Review of science and policy around face masks and COVID-19

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This paper summarises some of the evidence and policies around the use of non-surgical non-N95 masks by the public and in clinical settings for the purposes of reducing transmission of SARS-Cov-2/COVID-19. It is not intended to be an exhaustive, systematic review of the literature. Without a systematic review, we cannot be certain that all studies and literature have been identified and appropriately included. This paper also does not attempt to provide discussion on the quality of studies, the robustness of their findings and their limitations and strengths.

This report does not constitute guidance or policy on the use of face masks.

Guidance and recommendations from agencies

1. From the WHO: "*The use of masks made of other materials (e.g., cotton fabric), also known as nonmedical masks, in the community setting has not been well evaluated. There is no current evidence to make a recommendation for or against their use in this setting*."
2. Interim guidance from the WHO on the use of mask in the context of COVID-19 states that the use of "*non-medical masks in the community setting has not been well evaluated"*.

   "There is no current evidence to make a recommendation for or against their use in this setting." "*WHO stresses that it is critical that medical masks and respirators be prioritized for health care workers.*"
3. Patient advice from JAMA: "*Unless you are sick, a health care worker, or caring for someone who has COVID-19, medical masks (including surgical face masks and N95s) are not recommended*."
4. CDC "recommends wearing cloth face coverings in public settings where other social distancing measures are difficult to maintain (e.g., grocery

stores and pharmacies) especially in areas of significant community-based transmission." "Can be used as an additional, voluntary public health measure."

5. The CDC recommends the use of face masks but cannot find "any data that can quantify the risk reduction from the use of masks."

Science in the COVID-19 context

6. **No clinical trials on the efficacy of face coverings in public settings to protect against COVID-19 were identified.** Therefore, evidence is being pulled from indirect research. Much of this is associated with influenza, SARS, clinical settings, or N95 v surgical, for example.
7. This small study (n=4) examined the effectiveness of surgical and cotton masks in blocking SARS–CoV-2 in a controlled comparison in four patients.
    - **Conclusion: *"both surgical and cotton masks seem to be ineffective in preventing the dissemination of SARS–CoV-2 from the coughs of patients with COVID-19 to the environment and external mask surface."***
    - There has been much debate in response to this paper, specifically around the small sample size.
8. ***"Infection control measures like handwashing, wearing masks, protective clothing or gloves, are widely endorsed as a means of curbing the spread of COVID-19." "None of these measures present a silver bullet." "The efficacy of these measures can be compromised drastically when used imperfectly."***
9. N95 masks are most effective, followed by surgical masks. **Homemade masks are least effective**
10. Based on a non-systematic review, the Royal Society DELVE Initiative supports public mask use. The analysis suggests that "their use could reduce onward transmission by asymptomatic and pre-symptomatic wearers if widely used in situations where physical distancing is not possible or predictable, contrasting to the standard use of masks for the protection of wearers." The authors note the small number of studies.
    - **This report has been criticised by other scientists "… warning that it amounted to no more than opinion and overstated the available evidence.".**

- **“That is not a piece of research. That is a non-systematic review of anecdotical and non-clinical studies,” said Dr Antonio Lazzarino, of University College London’s (UCL) Department of Epidemiology and Public Health**.
- “Based on what we now know about Covid-19", Dr Lazzarino said, “**the negative effects of wearing masks outweigh the positive”.**
- Dr Ben Killingley, Consultant in Acute Medicine (Clinical Lead) and Infectious Diseases, University College London Hospital, said: “Regarding the analysis of the evidence base **– the report is overly optimistic about the value of face coverings and it is incorrect to conclude that the evidence shows that face covering can reduce viral transmission in the community**. **There is in fact no good evidence that face coverings achieve this.”**

11. An observational study of 10,211 pedestrians in several regions across Hong Kong between 1st–29th Feb 2020.

- *“94.8% (n = 9683) wore masks of which 83.7% wore disposable surgical masks.*

  However, 13.0% wore them incorrectly; with 35.5% worn ‘inside-out’ or ‘upside-down’; and 42.5% worn too low, exposing the nostrils or mouth. Many individuals who did not wear masks were smoking, eating, or covering their mouth and nose with tissues or hands. This is a dangerous practice which risks transmission from contaminated fomites.”
- The same study reports on an online survey (n=2859) “***76.3% of respondents reused their masks”. “Despite being considered unsafe****, reusing surgical masks is common when resources are stretched*.”
- The authors suggest that, subject to infection control, “*experts proactively formulating rational guidelines and devise methods for safe handling and storage of face masks for reuse, should it become necessary, [mask wearing] may prove to be the lesser of the two evils*.”

A journal article published in Korea: “*The temporary conclusion of this study based on limited epidemiological data and information on confirmed cases currently available is that group meetings lead to massive infections of COVID-19, and that caring for individual hygiene by wearing masks and sanitary gloves can prevent its spread. However, in the current epidemic, the group that needs the most masks are the medical staff working on the front lines. Therefore, an individual's wearing of a mask should be limited to patients suspected of having an infection*.”

From Hong Kong, epidemiological data and telephone survey of behaviour: “Our study shows that non-pharmaceutical interventions (including border restrictions, quarantine and isolation, distancing, and changes in population behaviour) were associated with reduced

transmission of COVID-19 in Hong Kong, and are also likely to have substantially reduced influenza transmission in early February, 2020."

- **In a Letter to the Editor of Cardiology Journal, the physical properties of a cloth mask, reuse, the frequency and effectiveness of cleaning, and increased moisture retention, may potentially increase the infection risk**
  - **The effectiveness of public mask wearing is speculative** "*would probably intercept the transmission link*".
  - ***"Most people in all seriously affected areas are reusing their disposable masks. The physical properties of a cloth mask, reuse, the frequency and effectiveness of cleaning, and increased moisture retention, may potentially increase the infection risk."***
- **In a cluster randomised trial of cloth masks compared with medical masks in healthcare workers, the rates of all infection outcomes were highest in the cloth mask arm. "*The results caution against the use of cloth masks*".**
  - ***"Results: The rates of all infection outcomes were highest in the cloth mask arm, with the rate of ILI statistically significantly higher in the cloth mask arm (relative risk (RR)=13.00, 95% CI 1.69 to 100.07) compared with the medical mask arm**. Cloth masks also had significantly higher rates of ILI compared with the control arm. An analysis by mask use showed ILI (RR=6.64, 95% CI 1.45 to 28.65)* **and laboratory-confirmed virus (RR=1.72, 95% CI 1.01 to 2.94) were significantly higher in the cloth masks group compared with the medical masks group. Penetration of cloth masks by particles was almost 97% and medical masks 44%."***3*
- Seasonal influenza: In an observational study conducted in elementary school children in Japan wearing masks reduced infection by around 15% (OR0.859; 95%CI 0.778-0.949) had significant protective association. Effectiveness of protection methods differed between old and young schoolchildren.
- Rapid expert consultation on the effectiveness of fabric masks for the COVID-19 pandemic stated there is "*only limited, indirect evidence regarding the effectiveness of [home-made fabric] masks for protecting others, when made and worn by the general public on a regular basis. That evidence comes primarily from laboratory studies testing the*

effectiveness of different materials at capturing particles of different sizes.” “*The current level of benefit, if any, is not possible to assess*.”

- Effect on users' risk behaviour: "*In our rapid review, we found no studies of the effects of wearing masks on users' behaviour. Speculatively, for some users, masks could provide a constant reminder of the importance of social distancing, as well as signal its importance to others, strengthening the social norm of social distancing.*

  Conversely, for some users, masks might "crowd out" other precautionary behaviours, giving them a feeling that they have done enough to protect themselves and others. Prior research, conducted in less intense settings, could support either speculation. Focused research could help determine when precautionary behaviours reinforce or displace one another. It is critically important that any discussion of homemade fabric masks reinforce the central importance of physical distancing and personal hygiene (frequent handwashing) in reducing spread of infection"

18. A synopsis summary published by Public Health Ontario: "The majority of studies **have not demonstrated benefit in cluster randomized controlled trials evaluating the effect of members of the general public wearing masks in non-healthcare settings to prevent the acquisition of viral respiratory infections**.
    - There is variability in the effectiveness of homemade and cloth masks.
    - **If masks are not used appropriately, and not combined with meticulous hand hygiene, there is a theoretical risk of increased infection risk through self- contamination**.
    - Any potential benefits of mask wearing are likely less impactful than physical distancing and hand hygiene. "
19. The efficacy of three types of masks and instant hand wiping was evaluated in a study conducted in China using avian influenza virus to proxy the coronavirus. "N95 masks, medical masks, and homemade masks made of four-layer kitchen paper and one-layer cloth could block 99.98%, 97.14%, and 95.15%, respectively, of the virus in aerosols." Authors propose that "*combined mask-wearing and instant hand hygiene (MIH) to slow the exponential spread of the virus*."
20. In an analysis piece published in the BMJ the authors state that the precautionary principle suggests acting "*without definitive evidence*".
    - "***Whether masks will reduce transmission of covid-19 in the general public is contested.*"**
    - *"Even limited protection could prevent some transmission of covid-19 and save lives*."
    - "Because covid-19 is such a serious threat, wearing masks in public should be advised."

21. With a shortage of N95 masks, surgical masks afford varying degrees of protection, dependent upon proper usage. "*Cloth masks carry unclear and variable benefits and may be a last-resort option only when respirators and surgical masks are unavailable*."
22. A review of evidence identified in what circumstances are standard masks putting healthcare workers at risk of contagion compared to respirator masks. "*Standard surgical masks are as effective as respirator masks (e.g. N95, FFP2, FFP3) for preventing infection of healthcare workers*."
23. An article by the Centre for Evidence-Based Medicine: discusses whether in the current pandemic we should all be wearing wear masks or not and if so in what circumstances. "But what of the folk walking down the road, going to the supermarket or watching the ducks in the pond? The answer is simple: we do not know."

- An article published in One Health states that "Coronaviruses are small, approximately 100– 120nm (0.12µm) in diameter. **This makes them able to pass the pores of the surgical masks very easily."**
- Aerosol Filtration Efficiency of Common Fabrics Used in Respiratory Cloth Masks: The study reviewed "several common fabrics including cotton, silk, chiffon, flannel, various synthetics, and their combinations. Filtration efficiencies for various fabrics when a single layer was used ranged from 5% to 80% for particle sizes of <300nm (SARS-COV-2 ≈120nm). The efficiencies improved when multiple layers were used and when using a specific combination of different fabrics. Filtration efficiencies of the hybrids (such as cotton-silk, cotton-chiffon, cotton-flannel) was >80% (for particles <300 nm) and >90% (for particles >300 nm)."

Policy in the COVID-19 context

- A comment piece published in The Lancet compares face mask use recommendations by different health authorities. There is "consistency in the recommendation that symptomatic individuals and those in health-care settings should use face masks", **but wide "discrepancies were observed in recommendations for the general public and community settings".**

Science outside the COVID-19 context

Clinical

- Bioburdens of the disposable surgical mask (SM) in terms of surgical site infection "SM (A: medical mask; B: medical surgical mask) and newly laundered cloth SM (C) were tested. Results: The bioburden of mask A was the highest. The bioburden of mask B was the lowest. **Mask C (newly laundered cloth mask) possessed the lowest filtering efficiency and the highest airflow resistance.** SM bioburden was higher in the speaking group. SM bioburden showed no significant difference after washing the face, despite the finding that washing could significantly reduce facial bioburden."
  - Conclusions: "*Multiple factors influence SM bioburdens. Mask B showed the lowest bioburden and best protection effects.* **Mask C is not recommended to be used [in surgical context], especially considering that surgeons do not wash the cloth masks daily. Unnecessary talking during operation is not recommended, and washing the face before surgery is not strictly necessary**."
- Optical Microscopic Study of Surface Morphology and Filtering Efficiency of Face Masks: Background: "Low-cost face masks made from different cloth materials are very common in developing countries. The cloth masks (CM) are usually double layered with stretchable ear loops. "
  - "It is common practice to use such masks for months after multiple washing and drying cycles."

- This study “characterized the surface of twenty different types of CMs using optical image analysis method.”
- Results: **“The pore size of masks ranged from 80 to 500µm (micrometres). SARS-Cov-2 is approximately 0.12 µm in diameter. This study showed that the filtering efficiency of cloth face masks were relatively lower, and washing and drying practices deteriorated the efficiency.”**

Surgical masks as source of bacterial contamination during operative procedures. This study “investigated the difference in bacterial counts between the surgical masks (SM) worn by surgeons and those placed unused in the operating room (OR), and the bacterial count variation with indicated wearing time. **The bacterial count on the surface of SMs increased with extended operating times.”**

- **"This study provides strong evidence for the identification that SMs as source of bacterial contamination during operative procedures."**

4. This study assessed the bacterial and fungal presence and prevalence on used surgical mask in dental practice. Conclusion: "dental professionals should change the mask after each dental operatory procedures, especially those beyond 2 hours. Double-layered surgical mask or 95% efficiency for aerosol particles of 3.0 to 5.0 μm in diameter should be provided to patients as well to prevent cross-contamination."
5. This study assessed the relationship of bacterial and fungal contamination on used surgical masks worn by the hospital personnel and microbial air quality in their working wards. **Results found that "bacterial and fungal counts in air samples showed significantly positive correlation with the bacterial contamination load on outside area of the used masks**, Conclusion: **High bacterial contamination on the outside area of the used masks was demonstrated, and it showed a significant correlation with microbial air quality of working wards."**

Non-clinical

6. Meta-analysis on the effectiveness of N95 respirators vs surgical masks in health care workers: **"insufficient data to determine definitively whether N95 respirators are superior to surgical masks in protecting health care workers against transmissible acute respiratory infections in clinical settings**."

7. A study published in 2001 on the occurrence of respiratory diseases Among Saudi women who wear a face veil: **"Respiratory infections and asthma were significantly more common in veils users."**
8. Systematic review on the use of masks and respirators to prevent transmission of influenza. This included studies in clinical and non-clinical settings:
    - **"None of the studies established a conclusive relationship between mask/respirator use and protection against influenza infection**. Some evidence suggests that mask use is best undertaken as part of a package of personal protection especially hand hygiene. The effectiveness of masks and respirators is likely linked to early, consistent and correct usage."
9. Cochrane review in July 2011 "Physical interventions to interrupt or reduce the spread of respiratory viruses". Main findings:
    - *"The highest quality cluster-RCTs suggest respiratory virus spread can be prevented by hygienic measures, such as handwashing, especially around younger children.*
    - *Surgical masks or N95 respirators were the most consistent and comprehensive supportive measures.*
    - *N95 respirators were non-inferior to simple surgical masks but more expensive, uncomfortable and irritating to skin.*

- *Adding virucidals or antiseptics to normal handwashing to decrease respiratory disease transmission remains uncertain.*
- *Global measures, such as screening at entry ports, led to a non-significant marginal delay in spread.*
- **There was limited evidence that social distancing was effective, especially if related to the risk of exposure.”**

10. Canada. A Personal View article published in The Lancet: Infectious Disease entitled

‘Collateral damage: the unforeseen effects of emergency outbreak policies.’ A review of policies and their success/failure.

- “Concerns that improperly fitted masks may have contributed to a nosocomial
  cluster led the POC to issue a province-wide requirement for N95 mask-it testing.”
- With a focus on masks, “there was concern that staff might ignore important control measures such as hand washing and avoiding self-contamination, and actually increase their risk of acquiring infection.”

A study published in 2013 entitled ‘Testing the Efficacy of Homemade Masks: Would They Protect in an Influenza Pandemic?’ This study (n=21) examined homemade masks as an alternative to commercial face masks. Findings ***“suggest that a homemade mask should only be considered as a last resort to prevent droplet transmission from infected individuals, but it would be better than no protection”.***

The aim of this study (published as a letter to the editor in the New England Journal of Medicine) “was to provide visual evidence of speech-generated droplets and to qualitatively describe the effect of a damp cloth cover over the mouth to curb the emission of droplets.”

- “When [the subject spoke] through a slightly damp washcloth over the speaker’s mouth, the flash count remained close to the background level (mean, 0.1 flashes); this showed a decrease in the number of forward-moving droplets.”

Benefits and advantages v. Risks and pitfalls

Benefits and advantages

- May reduce viral spread from viral shedders. This might be particularly important in the context of asymptomatic and pre-symptomatic people
- Masks may provide protection in closed spaces, such as public transport
  - Considers protection by face masks against influenza A(H1N1) pdm09 virus on trans-pacific passenger aircraft, in 2009. "Wearing a face mask was a protective factor against influenza infection. We recommend a more comprehensive intervention study to accurately estimate this effect."
- Masks may provide some protection at mass gatherings
  - The paper concludes "A modest proportion of attendees of MGs [mass gatherings] use facemask, the practice is more widespread among health care workers. Facemask use seems to be beneficial against certain respiratory infections at MGs **but its effectiveness against specific infection remains unproven."**
- Masks can be effective when used alongside hand hygiene
  - Objective: "To investigate whether hand hygiene and use of facemasks prevents household transmission of influenza."
    - Conclusion: "Hand hygiene and facemasks seemed to prevent household transmission of influenza virus when implemented within 36 hours of index patient symptom onset. These findings suggest that nonpharmaceutical interventions are important for mitigation of pandemic and interpandemic influenza."
    - "Variable adherence may have mitigated intervention effectiveness"
- Cloth masks can be made at home at low cost, are washable and reusable, and therefore reduce the demand on the ones needed by healthcare professionals.
- Universal wearing of masks fosters a sense of social solidarity in response to the pandemic
- Masks were a potential link to lower risk of SARS amongst people without known contact during the SARS epidemic
- Medical masks and N95 masks can be reused for a few days with steam decontamination between use.

Risks and pitfalls

- **"Improper use of face masks, such as not changing disposable masks, could jeopardise the protective effect and even increase the risk of infection."**
- "There is a risk that improper removal of the face mask, handling of a contaminated face mask or an increased tendency to touch the face while wearing a face mask by healthy **persons might actually increase the risk of transmission."**

- Home made cloth masks may be too porous to protect against SARS-Cov-2. The pore size of masked assessed in this study ranged from 80 to 500µm, while the diameter of the SARS-Cov-2 virus is approximately 0.12µm**.(NANO SCALE)**
    - "Washing and drying cloth masks deteriorates their efficiency. After 4 wash-dry cycles, the filtering efficiency of a cloth mask decreased from ~65% to ~50%."
- Researchers have found that masks may not be as effective at filtering COVID-19
- **Masks are not as effective as hand-washing, and**
    - "**Hand hygiene provided a significant protective effect**"
    - "**facemask use provided a non-significant protective effect**."
- Used/dirty masks not disposed of correctly become a health hazard

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- Difficult to use for some people, such as young children or people with respiratory issues ○ "Self-contamination by touching and reusing contaminated mask"
    - **Cloth (homemade) masks can become a breeding ground for pathogens due to irregular washing, moisture retention, and poor filtration**
    - Masks must fit correctly to be effective and used correctly to be effective
- May be used instead of, rather than as well as, hand-washing and social distancing
    - Masks can instil a false sense of security which could lead to engaging in higher risk behaviours
- Masks could create a false sense of security that could end up putting people at greater risk. Even with the mouth and nose fully covered, the virus can still enter through the eyes.
- Mandatory wearing increases demand, stretches supply - particularly for those required by health professionals
- **This journal article considers the quantity of masks required if people must wear them daily, repeat use of single-use masks in the face of shortages, and what to do with the rubbish. Used masks have been discarded in different places, such as buses, train stations, hospitals, streets, etc. These discarded masks may cause secondary infections**.
- "Discarded masks may cause secondary infections, which is a foremost concern of medical professionals. Therefore, the proper disposal of mask garbage should be actively promoted, and the public should learn how to properly deal with used masks".
- Low compliance for mask wearing in uninfected close contacts
- Depending on type of mask used, potential breathing difficulties
- Improper decontamination of medical masks or N95 masks can damage the blocking structure of masks

Country/State Policies

Country	Formal policy	Compulsory wearing	Policy	Mask type	Enforcement
Australia	N	N	Recommended for those who are sick and health care workers; **not for healthy public to prevent community transmission.** Specific requirements are in place for people who have returned from a country or region that is at high or moderate risk for COVID-19, or think may they have been in close contact with a confirmed case of coronavirus.	surgical masks	-
Austria	Y	Y	Compulsory in public transport, supermarkets, other food and drug stores. Supermarket needs to provide masks to the customers if they don't have one.	DIY	-
Belgium	Y	N	The federal government has not recommended facemasks for citizens unless someone suspects they actually have the virus. However, once the stay-at-home restrictions are lifted, sometime after 3 May, the wearing of facemasks **will be "advised** for any situation where a contact of at least 1.5 meters cannot be kept and in places where there will be a lot of people (for example in public transport and supermarkets)"	-	-
Bulgaria	Y	Y	Mandatory to wear a protective mask when in indoor or outdoor public places. Effective until April 26.	DIY	-
Canada	Y	y	Minister of Transport (April 20) announced requirement for all	Medical or DIY	-

			air passengers to have a non-medical mask or face covering to cover their mouth and nose during travel. Medical masks, including surgical, medical procedure face masks and respirators (like N95 masks), must be kept for healthcare workers and others providing direct care to COVID-19 patients. Also provide considerations on homemade masks, which could be used for short periods of time when physical distancing is not possible but has limitations.		
China (varies by province)	-	-	-	-	-

Cuba	Y	y	As reported on 1 Apr 2020, Cuban authorities are requiring the use of facemasks for anyone leaving their homes, threatening fines of up to 70 US dollars for those caught without a face covering.	home-made masks	fines of up to $70USD
Czech Rep	Y	y	Introducing a ban on any movement outside one's place of residence without protective respiratory equipment.	no guidance	-
Finland	N	N	**Finnish health officials have not recommended the use of protective masks for ordinary people, but there is dissent in the** ranks	-	-
Germany, **Bremen**	Y	y	Compulsory on public transport	no guidance	-
Germany, **Berlin**	Y	y	Compulsory on public transport Not when shopping	no guidance	-
Germany, **Rhineland**	Y	y	Compulsory on public transport Pupils will be given masks as part of lockdown exit from end May.	no guidance	-
Germany, **Bavaria**	Y	y	Compulsory on public transport Compulsory for everyone age >7y	surgical masks	-
Germany, **BW**	Y	y	Compulsory on public transport	no guidance	-
Hong Kong	N	N	Should put on surgical mask if travelling outside of Hong Kong and when returning to keep it on for 14 days; essential to wear surgical mask if symptomatic and if taking public	surgical masks	-

			transport or staying in crowded places. N95 respirators generally not recommended for general public due to training required and inadvertent risk of exposure		
Ireland	N	n	Wearing a mask is unlikely to be of any benefit if you are not sick.	-	-
Israel	-	-	Israeli guidelines added the obligation to wear reusable (home- made) masks in public environment/places where you can’t keep social distance.	-	-

Italy, Lombardy, Tuscany	Y	y	Lombardy, Tuscany make face masks compulsory;Authorities in Lombardy have introduced a law obliging citizens to wear face masks when they go outside	no guidance	-
Japan	N	N	Advised for use in confined and badly ventilated spaces; not considered efficient for open air environment	-	-
Lithuania	Y	y	Wearing a face mask or any other means of covering one's nose and mouth in public places is compulsory in Lithuania	no guidance	-
Luxembourg	Y	y	Wearing a mask is mandatory in places where it is not possible to keep enough distance to others such as supermarkets or on public transport	no guidance	-
Mexico, 11 states and Mexico City	Y	Y	Reported on 17/04/2020 that at least 11 states and Mexico City have declared the mandatory use of face masks in public places or in certain locations. However, it appears unlikely that Federal Government will make face mask usage mandatory given Deputy Health Minister Hugo López-Gatell's statement the week prior that there was no solid evidence about its widespread use and that it can lead to false sense of security.	no mention of type	some local authorities are imposing fines or other sanctions
Mongolia	Y	Y	If caught not wearing masks, in public places will result in fine of MNT 150,000 as it would be considered intentional to harm other people's health.	single use surgical masks or reusable cotton face masks	Fine MNT 150,000, ≈NZ$90.

Netherlands	Y	n	The Dutch government is holding firm to its refusal to make the wearing of face masks compulsory, despite mounting pressure from MPs.	-	-
Norway	Y	N	Norwegian Institute of Public Health: Not recommended to use face masks outside the healthcare service	-	-
Poland	Y	y	Covering the nose and mouth every time people leave their house	no guidance	fine
Portugal	N	N	No guidance, but government is thinking about it.	-	-
Russia, Khabarovsk	Y	y	Wearing of face masks is obligatory in the eastern Russia city	no guidance	-

Singapore	Y	y	As reported on 14 April, the Multi-Ministry Taskforce decided to make it mandatory for all persons to wear a mask when leaving their home during the period 7 April till 5 May 2020. This includes public transport, taxis, when in private cars, walking to or at markets and for all essential workers at all workplace premises. Surgical masks to be prioritised for health care workers due to global shortage of masks	reusable masks	First-time offenders charged $300, and repeat offenders will face higher fines or prosecution in court.
Slovakia	Y	y	Compulsory once you leave home	-	-
Slovenia	Y	y	For those who do venture to shops, face masks, even ones made at home, or equivalents such as scarves that cover the mouth and nose will be mandatory along with protective gloves; masks and gloves need to be worn in indoor public spaces.	DIY	-
South Korea	N	n	Health authorities are advising everyone to wear masks in the presence of others and to change into a new mask everyday.	-	-
Spain	N	n	the government distributes free face masks for commuters in large transportation hubs, but it is not mandatory to wear them	no guidance	-
Switzerland	Y	n	**Not a requirement**	-	-
Taiwan	Y	y	In addition to requiring physical distancing of more than 1 meter in public, as of April 1, face masks are mandatory when taking	-	-

			public transportation		
UK	N	n	The government's scientific advisory group for emergencies (Sage) met on Tuesday to review the evidence on wearing face masks. The Guardian understands that the group is split on the best policy to adopt because the evidence is so weak. The public should not and must not divert medical-grade supplies.	-	-
USA, NY and NJ	Y	y	Requirement for people to wear masks or face coverings in public whenever social distancing was not possible, to be effective from 17 April. Governor Murphy issued similar requirement for New Jersey with exception for children under 2 and those with a medical condition that prevents them from wearing masks.	DIY	civil penalties are being considered but not criminal penalties in New York. Some arrests made by police in New

					Jersey for non-compliance with requirements
USA, MD	Y	y	Effective on 18 April, masks are required to be worn at all retail establishments including grocery stores, pharmacies and public transportation. All people over age 9 to comply. Medical grade masks to be reserved for health care workers and first responders.	DIY	subject to imprisonment not exceeding one year or a fine not exceeding $5,000 or both.
USA, PA	Y	y	State order on the use of face masks or face coverings in grocery stores, markets and pharmacies or any businesses providing essential services during the pandemic. Employees and customers must wear face masks whenever on the premise of a business. Exceptions for businesses that provide medication, medical supplies or food, which provide pick-up or delivery service	DIY	none stated
USA, CT	Y	y	Effective on 20 April, state order issued by Governor Lamont on use of cloth face coverings or higher level protection in public whenever close contact is unavoidable. This includes using taxi, car, livery, ride-sharing or similar service or means of mass public	DIY	none stated

			transit, or while within any semi-enclosed transit stop or waiting area. Exemption for children under 2, older child who cannot and anyone whose medical condition prevents them from doing so.		
USA, RI	Y	y	Executive order on mandatory use of masks by businesses and customers. Exception for children age <2 and those for whom masks can endanger their life.	DIY	non compliance by customers can mean being denied entry and provision of service

USA, HA	Y	y	State order mandates the use of face coverings by customers and employees of essential businesses. It does not apply to persons who are engaged in permissible outdoor exercise activities so long as social distancing requirements are maintained. Masks should not be worn by children ≤2y, or anyone who has trouble breathing.	DIY	none stated
USA, CO	Y	y	Critical workers to wear a non-medical face covering. This includes workers in critical business, and critical functions, like grocery store workers, staff at senior care facilities, food supply or roads.	DIY	none stated
USA, IL	N	N	Some municipalities require everyone to wear a mask while in public. Exceptions are when exercising or doing other physical activities outside, riding in a personal vehicle, or while eating or drinking. But no statewide order issued mandating this.	DIY	Some reports in municipalities that are mandating requirements for face coverings, where arrests for non compliance and denial of services have occurred.
USA, CA	N	N	Face covering guidance from California Department of Public Health states that counties that intend to promote face covering policies should ensure that they do not put increased pressure on demand for medical masks - these should be	DIY	-

			reserved for health care workers. Other evidence based interventions such as social distancing and hand washing should be encouraged in conjunction.		
USA, FL	N	N	Provides guidance on use of face masks when one is sick and is coughing or sneezing. The carer of sick person should also wear a face mask. Discouraged from using masks if not sick - due to shortage of supply of masks.	-	-
USA, WA	N	N	Based on recommendation from CDC that people wear cloth face coverings when they are in public settings where they cannot maintain 6 feet of distance from others. This includes trips to the grocery store, pharmacy, hardware store, health	DIY	-

			clinic or similar places. Does not mandate face covering - considers it as an additional layer of protection.		

Literature Search strategy

Database: Ovid MEDLINE(R), search strategy adapted for Cochrane, Embase, Scopus, OVID Nursing, CINAHL, MEDRXIV (preprint server for health services)

Search Strategy:

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1 (facemask$ or face-mask$ or mask$ or ((face$ or cloth$) adj3 cover$)).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]

2 (2019-ncov or ncov19 or ncov-19 or 2019-novel CoV or sars-cov2 or sars-cov-2 or sarscov2 or sarscov-2 or Sars-coronavirus2 or Sars-coronavirus-2 or SARS-like coronavirus* or coronavirus-19 or covid19 or covid-19 or covid 2019 or ((novel or new or nouveau) adj2 (CoV on nCoV or covid or coronavirus* or corona virus or Pandemi*2)) or ((covid or covid19 or covid-19) and pandemic*2) or (coronavirus* and pneumonia)).mp.

3 (1 and 2)

4 limit 3 to yr="2019 -Current"

Further, and to provide coverage of policy measures, additional sources have been used including, for example, major news agencies.