Learning from crisis: lessons from COVID-19 for building global health security

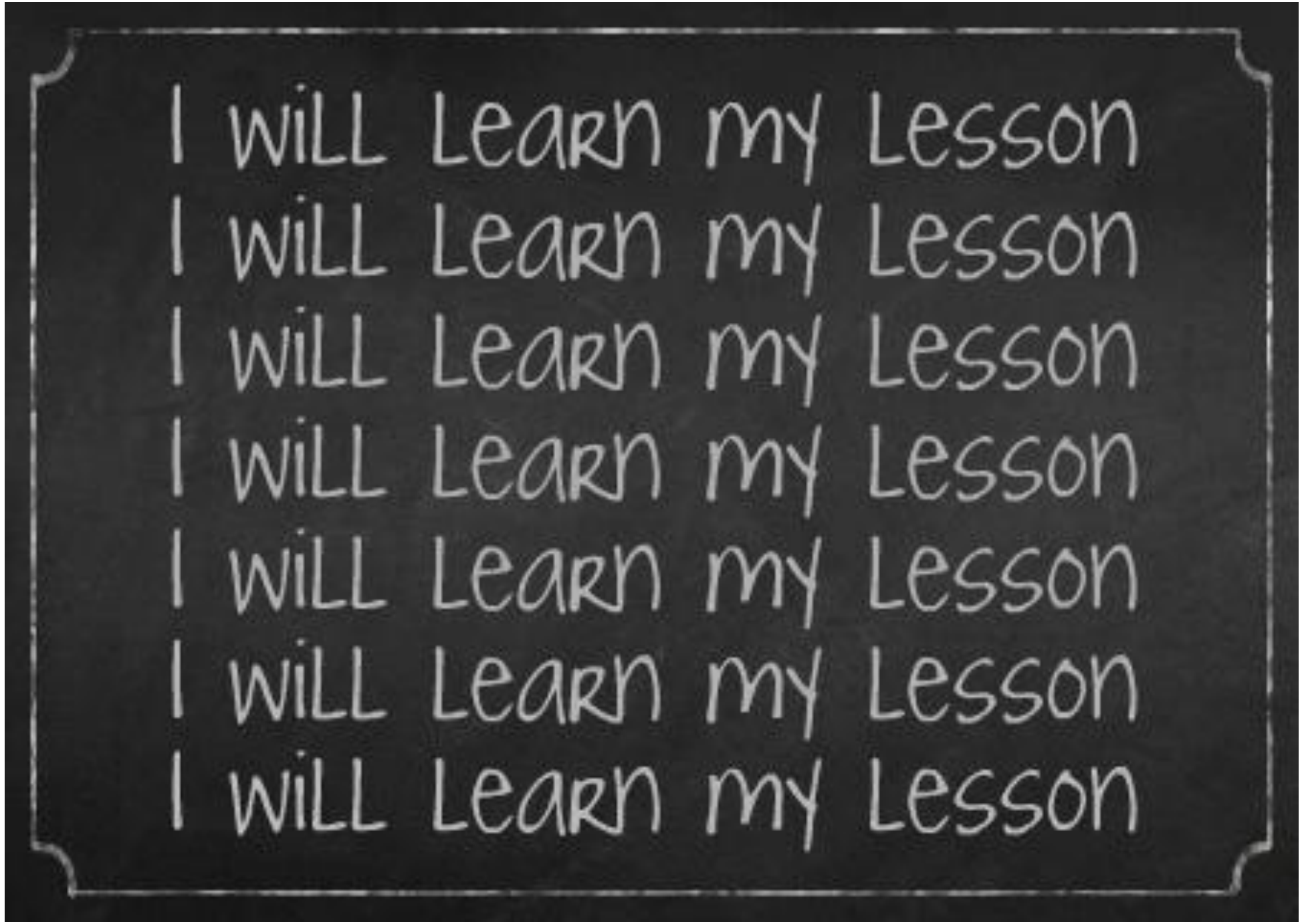
Gabriel Leung, Robin Shattock and Ilona Kickbusch

November 2, 2020

The Academy of Medical Sciences and The Lancet International Health Lecture

THE LANCET

The Academy of Medical Sciences


I will Learn my Lesson
I will Learn my Lesson
I will Learn my Lesson
I will Learn my Lesson
I will Learn my Lesson
I will Learn my Lesson
I will Learn my Lesson

The Daily Telegraph

BRITAIN'S BEST QUALITY NEWSPAPER

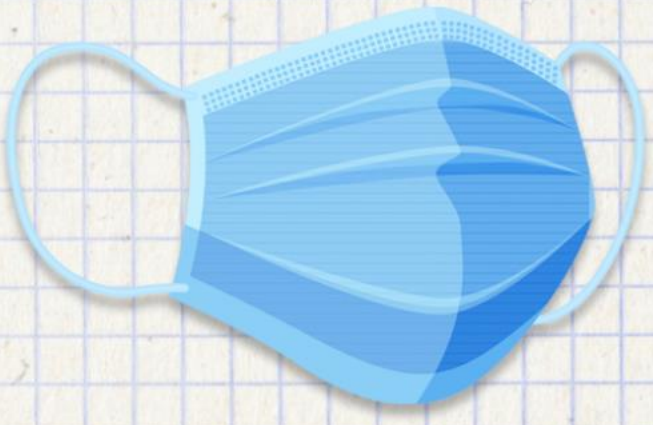
End of freedom

◆All public gatherings of more than two people to be outlawed with threat of fines

◆All non-essential shops to be closed as restrictions imposed for three-week period

◆Scientists told Prime Minister the NHS faced collapse unless public responded

WHY DID MASK GUIDANCE CHANGE?

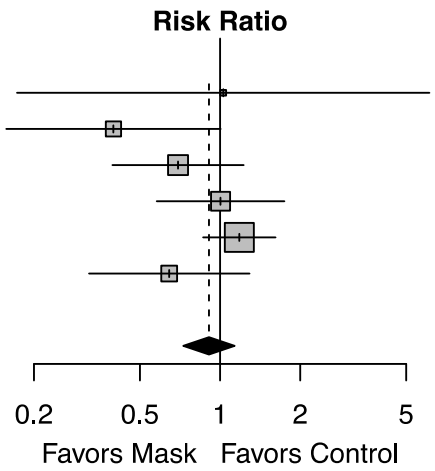


Pre-COVID: evidence base on effectiveness of face masks against influenza in the community

Facemask and hand hygiene

Author	Mask Events	Mask Total	Control Events	Control Total	Weight	Risk Ratio	95% C.I.
Aiello et al. 2010	2	316	3	487	1.6%	1.03	[0.17; 6.11]
Aiello et al. 2012	6	349	16	370	10.8%	0.40	[0.16; 1.00]
Cowling et al. 2009	18	258	28	279	18.8%	0.70	[0.39; 1.23]
Larson et al. 2010	25	938	24	904	17.1%	1.00	[0.58; 1.74]
Simmerman et al. 2011	66	291	58	302	39.7%	1.18	[0.86; 1.62]
Suess et al. 2012	10	67	19	82	11.9%	0.64	[0.32; 1.29]
Fixed effect model		**2219**		**2424**	**100.0%**	**0.91**	**[0.73; 1.13]**

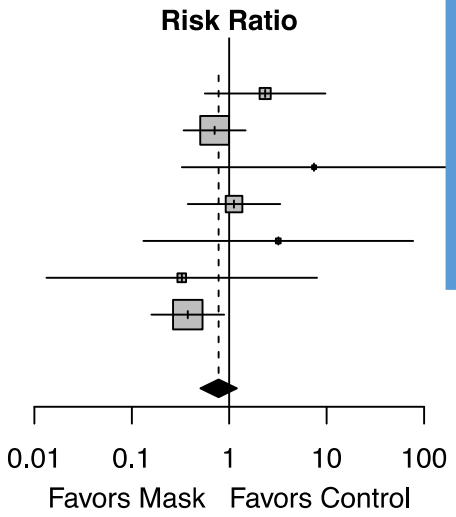
Heterogeneity: $I^2 = 35\%$, $\tau^2 = 0.0511$, $p = 0.17$
Test for overall effect: $z = -0.85$ ($p = 0.39$)



Mask only

Author	Mask Events	Mask Total	Control Events	Control Total	Weight	Risk Ratio	95% C.I.
Aiello et al. 2010	5	347	3	487	5.7%	2.34	[0.56; 9.72]
Aiello et al. 2012	12	392	16	370	37.3%	0.71	[0.34; 1.48]
Barasheed et al. 2014	1	11	0	28	0.7%	7.43	[0.33; 169.47]
Cowling et al. 2008	4	61	12	205	12.5%	1.12	[0.37; 3.35]
MacIntyre et al. 2009	1	94	0	100	1.1%	3.19	[0.13; 77.36]
MacIntyre et al. 2016	0	302	1	295	3.4%	0.33	[0.01; 7.96]
Suess et al. 2012	6	69	19	82	39.4%	0.38	[0.16; 0.89]
Fixed effect model		**1276**		**1567**	**100.0%**	**0.78**	**[0.51; 1.20]**

Heterogeneity: $I^2 = 30\%$, $\tau^2 = 0.1899$, $p = 0.20$
Test for overall effect: $z = -1.15$ ($p = 0.25$)



Ten RCTs were included in the meta-analysis, and there was no evidence that face masks are effective in reducing transmission of laboratory-confirmed influenza (pooled estimate was not statistically significant).

Some evidence of a limited benefit of hand hygiene and face masks for confirmed influenza

Point estimate – 10% to 20% reduction in influenza transmission associated with universal face mask use and enhanced hand hygiene

Xiao et al. 2020 *Emerg Infect Dis*

Rapid review in Lancet on face masks against SARS, MERS and COVID-19 mostly in health-care settings

	Country	Respirator (0=no)	Infection	Events, face mask (n/N)	Events, no face mask (n/N)	RR (95% CI)	% weight (random)
Health-care setting							
Scales et al (2003)[66]	Canada	0	SARS	3/16	4/15	0·70 (0·19–2·63)	3·2
Liu et al (2009)[51]	China	0	SARS	8/123	43/354	0·54 (0·26–1·11)	6·7
Pei et al (2006)[61]	China	0	SARS	11/98	61/115	0·21 (0·12–0·38)	7·9
Yin et al (2004)[75]	China	0	SARS	46/202	31/55	0·40 (0·29–0·57)	10·3
Park et al (2016)[59]	South Korea	0	MERS	3/24	2/4	0·25 (0·06–1·06)	2·8
Kim et al (2016)[48]	South Korea	0	MERS	0/7	1/2	0·13 (0·01–2·30)	0·8
Heinzerling et al (2020)[44]	USA	0	COVID-19	0/31	3/6	0·03 (0·002–0·54)	0·9
Nishiura et al (2005)[55]	Vietnam	0	SARS	8/43	17/72	0·79 (0·37–1·67)	6·5
Nishiyama et al (2008)[56]	Vietnam	0	SARS	17/61	14/18	0·36 (0·22–0·58)	9·0
Reynolds et al (2006)[64]	Vietnam	0	SARS	8/42	14/25	0·34 (0·17–0·69)	6·7
Loeb et al (2004)[53]	Canada	1	SARS	3/23	5/9	0·23 (0·07–0·78)	3·6
Wang et al (2020)[41]	China	1	COVID-19	0/278	10/215	0·04 (0·002–0·63)	0·9
Seto et al (2003)[67]	China	1	SARS	0/51	13/203	0·15 (0·01–2·40)	0·9
Wang et al (2020)[70]	China	1	COVID-19	1/1286	119/4036	0·03 (0·004–0·19)	1·7
Alraddadi et al (2016)[34]	Saudi Arabia	1	MERS	6/116	12/101	0·44 (0·17–1·12)	5·0
Ho et al (2004)[45]	Singapore	1	SARS	2/62	2/10	0·16 (0·03–1·02)	1·9
Teleman et al (2004)[68]	Singapore	1	SARS	3/26	33/60	0·21 (0·07–0·62)	4·2
Wilder-Smith et al (2005)[72]	Singapore	1	SARS	6/27	39/71	0·40 (0·19–0·84)	6·5
Ki et al (2019)[47]	South Korea	1	MERS	0/218	6/230	0·08 (0·005–1·43)	0·8
Kim et al (2016)[49]	South Korea	1	MERS	1/444	16/308	0·04 (0·01–0·33)	1·6
Hall et al (2014)[43]	Saudi Arabia	1	MERS	0/42	0/6	(Not calculable)	0
Ryu et al (2019)[65]	South Korea	1	MERS	0/24	0/10	(Not calculable)	0
Park et al (2004)[58]	USA	1	SARS	0/60	0/45	(Not calculable)	0
Peck et al (2004)[60]	USA	1	SARS	0/13	0/19	(Not calculable)	0
Burke et al (2020)[37]	USA	1	COVID-19	0/64	0/13	(Not calculable)	0
Ha et al (2004)[42]	Vietnam	1	SARS	0/61	0/1	(Not calculable)	0
Random subtotal (I^2=50%)				**126/3442**	**445/6003**	**0·30 (0·22–0·41)**	**81·9**
Non-health-care setting							
Lau et al (2004)[50]	China	0	SARS	12/89	25/98	0·53 (0·28–0·99)	7·5
Wu et al (2004)[74]	China	0	SARS	25/146	69/229	0·57 (0·38–0·85)	9·7
Tuan et al (2007)[69]	Vietnam	0	SARS	0/9	7/154	1·03 (0·06–16·83)	0·9
Random subtotal (I^2=0%)				**37/244**	**101/481**	**0·56 (0·40–0·79)**	**18·1**
Unadjusted estimates, overall (I^2=48%)				**163/3686**	**546/6484**	**0·34 (0·26–0·45)**	**100·0**
Adjusted estimates, overall (1 COVID-19, 1 MERS, 8 SARS)						**aOR 0·15 (0·07–0·34)**	
						aRR 0·18 (0·08–0·38)	

Interaction by setting, p=0·049; adjusted for N95 and distance, p=0·11

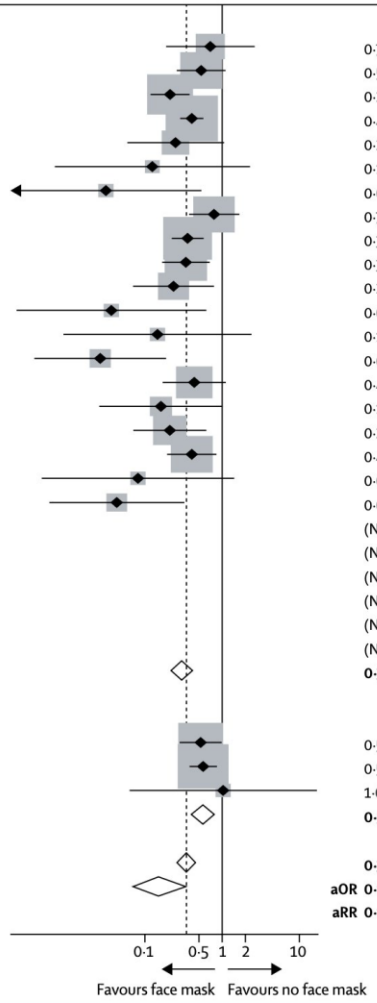


Figure 4: **Forest plot showing unadjusted estimates for the association of face mask use with viral infection causing COVID-19, SARS, or MERS**
SARS=severe acute respiratory syndrome. MERS=Middle East respiratory syndrome. RR=relative risk. aOR=adjusted odds ratio. aRR=adjusted relative risk.

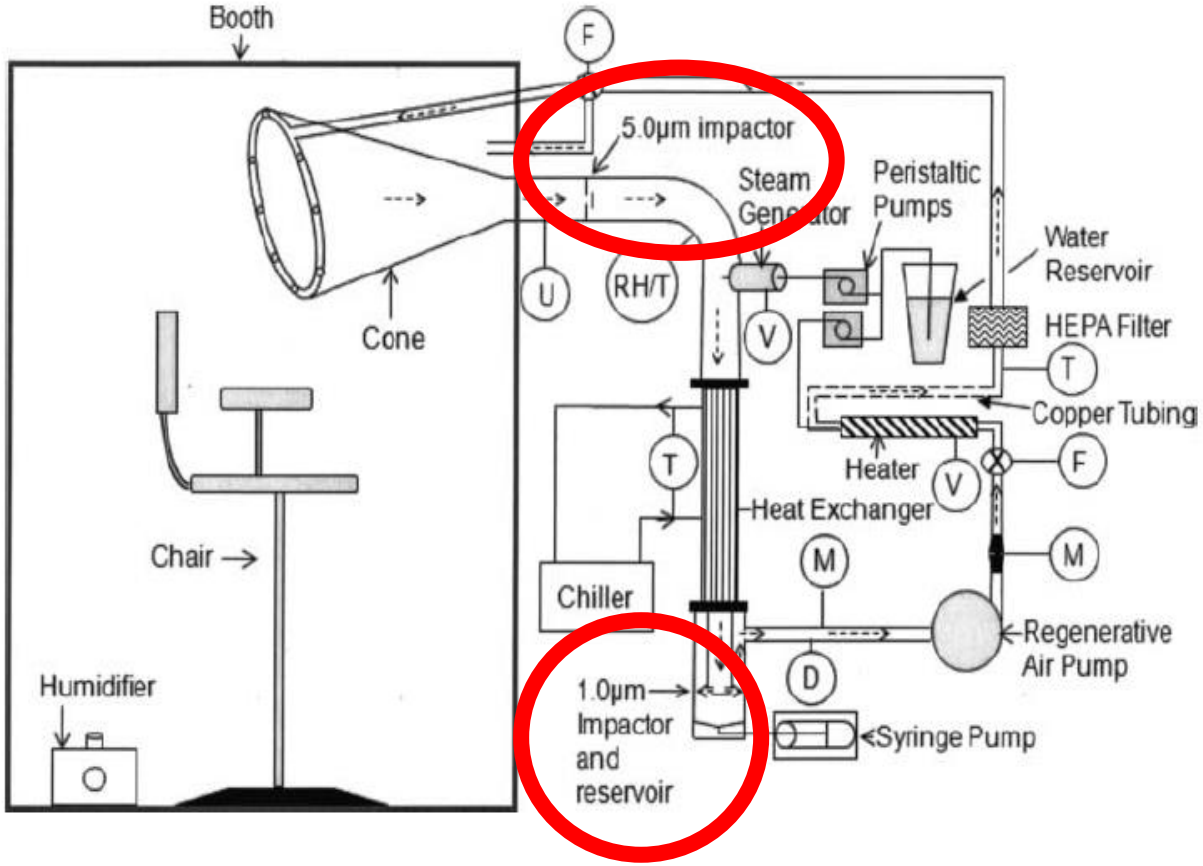
Very strong effects of face masks in health care settings (but likely confounded by use of other PPE). Many unadjusted estimates are included.

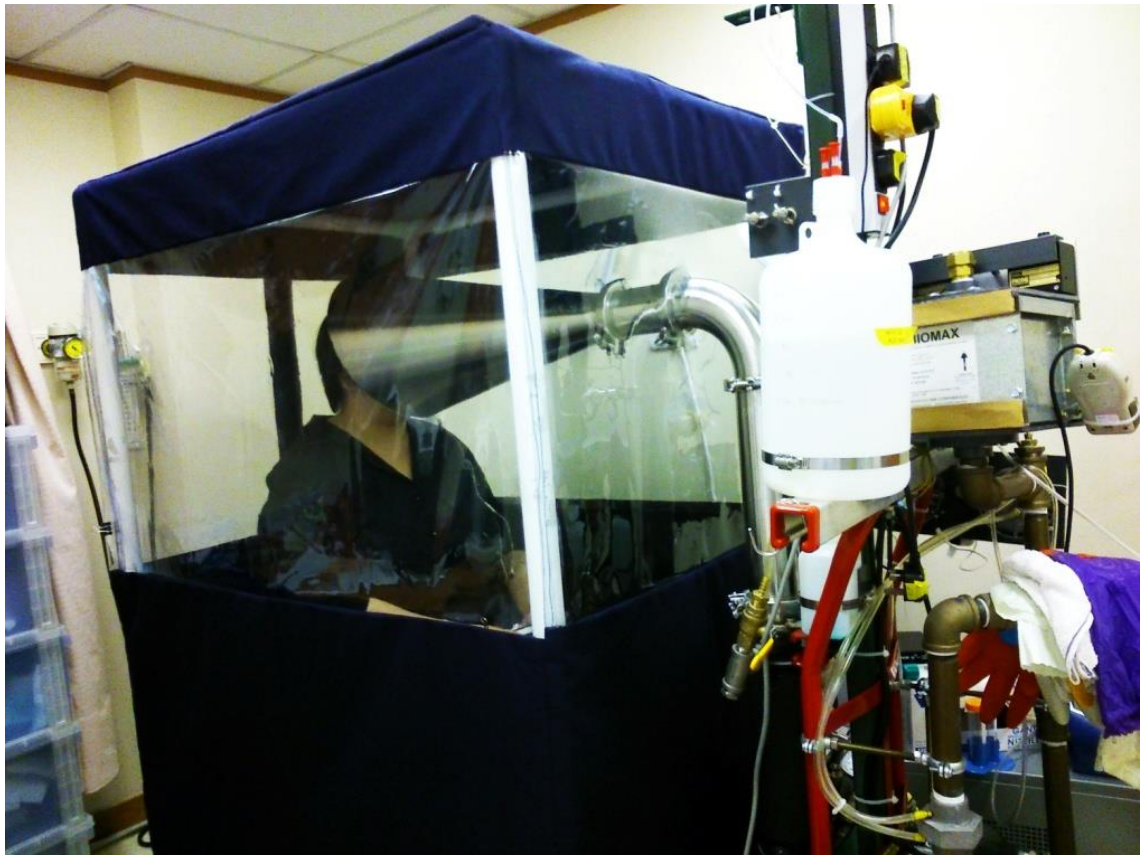
Three community studies shown at bottom of forest plot, but actually Lau et al. (2004) refers to mask use when visiting a family member with SARS in hospital, which is a healthcare exposure. SARS and MERS have limited community spread, data on community effectiveness of masks on these diseases are less informative.

By the way, the same review estimated that eye protection reduced the risk of SARS/MERS/COVID by 75% …

Chu et al. 2020 *Lancet*

HKU study on virus in exhaled breath

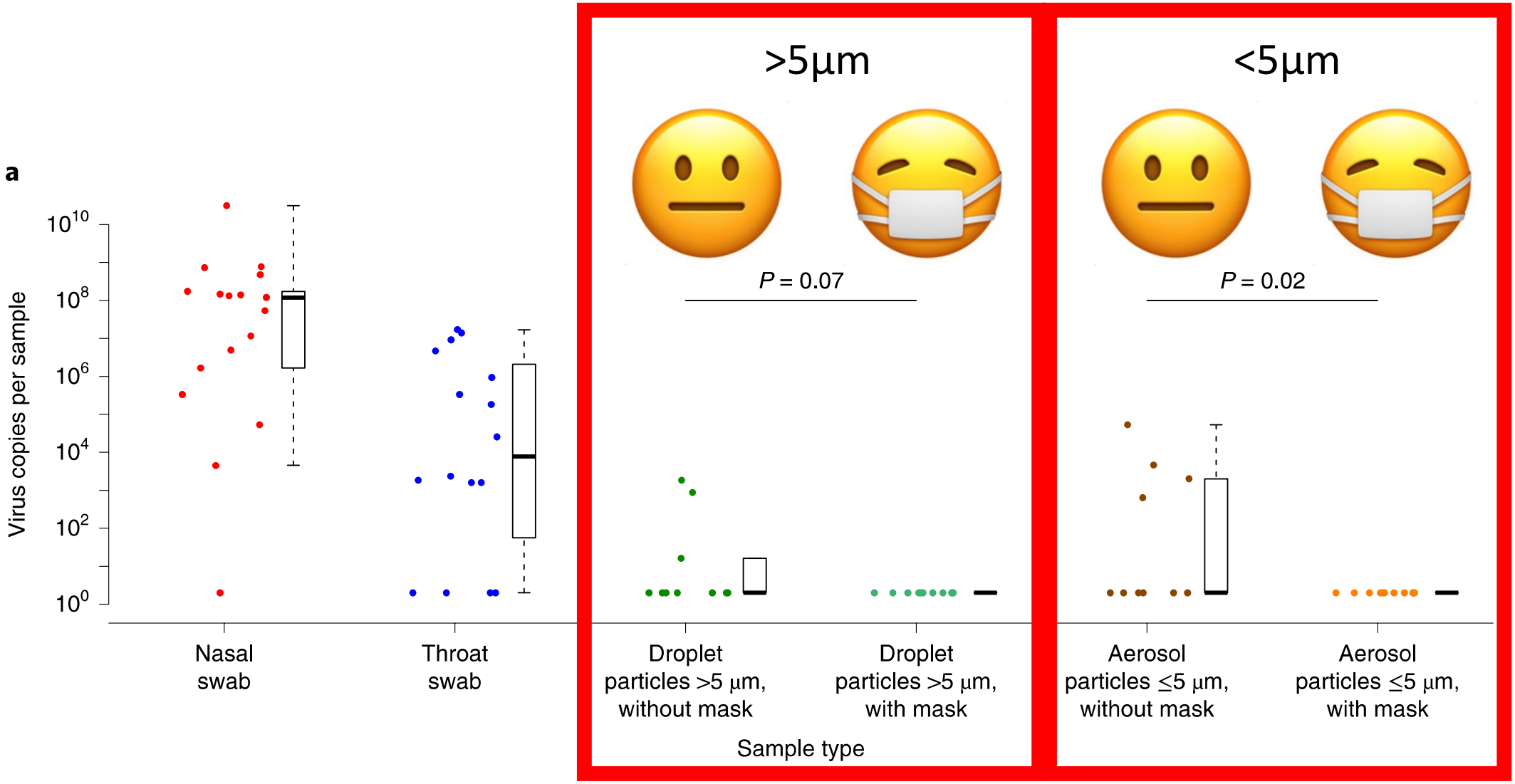




We collected exhaled breath (30-minute samples) from 246 outpatients with acute respiratory illness, randomly allocated to wear a surgical mask or not. Exhaled breath was split into coarse fraction >5µm and fine fraction <5µm

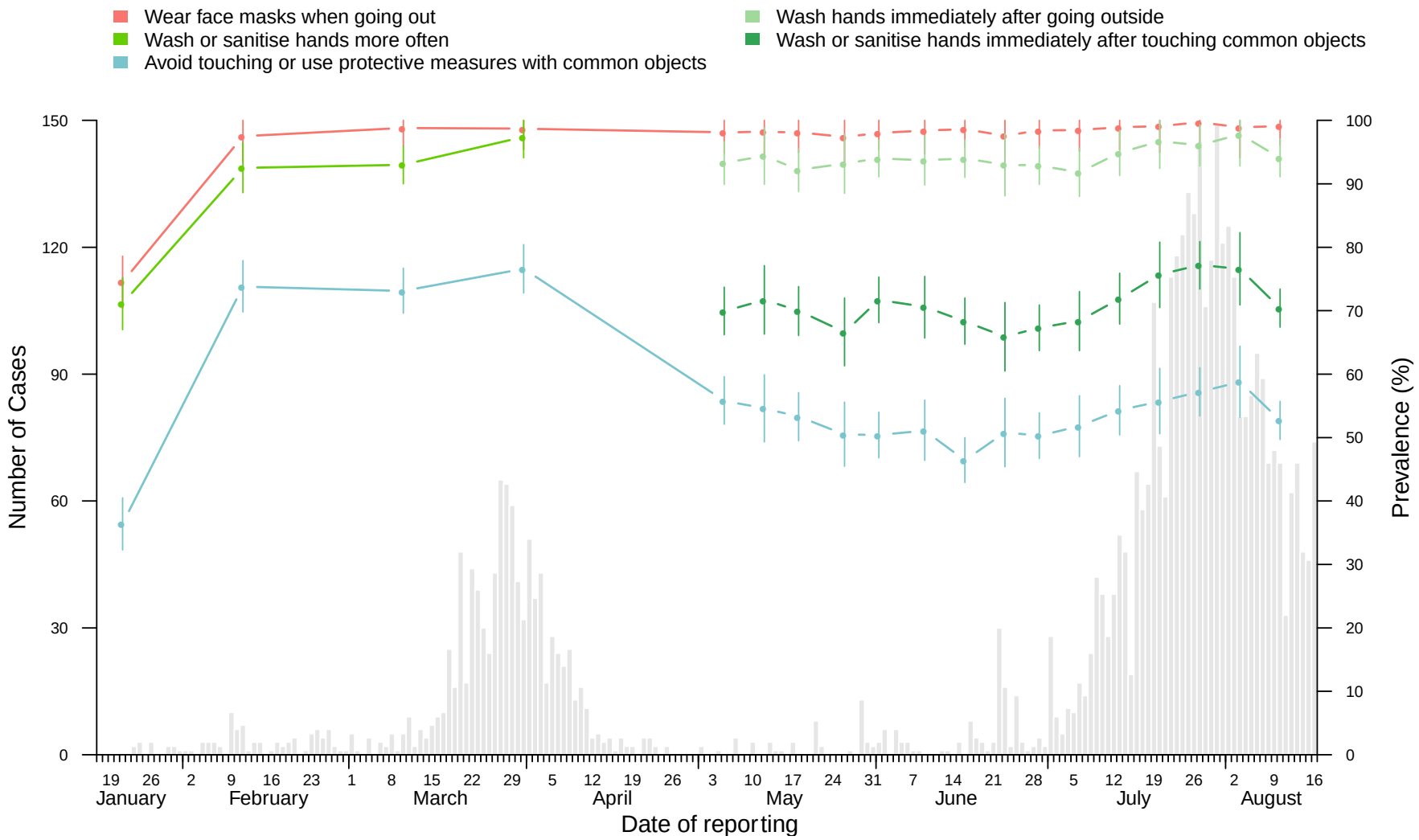
Milton DK, et al. Influenza Virus Aerosols in Human Exhaled Breath: Particle Size, Culturability, and Effect of Surgical Masks. PLoS Pathog 2013;9(3):e1003205.
McDevitt JJ, et al. Development and Performance Evaluation of an Exhaled-Breath Bioaerosol Collector for Influenza Virus. Aerosol Sci Technol 2013;47(4):444-51.

Human coronaviruses



Leung NHL et al. 2020 *Nat Med*

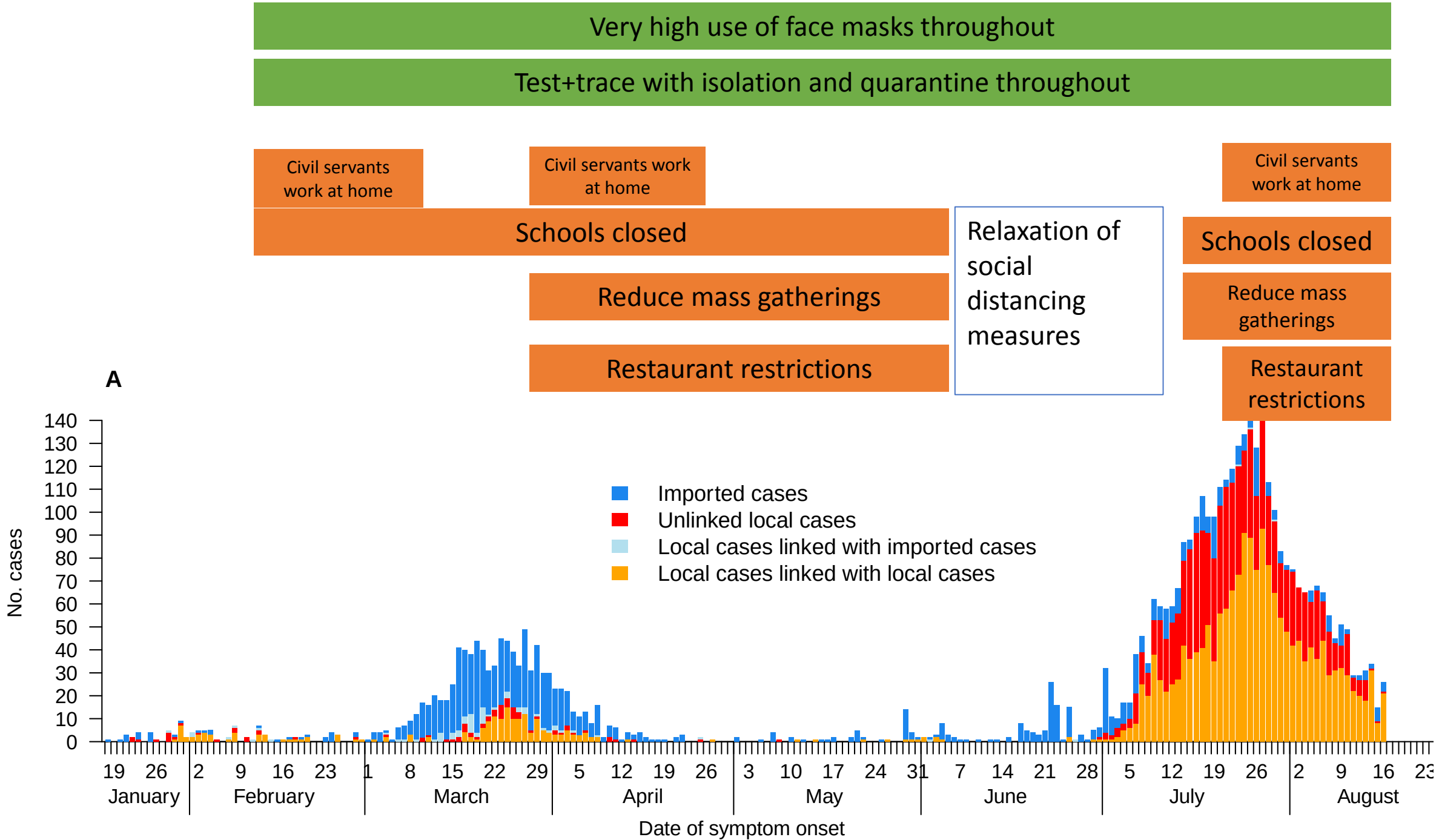
Two community epidemics of COVID-19 in Hong Kong despite >99% use of face masks in community



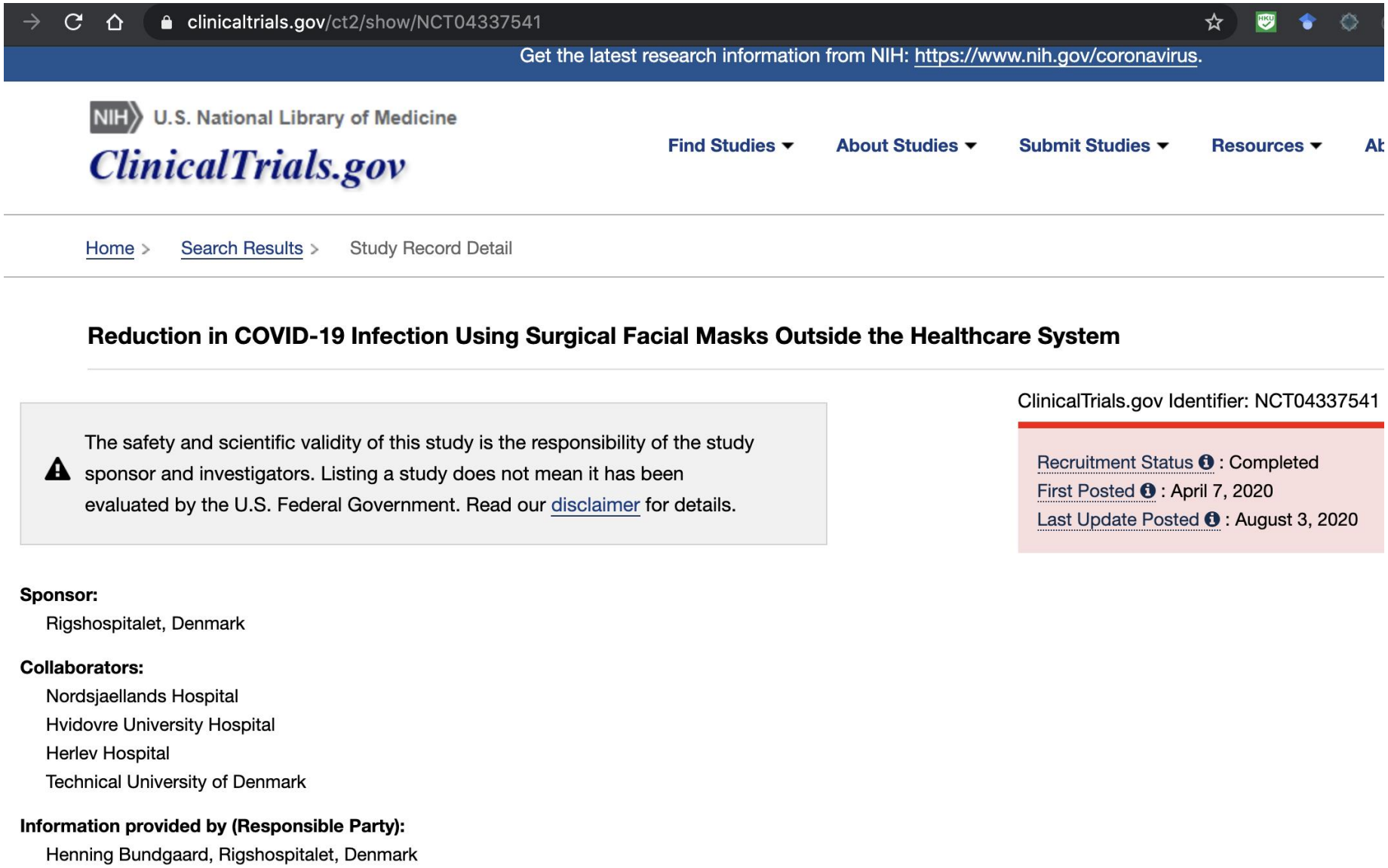
In repeated large telephone surveys of population behaviors we found >99% of adults in Hong Kong reported wearing masks in public.

However, most large outbreaks in Hong Kong have occurred in places where masks are not worn: Bars, restaurants, gyms, elderly homes, workers dormitories.

Methodology and first 4 datapoints reported in Cowling et al. 2020 *Lancet Public Health*


Very high use of face masks throughout
Test+trace with isolation and quarantine throughout
Civil servants work at home
Civil servants work at home
Schools closed
Reduce mass gatherings
Restaurant restrictions
Relaxation of social distancing measures
Civil servants work at home
Schools closed
Reduce mass gatherings
Restaurant restrictions
A
No. cases
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
Imported cases
Unlinked local cases
Local cases linked with imported cases
Local cases linked with local cases
19 26 2 9 16 23 1 8 15 22 29 5 12 19 26 3 10 17 24 31 7 14 21 28 5 12 19 26 2 9 16 23
January February March April May June July August
Date of symptom onset

Danish trial



Trial of 6000 adults randomized to wear mask in community vs not

Powered to identify a 50% reduction in risk of COVID-19 (from 2% to 1%), but such a strong effect of face masks is quite unlikely based on previous literature …

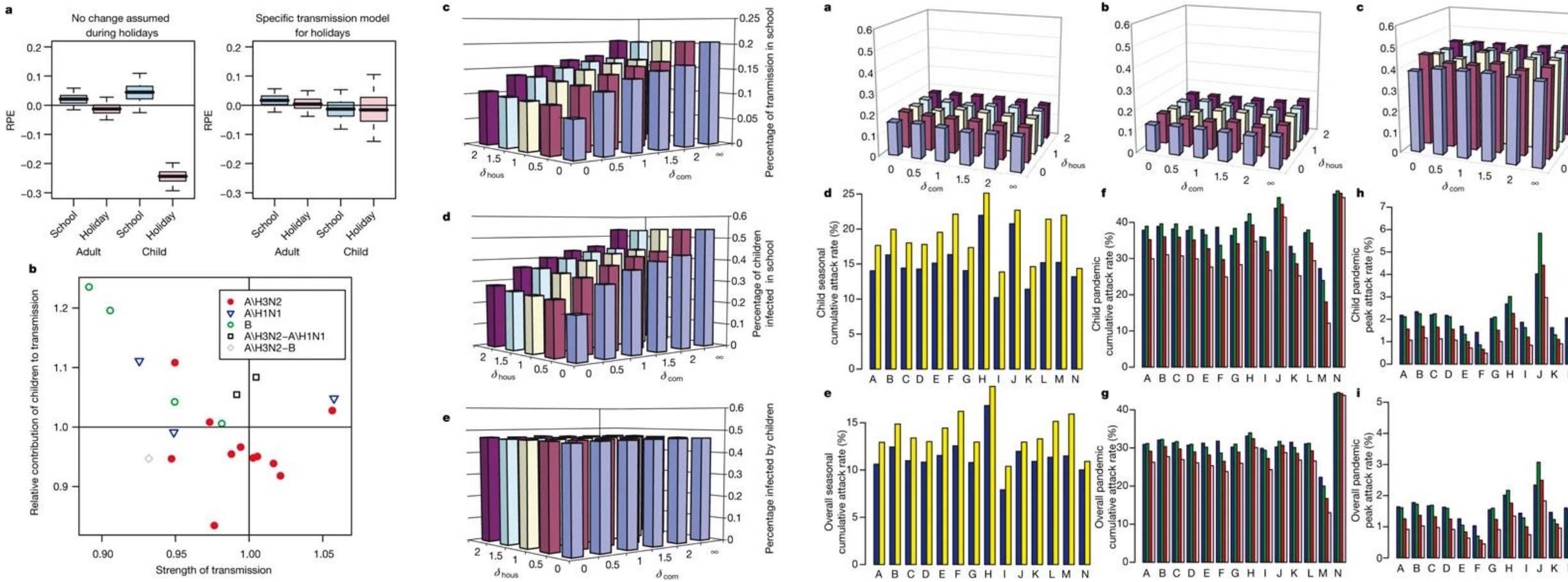
Results have not yet been reported. A negative result in this trial would not mean that masks don't work.

State of the Science

- Limited evidence base for the effectiveness of face masks in the community for influenza epidemics and pandemics, but data are consistent with a 10% to 20% reduction in transmission.
- Mechanistic evidence that face masks can provide source control of virus-laden droplets and aerosols
- Mechanistic evidence that face masks can provide protection for the wearer
- Fallacious to argue “masks don’t have 100% effect in stopping transmission therefore masks are useless”. A 10% reduction in transmission would be valuable!
- However, widespread use of face masks in Hong Kong has been insufficient to stop two community epidemics. Both epidemics were controlled after the implementation of moderate social distancing measures.


MIKE LUCKOVICH AJC © ajc.com 7-28-20
TRUMP FINALLY GOT A WALL...
School Reopening
Moms

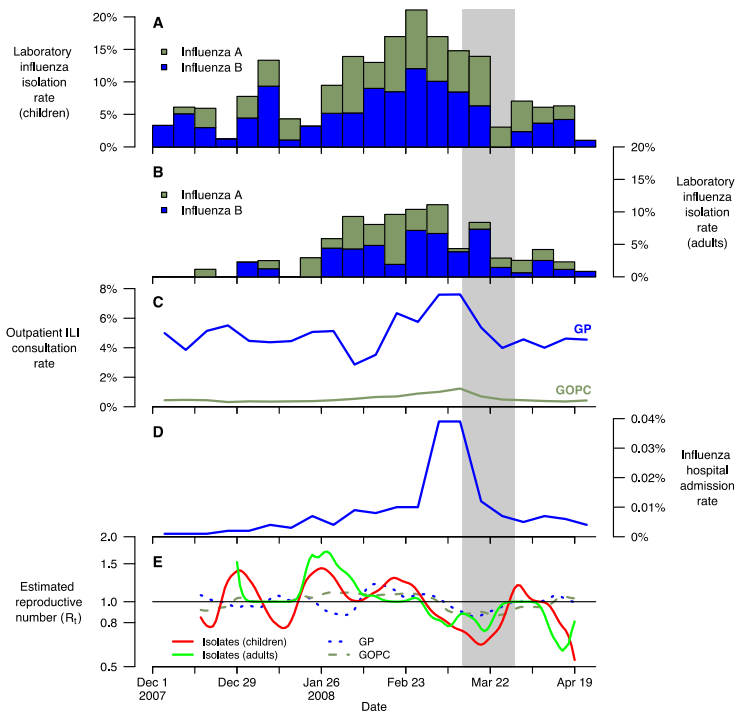
Joint analysis of surveillance data and holiday timing in France show that holidays prevent 16–18% of seasonal influenza cases



Cauchemez et al. *Nature* 2020

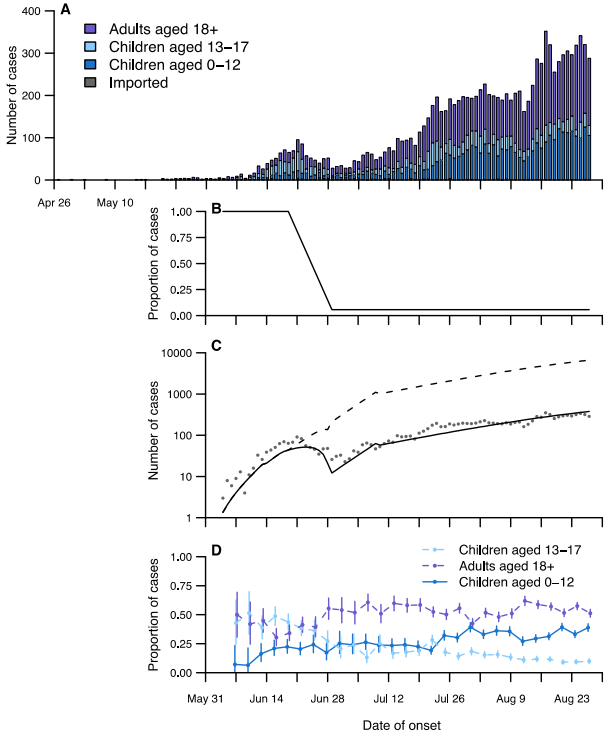
Should schools be closed, and for how long?
Susceptibility, severity and infectiousness in children

2008…too little, too late



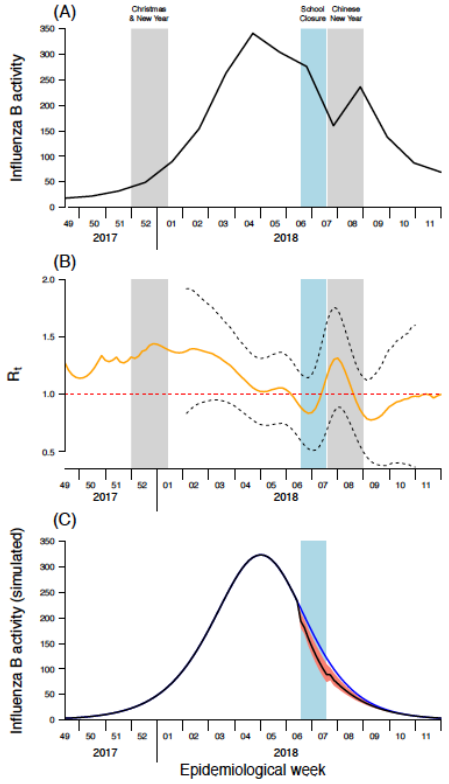
Cowling et al. 2008 *EID*

2009…12-25% reduction in transmissibility…peak delayed



Wu et al. 2010 *EID*

2018 Flu B



Ali et al. 2018 *EID*

The NEW ENGLAND JOURNAL of MEDICINE

MEDICINE AND SOCIETY

Debra Malina, Ph.D., *Editor*

Reopening Primary Schools during the Pandemic

Meira Levinson, D.Phil., Muge Cevik, M.D., and Marc Lipsitch, D.Phil.

"Whether (and how) to reopen primary schools is not just a scientific and technocratic question. It is also an emotional and moral one. Our sense of responsibility toward children — at the very least, to protect them from the vicissitudes of life, including the poor decision making of adults who allow deadly infections to spiral out of control — is core to our humanity."

SIMULATING THE POTENTIAL IMPACTS OF COVID-19 SCHOOL CLOSURES ON SCHOOLING AND LEARNING OUTCOMES: A SET OF GLOBAL ESTIMATES

JUNE 2020

Conference edition

WORLD BANK GROUP
Education

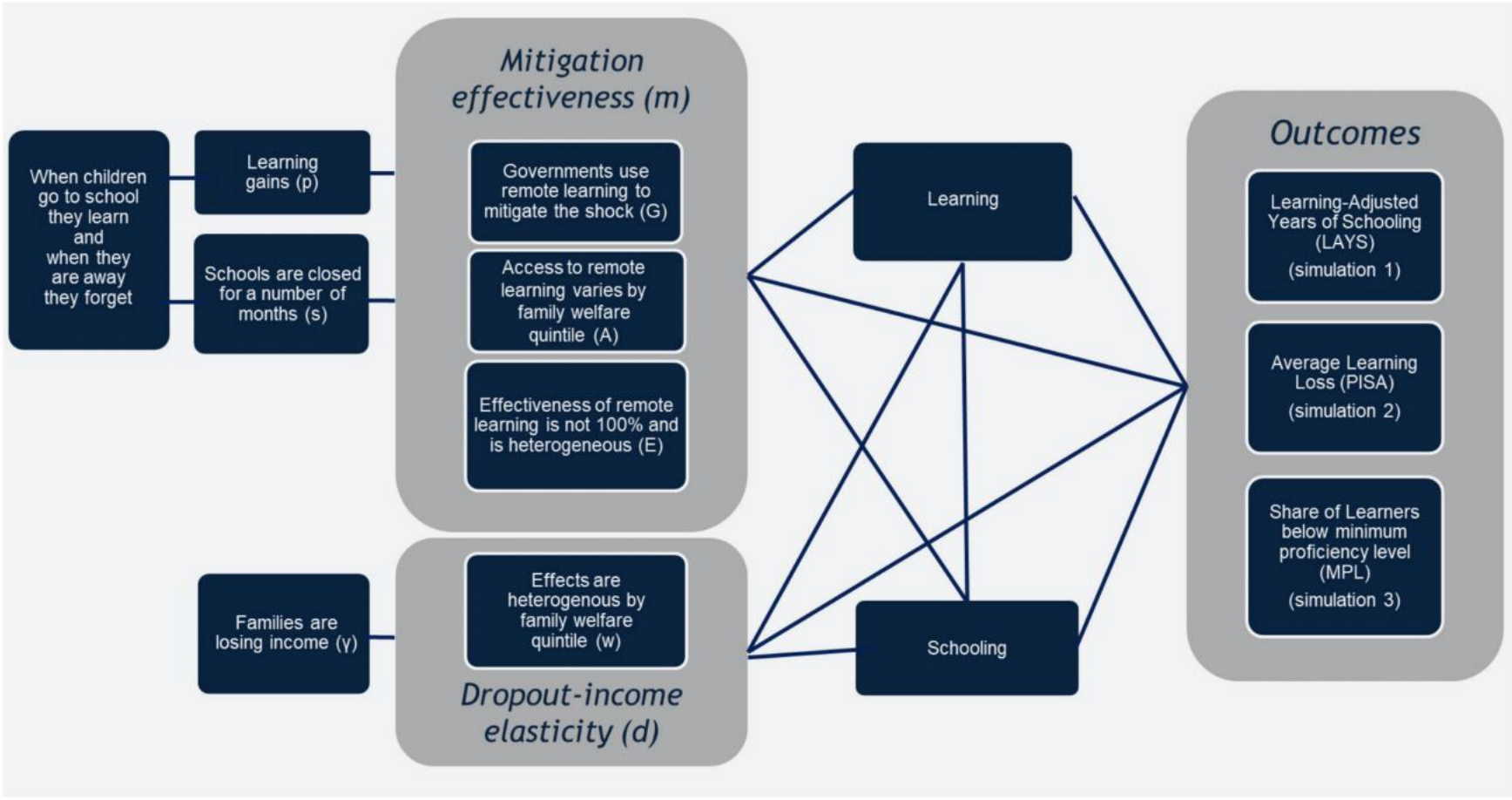


Figure 7: Learning adjusted years of schooling will fall 0.6 years, or 7%, in the intermediate scenario

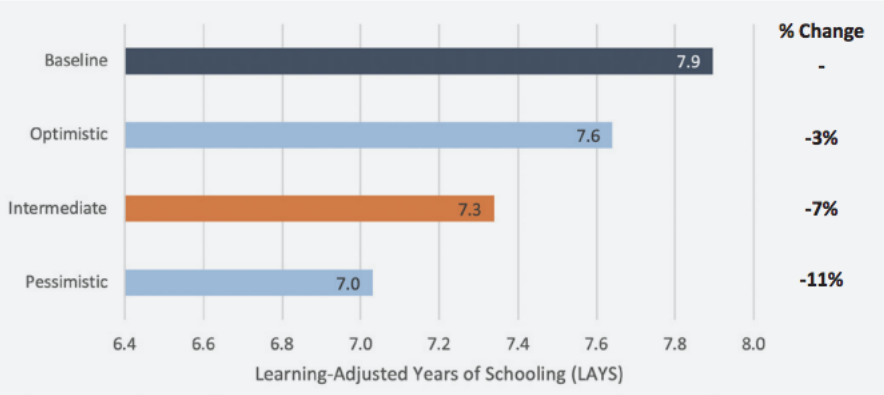
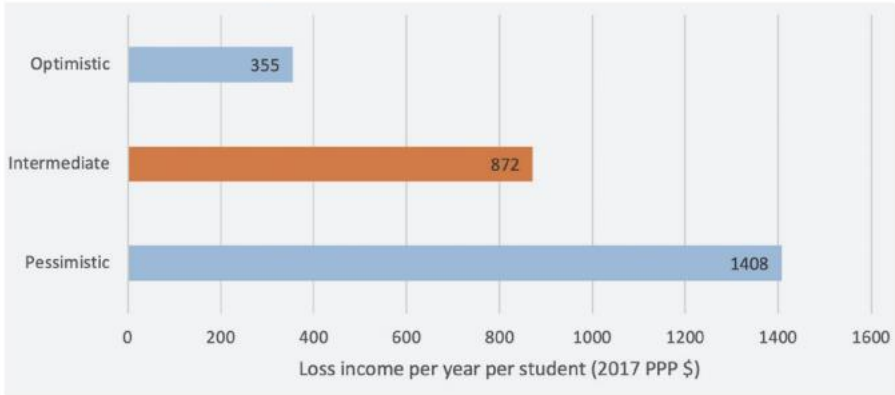


Figure 8: Expected earnings will fall due to reductions in learning-adjusted years of schooling



Note: Results based on latest available LAYs of 157 countries (unweighted average); Coverage of 97% of the population ages 4–17 (see annex A.3.9 for more details).

Figure 9: Average PISA scores will fall 16 points, or 4%, in the intermediate scenario

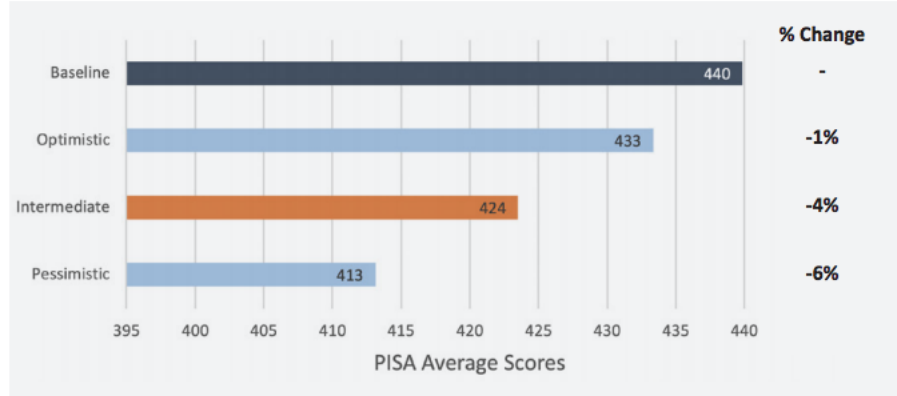
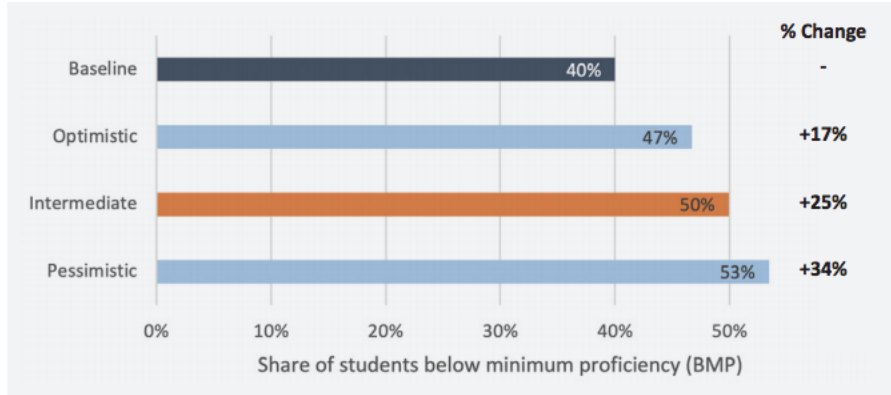
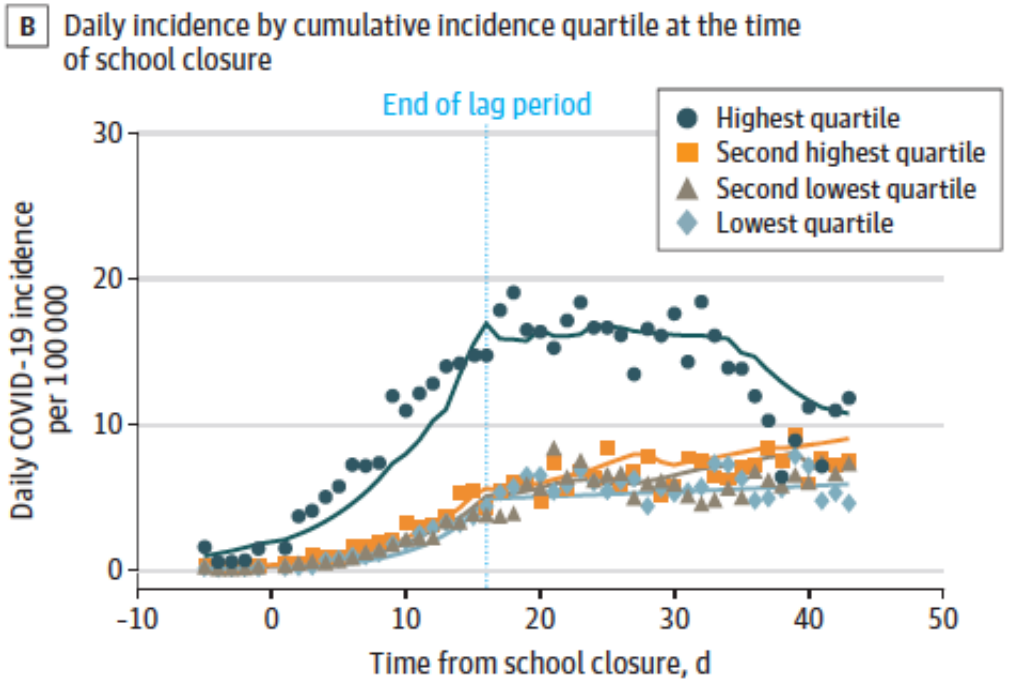
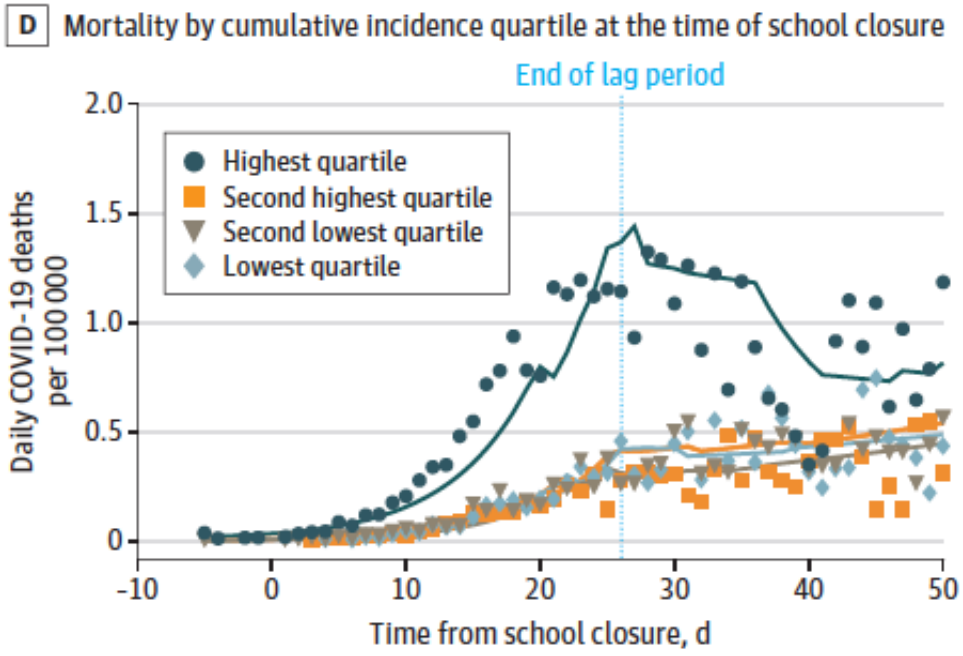


Figure 10: The share of students below PISA Level 2 will increase by 10 percentage points, or 25% in the intermediate scenario assuming that the distribution skews



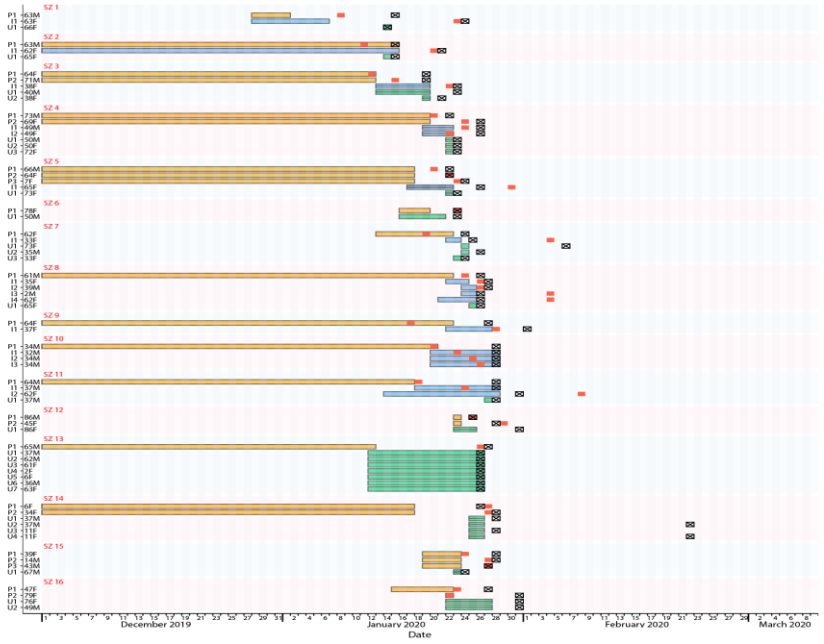
Note: Results based on latest available PISA and PISA-D of 92 countries. Unweighted average. Student coverage as share of lower secondary enrollment: 100% NAC; 95% LAC; 94% EAP; 91% ECA; 76% SAR; 39% MNA; 3% SSA; 75% World (see annex A.3.9 for more details).



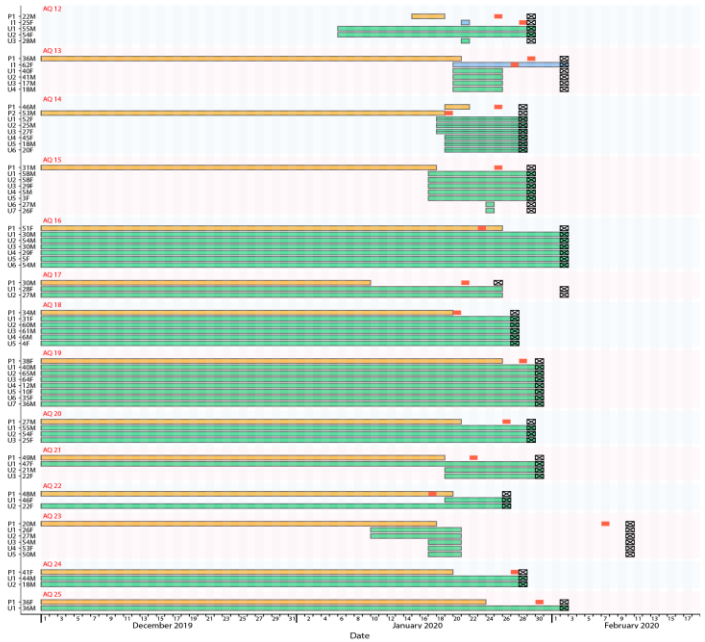


- Interrupted time series negbin model
- All 50 states closed schools March 13-23
  - No pos/neg controls
- Adjustment of covarying NPIs insufficient
- Correlation between school closure and other NPIs reflecting states' approach generally
- -62% incidence and -58% mortality implausibly high compared to pandemic and seasonal 'flu

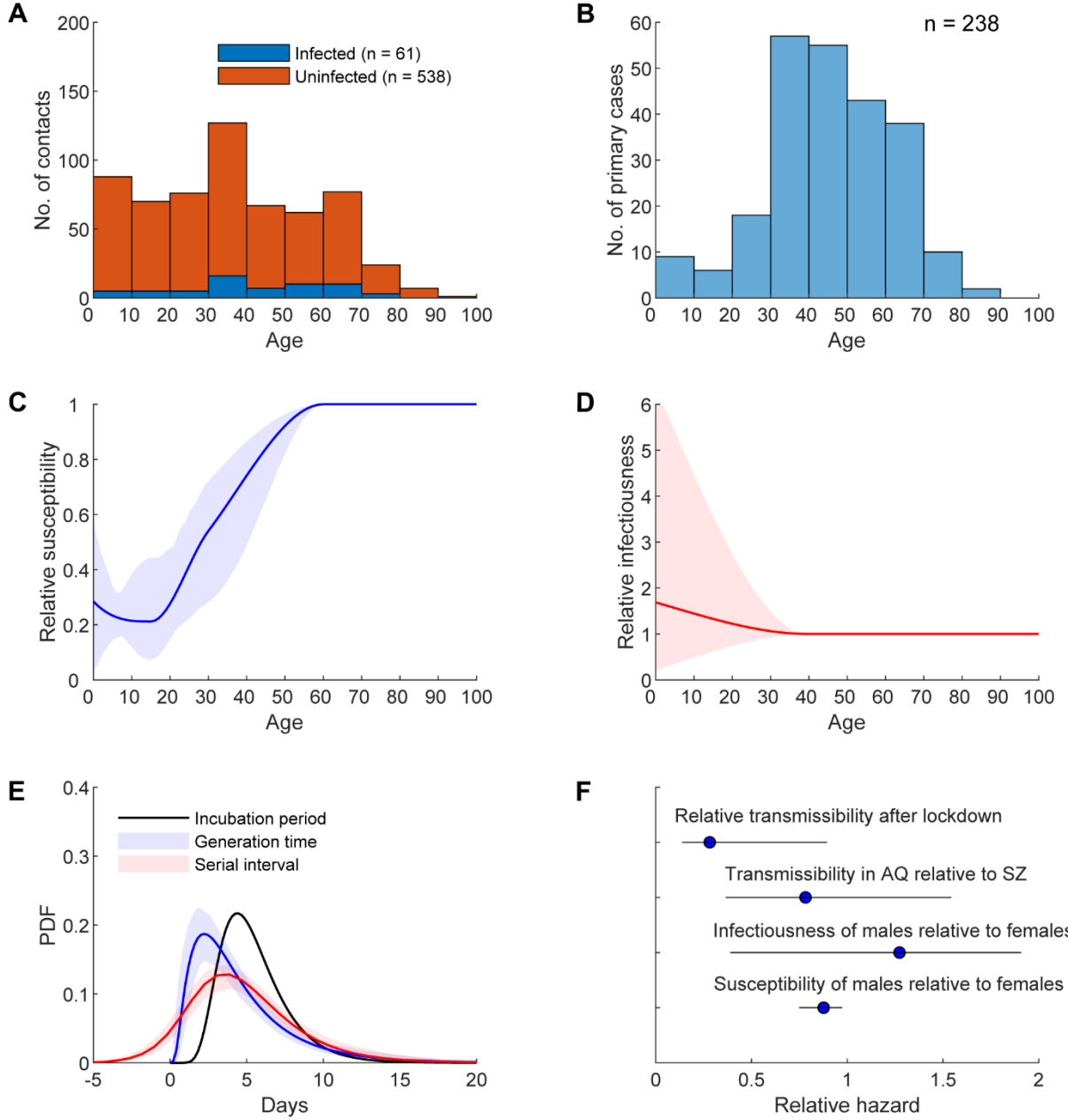
Auger et al *JAMA* 2020



Shenzhen

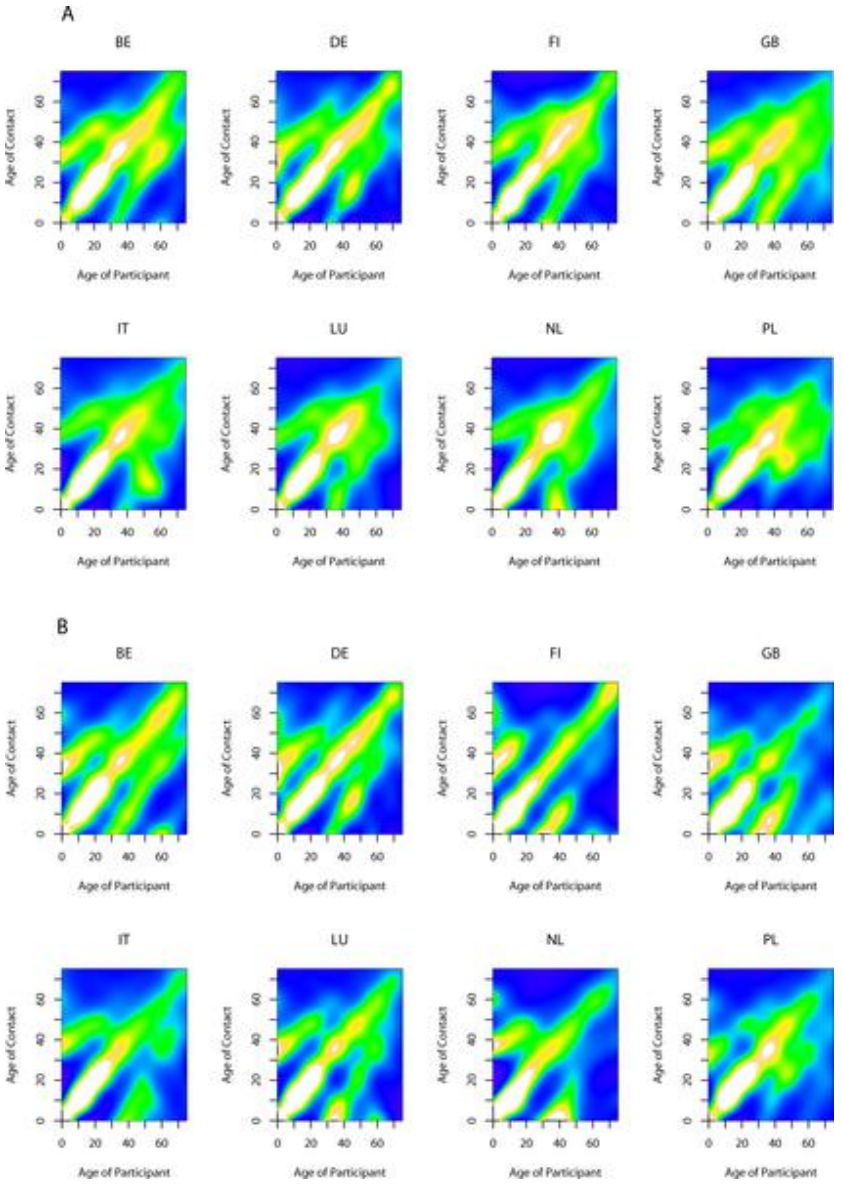


Anqing



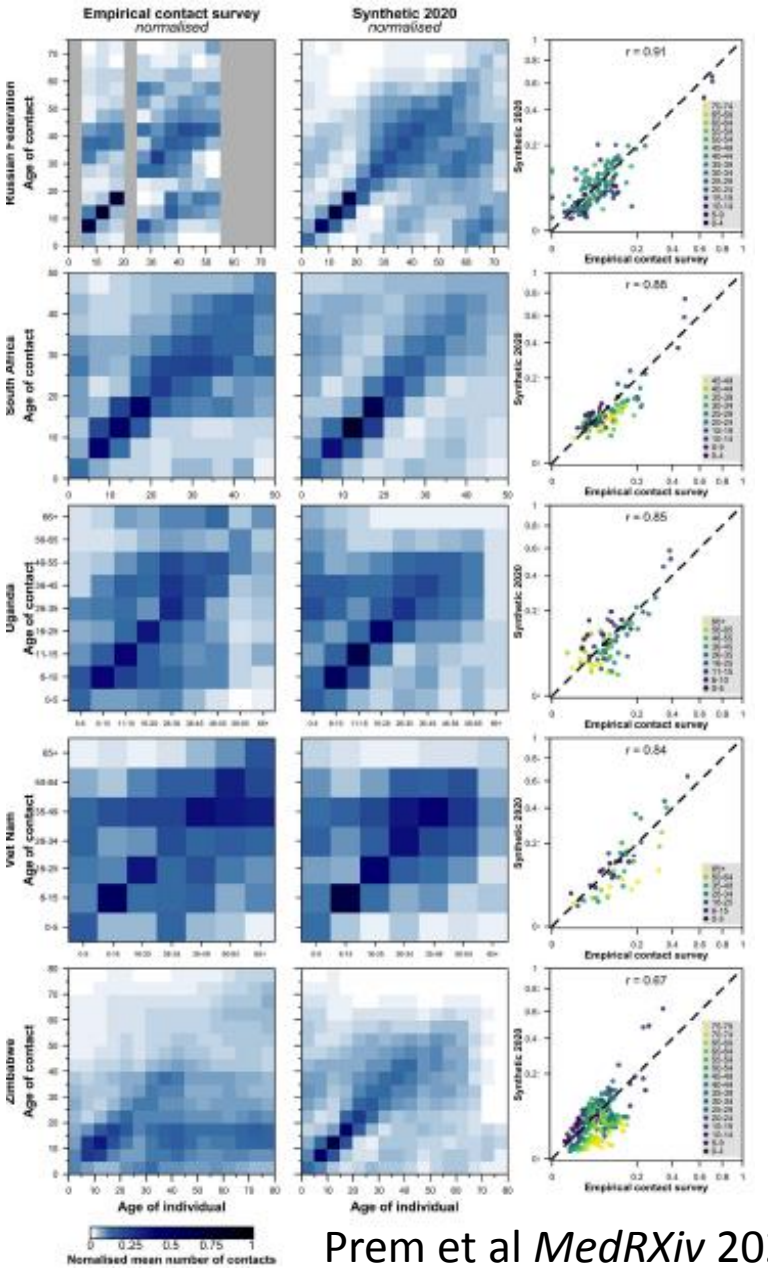
Wu et al *under review*

POLYMOD

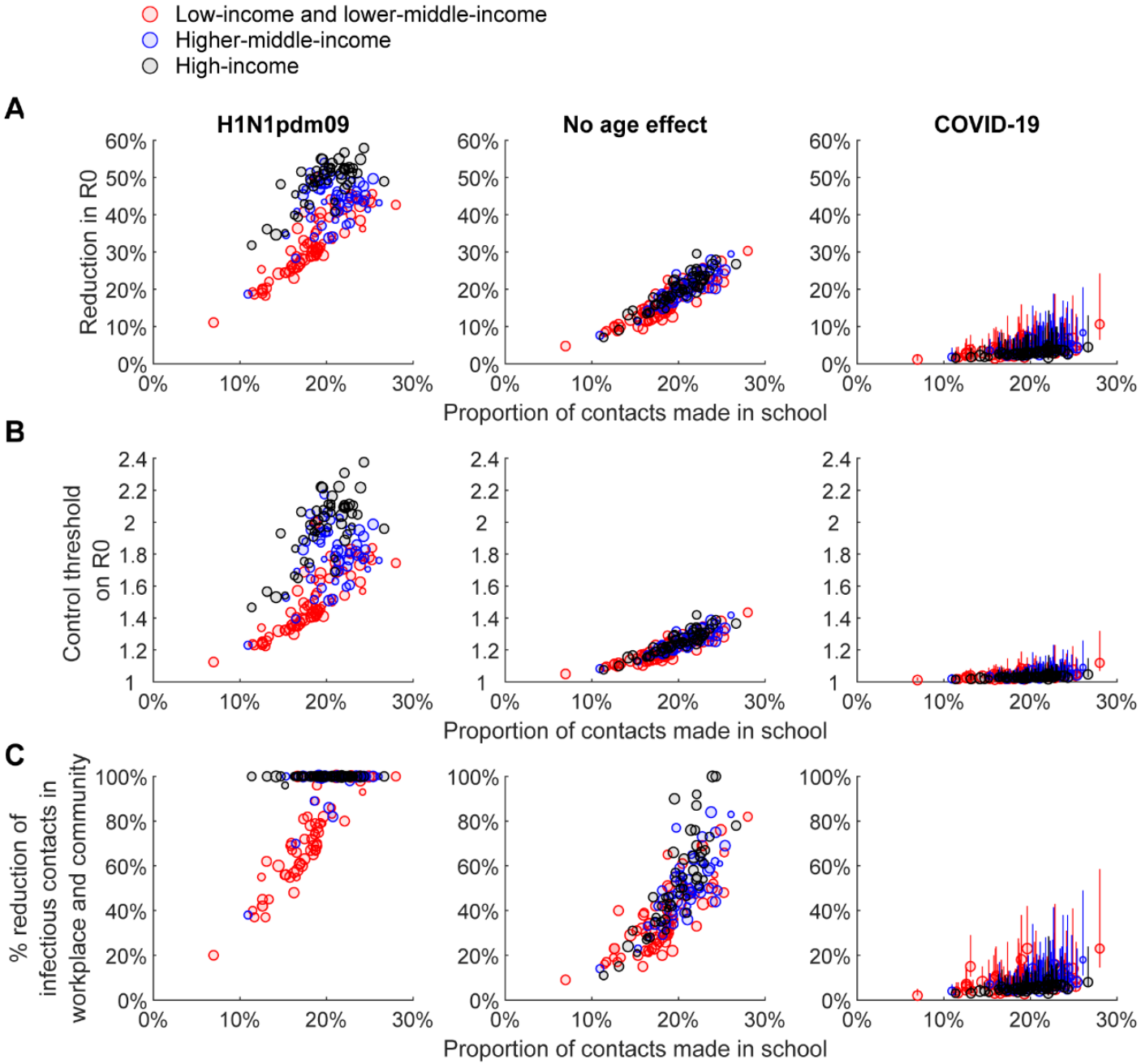


Mossong et al *PLoS Med* 2008

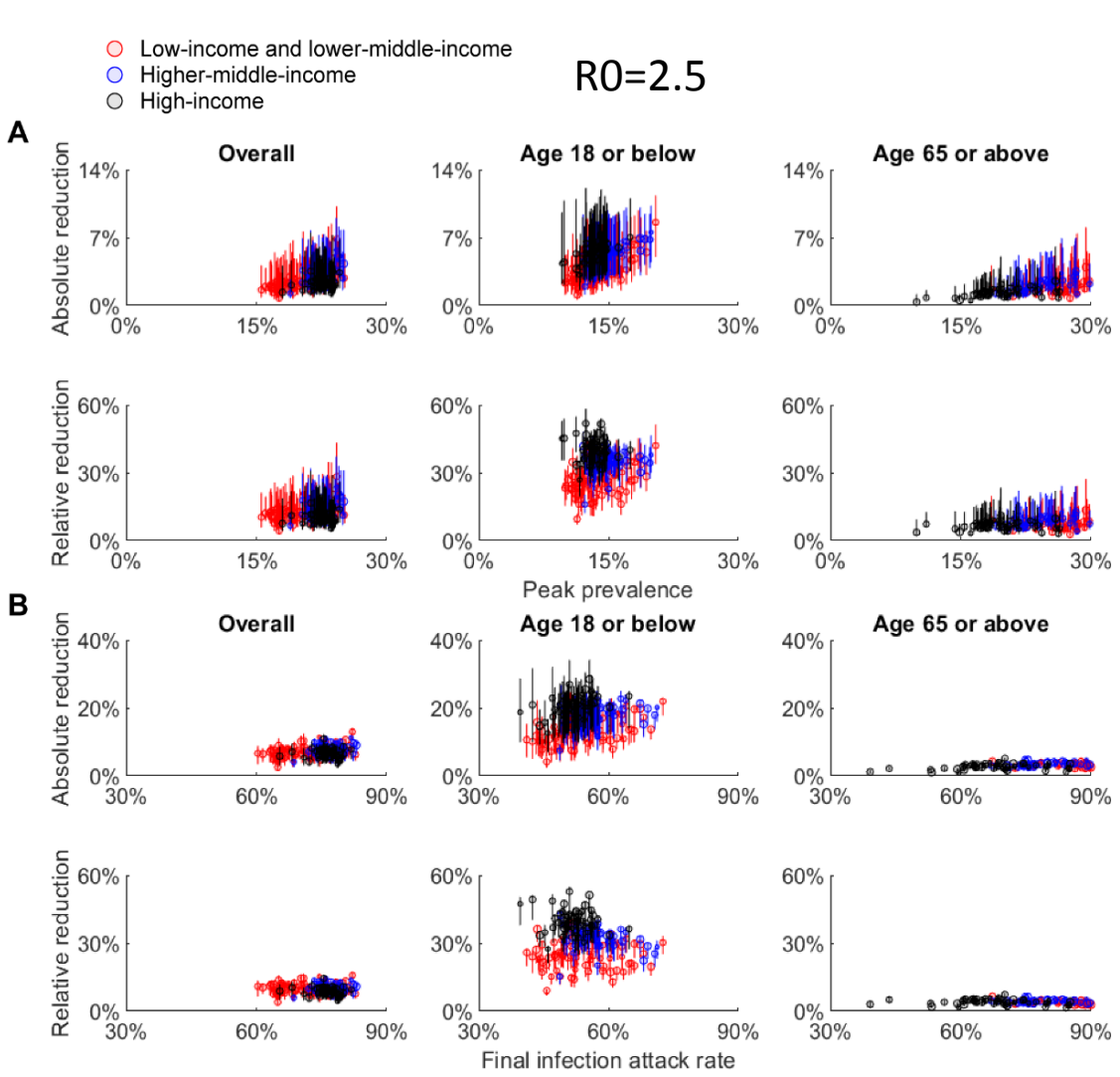
Synthetic Contact Matrices

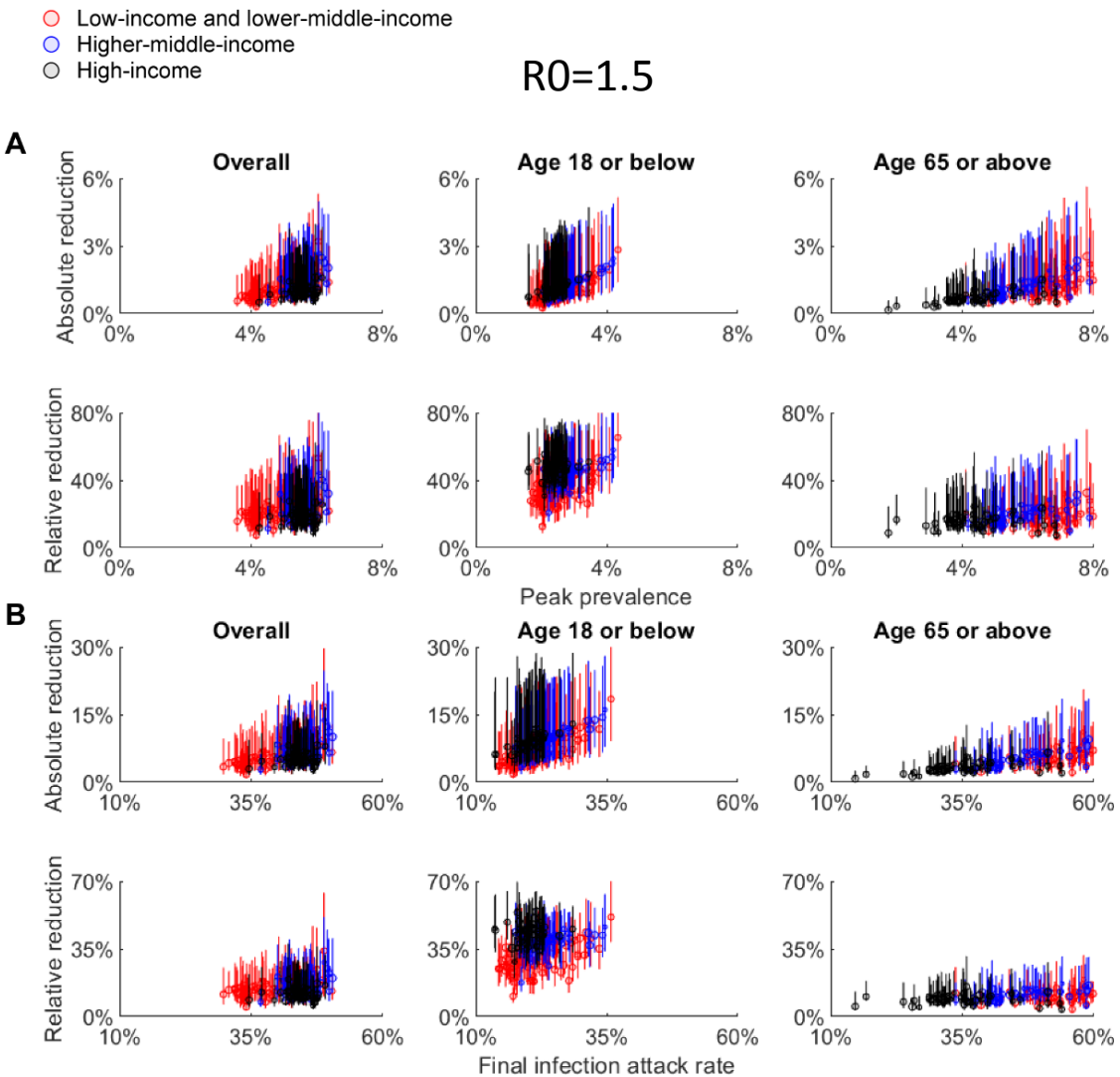


Prem et al *MedRXiv* 2020



Wu et al *under review*





Wu et al *under review*

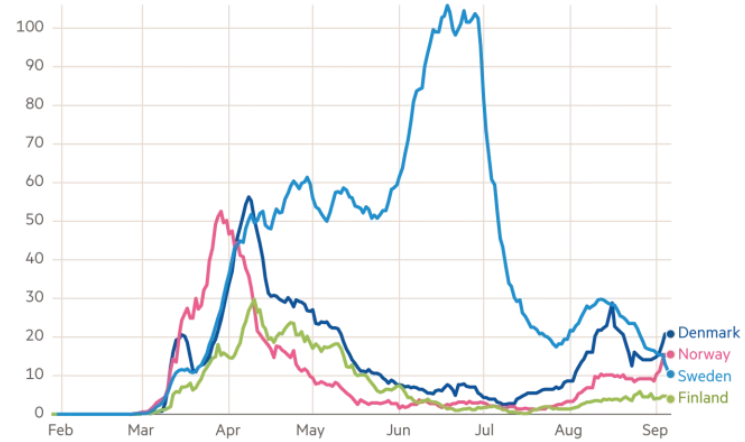
Comparative reduction in R for H1N1pdm09 and seasonal 'flu during school closure and holidays

	Published estimates	Our estimates
H1N1pdm09 in the UK during summer holidays [39]	35% (30-40%)	42%
H1N1pdm09 in HK during closure of kindergartens and primary schools [25]	13% (10-15%)	18%
H1N1pdm09 in HK during summer holidays [25]	35%	42%
H1N1pdm09 in India during summer holidays [40]	14-27%	30%
H1N1pdm09 in China during school holidays [41]	37% (28-45%)	37%
Seasonal influenza in France during summer holidays in 1985-2006 [42]	13-17%	19% if no age effect 40% if H1N1pdm09-like
Seasonal influenza B in Hong Kong during closure of kindergartens and primary schools in 2018 [43]	16% (10-26%)	8% if no age effect 18% if H1N1pdm09-like
Seasonal influenza in South Korea during school holidays in 2014-2016 [44]	6-23%	18% if no age effect 43% if H1N1pdm09-like

Wu et al *under review*

The profile of Sweden's pandemic differs radically from those of its neighbours

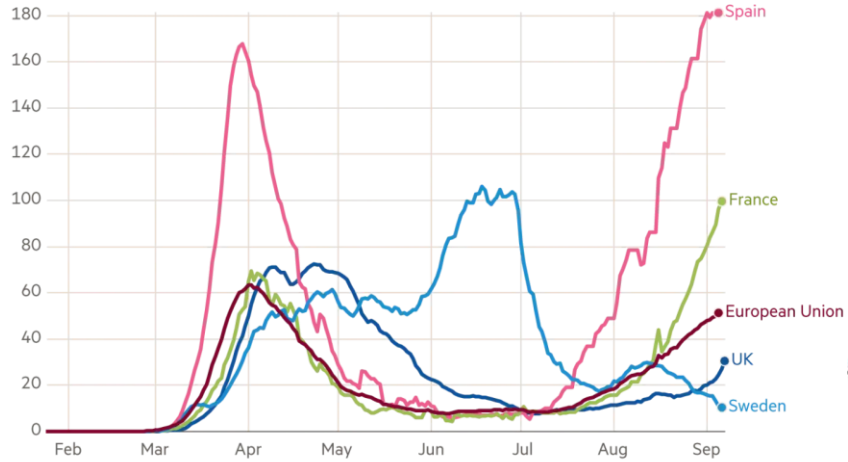
New confirmed cases of Covid-19, seven-day rolling average of new cases (per million)



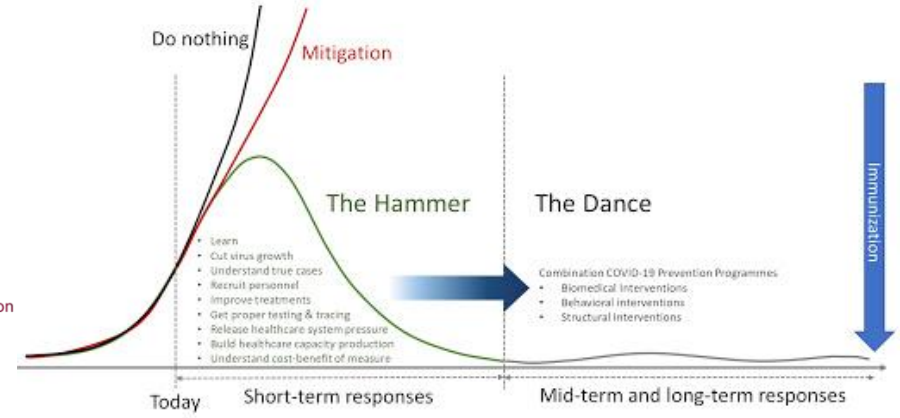
Source: FT analysis of data from the European Centre for Disease Prevention and Control, the Covid Tracking Project
Data updated Sep 8 at 1pm BST. Interactive version: ft.com/covid19
© FT

Cases are falling in Sweden but rising in the EU

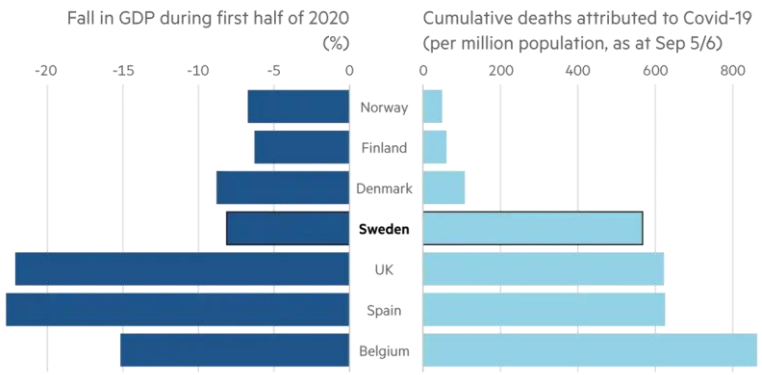
New confirmed cases of Covid-19, seven-day rolling average of new cases (per million)



Source: FT analysis of data from the European Centre for Disease Prevention and Control, the Covid Tracking Project, UK and Spanish government health departments. Data updated Sep 8 at 1pm BST. Interactive version: ft.com/covid19
© FT



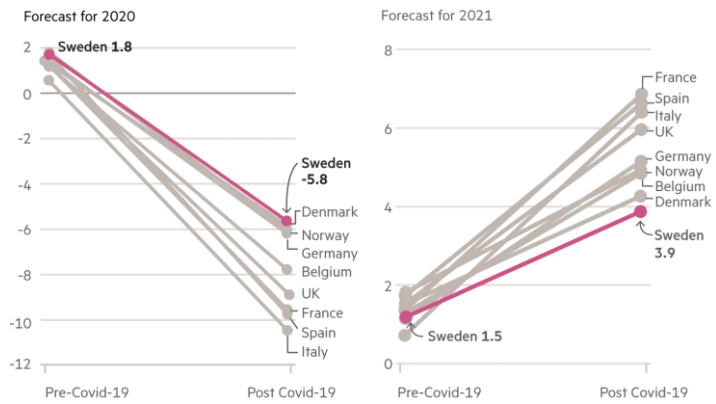
Sweden's experience is typical of the other Nordic countries on the economy... but of the worst of Europe on deaths



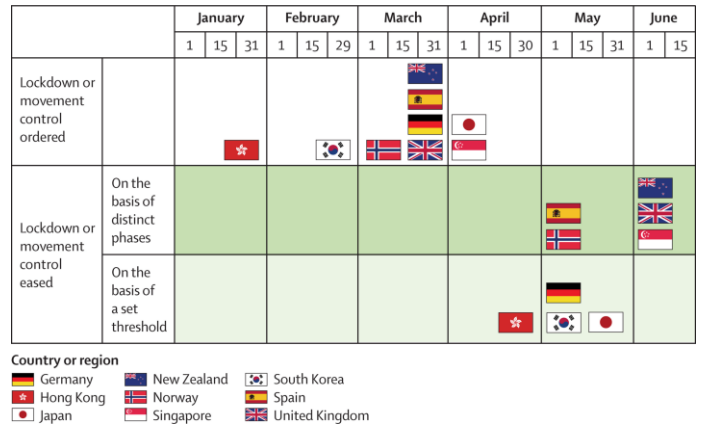
Sources: Refinitiv; FT analysis of data from the ECDPC, Covid Tracking Project, UK and Spanish government health departments
© FT

Sweden's economy will suffer less as a result of its light-touch lockdown

Annual % change in gross domestic product



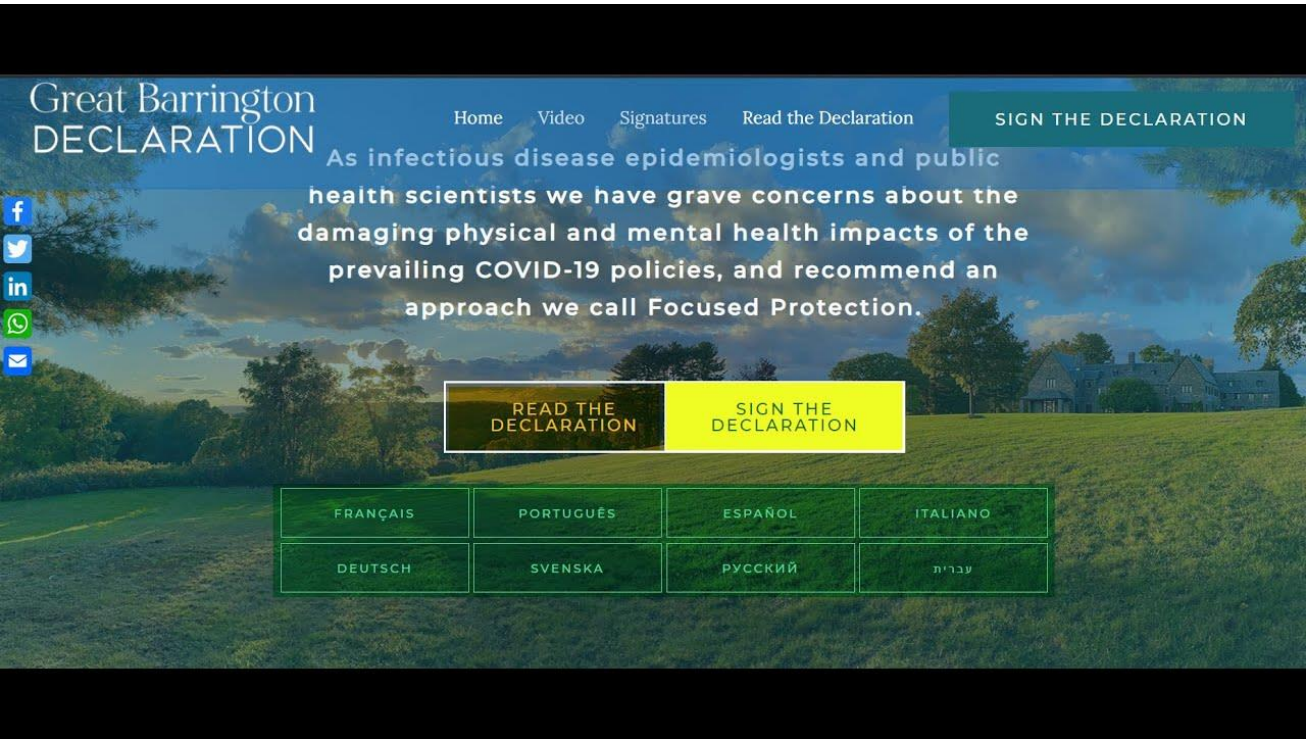
Source: Consensus Economics
© FT



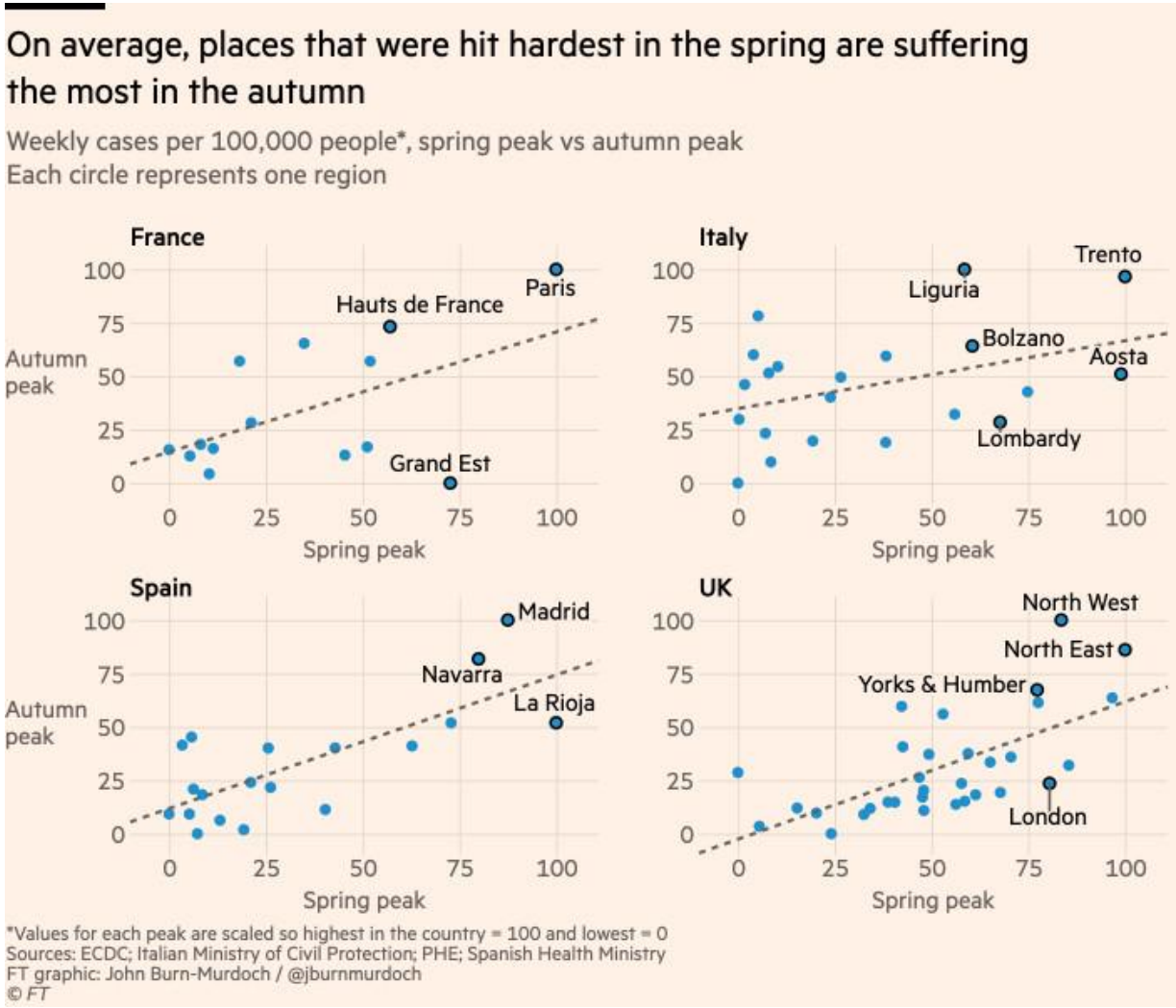
Sweden vs Scandinavia

Sweden vs EU

vs "Suppress and Lift"



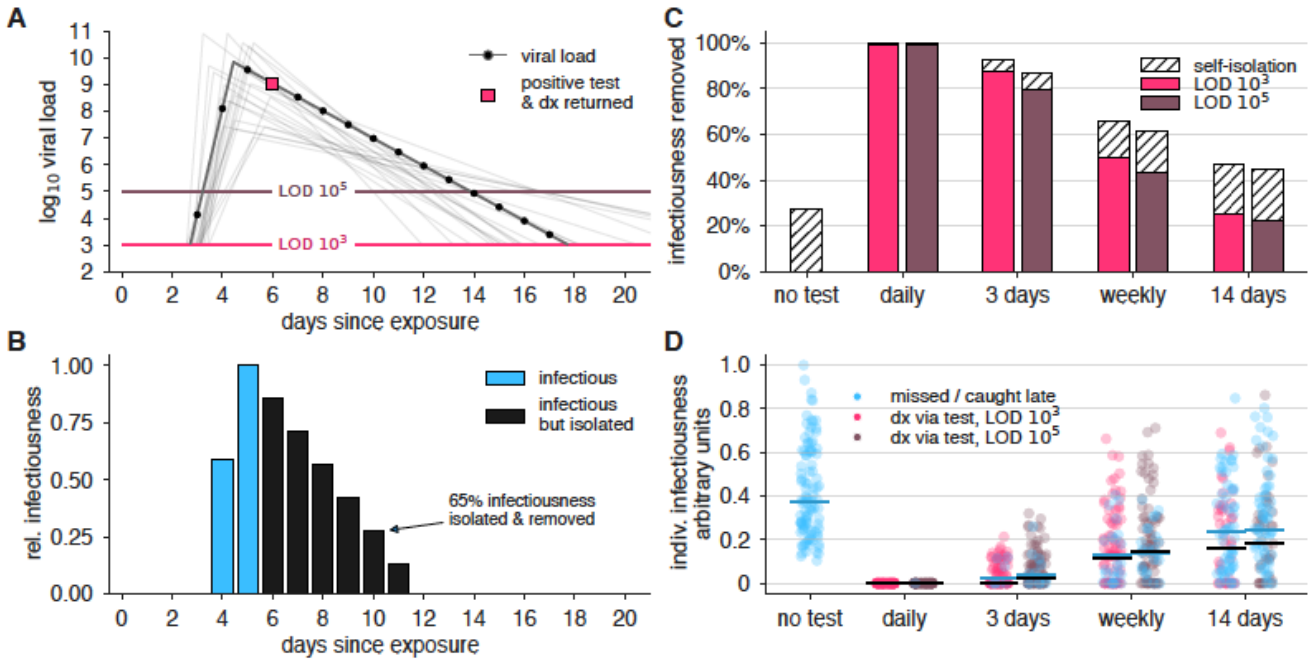
Science or politics?



Ecologic fallacy or subthreshold short-run effect?

ALL IN THE GOODNESS OF TIME…

Testing frequency vs sensitivity ceteris paribus (eg reporting delays; quarantine arrangements)



https://www.medrxiv.org/content/10.1101/2020.06.22.20136309v3.full.pdf

Utility and drawbacks of contact tracing apps

NEWSLETTERS
Sign up to read our regular email newsletters

NewScientist

News Podcasts Video Technology Space Physics Health More Shop Tours Events

England's covid-19 contact tracers failed to reach thousands of people

HEALTH 11 June 2020

Support The Guardian
Available for everyone, funded by readers
Contribute Subscribe

Search jobs Sign in Search International edition

The Guardian

News Opinion Sport Culture Lifestyle More

World Europe US Americas Asia Australia Middle East Africa Inequality Global development

Coronavirus outbreak

England's contact-tracing saga is at the heart of the government's failures

Move to include local authorities in test and trace could allow politicians to pass blame in a Covid second wave

Coronavirus - latest updates
See all our coronavirus coverage

John Harris
@johnharris1969
Tue 11 Aug 2020 19.43 BST
758

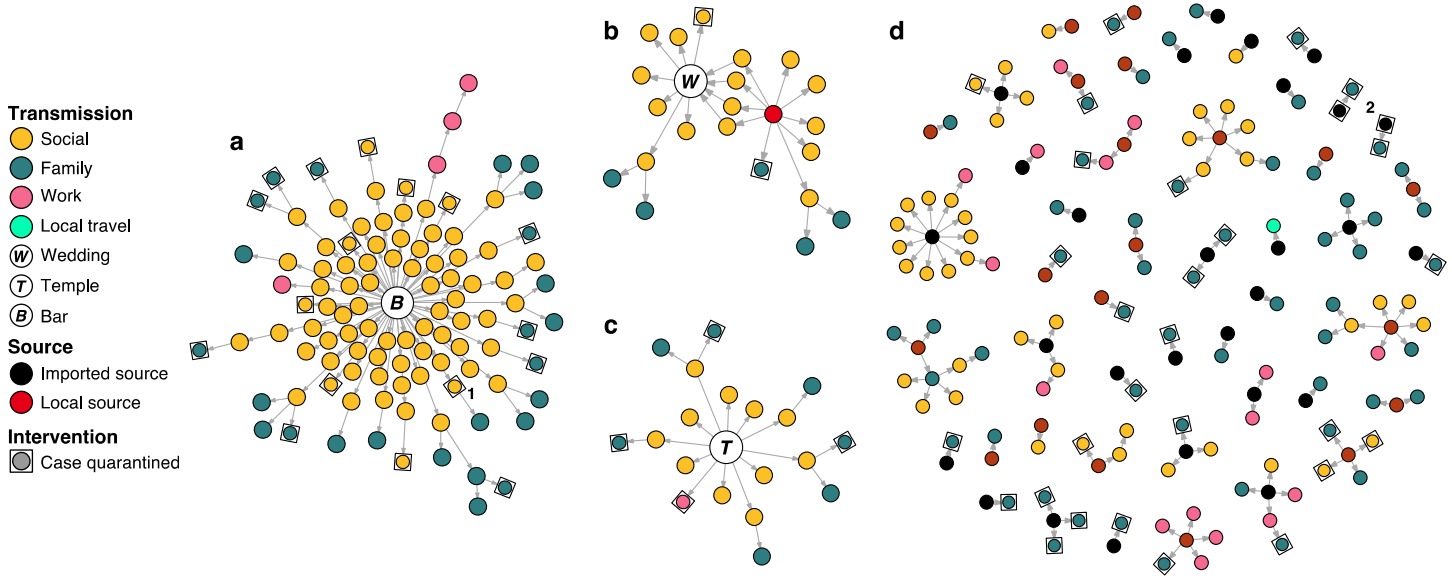
most viewed

Republicans express fears Trump will lose presidential election

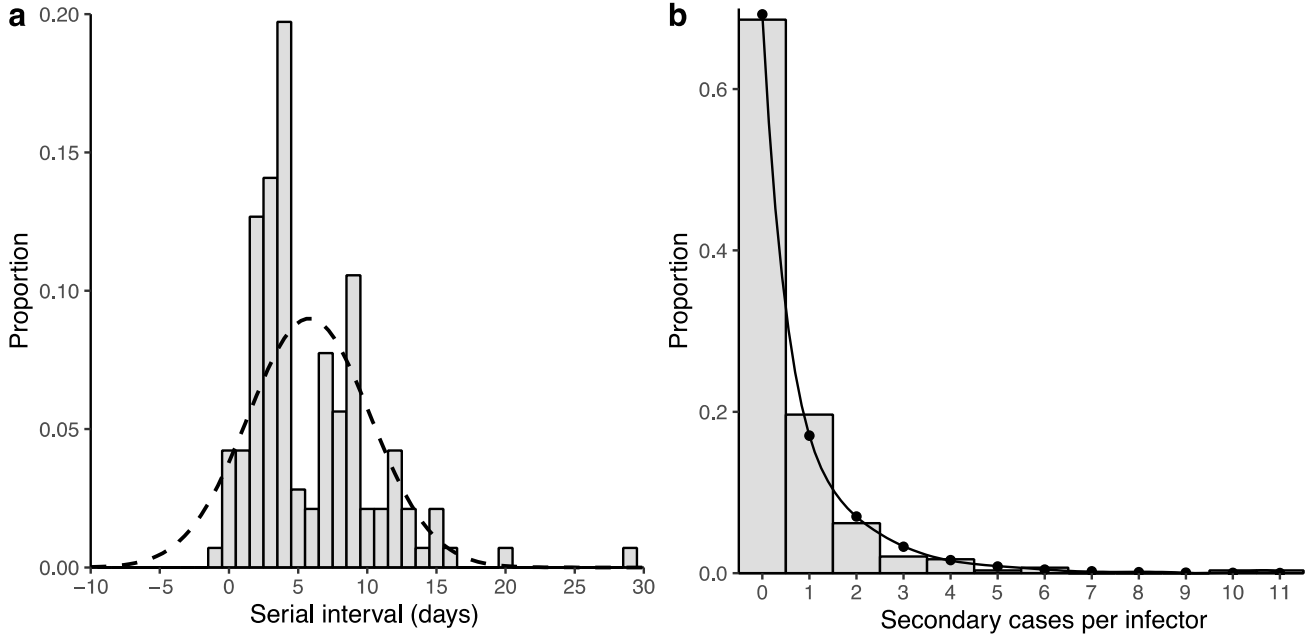
Lindsey Graham says Black people can 'go anywhere' in South Carolina if conservative

Live Coronavirus live news:

Surge capacity of contact tracing – comparative reflections with influenza implications for the future



17-19% of SARS-CoV-2 infections were responsible for 80% of all transmission events in Hong Kong, while 69% of cases did not infect anyone (Adam et al *Nat Med* 2020)



When will we ever learn?

Health and Medical Research Fund

UGC 大學教育資助委員會 University Grants Committee

創新科技署 Innovation and Technology Commission

NATIONAL INSTITUTES OF HEALTH

MIDAS Models of Infectious Disease Agent Study

CEIRS NIAID Centers of Excellence for Influenza Research and Surveillance

CDC Centers for Disease Control and Prevention