

Tang, Sanyi; Xiao, Yanni; Yuan, Lin; Cheke, Robert A.; Wu, Jianhong
Campus quarantine (*Fengxiao*) for curbing emergent infectious diseases: lessons from mitigating A/H1N1 in Xi'an, China. (English) Zbl 1336.92088
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Summary: During the 2009 A/H1N1 influenza pandemic, very strict interventions including campus quarantine (*Fengxiao*) (restrictions on the movements of university personnel) were taken in mainland China to slow down the initial spread of the disease from the university network to a wider community. The decision for implementation and/or relaxation of *Fengxiao* depends on the assessment of the level of infection within the university network compared with that in the wider community and on the degree of interruption of normal academic activities and the associated social/economic costs. However, the most important consideration influencing the decision is whether the initiation and termination of *Fengxiao* can alter the pattern of disease spread in the entire community for effective prevention and control of the emerging disease. Here we formulate and analyze a dynamic model to evaluate the effectiveness of *Fengxiao* as a social distance measure for curbing the outbreak in major cities of China. Using data from the initial laboratory-confirmed cases admitted to the 8th Hospital of Xi'an (the capital city of the Shaanxi Province), we estimated the reproduction number for the period under consideration in the range 1.273–1.784 and concluded that the population's mobility, combined with the suspension of the *Fengxiao* strategy, was a key factor contributing to a subsequent epidemic wave. *Fengxiao* in China is a reversal of the usual strategy of *school closures* adopted in many other countries, but the lessons learnt from it may be useful for disease management in other countries where restrictions on the movements across a facility boundary and close monitoring of the infection within the facility are feasible in the long term.

MSC:

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Keywords:

pandemic A/H1N1 influenza; reproduction number; *Fengxiao*; outbreak peaking times

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References:

- [1] Anderson, R.M.; May, R.M., *Infectious diseases of humans*, (1991), Oxford University Press Oxford, UK
- [2] Blower, S.M.; Dowlatabadi, H., Sensitivity and uncertainty analysis of complex models of disease transmission: an HIV model, as an example, *Int. stat. rev.*, 62, 229-243, (1994) · [Zbl 0825.62860](#)
- [3] Cauchemez, S., Household transmission of 2009 pandemic influenza A (H1N1) virus in the united states, *N. engl. J. med.*, 361, 2619-2627, (2009)
- [4] Cauchemez, C., Closure of schools during an influenza pandemic, *Lancet*, 9, 473-481, (2009)
- [5] CMH, 2009. China Ministry of Health $\langle \text{http://www.moh.gov.cn/publicfiles/business/htmlfiles/wsb/index.htm} \rangle$.
- [6] Chowell, G.; Ammon, C.E.; Hengartner, N.W.; Hyman, J.M., Transmission dynamics of the great influenza pandemic of 1918 in Geneva, Switzerland: assessing the effect of hypothetical interventions, *J. theor. biol.*, 241, 193-204, (2006)
- [7] Cowling, B.J.; Fang, V.J.; Riley, S., Estimation of the serial interval of influenza, *Epidemiology*, 20, 3, 344-347, (2009)
- [8] Day, T.; Park, A.; Madras, N.; Gumel, A.; Wu, J.H., When is quarantine a useful control strategy for emerging infectious diseases?, *Am. J. epidemiol.*, 163, 479-485, (2006)
- [9] Diekmann, O.; Heesterbeek, J.A.P., *Mathematical epidemiology of infectious diseases: model building, analysis and interpretation*, (2000), John Wiley Chichester · [Zbl 0997.92505](#)
- [10] Fengxiao strategy a, 2009. $\langle \text{http://health.hsw.cn/system/2009/09/04/050296659.shtml} \rangle$.
- [11] Fengxiao strategy b, 2009. $\langle \text{http://news.xinhuanet.com/english/2009-09/12/} \rangle$.
- [12] Fraser, C.; Donnelly, C.A.; Cauchemez, S., Pandemic potential of a strain of influenza A (H1N1): early findings, *Science*, 324, 1557-1561, (2009)
- [13] Geweke, J., Evaluating the accuracy of sampling-based approaches to the calculation of posterior moments, (), 169-193
- [14] Gojovic, M.Z., et al., 2009. Modelling mitigation strategies for pandemic (H1N1) 2009. *CAMJ*. doi:10.1503/cmaj.091641.

- [15] Haario, H.; Laine, M.; Mira, A.; Saksman, E., DRAM: efficient adaptive MCMC, *Stat. comput.*, 16, 339-354, (2006)
- [16] Hatchett, R.J.; Mecher, C.E.; Lipsitch, M., Public health interventions and epidemic intensity during the 1918 influenza pandemic, *Proc. natl. acad. sci. USA*, 104, 7582-7587, (2007)
- [17] Khan, K., Spread of a novel influenza A (H1N1) virus via global airline transportation, *N. engl. J. med.*, 361, 212-214, (2009)
- [18] Keeling, M.J.; Rohani, P., *Modeling infectious diseases in humans and animals*, (2008), Princeton University Press, pp. 313-320
- [19] Marino, S.; Iain, B.; Hogue, I.B.; Ray, C.J.; Kirschner, D.E., A methodology for performing global uncertainty and sensitivity analysis in systems biology, *J. theor. biol.*, 254, 178-196, (2008)
- [20] McKay, M.D.; Beckman, R.J.; Conover, W.J., Comparison of 3 methods for selecting values of input variables in the analysis of output from a computer code, *Technometrics*, 21, 239-245, (1979) · [Zbl 0415.62011](#)
- [21] Nishiura, H.; Wilson, N.; Baker, M.G., Estimating the reproduction number of the novel influenza A virus (H1N1) in a southern hemisphere setting: preliminary estimate in New Zealand, *N. Z. med. J.*, 122, 129, (2009)
- [22] RP, 2009. Report policy <http://www.gov.cn/zwgg/2009-04/30/content?1300891.htm>.
- [23] SPBH, 2009. Shaanxi provincial bureau of health <http://www.sxhealth.gov.cn/h1n1.asp>.
- [24] Tang, S.Y.; Xiao, Y.N.; Yang, Y.P., Community-based measures for mitigating the 2009 H1N1 pandemic in China, *Plos one*, 5, 1-11, (2010), (e10911)
- [25] Tuite, A.R., Estimated epidemiologic parameters and morbidity associated with pandemic H1N1 influenza, *Cmaj*, (2009)
- [26] Van den Driessche, P.; Watmough, J., Reproduction numbers and sub-threshold endemic equilibria for compartmental models of disease transmission, *Math. biosci.*, 180, 29-48, (2002) · [Zbl 1015.92036](#)
- [27] White, L.F.; Pagano, M., A likelihood-based method for real-time estimation of the serial interval and reproductive number of an epidemic, *Stat. med.*, 27, 2999-3016, (2008)
- [28] White, L.F., Estimated of the reproductive number and the serial interval in early phase of the 2009 influenza A/H1N1 pandemic in the USA, *Influenza other respi. viruses*, 3, 267-276, (2009)
- [29] Wallinga, J.; van Boven, M.; Lipsitch, M., Optimizing infectious disease interventions during an emerging epidemic, *Proc. natl. acad. sci. USA*, 107, 923-928, (2010)

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