

# Masks: Rationale and Use in Different Settings in a COVID-19 epidemic

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*Children First*



# Overview

- COVID-19 transmission
- Role of masks in preventing transmission of
  - viral infections
  - COVID-19
- Universal mask usage
  - In health care facilities – N95, surgical
  - In public – cloth masks
- Optimizing resources & limited supply of masks

# COVID transmission

- spread largely from droplets from symptomatic people, coughing
  - Social distance of 1-2m; hand hygiene
  - ***Wear if symptomatic – USA CDC, WHO (until last week!!)***
- **2m may be *inadequate***
- **Aerosol spread**
- Viral RNA found at 6m in isolation rooms of patients with COVID
- Highest viral concentrations - pts on nasal cannula oxygen
- High concentrations in toilets & areas where PPE used
- Aerosolisation of virus from normal breathing

JAMA Insights

Turbulent Gas Clouds and Respiratory Pathogen Emissions  
Potential Implications for Reducing Transmission of COVID-19

Lydia Bourouiba, PhD

National Research Council 2020. *Rapid Expert Consultation on the Possibility of Bioaerosol Spread of SARS-CoV-2 for the COVID-19 Pandemic (April 1, 2020)*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/25769>.

A choir decided to go ahead with rehearsal. Now dozens of members have COVID-19 and two are dead



**Los Angeles Times**

29 March 2020

# COVID transmission....

- **Transmission from asymptomatic, mildly symptoms or pre-symptomatic people**
  - children
- **China - up to 86% of all new COVID–19 infections are undiagnosed; these cases are responsible for 79% of all cases**
- High viral loads also occur *prior* to onset of symptoms
- Prolonged shedding of virus – 1/3 shed for > 20 days, *To et al, Lancet 2020*
- Dose exposure matters – dose intensity & sustained exposure
- **Masks**

*Li, R., Pei, S., Chen, B., Song, Y., Zhang, T., Yang, W. and Shaman, J., 2020. Substantial undocumented infection facilitates the rapid dissemination of novel coronavirus (SARS-CoV2). Science*

# Methods of transmission

- **CONTACT** **Hand hygiene / gloves/ social distance**
- **DROPLET** **Surgical/ homemade masks**
  - cough
  - talking
- **AIRBORNE** **N95 masks**
  - aerosolized procedures

**What is evidence that masks can prevent transmission of viruses?**

# Masks & transmission of viruses

- Systematic review of **2003 SARS outbreak** – masks **68%** effective
- Systematic review masks at mass gatherings - significant protect for **resp infections** (RR = **0.89**, 95% CI 0.84-0.94)
- Systematic review of RCTs of masks in **influenza** – masks protective for **influenza-like illness** (**OR 0.80**, 95% CI 0.63–1.01)
- Cluster randomized trial in households over 2 seasons - mask protection for **resp disease 74%** (0.26, 95% CI 0.09–0.77)
- Mathematical modelling – **if 80% of population wear masks, influenza outbreaks would be eliminated**

Jefferson et al. *Physical interventions to interrupt or reduce the spread of respiratory viruses: systematic review*. BMJ 2008

Barasheed O *Uptake and effectiveness of facemask against respiratory infections at mass gatherings: systematic review*. *Int J Infect Dis* 2016

Rashid H et al *Unmasking Masks in Makkah: Preventing Influenza at Hajj*. *CID* 2012

MacIntyre CR et al. *Face Mask Use and Control of Respiratory Virus Transmission in Households*. *Emerg Infect Dis* 2009

Yan et al, *Modeling the Effectiveness of Respiratory Protective Devices in Reducing Influenza Outbreak*; *Risk Anal* 2019

# Masks & transmission of TB

- 65% reduction of transmission of MDR TB with use of surgical masks

Dharmadhikari et al. Surgical Face Masks Worn by Patients with Multidrug-Resistant *Tuberculosis: Impact on Infectivity of Air on a Hospital Ward*. <https://www.atsjournals.org/doi/full/10>.

# How effective are surgical masks?

- Surgical masks *reduced coronavirus* in aerosols & resp droplets in children & adults with resp symptoms
- Masks also *reduced influenza* in respiratory droplets
- **Surgical masks can prevent transmission of coronavirus and influenza virus in symptomatic people**

nature  
medicine

BRIEF COMMUNICATION

<https://doi.org/10.1038/s41591-020-0843-2>



## Respiratory virus shedding in exhaled breath and efficacy of face masks

Nancy H. L. Leung<sup>1</sup>, Daniel K. W. Chu<sup>1</sup>, Eunice Y. C. Shiu<sup>1</sup>, Kwok-Hung Chan<sup>2</sup>, James J. McDevitt<sup>3</sup>, Benien J. P. Hau<sup>1,4</sup>, Hui-Ling Yen<sup>1</sup>, Yuguo Li<sup>5</sup>, Dennis K. M. Ip<sup>1</sup>, J. S. Malik Peiris<sup>1</sup>, Wing-Hong Seto<sup>1,6</sup>, Gabriel M. Leung<sup>1</sup>, Donald K. Milton<sup>7,8</sup> and Benjamin J. Cowling<sup>1,8</sup> ✉

# Universal masks reduce COVID-19 transmission

- **China**

- dramatic reductions in COVID-19 infections with social distancing & compulsory masks in public places
- secondary community transmission in other provinces contained after five million people left Wuhan before Chinese New Year
- Most secondary cases in families where masks were not worn at home
- Universal mask wearing also reduced other viral diseases

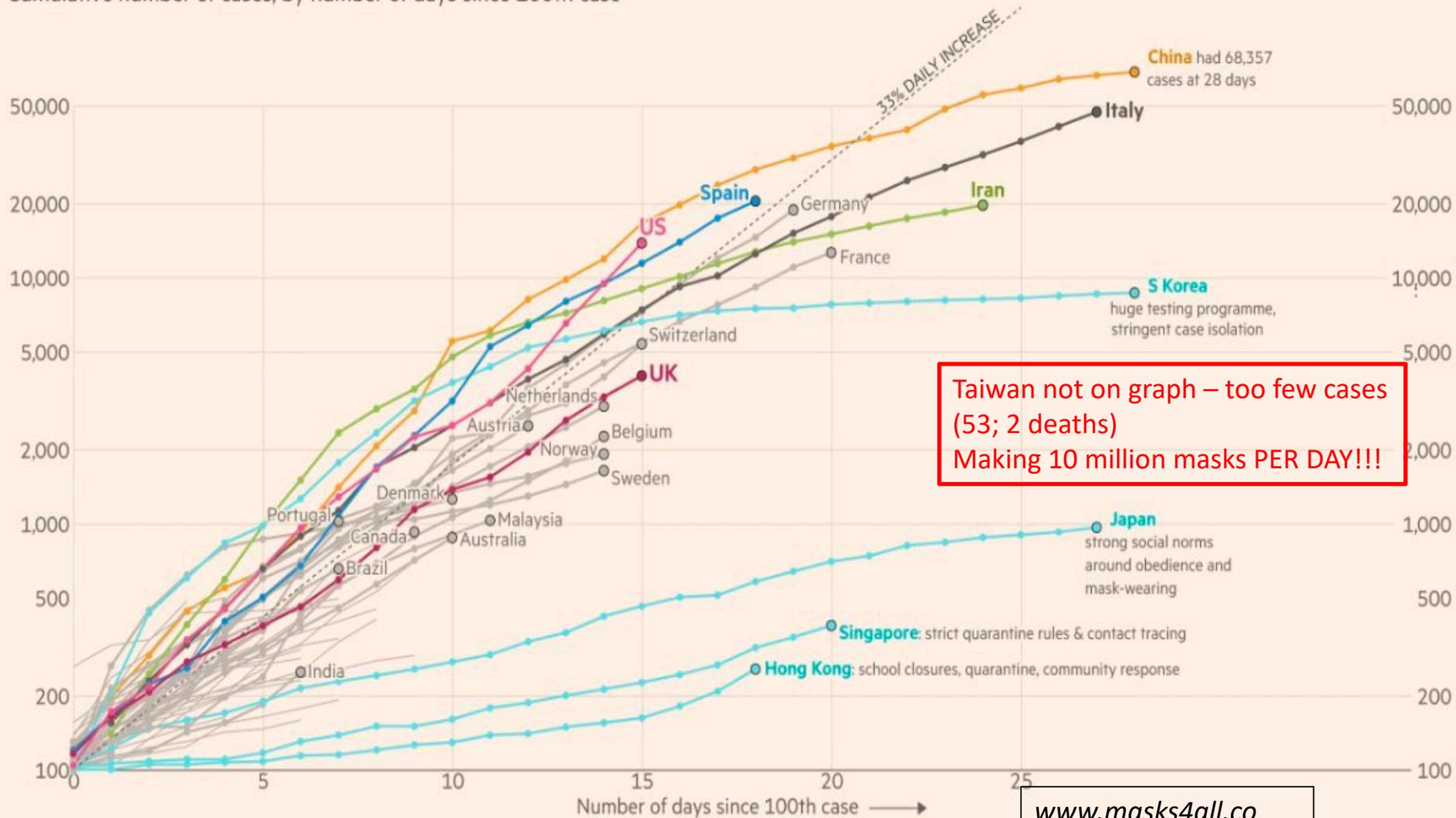
- **Hong Kong**

- most healthy people wore masks in public places
- few secondary local transmissions
- clusters of cases in families where masks were not worn
- precipitous drop in laboratory detection of influenza & all other respiratory viruses

*Leung et al IJTLID in press*

# Country by country: how coronavirus case trajectories compare

Cumulative number of cases, by number of days since 100th case



# COVID transmission & universal masks

- The big mistake in the US and Europe, in my opinion, is that people aren't wearing masks. This virus is transmitted by droplets and close contact. Droplets play a very important role - you've got to wear a mask, because when you speak, there are always droplets coming out of your mouth. Many people have asymptomatic or pre-symptomatic infections. If they are wearing face masks, it can prevent droplets that carry the virus from escaping and infecting others.

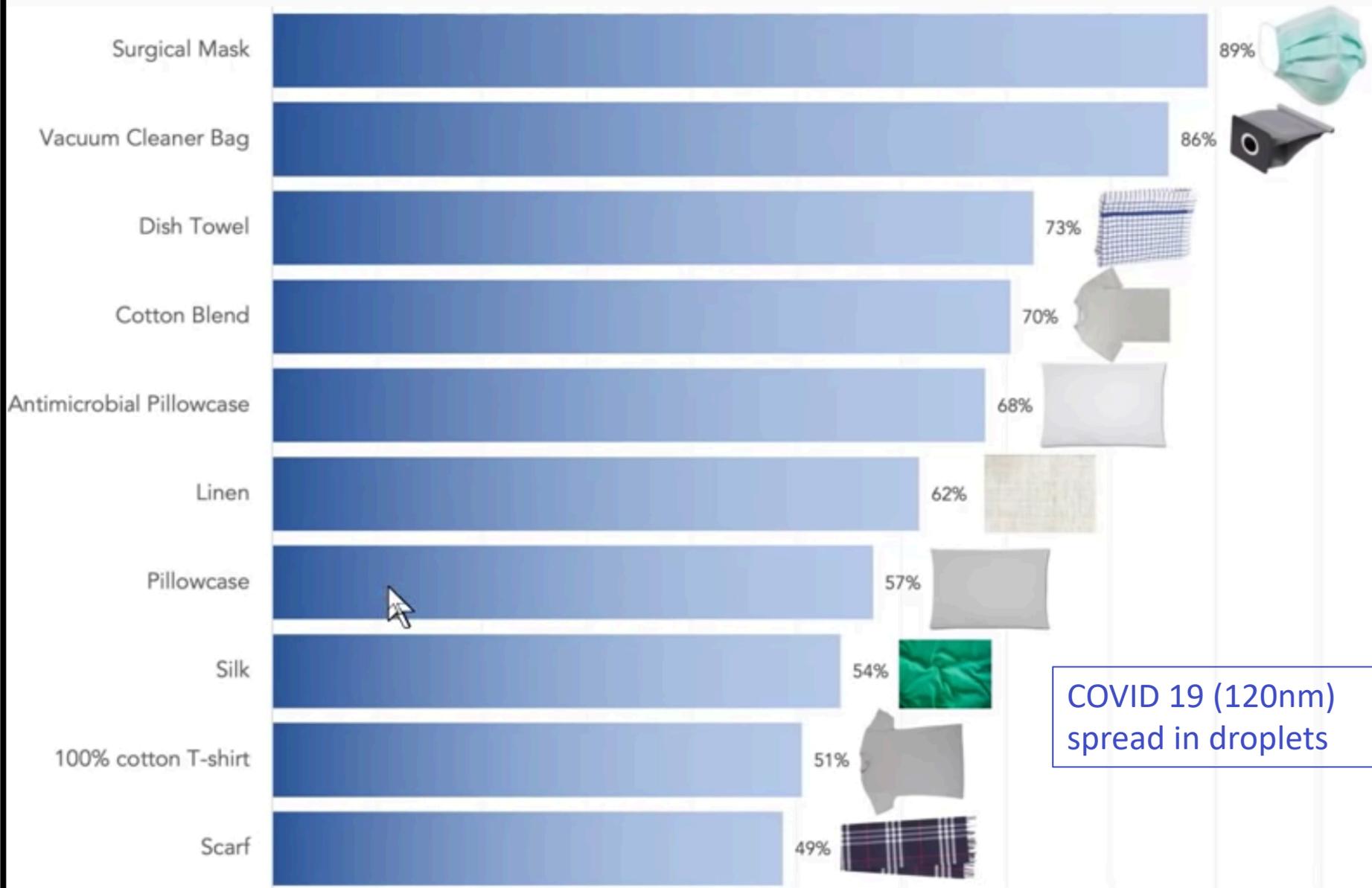
George Gao, Director of Chinese Center for Disease Control (CDC)

*Science 27 Mar 2020*

**BUT global shortage of surgical &  
N95 masks ...**

# Household Materials' Effectiveness Against 0.02-Micron Particles

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%



COVID 19 (120nm) spread in droplets

# Change in guidelines to recommend cloth masks for public

- Chinese CDC – recommending for months
- Several other countries in SE Asia – Taiwan, Mongolia, Japan, Hong Kong etc.
- USA CDC – recommend 3 April 2020 for public use & guidelines on how to make these  
<https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/cloth-face-cover.html>
- Czech Republic – 18 March
- Germany, Austria
- WHO interim guidelines
- WC Dept of Health – last week

Advice on the use of masks in the context of COVID-19

Interim guidance  
6 April 2020



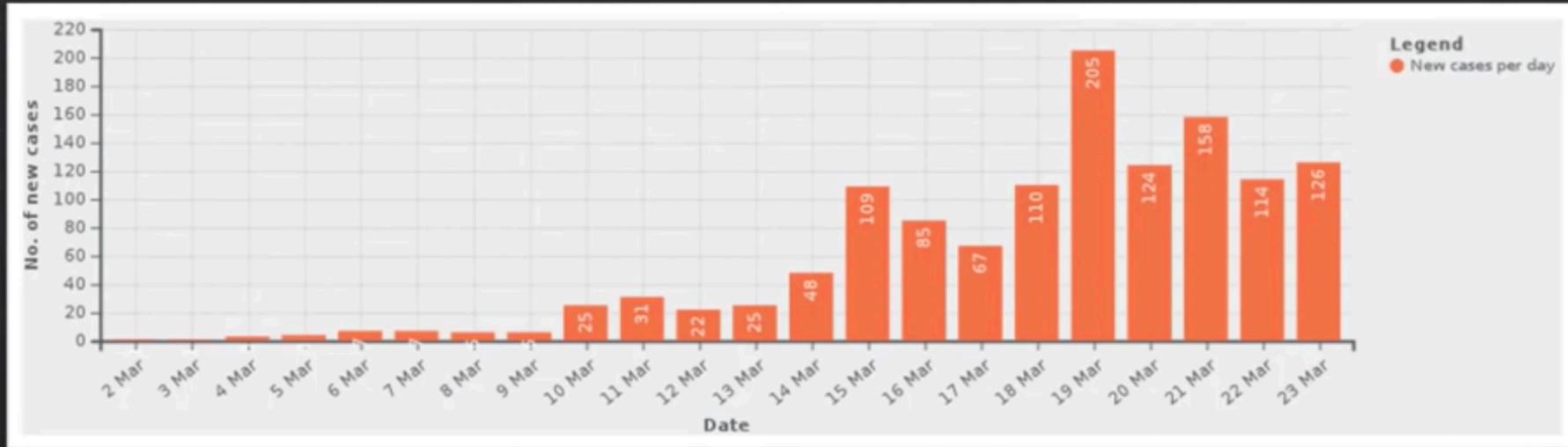
# Cloth Masks – for use in public



<https://www.westerncape.gov.za/departments-of-health/news/covid-19-cloth-masks-public-use>

- WC-DOH guidelines to make & use cloth masks
- **For use of non health care workers and public**
- Wash hands before
- Cover nose and mouth
- Wash daily
- Single mask for each person
- Make 2 - so one can be washed & dried

# Czech Republic – masks since 18 March; 2 deaths



“your mask protects me, my mask protects you”

# Other advantages of universal use

- Reduces stigma
- Socially requirement
- Prevents people touching their faces
- Barrier especially in crowded places – social distancing difficult
- Create greater awareness of COVID
- REDUCED transmission of other viral illnesses (RSV, influenza) - ??TB

**For all staff in health care facilities**

- **surgical masks**

- **N95 for aerosolized procedure**

**Protecting HCWs must be a priority**

# WHO guidance on HCWs & masks

[https://www.who.int/publications-detail/infection-prevention-and-control-during-health-care-when-novel-coronavirus-\(ncov\)-infection-is-suspected-20200125](https://www.who.int/publications-detail/infection-prevention-and-control-during-health-care-when-novel-coronavirus-(ncov)-infection-is-suspected-20200125)

- HCWs should use a medical mask
- N95 for aerosolising procedures
  - CPR
  - Ventilation before intubation
  - Intubation
  - Non-invasive ventilation
  - Sampling respiratory
  - bronchoscopy

Infection prevention and control during health care when COVID-19 is suspected

Interim guidance  
19 March 2020



# Limited stock surgical, N95 masks

- Limit public use - ? regulate sales
- Stock piles and private sellers – access and distribute
- Philanthropic donations
- public - only cloth masks
- Ramp up local production (Taiwan example)
- Possible re-use or extended use of N95 masks?

# Can we re-use N95 masks?

- CDC new guidelines for possible extended use or re-use

<https://www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/decontamination-reuse-respirators.html>

- Gas sterilisation
- 4 N95 masks per healthcare worker
- UV light
- NOT after contact with a COVID patient
- Risks

**Correct use & disposal of masks by  
HCWs is essential**

# Masks must be part of broad public health interventions

- Rigorous testing for COVID (including asymptomatic)
- Rigorous contact tracing
- Isolation of infected people
- Social distancing
- Hand hygiene
- **Universal use of Masks – #Masks4All**  
([masks4all.org](https://masks4all.org))

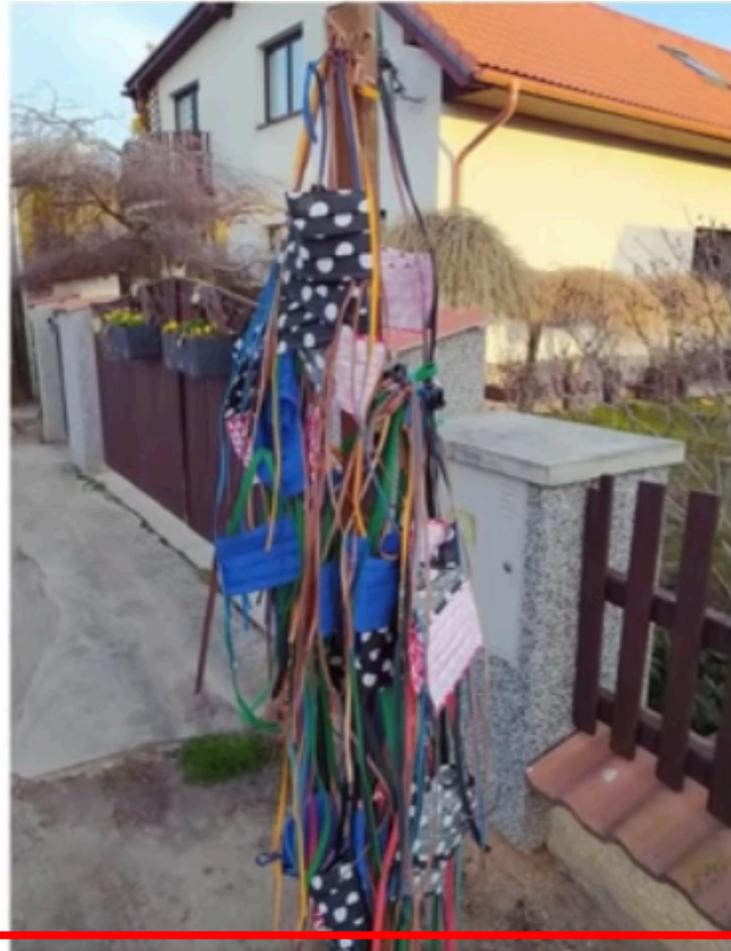
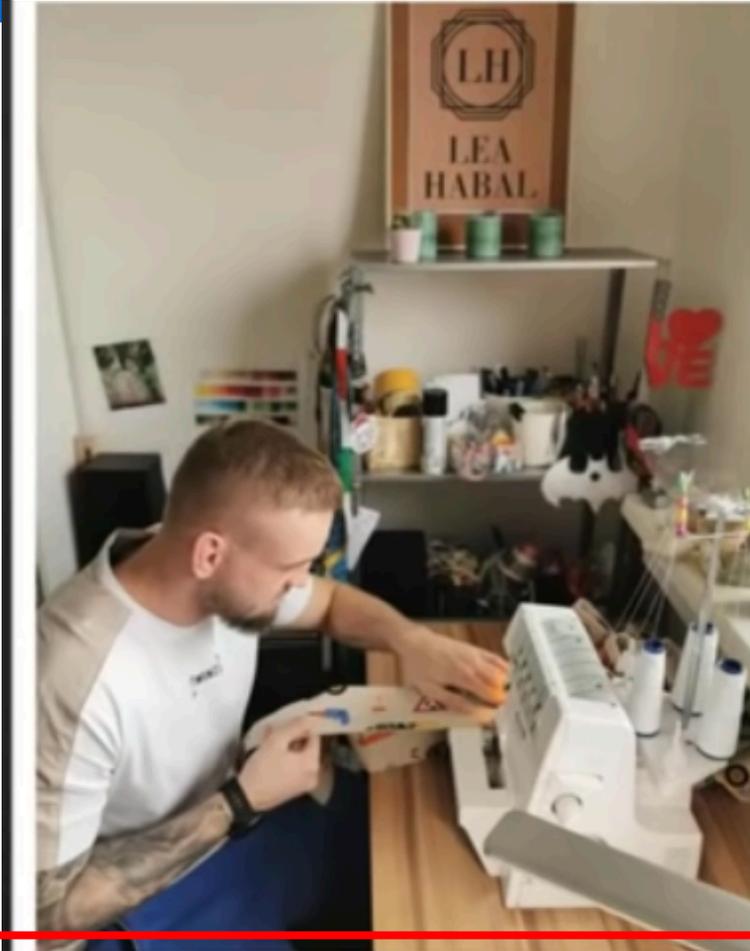
[https://www.theunion.org//COVID-Editorial-Leung-et-al\\_accepted\\_for\\_publication.pdf](https://www.theunion.org//COVID-Editorial-Leung-et-al_accepted_for_publication.pdf)

EDITORIAL

**Let us not forget the mask in our attempts to stall the spread of COVID-19**

C. C. Leung,<sup>1</sup> T. H. Lam,<sup>2</sup> K. K. Cheng<sup>3</sup>

# Lets make masks....



<https://www.youtube.com/watch?v=BoDwXwZXsDI&feature=youtu.be>

<https://www.youtube.com/watch?v=9K4dH3-LHLQ>

[https://www.youtube.com/watch?v=lOe\\_8z8k01U](https://www.youtube.com/watch?v=lOe_8z8k01U)