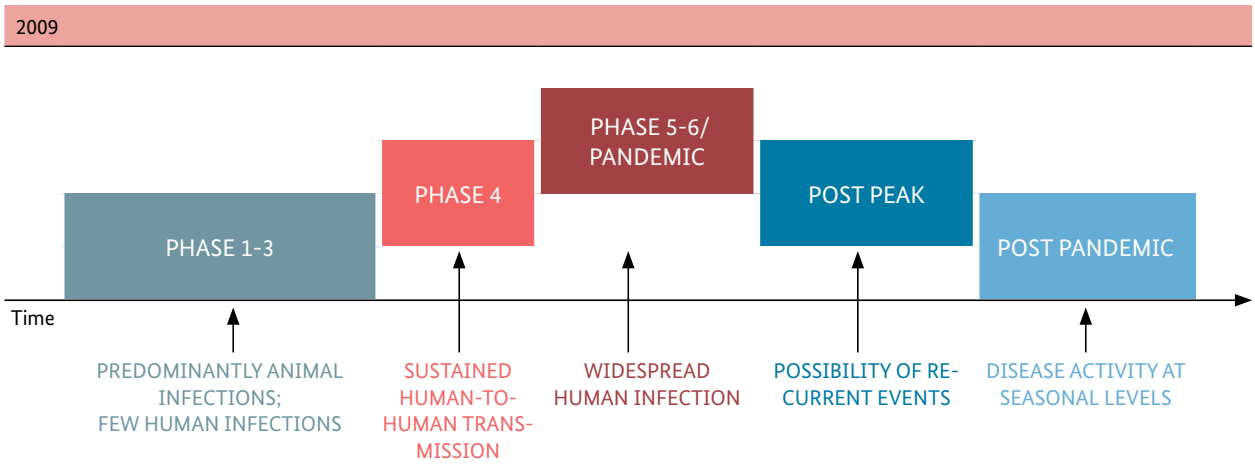
During a public health emergency, events often unfold very rapidly. New information is collated and analysed on a daily or even hourly basis and quick decisions need to be taken about response measures. The systems and communication channels which are relied upon during a pandemic outbreak must therefore be prepared and tested before they are needed. Once an outbreak is detected, there is simply not enough time to clarify roles and responsibilities among key players and to put in place many of the measures which can help to mitigate impacts.

A national pandemic preparedness plan is one of the key tools a country can use to ensure its readiness to detect and respond to a disease outbreak or other emergency. Pandemic plans provide a comprehensive description of a country's priorities and actions for strengthening its preparedness. They also outline the steps which should be taken in five functional areas – planning and coordination, situation monitoring and assessment, prevention and containment, health system response and communication – during each of the WHO's six pandemic phases, as well as in the post-pandemic phase (Figure 1.).

The WHO provides countries with guidelines, checklists and other resources to support the development and implementation of national preparedness plans. Although these frameworks have traditionally focused on threats of pandemic influenza, they can be adapted to other public health threats, in line with the all hazards approach promoted by the IHR. The most effective plans reflect a whole-of-society approach – one which goes beyond the traditional government-centric worldview to bring together people and institutions across sectors into a joint effort to reduce risks and vulnerabilities throughout society.

By 2009, the majority of WHO member states had already developed national pandemic preparedness plans, in many cases prompted by outbreaks of avian influenza starting in 2003. The influenza A (H1N1) pandemic provided additional

Figure 1. WHO Pandemic Influenza Phases



Source: www.who.int/csr/disease/swineflu/phase/en/

Because public health emergencies occur infrequently, simulation exercises – such as this one, in Khudjand, Tajikistan – present the best opportunity for testing the practicability of national pandemic preparedness plans.

impetus for countries to further develop and revise their plans. Despite progress in pandemic planning, significant gaps remained. A comparative analysis of 142 national pandemic preparedness plans (WHO, 2011a) found that they varied widely in terms of completeness. The most comprehensive plans were found in high-income countries, while the national plans in many of the world's poorer countries were more limited in scope. Another report (WHO, 2012b) added:

- Many pandemic plans were not well operationalized in practice, particularly at the sub-national (regional and local) level;
- Many plans did not pay enough attention to intersectoral approaches and integrated planning (e.g. involving civil society organizations and representatives of the private sector);
- Some national pandemic plans were dense, technical and not user-friendly; and
- Many plans still needed to be revised to reflect an all-hazards approach.

The PPI has responded to these gaps by supporting a number of countries to develop and strengthen their national pandemic preparedness plans. Selected examples are described below.

Tajikistan: Revising and operationalizing the national preparedness plan

The Central Asian state of Tajikistan is the poorest of the former Soviet republics. The country's health system has been heavily under-funded since the collapse of the Soviet Union and it struggles to prevent and control the spread of infectious diseases such as measles, polio, malaria and typhoid fever. Infectious diseases account for the largest proportion of hospitalizations in Tajikistan, and mortality from infectious diseases is higher than in any other country in the region.

Tajikistan's experience with infectious disease outbreaks, including avian flu and the influenza A (H1N1) pandemic in 2009, demonstrated that the country was not ready to confront a full-fledged pandemic on its territory. Among the 147 cases of influenza A (H1N1) detected in Tajikistan there were 12 deaths – all but one of them pregnant women. This fact underscored the lack of capacity to detect novel influenza cases, to effectively control its spread, and to communicate the risks of the outbreak to vulnerable population groups. Following WHO recommendations, Tajikistan used the post-pandemic phase following H1N1 to reflect on past experiences and to take appropriate measures to improve national preparedness and response capacity.

Working with the State Sanitary and Epidemiological Surveillance Service of the Ministry of Health of Tajikistan, the PPI supported a project aimed at strengthening pandemic preparedness and the response capacity of the Tajik health care system. First an inter-ministry working group collaborated with national and international experts from the WHO and UNICEF to revise the country's National Influenza Pandemic Preparedness and Response Plan. In accordance with the IHR, the new plan reflected an all-hazards approach.

On this basis training sessions were organized nationwide to introduce the contents of the revised national plan to 150 public health managers and individuals responsible for emergency response in various government ministries. Finally, experts from the WHO worked with the Tajik State Sanitary and Epidemiological Surveillance Service to introduce operational plans at the regional and district levels and to train health care managers in their contents.

Much of the project's attention was focused on bringing the contents of the new national preparedness plan directly to those stakeholders who have responsibilities to execute in the case of a public health emergency. After training stakeholders in the contents of the new plan, a simulation exercise was held in the city of Khudjand. Sixty personnel from the regional health authorities had the chance to practice their responses to a theoretical outbreak in four different settings – hospitals, schools, the city council, and local health authorities – taking into account the WHO's six pandemic phases. This was followed, at a later stage, by a similar exercise at national level. Both simulations helped to test the practicability of the plan and fed back into the planning process in Tajikistan.

Burkina Faso: Clarifying roles and responsibilities for an enhanced intersectoral response

Burkina Faso is one of the poorest and least developed countries in western Africa. As in many other developing countries, its health system has limited resources at its disposal to address a complicated mix of infectious and chronic disease burdens. Until the influenza A (H1N1) pandemic occurred in 2009, the threat of pandemic influenza was not a high priority in Burkina Faso. Afterwards, however, the country took steps to develop a national pandemic preparedness plan and to integrate influenza into the country's routine surveillance systems.

A subsequent evaluation of the country's national pandemic preparedness plan found that the roles and responsibilities of various stakeholders were not clearly delineated and that coordination mechanisms were inadequately described. Given that the quick and effective control of disease outbreaks is critical for mitigating their social and economic costs, it was essential that this aspect of Burkina Faso's national plan be improved. Alongside the WHO, the PPI assisted authorities in Burkina Faso to revise their national pandemic preparedness plan with particular attention to intersectoral coordination arrangements. The main partner in this effort was the country's national disaster protection agency, *Conseil National de Secours d'Urgence et de Réhabilitation*.

At a series of workshops, representatives of eight different ministries – Health, Decentralisation and Security, National Defense, Animal Resources, Transport, Agriculture, Communication, and Social Action and National Solidarity – and the Red Cross discussed and clarified the roles of stakeholders in public health emergencies. The agreed-upon arrangements were reflected in the revised national pandemic preparedness plan which was then pre-tested through a simulation exercise before being distributed across the country's 70 health districts.

The revised plan also took into account the findings of a specially-commissioned study which looked at the effects of the 2009 influenza A (H1N1) epidemic on different age groups in the country. A higher-than-expected proportion of influenza cases had occurred among 15-34 year olds, a group which is generally thought to be less susceptible to influenza than children under five, pregnant women, and people at the age of 65 and older. The national pandemic preparedness plan now reflects an awareness that the country's working age population needs to be monitored closely during future influenza outbreaks.

The project contributed to a number of positive developments in Burkina Faso's pandemic planning: the government has demonstrated strong leadership and engagement in a multisectoral approach involving multiple ministries and public health authorities; key stakeholders across ministries have become sensitized to issues of pandemic preparedness; and important progress has been made in harmonizing roles and decision-making responsibilities. Through the simulation exercise a number of key ministries developed a better understanding of how their mandates would be affected by a pandemic. According to Dr Isaïe Medah, the Director of Disease Control with the Ministry of Health, "Thinking about how to ensure the continuity of services and how to address the specific needs of the different vulnerable groups has been particularly enlightening. All of us had to think hard and to use our creativity: there is no simple blueprint for a locally-adapted pandemic plan."

Ghana: Business continuity planning

Public and private sector institutions alike are at risk of disruptions to their regular operations as a result of emergencies ranging from natural disasters to accidents, power outages and disease outbreaks. Business continuity plans can help to ensure that organizations are able to continue delivering essential services in emergency situations and to recover their data, facilities and assets following the crisis. The PPI has worked with the Ghanaian National Disaster Management Organization (NADMO) to strengthen a whole-of-society approach to pandemic planning in the country. One part of this approach has focused on the development of business continuity plans, which are relatively new in Ghana.

With support from the project, NADMO supported management personnel from interested organizations to undertake risk and vulnerability analyses of their operations. This required them to identify and prioritize the essential functions which they perform – for example, vital services which they provide to the public – and the resources which are needed to fulfill these functions (e.g. facilities, communication systems, personnel, recordkeeping systems). On the basis of this assessment, they identified measures which could be implemented to reduce vulnerability to emergencies. These include provisions such as planning for alternative work sites, setting up an emergency communication system for conveying essential information, specifying the line of succession for key positions in the organization, and mandating procedures for storing and backing up vital records and databases.

The Ghana Revenue Authority was the first partner organization to design an all-hazards business continuity plan with support from NADMO. Ghana Water Limited, which provides urban areas with water, and two private sector companies are currently in the process of developing business continuity plans using the same approach. Many institutions in Ghana and beyond would benefit from such plans, and more work will need to be done in low-income countries to build awareness of their usefulness.

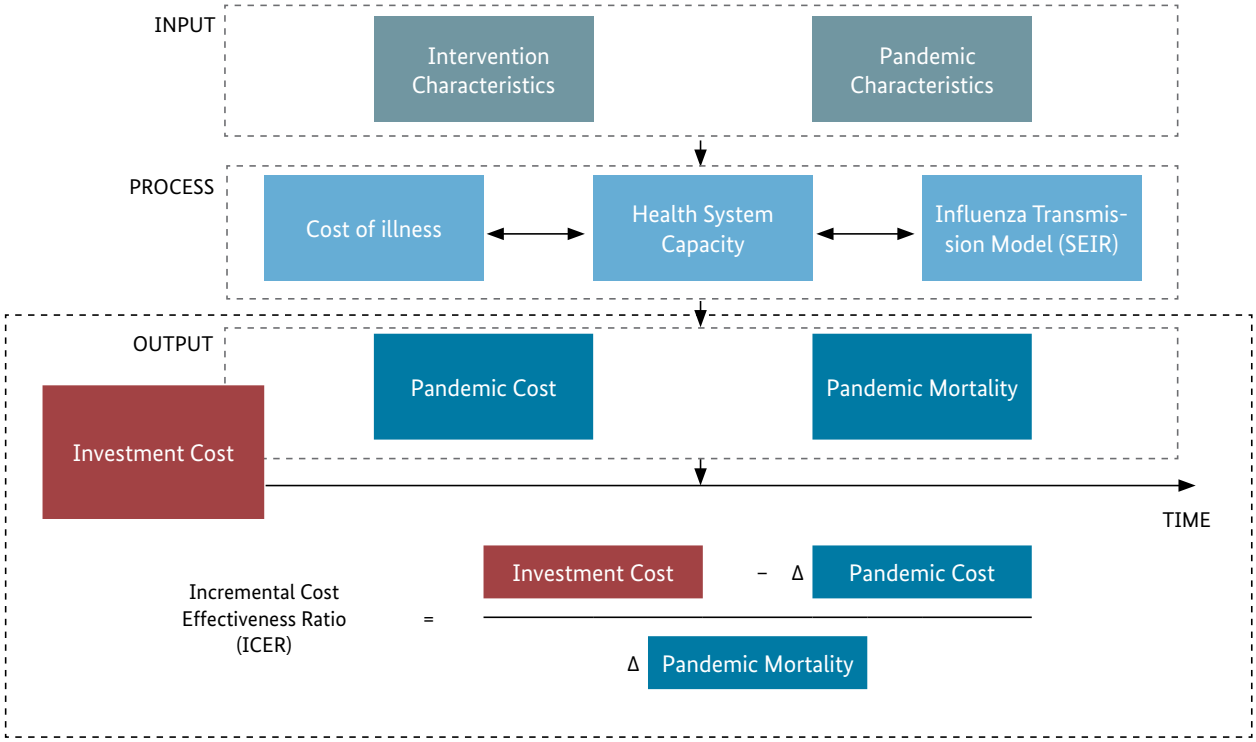
Cambodia: Guiding strategic investments in pandemic preparedness

Influenza pandemics are an ever-present threat in Cambodia and comprehensive pandemic planning is therefore of great importance. As in many low-income countries, policymakers in Cambodia struggle to reach consensus on how to allocate limited resources for pandemic preparedness (Huszar et al., 2013), in part because of a lack of information about the cost effectiveness of various interventions. Globally, only a relatively small number of economic evaluations of pandemic preparedness have been conducted to date (Pérez Velasco et al., 2012). These have largely focused on high-income countries, concentrated on expensive pharmaceutical interventions (e.g. antiviral stockpiling) as opposed to non-pharmaceutical measures, and assumed robust health system capacity (Drake et al., 2012).

With these gaps in mind, the PPI supported the Cambodian Ministry of Health, in cooperation with the London School of Hygiene and Tropical Medicine and a number of national institutions, to implement the 'CamFlu' project. CamFlu aimed at improving priority setting for pandemic mitigation investment in Cambodia by assessing whether various pandemic mitigation options could be considered a good use of scare resources.

Outputs from the CamFlu project include analyses of the treatment costs and outcomes of influenza A (H5N1) cases in Cambodia, human social contact networks, treatment

Figure 2. Schematic overview of the cost effectiveness model



Source: CamFlu Project, February 2013

seeking behaviour, stakeholder perspectives on pandemic preparedness and the distribution of health resources. These findings are supporting policymakers to make decisions on pandemic preparedness and other public health investments.

The project represented the first pandemic cost effectiveness study to focus solely on a low-income country. It was also the first to develop a pandemic cost effectiveness model which incorporates health system capacity (Figure 2.) – a methodological advance in the field. Initial results from the cost effectiveness model did not present a clear course of action for Cambodian policymakers: the analysis found weak evidence that antiviral stockpiling would be a cost-effective use of resources in Cambodia. This finding underscores the need to explore non-pharmaceutical interventions in the Cambodian setting, although due to the high level of uncertainty surrounding pandemic events it is difficult to draw strong conclusions. An extended analysis will turn next to other investment scenarios.

Lessons learned

The following are among the main lessons learned in the area of national pandemic preparedness planning:

- Planning for pandemic preparedness should be seen as a continuous learning process. National pandemic preparedness plans are, in fact, never finished: each successive disease outbreak or public health emergency reveals areas of strength and weakness in a nation's pandemic readiness. Improvements need to continue in inter-pandemic phases.

- It is important that stakeholders at all levels have the opportunity to test national pandemic preparedness plans for practicability during inter-pandemic periods. Projects supported by the PPI have demonstrated the value of simulation exercises which are tailored to the specific geographic and administrative configurations of individual countries. They provide participants with the chance to apply what they learned in pandemic preparedness trainings and to test their decision-making abilities. In addition, they strengthen intersectoral collaboration and raise people's awareness of their own critical contributions to their countries' national plan.

- Business continuity plans are an essential component of a whole-of-society approach to pandemic preparedness. Whilst they have become relatively standard components of disaster and emergency preparedness among large companies and institutions in developed countries, they are only beginning to be adopted in low- and middle-income countries. The PPI's experience supporting the development of business continuity plans in Ghana provides an example of how this can be undertaken in practice.

Risk communication and health promotion in pandemic preparedness

In the field of public health, risk communication refers to the process of conveying information about potential health risks, including the level of the threat, its significance and potential implications, and the actions which are being taken to manage it.[4] It aims to help people make informed decisions about risks to their health and safety, including actions which they can take to protect themselves.

Although risk communication is particularly important during times of crisis when people require clear information and instructions about health hazards, it has an essential role to play in the periods between crises as well. In the absence of an immediate threat, risk communication prepares people to respond in the event of an actual emergency and builds confidence in the competence of those responsible for managing the response. It also helps to educate people about potential health risks and to encourage the adoption of certain preventive behaviours, for example, through health promotion initiatives.

Risk communication is a multi-directional process which brings together 'expert' and 'lay' understandings of risk. It involves a wide range of actors, from government authorities and official agencies to scientists, medical experts, the media, civil society organizations and individual citizens.

Risk communication is closely associated with the question of trust. Successful risk communication maintains the public's trust – both in the institutions and individuals responsible for managing public health emergencies, and in the recommendations which they issue. It also requires trust between the authorities who are developing the messages and the 'communicators' – such as the media – who convey them to the public.

Effective risk communication is an essential component of pandemic preparedness, but it does not usually receive the same attention as technical tasks, such as planning, surveillance or vaccine development. Recognizing the unmet needs

[4] Material in this section draws upon Lang et al. (2001).

Lilja Juchimiv, an official with the Lviv Regional State Administration, participates in a media training. In Ukraine, public health experts have learned to make their language more accessible for journalists and the public.

in this area, the PPI has supported projects which address various aspects of risk communication – from improving the quality of outbreak communication to building public awareness about health risks and promoting behaviour change measures to prevent the outbreak and spread of disease. Through its focus on health promotion as an important non-medical aspect of pandemic preparedness, the PPI has gone beyond the IHR and built upon German Development Cooperation's significant expertise in this area.

Ukraine: Facilitating government-media collaboration for improved outbreak communication

In 2009, the influenza A (H1N1) outbreak in Ukraine took much of the country by surprise. Public health officials appeared unsure how much and what type of information to share with the public about the spread of infections, and among the media and the population at large there were widely varying understandings about the type and severity of the disease. This gave rise to panic: people began rushing to health facilities and more than 120,000 were hospitalized. Overall, 440 people in Ukraine died as a result of the epidemic.

After this episode the Ukrainian Ministry of Health recognized the need to improve its risk communication capacity. It was clear that responses to future outbreaks would be more effective if they better reflected the five principles for effective outbreak communication outlined by the WHO (2005): building a 'trust triangle' between technical experts, communicators and decision-makers; making early announcements about an outbreak to prevent misinformation; ensuring transparency in communications (i.e. information must be candid, correct and easily understandable); listening to public concerns and addressing them directly; and incorporating risk communication into national preparedness plans.

With support from the PPI, the Ukrainian non-governmental organization Movement for Health undertook a project, in cooperation with the Ministry of Health, to improve risk communication in the country. The project aimed to establish a risk communication strategy within the Ministry of Health and to strengthen the working relationship between the Ministry and the media so that the Ukrainian public would receive accurate and relevant information about disease outbreaks and preventive behaviour.

Following the systematic efforts of a project working group which included, among other members, legal and communications experts, the Ministry of Health adopted a new crisis communication policy which is binding across the entire national health system. It also established a five-person Health Promotion and Prevention Department responsible for coordinating risk communication measures. The effects of these changes were immediately visible: communications from the Ministry of Health are now more proactive than in the past, focus strongly on preventive health measures, and directly address the public's information needs, which were assessed during the course of the project.

The second component of the project sought to improve the quality of health-related communication in the country by strengthening the capacity of health sector representatives to explain technical content, on the one hand, and by building the skills of the media to clearly convey this content to the public, on the other. This task was complicated by the fact that government and the media in Ukraine have historically been quite skeptical, if not distrustful, of one another. In order to overcome this dynamic, trainings sessions were undertaken in six districts, bringing together staff from the Ministry of Health, district health departments and members of the media. Participants jointly developed media messages and took part in simulated press conferences and interviews, reportedly valuing the opportunity to share experiences and viewpoints with representatives of the 'other' side.

As Olga Gavrilova, the head of Movement for Health, explained, "It was an interesting, complex and highly ambitious project since we had to bring people together who in critical situations often are on different sides of the barricades." The media trainings proved to be even more successful than expected and have led to concrete changes in the working relationship between government and the media in some areas of the country. The trainings were also filmed and will act as the basis for an e-learning module which will reach 700 medical students across the country annually.

A larger-than-life model of a human lung was one of the highlights of the 'Combating Contagious Diseases' exhibition in Jakarta's science and education centre.

Indonesia: Raising popular awareness of health risks through an interactive exhibition

Indonesia is not only prone to natural disasters, but is also the country which has been most heavily affected by avian influenza in recent years. Given the likelihood of infectious disease outbreaks, the Indonesian government has placed a high priority on risk communication initiatives which inform the public about the spread of infectious diseases and their prevention. Health-related messages are not only disseminated through the school system and via the Ministry of Health, but also featured at various centres for public education across the country.

The PPI supported the, an agency under the Indonesian Ministry of Research and Technology, to develop a 725 square meter interactive exhibition called Combating Contagious Diseases. The exhibition aimed at increasing knowledge about infectious diseases and their prevention among the general population, focusing in particular on school-aged children. The Science and Technology Centre, which works to promote science and technology among the Indonesian population, has developed more than 350 state-of-the-art exhibits for the country's main science and education centre in Jakarta, in addition to travelling exhibits which visit regional centres throughout Indonesia.

Box 4. Pandemic Preparedness at Points of Entry

Given the dramatic increase in international travel over the past decades, international points of entry – whether land crossings, seaports or airports – have become key players in the quest to prevent and control the spread of infectious diseases. The IHR outline a number of specific capacities which countries should develop at designated points of entry to manage public health risks. These include providing access to appropriate medical services (with diagnostic facilities), services for the transport of ill persons, trained personnel to inspect ships, aircraft and other conveyances, maintaining a healthy environment and ensuring that facilities are prepared to apply emergency measures, such as quarantine.

Ghana: Due to its proximity to war-torn Côte d'Ivoire, where disease surveillance and monitoring structures are inadequate for the timely detection of cases with pandemic potential, Ghana's Western Region is at higher risk of severe disease outbreaks. The international airport and the harbour in Sekondi-Takoradi provide a particularly enabling environment for the spread of disease during pandemic outbreaks. Due to this vulnerability, the National Disaster Management Organization asked for support to enhance its risk communication at points of entry. In response, a PPI-supported project established a free hotline which citizens can call to receive up-to-date information about public health threats, as well as an information centre at the border to Côte d'Ivoire. Takoradi Harbour Authority personnel and border control officers have also been trained in methods for facilitating a two-way flow of information about public health threats between authorities and the citizenry.

Kenya: Kenya is home to one of the fastest-growing economies in eastern Africa and the volume of goods and business travellers moving in and out of the country has risen dramatically in recent years. As part of a PPI-supported surveillance strengthening project in Kenya, 29 health officers from 17 points of entry – including Mombasa, Kenya's largest seaport – have been trained as part of 'rapid response teams.' These six-member groups comprised of medical and veterinary experts have learned to rapidly detect, assess, respond to and contain suspected pandemic or epidemic diseases, thereby extending integrated surveillance and response capacity to Kenya's points of entry.

The Science and Technology Centre worked for more than a year, in close collaboration with the WHO and the Indonesian Ministry of Health, to develop the content of Combating Contagious Diseases. The exhibit, which opened in June 2012, uses both modern and traditional communication techniques to share information about the spread of disease, the symptoms of respiratory infections, and the effects of influenza on the body. It engages visitors in interactive exhibits, including a larger-than-life model of the human respiratory system and an 'invisible organism' display in which a human mannequin delivers 'glowing germs' to visitors when shaking their hands. Young children learn about the importance of personal hygiene in a traditional puppet show about influenza, while school children can test their knowledge of infectious diseases in a board game. The exhibit also features seminars, workshops and trainings about pandemic preparedness, as well as additional materials for teachers to use in their classrooms.

More than 300,000 people have visited Combating Contagious Diseases since its opening, including more than 40,000 in the first month alone. Visitors have responded positively to its interactive design. A teacher from Madrasah Ibtidaiyah Negeri observed: "Some children had no idea about viruses before coming here and interacting with the exhibits. I especially like the 'invisible organism' exhibit because it illustrates to students that washing their hands is important and that shaking hand with others could spread viruses."

The running costs of the exhibition are covered by the Ministry of Research and Technology, thereby ensuring that the exhibition will remain open for several years and reach a wide audience.

Uzbekistan: Improving kindergarten health – 'Your safety is in your clean hands!'

Uzbekistan faces a high incidence of influenza and other viral infections. Not only are children especially susceptible, but they can also contribute to the rapid spread of infectious diseases in kindergartens, schools and family networks. Health promotion activities among pre-school aged children can therefore make an important contribution to pandemic preparedness by encouraging the adoption of protective behaviours, such as handwashing with soap, which help to prevent the outbreak and spread of infectious diseases.

The PPI supported Uzbekistan's Ministry of Health and Ministry of Public Education to implement a project aimed at improving the observance of rules of personal hygiene among pre-school aged children in Tashkent. In order to reach children who attend pre-school institutions as well as those who stay at home, the project was implemented through 20 kindergartens and 38 family polyclinics. Kindergarten staff and nurses at the polyclinics were provided with a specially-developed training curriculum which taught them how to educate children and their parents about the importance of personal hygiene in preventing the spread of disease. Hygiene products, such as soap, soap dispensers, paper towels, toothbrushes and toothpaste, were provided to participating institutions. Finally, a very popular children's book, Water Droplet, was developed, featuring age-appropriate pictures and stories which explain why and how to wash hands and brush teeth correctly. Under the supervision of kindergarten staff and nurses, children practiced these behaviours and integrated them into their daily routines.

This simple and low-cost approach to health promotion yielded rapid results. During the pilot phase of the project, systematic observations of hygiene practices in kindergartens

Kindergarten children in Tashkent proudly show off their freshly-washed hands. Health promotion activities encourage the adoption of protective behaviours which can limit the outbreak and spread of infectious disease.

revealed that only 15% of children were washing their hands after using the toilet. Three months after the implementation of the approach, follow-up observations found that all of the children were washing their hands and more than 85% of children at kindergartens and at home were brushing their teeth twice a day. The initiative has proven popular among kindergarten staff and has been replicated in additional kindergartens, which collect money from parents to cover the costs of the hygiene products.

In addition to conveying important life skills and creating a health promoting environment at pre-schools, the project has strengthened intersectoral collaboration by bringing together representatives of Uzbekistan's health and education sectors. The Water Droplet training curriculum has been integrated into the national programme on pre-school education, as well as into vocational education for nurses, thereby ensuring that the approach will become further institutionalized in educational and health settings serving pre-school aged children.

According to Raushan Ataniyazova of GIZ Uzbekistan, these were significant accomplishments: "It was difficult at the beginning to bring together the various stakeholders into a discussion on this topic, but through regular meetings we managed to start a multisectoral dialogue which led to real results. At first glance, the topic seems to be very simple, but through it we've succeeded in making a big contribution to the national strategy for 'Raising a Healthy Generation.'"

Lessons learned

The Pandemic Preparedness Initiative has supported a wide range of projects in the area of risk communication and health promotion. The following are among the main lessons learned:

- Risk communication should not be seen as an 'add-on' activity, but as a core capacity which is needed to promote health both under normal circumstances and in times of crisis. In the long run, this will require investments in communications expertise and in the creation of durable relationships between health sector representatives, journalists and professionals from other sectors. These linkages need to be built and tested prior to an emergency breaking out.

- Achieving intersectoral collaboration in practice requires perseverance, flexibility and a willingness to invest time in the complex process of relationship building. In countries where the health and education sectors rarely work together, for example, it was necessary to identify incentives which would bring key players to the table – in this

Box 5. Integrating Pandemic Preparedness into the 'Fit for School' Approach in Cambodia

Schools are settings where children can easily transmit and contract infectious diseases due to their close contact with other children, but they are also places where important life skills can be learned and effective infection prevention measures can be undertaken. It is for this reason that the PPI began a collaboration with the regional Fit for School programme, which works to reduce the incidence of the most prevalent diseases among school-aged children.

At ten public elementary schools in five provinces in Cambodia teachers have been trained to recognize early signs of a disease outbreak – for example, increased absenteeism – and to contact local health authorities who then investigate further. In this way schools have been linked to the existing system for disease surveillance and contribute to strengthening pandemic preparedness and resilience. School closures in Cambodia in the summer of 2012 due to severe cases of hand, foot and mouth disease, as well as the outbreak of avian flu in early 2013, demonstrate that this initiative is both timely and relevant.

Following the successful experience in Cambodia, aspects of pandemic preparedness will be integrated into the regional Fit for School programme in Indonesia, Laos and Philippines. The Southeast Asian Ministers of Education Organization has already decided to include the Fit for School approach with a focus on pandemic preparedness as a best practice in its course on disaster risk management.

case, low-cost, simple approaches for improving health and educational outcomes. Cooperation tended to begin very slowly, around a basic idea, yet became deeper and more complex over time as personal relationships and trust were built.

Strengthening diagnostic capacity and surveillance

Under the IHR, member states are required to notify the WHO within 24 hours of any events in their territories which pose a potential threat to international public health. Following notification, they must continue to provide detailed information about the event, including case definitions, laboratory results, the source and type of risk, and the number of cases and deaths (WHO, 2011a). To fulfil these obligations, countries need a well-organized and sensitive disease surveillance system capable of sounding an early warning about new risks, coupled with robust clinical data which can be analyzed to determine the severity of disease outbreaks.

Different approaches can be taken to systematically collecting and analyzing patient data to inform public health decision-making. Countries following the Integrated Disease Surveillance and Response strategy – including those in the WHO Africa Region – use a single surveillance infrastructure to gather information about multiple diseases, such as malaria, influenza or tuberculosis. In sentinel surveillance systems, a sample of sites across the country collect and report all cases of designated conditions.

The rapid detection and assessment of disease outbreaks requires the existence of a well-organized and sensitive disease surveillance system capable of sounding an early warning about new risks.

In the case of influenza, routine surveillance and laboratory-based (virological) surveillance are used to assess a country's influenza burden and to identify population groups targeted for seasonal influenza vaccination. Routine surveillance also helps to identify abnormal clusters of influenza-like illnesses among the population. Almost two-thirds of WHO member states have established routine surveillance for influenza-like illnesses or acute respiratory infections (WHO, 2011a).

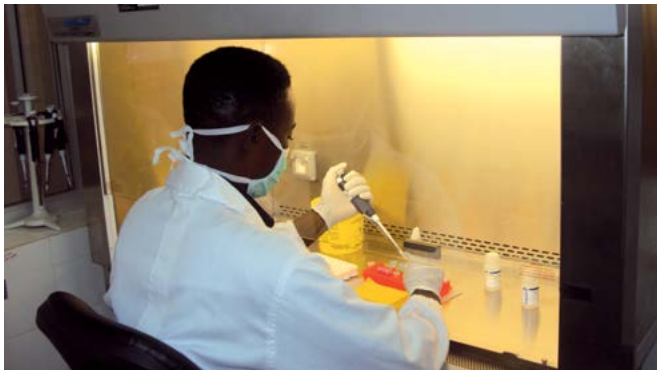
Since the adoption of the IHR, significant progress has been made in the area of disease surveillance. In many countries surveillance and laboratory capacities have been upgraded, national influenza centres have been established in countries where they did not previously exist, and international surveillance networks have been expanded (WHO, 2011a). At the same time, however, it can be challenging to establish and maintain high-quality surveillance systems: low- and middle-income countries sometimes struggle to meet international surveillance standards due to a lack of trained personnel, limited resources and infrastructure/logistical challenges. Some of the issues which continue to require attention in the area of in global disease surveillance include the following:

- **Quality and quantity of surveillance data.** As the saying goes, 'only good data are relevant data.' Data that are imprecise, incomplete or incorrect lead to delays, wrong decisions and contradictory recommendations. In a worst case scenario, this can cost people's lives;
- **Response time.** In an outbreak situation, time is of the essence. Not only must information be correct and be interpreted correctly, but it must be received quickly and on a continuous basis; and
- **Information sharing and communications.** During disease outbreaks communication channels must function smoothly and transparently. When different experts have different information this can lead to divergent recommendations which generate confusion and mistrust among the public.

In the projects which it supported in the area of diagnostic capacity and surveillance, the PPI sought to address these gaps in the core capacities of partner countries. A selection of these projects is described below.

Togo: Integrating influenza into national surveillance systems

Togo began to establish a disease surveillance system in 1998, making it one of the first countries in West Africa to do so. Yet prior to the influenza A (H1N1) pandemic in 2009 the system did not include influenza among the communicable diseases which it targeted. Following WHO recommendations and the IHR, Togo has since taken steps to integrate influenza into its national pandemic preparedness plan and into its disease surveillance system. The PPI



A laboratory technician works with pathogenic germs under special secure conditions at the new national influenza reference laboratory in Lomé.

has supported this process, working with the WHO, the Togo Ministry of Health and the *Institut National d'Hygiène* in Lomé to strengthen the epidemiological and virological surveillance of influenza viruses across the country.

With support from the project, the Ministry of Health was able to establish a national influenza reference laboratory in Lomé, equipped with PCR machines, microscopes, incubators and other instruments needed to diagnose influenza viruses. Among other benefits, it is no longer necessary to send samples from Togo to laboratories in neighbouring countries – a development which will save valuable time in the case of future influenza outbreaks.

The bulk of the project, however, was aimed at improving the skills of Influenza Focal Points in 40 districts countrywide whose responsibility it is to analyse data from local sentinel surveillance sites and to report findings to authorities at the national level. Accurate reporting is essential for identifying the overall trend, intensity and impact of an emerging influenza outbreak. During trainings in the northern, central and southern parts of the country, up to two people per district were trained in influenza surveillance and case investigation. The training covered how to detect potential influenza cases, how and when to report cases, and how to care for patients suspected of being infected with influenza. They also reinforced procedures for dealing with other sorts of public health emergencies, addressing issues such as biosecurity and the transportation of contagious materials.

The project in Togo has led to better quality continuous reporting of surveillance data from across the country to the *Institut National d'Hygiène* in Lomé. Improvements can be seen not only in influenza surveillance, but in the surveillance of other infectious diseases as well. This result has not gone unnoticed: other agencies have replicated the approach taken in the influenza project supported by the PPI and expanded the Togolese surveillance system to address diseases such as Buruli ulcer and meningitis.

West Africa[5] and Democratic Republic of Congo: Using new tests to improve detection of viral haemorrhagic fevers in remote areas

The incidence of viral haemorrhagic fever outbreaks in remote areas of Africa has increased markedly in recent years. Effective control of outbreaks depends on early detection and confirmation of cases to enable an appropriate response. Until recently, however, sample testing to confirm viral haemorrhagic fever outbreaks has had to take place in laboratories far removed from the areas where most outbreaks occur. Because transportation links are so poor, by the time a sample reaches its destination it is often no longer suitable for diagnostic purposes. There has therefore been an urgent need to facilitate reliable testing closer to the origin of outbreaks. 'Point of Care' diagnostic tests greatly simplify the testing of samples and are an ideal solution in resource-poor settings.

The PPI has supported a collaborative project between the Institut Pasteur de Dakar in Senegal and the Georg-August-

[5] Burkina Faso, Guinea, Mali and Senegal are the West African countries involved in this project.

Health care workers from remote health centers in five countries were trained in Dakar in the use of a new line assay for diagnosing Viral Haemorrhagic Fevers.

Teams from Chughtai Lahore Laboratory and the Punjab Institute of Public Health consult on laboratory standards. The establishment of the Pakistan Laboratories Network has fostered peer learning between public and private laboratories in Pakistan.

Universität Göttingen in Germany to improve the control of viral haemorrhagic fever outbreaks in five African countries by moving frontline diagnostics into the field. At the heart of the project is the use of a newly-developed diagnostic line assay test which is simple to administer, but sensitive and reliable enough to be used for outbreak investigations in remote areas.

Through the project health workers from 25 health care centres in remote areas of Burkina Faso, Democratic Republic of Congo, Guinea, Mali and Senegal were taught how to use the new line assay. The test can be conducted by nurses using blood samples taken from finger pricks, averting the need for laboratory personnel or the transfer of samples. Following a one-week training course, the new technology moved to the field to be tested under real-life conditions. The project team made follow-up visits to the health facilities to ensure that the health workers were using the assay correctly. In the final element of the project, young scientists from the region were trained to become members of viral haemorrhagic fever outbreak investigation teams.

The early identification of viral haemorrhagic fever outbreaks through the use of line assays in remote health facilities, combined with effective control and case management by specialized outbreak teams, should reduce the case to death ratio of individual outbreaks in these areas. And due to the low cost of the assay, it has the potential to become a useful tool for a wide range of clinical and scientific groups across Africa. Technology of this type represents a new opportunity to build sustainable surveillance systems, while increasing local diagnostic capacity of transmittable diseases in low-income countries.

Pakistan: Improving surveillance data through a public-private laboratory collaboration

Pakistan is a country at high risk of infectious disease outbreaks, including type A influenza, hepatitis, cholera, typhoid fever, dengue fever and malaria. Yet following the dissolution of Pakistan's Ministry of Health in 2011 and the devolution of health responsibilities to provincial level, there has not been a central focal point for the national surveillance of infectious diseases. The country's existing Health Management Information System collects information about cases of routine and communicable diseases and a Disease Early Warning System is in place in conflict-affected districts, but these are not adequate for tracking the incidence of emerging infections and cannot be relied upon to detect the onset of potential outbreaks.

The PPI has supported the formation of the Pakistan Laboratories Network, a group of five high-quality, high-volume diagnostic laboratories (three private, two public) which collate information about laboratory-confirmed cases of specific communicable diseases in a central database. Because the participating laboratories serve populations which are geographically and demographically representative of the country as a whole, the data which they generate can act as a surrogate for a national sentinel surveillance system. The data generated by the network complement that produced by the Disease Early Warning System and link directly with national and regional epidemic response centres, which monitor and forecast threats of communicable diseases of public health importance.

Once the member laboratories were identified, the project supported a series of measures aimed at strengthening their capacity to reliably diagnose priority communicable diseases, including type A influenza, hepatitis B and C, poliomyelitis, tuberculosis, dengue and HIV. Particular attention was paid to improving the quality of the laboratories' pre-analytical work, which is essential for precise and conclusive diagnostic results. Over the course of the project the laboratories have enhanced the quality and reliability of their diagnostic results and since October 2012 have been providing monthly data on the 'top ten' communicable diseases identified at their sites, disaggregated by age, gender and geographical location.

One of the notable elements of this project was its success in bringing together public and private laboratories into a formal network whose members are committed to meet an agreed set of quality standards. Moreover, it is a positive development for disease surveillance in Pakistan that members

of the network are committed to extending it to additional diagnostic laboratories which are willing and able to meet the designated quality benchmarks.

Lessons learned

The following are among the main lessons learned in the area of diagnostic capacity and surveillance:

- Capacity building interventions which focus on improving the surveillance of a specific disease can have spill-over effects which strengthen health systems more generally. While many projects supported by the PPI concentrated in the first instance on influenza surveillance, they generated benefits for disease surveillance as a whole. These projects, and others like them, reinforce the premise of the Integrated Disease Surveillance and Response approach, which uses common structures, processes and personnel to detect, confirm and respond to multiple diseases.

- The quality of surveillance data can be improved through capacity building interventions which focus on laboratories and laboratory networks. Standardizing sample collection strategies and ensuring linkages between sampling and clinical information help to improve the quality, reliability and timeliness of results. Efforts to promote links and collaboration between laboratories – both public and private – also improve the effectiveness of a disease surveillance system.

- Efforts to build the capacity of a single focal point at district level will have more limited impact than an approach which also aims to improve surveillance capacity among provincial and national health authorities. This point was clearly illustrated in the projects supported in this thematic area: in Togo, for example, information about the IHR was included in training activities at all levels of national surveillance systems. Integrating this content enhances the role of the national IHR Focal Point, whose ability to fulfill tasks effectively depends upon strong linkages with focal points at lower levels and a shared understanding of the country's responsibilities under the IHR.

Improving vaccine manufacturing capacity

Immunization is one of the most powerful and cost-effective of all health interventions. The WHO estimates that three million deaths are prevented and 750,000 children are saved from disability each year by vaccines. In addition to their important role in preventing childhood illnesses, vaccines are central to efforts to control seasonal and pandemic influenza, which have the potential to spread rapidly through populations. The capacity to develop and deploy influenza vaccines worldwide is therefore a critical element of pandemic preparedness.

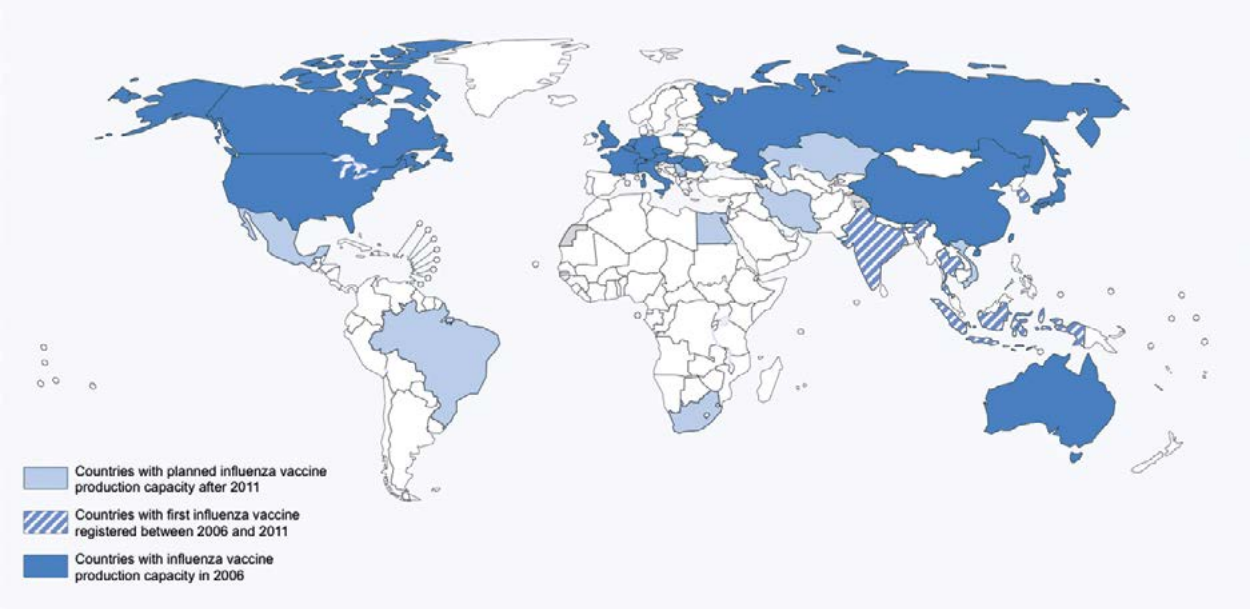
Immunization is one of the most powerful and cost-effective of all health interventions.

Despite the progress which has been made in the development and production of vaccines in high-income countries, low-income countries face significant challenges in ensuring an adequate vaccine supply. One of the main problems is affordability: the vaccines produced by the world's leading pharmaceutical companies are often too expensive for developing countries to purchase in the quantities needed.

In the case of influenza, production capacity is also a challenge. Because influenza viruses mutate constantly, new seasonal influenza vaccines must be produced each year. The resources and technology do not exist in many developing countries to undertake this intensive vaccine production cycle on an annual basis. And as seasonal influenza vaccines do not protect against strains of pandemic influenza, separate vaccines are needed if new influenza forms are detected. Because production capacity for influenza vaccines is so limited in low-income countries, existing global production capacity is presently not sufficient to ensure adequate quantities of pandemic influenza vaccine (Map 1.).

Since 2006 the Global Pandemic Influenza Action Plan to Increase Vaccine Supply has been working to decrease the shortfall between the projected demand for a pandemic vaccine and projected production capacity. However the 2009 influenza A (H1N1) outbreak made it clear that much remains to be done: while the WHO had set a goal that there should be enough pandemic influenza vaccine available for two billion people within six months of the virus strain being provided to manufacturers, only 534 million

Map 1. Global influenza vaccine production capacity



Source: Partridge & Kieny, 2013, reproduced with permission.

doses were produced within this timeframe (Partridge & Kieny, 2010). If the pandemic strain had been more severe, the consequences of this shortfall could have been catastrophic.

One of the main strategies being pursued by the Global Pandemic Influenza Action Plan to Increase Vaccine Supply is to increase vaccine manufacturing capacity in developing countries, including more widespread use of adjuvants. Adjuvants are agents added to a vaccine which augment the immunization effect by stimulating the immune system's response. When an adjuvant is included in a vaccine, less of the basic agent (antigen) is needed. In this way, the use of adjuvants has the potential to expand the number of available doses of vaccine.

Because the technology to produce adjuvant vaccines is not widely available in developing countries, initiatives have been undertaken in recent years to transfer these technologies to low- and middle-income countries. This enables local and regional manufacturers to produce greater quantities of effective vaccines at a more reasonable cost. The PPI has directly supported this effort through intensive collaborations with two members of the Developing Countries Vaccine Manufacturers Network, a voluntary public-health-driven alliance of 14 vaccine manufacturers from developing countries. Members of the network are committed to producing a consistent supply of good quality vaccines that are accessible to developing countries.

Expanding vaccine manufacturing capacity in Indonesia and Vietnam

Although an outbreak of pandemic influenza could occur anywhere in the world, the risk is particularly great in the densely populated nations of Southeast Asia, where strains of influenza A (H5N1) continue to circulate in animals. Indonesia and Vietnam are among the countries in this region which are moving towards more comprehensive vaccine development strategies as part of their pandemic preparedness planning. Indonesia is currently establishing a basis for its own pandemic influenza vaccine production at the state-owned Bio Farma based in Bandung, West Java; Vietnam is undertaking a similar effort at the Institute of Vaccines and Medical Biologicals (IVAC) based in Nha Trang.

The PPI has supported technology transfer projects to establish laboratory-scale adjuvant manufacturing platforms at Bio Farma and IVAC. The adjuvant manufactured in these

Technicians at the Institute of Vaccines and Medical Biologicals in Vietnam are trained in adjuvant vaccine production. Expanding vaccine manufacturing capacity in low-income countries helps to reduce dependence on imported vaccines.

projects – an oil-in-water emulsion – has been demonstrated to increase the number of available vaccine doses by up to 10-15 times when starting with the same amount of antigen.

The Vaccine Formulation Laboratory at the University of Lausanne in Switzerland provided the adjuvant technology and coordinated the project, which unfolded over a number of stages. First, a team of Bio Farma and IVAC trainees spent a week in Lausanne participating in interactive workshops which introduced the adjuvant technology used at the Vaccine Formulation Laboratory. Following this, a team of trainers travelled from Europe to Indonesia and Vietnam and worked in collaboration with the trainees to build the capacity for adjuvant vaccine production. This included setting up the equipment, demonstrating its usage and ensuring that the trainees were able to operate the equipment independently and confidently.

In order to confirm that the trainees had assimilated the technology and were comfortable in its use, the trainees produced batches of adjuvant once the trainers had returned to Europe. The independently manufactured adjuvant was then shipped to the Vaccine Formulation Laboratory where its quality was confirmed through laboratory tests. In addition, the adjuvant was assessed for compatibility with pandemic influenza vaccine antigens, and several immunogenicity studies were carried out investigating H5N1 influenza vaccines mixed with the adjuvant in order to further characterize the vaccine/adjuvant combination.

As a result of the technology transfer project, partner institutions in both countries have significantly enhanced capacity in the application of modern vaccine production technologies and are in a position to transfer this knowledge further to other colleagues in the field. Collaborators at the University of Lausanne will also publicize the experience gained through the project.

Lessons learned

The following are among the main lessons learned in the area of vaccine manufacturing capacity:

- Carefully managed technology transfer projects can be successful in increasing vaccine manufacturing capacity in developing countries. The results of training even a relatively small cohort of people in new vaccine production techniques can be seen at a national level. Capacity building and technology transfer projects are one of the best ways to overcome the gap in vaccine production capacity which continues to exist between high-income and developing countries and to ensure a more equitable distribution of vaccine supplies.

- Given the rapidly growing markets for vaccines, both nationally and internationally, there are many business opportunities for public and private institutions interested in supporting vaccine research and/or manufacturing. Yet it is also a complex field which differs from the markets for many other products and services. Business models need to take into consideration specific added-value created, and where these advantages can overcome inherent market challenges (e.g. fluctuating demand, high levels of government regulation). Sustainability is created when all stakeholders benefit from the business model.

- Despite high barriers to entry, support for expanded vaccine production is an investment in the national and international public good. Immunization should be seen as an asset which yields collective benefits far beyond the protection of individual and public health, including reducing conflicts within and between countries during pandemic outbreaks. While most economic evaluations of childhood immunization capture only the health and short-term economic benefits, measuring the longer-term economic effects of immunization provides a more complete picture of the value of vaccines.

Reflections and recommendations

The launch of the German Pandemic Preparedness Initiative (PPI) in 2009 marked the start of an innovative, demand-driven effort to enhance pandemic preparedness through the provision of technical assistance and capacity building support to partner organizations in low- and middle-income countries. From the start, the PPI was designed as a temporary measure: it provided a platform for testing promising approaches to pandemic preparedness which could then be taken up by governments and mainstreamed into health systems strengthening efforts.

As the PPI draws to a close, German support for pandemic preparedness will continue through German Development Cooperation's on-going programmes on health systems strengthening under the mandate of BMZ. This final section of the document begins with some reflections on the approach this initiative has taken and concludes with recommendations for other public and private organizations which may consider investing in the timely area of pandemic preparedness.

Reflections

A comprehensive approach to pandemic preparedness

The PPI has supported a wide range of projects which have contributed to building the core capacities required by the IHR. These projects have spanned the entire range of preparedness, from developing national pandemic preparedness plans to strengthening risk communication strategies, improving disease surveillance systems and increasing vaccine manufacturing capacity. In the area of risk communication, the PPI has gone beyond the provisions of the IHR to include a focus on health promotion. These projects have raised people's awareness of measures which prevent infectious disease outbreaks and reduce their spread – an important non-pharmaceutical approach to the mitigation of pandemics.

Responding to the specific needs of partners, within a whole-of-society approach

Over the course of the PPI, the greatest demand for support came from national governments, including ministries and disaster management agencies. This reflected a clear understanding that governments are responsible for protecting their populations against the effects of public health emergencies, as well as a recognition that measures were needed to strengthen pandemic readiness. While demand for services came mainly from government, the PPI sought to promote a whole-of-society approach in the implementation of supported measures. For example, participants in project activities often represented a wide range of stakeholders, including multiple government ministries and agencies, private sector companies, and civil society organizations.

Contributing to health systems strengthening

All projects supported by the PPI shared a common orientation on health systems strengthening. The projects profiled in this publication demonstrate some of the myriad ways in which this can be undertaken in practice – from enhancing the relationship between journalists and health officials, to developing the technological capacity of state-owned vaccine manufacturers. By concentrating its assistance on measures which reinforced and improved the functioning of national structures, the PPI contributed to on-going efforts to strengthen health systems. In doing so, it aimed to make a sustainable contribution to health systems as a whole and to strengthen countries' overall resilience in the face of public health emergencies.

Sharing lessons learned and promoting networks

The results of the PPI's work have been shared widely, both within German Development Cooperation and with other interested groups through conferences and professional networks. This allows promising approaches to be replicated or adapted by other countries and programmes. The PPI has also supported national and regional African networks of professionals and practitioners interested in exchanging information and expertise on pandemic preparedness. One important contribution was an international pandemic preparedness conference convened by the Government of Ghana and the PPI in Accra in June 2012. More than 150 scientists and experts from Africa, the United States and Europe met and shared lessons learned from pandemic preparedness efforts to date.

Recommendations

Based on the PPI's experience, the following recommendations may be relevant to future efforts to support pandemic preparedness:

- **Invest in planning as the essential core of pandemic preparedness.** National pandemic preparedness plans are the overarching framework uniting all other aspects of pandemic preparedness. Ideally, they should be closely aligned with both national health plans and disaster

plans. Due to the unpredictable nature of pandemics, national pandemic preparedness plans will always remain a 'work in progress.' They need to be revisited regularly and updated on the basis of experience gained in previous outbreaks and emergencies. Simulation exercises provide much-needed opportunities for stakeholders to test the practicability of national pandemic preparedness plans in inter-pandemic periods.

- **Continue to support the Integrated Disease Surveillance and Response strategy.** Assessments of the IHR core capacities have shown that the greatest progress has occurred in the area of surveillance. The experience of the PPI has shown that the Integrated Disease Surveillance and Response strategy is essential for strengthening health systems as a whole, because it promotes the use of a single surveillance infrastructure to gather information about multiple diseases.

- **Treat risk communication as a core capacity for pandemic preparedness.** There is a danger that pandemic preparedness efforts focus disproportionate attention on technical topics such as surveillance and vaccine production at the expense of essential 'soft' skills such as risk communication. In self-assessments of their core capacities, WHO member countries often assign themselves low marks in the area of risk communication. This suggests that greater attention needs to be paid to risk communication as a tool for promoting health, both under normal circumstances and in times of crisis. Among others, investments are needed in communications expertise and in the creation of trust-based relationships between health sector representatives, journalists and professionals from other sectors. Attention must also be paid to harnessing the powerful capacities of social media to enhance risk communication.

- **Invest in technology transfers.** Projects which expand vaccine manufacturing capacities, in line with the strategies being pursued by the Global Pandemic Influenza Action Plan to Increase Vaccine Supply, do much to strengthen low-income countries' access to influenza vaccines. When domestic production is increased, countries are less dependent upon vaccine imports.

- **Promote intersectoral collaboration in all implemented measures.** All investments in the area of pandemic preparedness should be grounded in a genuine commitment to intersectoral collaboration. While the health sector will be the logical home for many interventions supporting pandemic preparedness, certain approaches – such as those pertaining to risk communication and health promotion – could be taken up by sectors other than health. Pandemic preparedness is relevant across sectors and resilience is greatly enhanced when actions in support of preparedness are not limited to the health sector alone. Health systems are, in fact, strengthened through contributions made by other sectors.

References

Dawood FS et al. (2012). Estimated global mortality associated with the first 12 months of 2009 pandemic influenza A H1N1 virus circulation: a modelling study. *Lancet Infectious Diseases,* 12(9):687-95.

Drake TL, Chalabi Z, Coker R (2012). Cost-effectiveness analysis of pandemic influenza preparedness: what's missing? *Bulletin of the World Health Organization,* 90:940-941.

Huszar A et al. (2013). Prioritising in pandemic influenza preparedness: a study of key informants in Cambodia. *South East Asian Journal of Public Health,* (in press).

Lang S, Fewtrell L, Bartram J (2001). Risk communication. In: Fewtrell L, Bartram J, eds. *Water quality: guidelines, standards and health.* London, World Health Organization/ IWA Publishing.

Martin EA, ed. (2012). *Concise medical dictionary,* 8th edition. Oxford, Oxford University Press.

Partridge J and Kieny MP (2010). Global production of seasonal and pandemic (H1N1) influenza vaccines in 2009–2010 and comparison with previous estimates and global action plan targets. *Vaccine,* 28(30):4709-12.

Partridge, J and Kieny, MP (2013). Global production capacity of seasonal influenza vaccine in 2011. *Vaccine,* 31(5):728-731.

Pérez Velasco R et al. (2012). Systematic review of economic evaluations of preparedness strategies and interventions against influenza pandemics. *PLoS ONE* 7:e30333.

WHO (2005). *Outbreak Communication Guidelines.* Geneva, World Health Organization. Available at: http://www.who.int/infectious-disease-news/IDdocs/whocds200528/whocds200528en.pdf (accessed 31 March 2013).

WHO (2007). *The World Health Report 2007. A safer future: Global public health security in the 21st century.* Geneva, World Health Organization.

WHO (2011a). *Comparative analysis of national pandemic influenza preparedness plans.* Geneva, World Health Organization.

WHO (2011b). Implementation of the International Health Regulations (2005): *Report of the Review Committee on the functioning of the International Health Regulations (2005) in relation to Pandemic (H1N1) 2009.* Geneva, World Health Organization.

WHO (2012a). Implementation of the International Health Regulations (2005): *Report by the Director-General.* Geneva, World Health Organization.

WHO (2012b). *Key changes to pandemic plans by Member States of the WHO European Region based on lessons learnt from the 2009 pandemic*. Geneva, World Health Organization. Available at: http://www.ecdc.europa.eu/en/publications/Publications/1203-MER Joint_WHO_EURO_PiP%20Workshops%20Summary.pdf (accessed 31 March 2013).

Published by
Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

Registered offices
Bonn and Eschborn
Germany

German Pandemic Preparedness Initiative
Dag-Hammarskjöld-Weg 1-5
65726 Eschborn, Germany
Tel. +49 (0) 6196 79 - 1731
Fax +49 (0) 6196 79 - 1115

panprep@giz.de
www.giz.de

Edited by
Karen Birdsall

Design and layout
www.golzundfritz.com

Photo credits
Cover image: © GIZ/Silvia Rath
p. 6: © WHO/Tom Pietrasik
p. 8: © Wikimedia/Eneas De Troya
p. 13: © GIZ/Regina Meissner
p. 17: © GIZ/Valentina Chernenko
p. 18: © GIZ
p. 19: © GIZ/Raushan Ataniyazova
p. 22l: © GIZ/Abiba Banla
p. 22r: © GIZ/Caroline Schollmayer
p. 23: © GIZ/Lundy Keo
p. 26: © GIZ/Le Kim Hoa

As at
May 2013

GIZ is responsible for the content of this publication.

On behalf of
Federal Ministry for Economic Cooperation and Development (BMZ);
Division Health and Population Policies

Addresses of the BMZ offices

BMZ Bonn
Dahlmannstraße 4
53113 Bonn, Germany
Tel. +49 (0) 228 99 535 - 0
Fax +49 (0) 228 99 535 - 3500

BMZ Berlin
Stresemannstraße 94
10963 Berlin, Germany
Tel. +49 (0) 30 18 535 - 0
Fax +49 (0) 30 18 535 - 2501

poststelle@bmz.bund.de
www.bmz.de