

Non pharmaceutical interventions for pandemic influenza

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Oxford University Research Unit, Vietnam

Lancet conference on Influenza in the Asia Pacific

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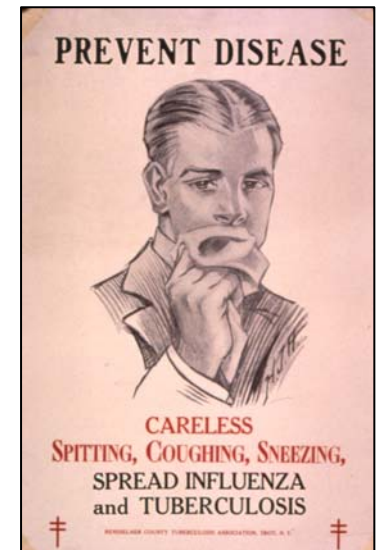
Beijing, China

International

- Travel restrictions
- Exit screening
- Entry screening
- Quarantine

Domestic

- Case detection & isolation
- Contact tracing & quarantine
- Travel restrictions
- Social distancing
 - School closure
 - Work place closure
 - Cancel events
- Masks
- Hand washing
- Respiratory hygiene



6.8 billion people

Vaccine

- Availability
- Global capacity 2-3 billion year
- 1 – 3 billion vaccinated
- At best less than 50% global population
- Cost

Antiviral drugs

- Availability
- Cost
- Resistance
- Side-effects

Nonpharmaceutical Interventions for Pandemic Influenza, National and Community Measures

World Health Organization Writing Group*1

‘The evidence base for recommendations is limited, consisting primarily of historical and contemporary observations, rather than controlled scientific studies’

Improved evidence base

- Randomized controlled trials
- Meta-analyses and reviews
- Reanalysis of historical data

RCT's - masks and hand hygiene

Annals of Internal Medicine

ARTICLE

Facemasks and Hand Hygiene to Prevent Influenza Transmission in Households

A Randomized Trial

Benjamin J. Cowling, BSc, PhD; Kwok-Hung Chan, BSc, PhD; Vicky J. Fang, BSc, MPhil; Calvin K.Y. Cheng, BSc, MMedSci; Rita O.P. Fung, BNS; Winnie Wai, BNS; Joey Sin, BNS; Wing Hong Seto, MBBS; Raymond Yung, MBBS, MPH; Daniel W.S. Chu, MBBS; Billy C.F. Chiu, MBBS; Paco W.Y. Lee, MBBS; Ming Chi Chiu, MBBS; Hoi Che Lee, MBBS; Timothy M. Uyeki, MD, MPH; Peter M. Houck, MD; J.S. Malik Peiris, MBBS, DPhil; and Gabriel M. Leung, MD, MPH

Study group	n	RT-PCR	Clinical flu
Control	279	1 (reference)	1 (reference)
Hand hygiene	257	0.57 (0.26-1.22)	0.92 (0.57-1.48)
Hand hygiene & face masks	258	0.77 (0.38-1.55)	0.25 (0.79-1.98)

Intervention started within 36 hours of onset

Study group	n	RT-PCR	Clinical flu
Control	183	1 (reference)	1 (reference)
Hand hygiene	130	0.46 (0.15-1.43)	0.46 (0.22-0.96)
Hand hygiene & face masks	149	0.33 (0.13-0.87)	0.86 (0.48-1.53)

Face Mask Use and Control of Respiratory Virus Transmission in Households

C. Raina MacIntyre, Simon Cauchemez, Dominic E. Dwyer, Holly Seale, Pamela Cheung, Gary Browne, Michael Fasher, James Wood, Zhanhai Gao, Robert Booy, and Neil Ferguson

- 143 households exposed to child with ILI
- Intention to treat analysis = no benefit
- < 50% participants wore mask most of the time
- Analysis of adherent mask users only = relative reduction in daily risk of developing an ILI of 60-80%

Study data awaited

- Thailand - household based RCT
- China – HCW study (control, N95, surgical mask)
- U.S. - educational settings

Summary

- Face masks can, in some circumstances, result in a reduction in transmission
- But early use and adherence major problems
- Effectiveness not clearly established

Effect of Hand Hygiene on Infectious Disease Risk in the Community Setting: A Meta-Analysis

Allison E. Aiello, PhD, Rebecca M. Coulborn, BS, Vanessa Perez, MS, and Elaine L. Larson, PhD, RN

To quantify the effect of hand-hygiene interventions on rates of gastrointestinal and respiratory illnesses and to identify interventions that provide the greatest efficacy, we searched 4 electronic databases for hand-hygiene trials published from January 1960 through May 2007 and conducted meta-analyses to generate pooled rate ratios across interventions (N=30 studies).

Improvements in hand hygiene resulted in reductions in gastrointestinal illness of 31% (95% confidence intervals [CI]=19%, 42%) and reductions in respiratory illness of 21% (95% CI=5%, 34%). The most beneficial intervention was hand-hygiene education with use of nonantibacterial soap. Use of antibacterial soap showed little added benefit compared with use of nonantibacterial soap.

Hand hygiene is clearly effective against gastrointestinal and, to a lesser extent, respiratory infections. Studies examining hygiene practices during respiratory illness and interventions targeting aerosol transmission are needed. *Am J Public Health*. 2008;98:1372-1381. doi:10.2105/AJPH.2007.124610

'Hand hygiene is clearly effective against gastrointestinal, and to a lesser extent respiratory infections.'

Reductions in respiratory illness of 21% (95% CI 5%,34%)

Am J Public Health. 2008 Aug;98(8):1372-81.

Physical interventions to interrupt or reduce the spread of respiratory viruses: systematic review

Tom Jefferson, coordinator,¹ Ruth Foxlee, trials search coordinator,² Chris Del Mar, dean,³ Liz Dooley, review group coordinator,⁴ Eliana Ferroni, researcher,⁵ Bill Hewak, medical student,³ Adi Prabhala, medical student,³ Sree Nair, professor of biostatistics,⁶ Alex Rivetti, trials search coordinator¹

Respiratory hygiene

Virucidal tissues

- Hayden GF *et al.* J Infect Dis. 1985
Aug;152(2):403-7.
- Dick EC *et al.* J Infect Dis. 1986
Feb;153(2):352-6
- Longini I, Monto A. Am J Epidemiol. 1988
Sep;128(3):639-44.
- Farr BM, *et al.* Am J Epidemiol. 1988
Nov;128(5):1162-72.

Closure of schools during an influenza pandemic

Simon Cauchemez, Neil M Ferguson, Claude Wachtel, Anders Tegnell, Guillaume Saour, Ben Duncan, Angus Nicoll

- Models – depend on parameters used
- Optimistic scenario – 40% reduction in peak attack rate, 15% in overall attack rate
- Can have no effect – especially if late
- Substantial social costs

The effect of public health measures on the 1918 influenza pandemic in U.S. cities

Martin C. J. Bootsma* and Neil M. Ferguson†‡

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Public health interventions and epidemic intensity during the 1918 influenza pandemic

Richard J. Hatchett*¹, Carter E. Mecher²[§], and Marc Lipsitch¹

¹Division of Allergy, Immunology, and Transplantation, National Institute of Allergy and Infectious Diseases, National Institutes of Health, Bethesda, MD 20892; ²Department of Veterans Affairs, VA Southeast Network, 3700 Crestwood Parkway, Duluth, GA 30096; [§]Homeland Security Council, Executive Office of the President, EEOB, 1650 Pennsylvania Avenue NW, Washington, DC 20502; and [†]Department of Epidemiology and Department of Immunology and Infectious Diseases, Harvard School of Public Health, 677 Huntington Avenue, Boston, MA 02115

Nonpharmaceutical Interventions Implemented by US Cities During the 1918-1919 Influenza Pandemic

Howard Markel, MD, PhD

Harvey B. Lipman, PhD

Context A critical question in pandemic influenza planning is the role nonpharmaceutical interventions might play in delaying the temporal effects of a pandemic, reducing the overall burden of the pandemic, and reducing the number of fatalities. The goal of this study was to describe the nonpharmaceutical interventions implemented by US cities during the 1918-1919 influenza pandemic.

Quantifying social distancing arising from pandemic influenza

Peter Caley^{1,*}, David J. Philp¹ and Kevin McCracken²

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²*Department of Human Geography, Macquarie University, Sydney, New South Wales 2109, Australia*

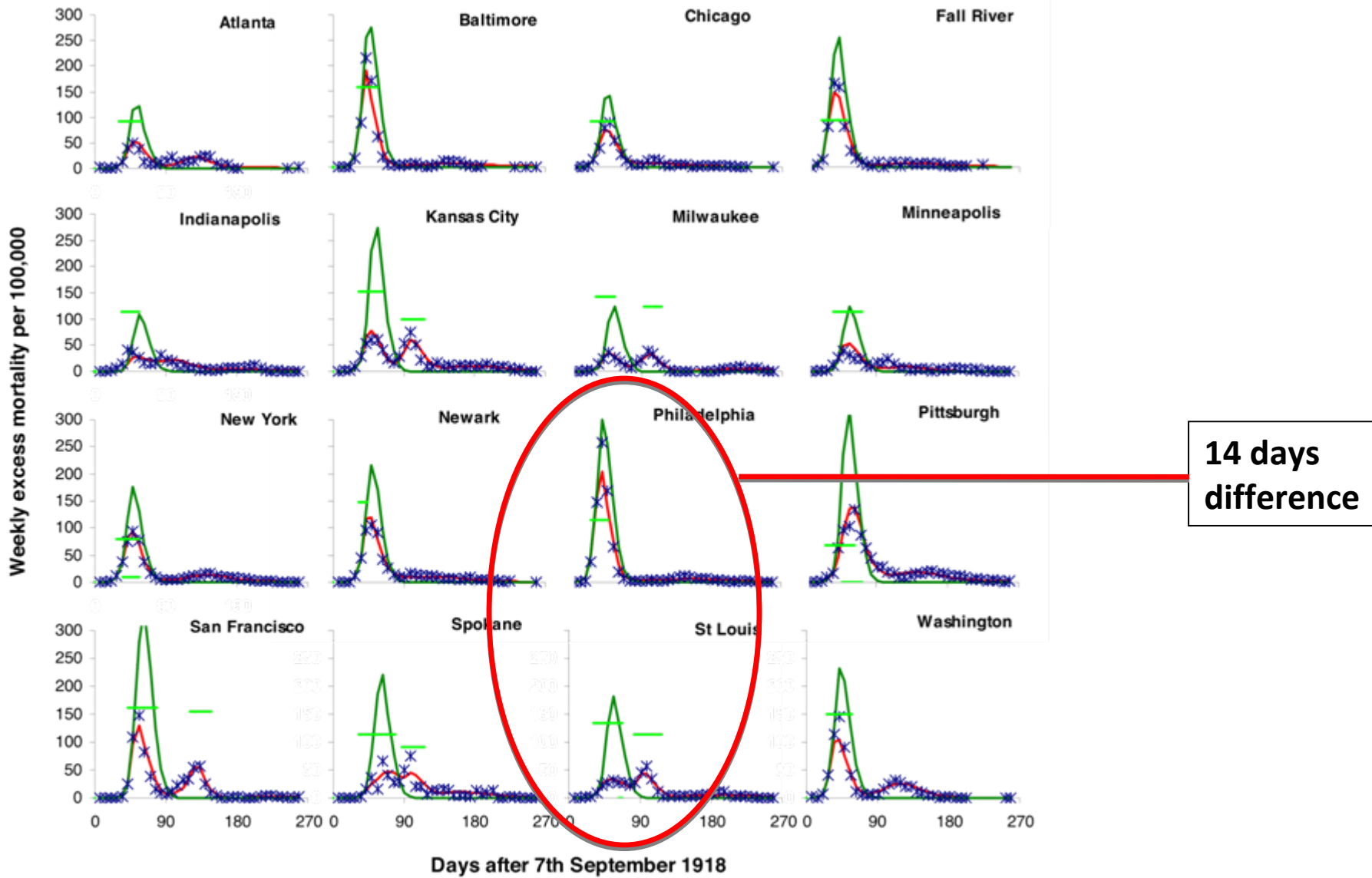


Fig. 3. Weekly excess mortality (per 100,000) resulting from the 1918 pandemic in 16 U.S. cities (blue points), compared with the fit of model variant 4, Table 1 (red curves). This variant fits R_0 and T , the duration of the population "memory" of past mortality, as parameters common to all cities and other parameters as city-specific. Estimated weekly mortality, had controls not been implemented, is also plotted (dark-green curves). The effectiveness and period of implementation of control measures are also shown as light-green horizontal lines; horizontal position and length, indicate start date and duration of interventions, and vertical position indicates estimated effectiveness. The top of the vertical axis is 100% effectiveness, and the bottom of this axis is 0%.

Historical re-analysis

- Early interventions associated with lower peak death rate and, to lesser extent, lower overall mortality
- Reduced mortality by 10-30%
- Reduced peak mortality rate by up to 50%
- Cities that started interventions earlier had greater impact
- Rapid implementation of multiple NPIs can significantly reduce influenza transmission, but viral spread may restart upon relaxation of measures

But...

- 2009 is not 1918
 - Population size and density
 - Mixing patterns
 - Mobility
 - Adherence
 - Interdependence and resilience
- H1N1 2009 is not H1N1 1918
 - Much lower mortality

Recent experiences

- U.S. - "*We know now that closing schools is not the best option in most cases*" Thomas Frieden
- Japan - >3000 schools closed in 2 prefectures. Contained local outbreak but very disruptive. Cases accelerated again some weeks later.
- Mexico – attributable impact?
- Hong Kong – attributable impact?

Re-calibration

- Society wide interventions currently unjustified in mitigation stage
- Re-focus on
 - Case exclusion
 - Reactive closures for operational reasons
- Pre-emptive closure
 - to ease health care pressure
 - to buy time
 - if severity increases

Challenges

- Scale of benefits unclear
 - Package of interventions
 - Population wide
 - Dependent on epidemiology
- RCT's of social distancing acceptable?
- Decision support tools that are robust to
 - Heterogeneity
 - Uncertainty
 - Change
- Hardest policy decision is to do nothing

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