Institution: London School of Hygiene & Tropical Medicine (LSHTM)

Unit of Assessment: UoA2 – Public Health, Health Services & Primary Care

Title of case study: Supporting influenza pandemic preparedness

1. Summary of the impact

Research conducted by LSHTM into how governments and international organisations are preparing for an influenza pandemic has made an important contribution towards efforts to avoid the risks of up to 150m deaths anticipated by WHO in the event of such a pandemic. Governments, including the UK, and global institutions, have made policy changes and resource allocation decisions directly as a result of this research and technical advice.

2. Underpinning research

WHO estimates that a pandemic could cause up to 150m deaths worldwide. Unsurprisingly, therefore, governments have spent billions preparing for such a pandemic. Professor Richard Coker (LSHTM since 2001, then Senior Lecturer) has focused his research on preparedness for influenza pandemics.

In 2005/2006, Coker and Mounier-Jack (Lecturer, LSHTM since 2005, then Research Fellow) developed an innovative framework to analyse national strategic preparedness for an influenza pandemic, which was used to evaluate plans produced by countries in regions across the world – for example, Europe[3.1] and Asia-Pacific.[3.2] In 21 European countries they found that, although preparation was good in some areas, maintenance of essential services, putting plans into action and public health interventions were inadequate. Plans for the timely distribution of available medical supplies were notably absent, and substantial variations existed between countries.

The evaluations in other parts of the world showed that low- and middle-income countries were much less well prepared than European countries. It was clear that, in addition to evaluating national plans, novel frameworks were needed to evaluate systematically, and identify strategies for improving, the capacity of countries to implement their plans. This was (and still is) of particular importance in Southeast Asia, where conditions are fertile for the emergence of novel (and possibly highly lethal) influenza viruses with pandemic potential, not least due to the continued circulation of the highly pathogenic avian influenza H5N1.

In 2007, Coker and country partners conducted a pilot project in Thailand using three pandemic scenarios to determine resource needs, availability and gaps.[3.3] Building on this, the EU and the Rockefeller Foundation funded the AsiaFluCap project which developed a framework to assess pandemic response capacity, including analyses of governance arrangements, modelling pandemic scenarios and mapping the availability and shortages of key health care resources. Working directly with policy-makers, Coker and colleagues applied the framework across six Southeast Asian countries. They found marked inequities in the distribution of resources within and between countries, and showed how such inequities and resource gaps could greatly increase the number of pandemic deaths, and how resolving resource mismatches and cross-border sharing of resources might pay dividends.[3.4]

In 2011, Coker and colleagues built on the results of AsiaFluCap with two detailed country case studies extending their analyses of pandemic preparedness in Cambodia and Indonesia in collaboration with country academics and government officials. In Cambodia, research focused on prioritising pandemic mitigation investment options. Analysis of stakeholder perspectives, H5N1 case outcomes and cost of illness, and social contact patterns fed into a cost effectiveness mathematical model characterising epidemiological, clinical and economic aspects of pandemic influenza events and potential interventions. Methodological development in the pandemic cost effectiveness models included a critical appraisal of previous studies;[3.5] inclusion of health system capacity within the model; and an analysis of parameter uncertainty identifying time-to-pandemic as a key driver of uncertainty in cost effectiveness results.

The Indonesian study integrated influenza pandemic preparedness into a multi-hazards framework to inform policy to enhance the health system's ability to cope with other types of surges in demand.[3.6]

3. References to the research

3.1 Mounier-Jack, S and Coker RJ (2006) How prepared is Europe for pandemic influenza? Analysis of national plans, *Lancet*, 367(9520): 1405–1411, doi:10.1016/S0140-6736(06)68511-5.

3.2 Coker R and Mounier-Jack S (2006) Pandemic influenza preparedness in the Asia-Pacific region, *Lancet*, 368(9538): 886–889, doi:10.1016/S0140-6736(06)69209-X.

3.3 Putthasri, W, Lertiendumrong, J, Chompook, P, Tangcharoensathien, V and Coker R (2009) Capacity of Thailand to contain an emerging influenza pandemic, *Emerging Infectious Diseases*, 15(3): 423–432, doi:10.3201/eid1503.080872.

3.4 Rudge, JW, Hanvoravongchai, P, Krumkamp, R, Chavez, I, Adisasmito, W, Ngoc Chau, P, Phommasak, B, Putthasri, W, Chin-Shui S, Stein, M, Timen, A, Touch, S, Reintjes, R and Coker, R, on behalf of the AsiaFluCap Project Consortium (2012) Health system resource gaps and associated mortality from pandemic influenza across six Asian territories, *PLoS One*, 7(2): e31800, doi:10.1371/journal.pone.0031800.

3.5 Drake, TL, Chalabi, Z and Coker R (2012) Cost-effectiveness analysis of pandemic influenza preparedness: what's missing?, *Bulletin of the World Health Organization*, 90(12): 940–941, doi:10.2471/BLT.12.109025.

3.6 Watson, SK, Rudge JW and Coker R (2013) Health systems' 'surge capacity': state of the art and priorities for future research, *Milbank Quarterly*, 91(1): 78–122, doi:10.1111/milq.12003.

Key grants

- Coker, Heath System Analysis to Support Capacity Development in Response to the Threat of Pandemic Influenza in Cambodia and Laos, Rockefeller Foundation, 2008–2011, $619,270.
- Coker, Health System Analysis to Support Capacity Development to Respond to Pandemic Influenza in Asia, European Commission, 2008–2011, €3,896,000.

4. Details of the impact

The research described above has influenced both individual countries and international organisations to modify their influenza preparedness policies and plans. The following aspects are key.

Improving national pandemic planning and response capacities

Since 2008, research findings on existing plans for an influenza pandemic, together with further capacity evaluations, have led some governments in Europe and Southeast Asia to significantly alter their influenza pandemic plans.

In the UK, for example, the published results on pandemic planning in Europe led the government, through the Cabinet Office, to commission Coker and Mounier-Jack to help develop cross-government strategy on human pandemic and avian influenza.[5.1] In addition, Mounier-Jack became specialist adviser to the House of Lords inquiry into pandemic preparedness in the UK in 2008, which stated: 'we are enormously grateful for her assistance'.[5.2] During this inquiry she provided insight and advice to scrutinise whether the response to the 2009 H1N1 pandemic was adequate.[5.2] In 2011, she was also appointed specialist adviser to a House of Commons inquiry reviewing scientific advice and evidence in emergencies,[5.3] and she contributed to Dame Deirdre Hine's report on the H1N1 pandemic response.[5.4] Specific recommendations to which she contributed included clarifying the function and operation of the national flu line service and the need to ensure adequate capacity for critical care, which was responded to by the government.

An evaluation led by collaborators in the AsiaFluCap project revealed a number of impacts in

several Asian countries.[5.5] Some of these impacts occurred even before the outputs detailed in Section 3 had been published, due to strong and ongoing engagement with policy-makers throughout the programme of work. In Taiwan, supplies of the anti-viral drug, Osetamivir, were redistributed to ensure more equitable coverage across administrative areas.[5.6] Policies in Taiwan were also revised to improve strategies for risk communication,[5.6] after these were identified as a weakness by AsiaFluCap. In Indonesia, the research led to a countrywide 'Health Facility Framework Survey' ('RIFASKES') by the National Institute for Health Research and Development (NIHRD). This, modelled on work conducted through AsiaFluCap, was carried out in 2011 to enumerate and map health care resources across the country and is informing policy on the allocation of health care resources across Indonesia.[5.7] In Cambodia, policy-makers are drawing upon the research to support decisions around investments for preparedness.[5.8]

Based on responses of policy-makers, the AsiaFluCap evaluation also concluded that the project had 'strengthened cooperation and information exchange between national ministries and government institutions, national communicable disease control institutions, policy-makers, district health care administrations and hospital administrations'.[5.5] This is echoed by the former Director of the Taiwan CDC who writes: 'I applaud Professor Coker's coordination skills to bring so many countries with various cultures together, which in fact has also resulted in an informal yet useful network to fight future infectious diseases in the region.'[5.6]

An innovative software tool for influenza-related resource allocation developed by Coker and colleagues on the basis of the research was launched online in 2012 and allows policy-makers and other stakeholders to estimate and display the availability, needs and gaps of 28 key health care resources for a selected pandemic scenario in a country or region (http://www.biomedcentral.com/1471-2458/12/870). The tool was considered among project partners, including several policy-makers, to be very useful for informing policy decisions for resource allocation, particularly at the national level and for major hospitals.

Shaping global policy on influenza control

At the invitation of the UN System Coordinator for Influenza, Coker and his team have contributed time and personnel to feed research findings into the annual UN/World Bank reports 2006–2010. The 2010 report acknowledges the contribution of Coker's research, noting its usefulness to 'address priority setting for strengthening public health systems' and calling upon the greater use of approaches such as those of his team to 'strengthen allocation of funding … for countries with scarce resources.'[5.9]

5. Sources to corroborate the impact

5.1 Mounier-Jack, S and Coker, RJ (2008) *UK Cross-government International Strategy on Human Pandemic and Avian Influenza*, Cabinet Office briefing paper, April. London: Cabinet Office.

5.2 House of Lords, Science and Technology Committee (2009) *3rd Report of Session 2008/2009: Pandemic Influenza – Follow-up* (see p. 7, para 14, p. 15, p. 49, Q51), http://www.publications.parliament.uk/pa/ld200809/ldselect/ldsctech/155/155.pdf.

5.3 House of Commons Science and Technology Committee (2011) *Third Report: Scientific Advice and Evidence in Emergencies*. London: House of Commons Science and Technology Committee (see p. 6, para 6), http://www.publications.parliament.uk/pa/cm201011/cmselect/cmsctech/498/498.pdf).

5.4 Hine, D. and Pandemic Flu Response Review Team (2010) *The 2009 Influenza Pandemic: An Independent Review of the UK Response to the 2009 Influenza Pandemic*. London: Cabinet Office, p. 151, http://www.dhsspsni.gov.uk/the2009influenzapandemic_acc.pdf (accessed 12 September 2013).

5.5 Ahmad, A, Krumkamp, R, Hanvoravongchai, P, Coker, R and Reintjes R (2011) *The AsiaFluCap Project: Evaluation*. Hamburg: http://www.cdprg.org/resources/AsiaFluCap%20-%20Final%20Evaluation%20Report%20-%2010.04.pdf (accessed 12 September 2013).

5.6 Former Director, Taiwan Center for Disease Control.

5.7 Director of Partnership and Business Incubator, Universitas Indonesia.

5.8 Director of Communicable Disease Control Department, Ministry of Health, Cambodia.

5.9 UN System Influenza Coordination and World Bank (2010) *Animal and Pandemic Influenza: A Framework for Sustaining Momentum, 5th Global Progress Report*. Bangkok: UN/World Bank, http://siteresources.worldbank.org/EXTAVIANFLU/Resources/3124440-1172616490974/Fifth_Global_Progress_Report_July_2010.pdf (accessed 24 October 2013) (see p. 158, refs 86, 88, 91 and acknowledgements, xiii).