

The global economics of antiviral stockpiling for influenza pandemics

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The best way to protect yourself against influenza is via vaccination, but the time lag between the emergence of an influenza pandemic, such as the 2009 H1N1 outbreak, and the development of a suitable vaccine is long enough that vaccination is unfeasible during the first wave of the epidemic. Given the potentially high mortality rate of influenza pandemics (“Spanish influenza” in 1918 killed more people than the Great War it ended), other strategies to mitigate influenza pandemics are needed.

One option is to develop and maintain an antiviral stockpile. Antivirals have two prospective uses: (i) treating cases to reduce their infectivity and severity of symptoms and (ii) deployment as prophylaxis as a short-term measure to prevent healthy individuals being infected. However, antiviral stockpiles are relatively costly, partly because both tamiflu and relenza are currently under patent. This is particularly problematic in countries with fewer resources, where decision makers have to elect whether to redirect funds from other health priorities to keep a stockpile with uncertain payoff.

We developed a comprehensive epidemic-economic model of how antivirals might be used and their effects in ameliorating the morbidity and mortality of influenza pandemics in a representative basket of countries: Brazil, China, Guatemala, India, Indonesia, New Zealand, Singapore, the United Kingdom, the United States, and Zimbabwe. The model accounts, importantly, for the feedback loops in deploying antivirals, namely that reducing the period of symptoms for an individual reduces the number of people s/he will infect, and therefore prunes away part of the infection tree. It also accounts for a suite of costs resulting from maintaining and deploying the stockpile to work absenteeism, as well as severe uncertainty in the frequency and severity of pandemic occurrence.

We found that stockpiling antiviral drugs, essential for the mitigation of high number of fatalities and economic costs worldwide, is not cost-effective for approximately two thirds of the world population. Worldwide, we found that stockpiling brought different benefits to higher and lower resourced countries, causing a large beneficial economic impact in developed countries while developing countries benefit most from the life-saving nature of an antiviral stockpile.

From a global perspective and from the perspective of well-resourced countries, it makes good clinical, ethical and economic sense for resource-limited countries to be able to stockpile antiviral medications. We note that lower cost, generic antivirals could make stockpiling effective for countries with large populations, like China, India and Indonesia. Overall, we believe that international cooperation and a global network of generic national antiviral stockpiles could provide a way to avoid substantial economic impacts and fatalities in the event of a global pandemic.

The work has been published in the Journal of the Royal Society Interface [INSERT LINK TO

<http://rsif.royalsocietypublishing.org/content/early/2011/02/03/rsif.2010.0715.short?rss=1>
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and has been covered by Reuters [<http://www.reuters.com/article/2011/02/02/us-flu-stockpiling-idUSTRE7117WH20110202>],

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and the Royal Society Science News [<http://royalsociety.org/news/Stockpiling-flu-drugs-not-cost-effective-for-two-thirds-of-countries/>]

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Pointing out the effect of elasticity of annual labour time versus labour productivity on the economic impact of a potential influenza pandemic in Singapore. (Cook, left, Carrasco, right; photography by Rehena Ganguly)