

DIY MASKS TORONTO: Collaborative Literature & Tutorial Review

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BACKGROUND

- **Project DIYMasksTO¹** is conducting a **collaborative literature review** to determine the **safety and effectiveness** of home-made masks, **and a tutorial review** to determine which materials, design, and instructions may be suitable for our context.
- We hope to provide a resource to understand DIY mask best practice, and produce **masks for distribution to community workers** (i.e. grocery store clerks, delivery couriers, other essential service workers, on-the-ground volunteers, etc.).
- We hope this will **reduce community transmission**, and divert **surgical & N95 masks to frontline medical staff** (hospitals, pharmacists, etc.).

OUR RESEARCH QUESTIONS

(please feel free to add more!)

- **Safety / Effectiveness:**
 - Are DIY Face masks effective? Should the average person wear a mask? When might they be more helpful or harmful?
 - Who would these masks be for? For what purpose(s) will they be used?
 - Given risks, should we only encourage them if it gets to X% of local transmission? If so, what % might this be? How do we account for insufficient testing (and therefore high likelihood of under-estimation)

¹ We are a small group based in Toronto / Tkaronto, Canada connected to [Caremongering-TO](#), [OpenSource Covid Medical Supplies](#), and the [CommunityMake](#) project.

- How scarce are they actually in our context (Toronto, Ontario, Canada)? Are hospitals reporting shortages?
- What are important design specs to consider for choosing a DIYMaskTO tutorial?
- Which materials are most effective in preventing Covid19?

- Production / Logistics

- Where to source the materials? How much would they cost? How available/accessible in our local community?
- How to balance ease of use & production vs. effectiveness? Do they require a sewing machine? 3D printing machine?
- Which tutorials are most clear? Which tutorials might cause harm and we would want to discourage?
- Which groups in the community can we reach out to to produce them? How might we recruit individual volunteers?

HOW YOU CAN HELP:

1. Add new literature & tutorials

- Look for more literature and tutorials that can answer our research questions, and paste them in [Sources To Review](#) or [Tutorials to Review](#).

2. Contribute to our collaborative annotated bibliography

- Contribute to our [collaborative annotated bibliography](#) using the following template:
 - Article author, title & link:
 - Article date:
 - Reviewed by: (Your name here)
 - Questions this source answers: (*choose from a few of the research questions above*)
 - Summary notes from article/source:
 - Concerns/Limitations (e.g. of source validity); Arising Questions & Other Comments
 - Tips:
 - If academic source, reviewing the abstract should be sufficient (but be critical of methodology & highlight limitations) .

- Try speed-reading by reviewing intro, conclusion, and skim the methodology.
- If non-academic source, critically assess expertise of author. Do they have credentials to make their claims? Are they citing sources?

3. Contribute to collaborative tutorial review

- a. Contribute to our [collaborative tutorial review](#) using the following template(s)²:
 - **Design Title [hyperlinked]:**
 - Reviewed [date]
 - Reviewed by: [your name, if you wish]
 - Materials Used
 - Simplified Instructions:
 - Pros of Tutorial
 - Cons of Tutorial
 - Other comments?

4. Contribute to the synthesis document & working tutorial:

- a. Contribute to the [synthesis document](#) of these findings or review our [working tutorial](#). **Update: We w/ support of CommunityMake have developed a tutorial review based on these findings:**
<http://communitymake.ca/diy-face-mask> . Given the uptake of DIY masks, the synthesis effort is no longer an urgent priority for our team. We hope whatever shape this is, can still be considered a useful resource!

5. Join our Team

- a. If interested, join our team! We need researchers, project leads, mask-makers!
 - i. Click here to join the [CommunityMake Slack](#) -- **Join the #DIYFaceMasks_Research channel.**
 - ii. [Volunteer as a mask-maker](#) (for Toronto / Greater Toronto Area)
 - iii. Join our next community call on **Wed Mar 25th, 5-6pm** (put your name, email below)

² These templates inspired by [Open Source Covid19 Medical Supplies - Surgical Masks](#)

1. Minutes from our first call: [Community Call 1: Fri Mar 20th, 8:30-9:30pm EST](#)
2. Rough minutes from our second call: [Community Call 2: Mon Mar 23th, 6:00-7:00pm EST](#)
3. Names, emails:

COLLABORATIVE ANNOTATED BIBLIOGRAPHY

Copy and paste the template below, and choose one of the [sources](#) to review.

TEMPLATE: Last name (Date published) Article title [hyperlinked]:

Article date:

Reviewed by: (Optional: name here, footnote contact info³)

Research Questions you're answering:

Summary notes from article/source:

Concerns/Limitations/Arising Qs/Comments/Implications:

Davies et. al (2013) [Testing the Efficacy of Homemade Masks: Would they protect in an influenza pandemic?](#)

Article date: August 2013

Reviewed by: MH.⁴

Research Questions you're answering:

- Are DIY Face masks effective? Should the average person wear a mask? When might they be more helpful or harmful?
- Which materials are most effective in preventing Covid19?

Strengths/Concerns/Limitations/Arising Questions/Implications:

- **Effectiveness of DIY Face Masks:**
 - **From abstract.**
 - This study examined homemade masks as an alternative to commercial face masks
 - Both masks significantly reduced the number of microorganisms expelled by volunteers, although the surgical mask was 3 times more effective in blocking transmission than the homemade mask.
 - Our 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.** (Disaster Med Public Health Preparedness. 2013;0:1-6).
- **Conclusion:**

³ If people want to get in touch

⁴ maggiepyhuang@gmail.com

- A protective mask may reduce the likelihood of infection, but it will not eliminate the risk, particularly when a disease has more than 1 route of transmission. **Thus any mask, no matter how efficient at filtration or how good the seal, will have minimal effect if it is not used in conjunction with other preventative measures, such as isolation of infected cases, immunization, good respiratory etiquette, and regular hand hygiene.**
- **An improvised face mask should be viewed as the last possible alternative if a supply of commercial face masks is not available,** irrespective of the disease against which it may be required for protection.
- **Improvised homemade face masks may be used to help protect those who could potentially, for example, be at occupational risk from close or frequent contact with symptomatic patients. However, these masks would provide the wearers little protection from microorgan- isms from others persons who are infected with respiratory diseases.** As a result, we would not recommend the use of homemade face masks as a method of reducing transmission of infection from aerosols

- **Materials:**

TABLE 1

Filtration Efficiency and Pressure Drop Across Materials Tested with Aerosols of <i>Bacillus atrophaeus</i> and Bacteriophage MS2 (30 L/min)^a						
Material	<i>B atrophaeus</i>		Bacteriophage MS2		Pressure Drop Across Fabric	
	Mean % Filtration Efficiency	SD	Mean % Filtration Efficiency	SD	Mean	SD
100% cotton T-shirt	69.42 (70.66)	10.53 (6.83)	50.85	16.81	4.29 (5.13)	0.07 (0.57)
Scarf	62.30	4.44	48.87	19.77	4.36	0.19
Tea towel	83.24 (96.71)	7.81 (8.73)	72.46	22.60	7.23 (12.10)	0.96 (0.17)
Pillowcase	61.28 (62.38)	4.91 (8.73)	57.13	10.55	3.88 (5.50)	0.03 (0.26)
Antimicrobial Pillowcase	65.62	7.64	68.90	7.44	6.11	0.35
Surgical mask	96.35	0.68	89.52	2.65	5.23	0.15
Vacuum cleaner bag	94.35	0.74	85.95	1.55	10.18	0.32
Cotton mix	74.60	11.17	70.24	0.08	6.18	0.48
Linen	60.00	11.18	61.67	2.41	4.50	0.19
Silk	58.00	2.75	54.32	29.49	4.57	0.31

^a Numbers in parentheses refer to the results from 2 layers of fabric.

- **Specs / Design Considerations:**

- **Determining the Fit Factor of the Mask**

- A commercial fit test system (TSI PortaCount Plus Respirator Fit Tester and N95- Companion Module model 8095) was used to measure respirator fit by comparing the concentration of microscopic particles outside the respirator with the concentration of particles that have leaked into the respirator. The ratio of these 2 concentrations is known as the fit factor. To conduct the fit test, the apparatus was set up and operated according to the manufacturer's instructions.
- Volunteers were instructed to fit their surgical and homemade face masks with no help or guidance from the operator; to ensure that the mask was comfortable for 2 minutes; the participants were given time to purge any particles trapped inside the mask. The fit test was then

conducted with volunteers performing the following consecutive exercises, each lasting 96 seconds: (1) normal breathing, (2) deep breathing,⁷ (3) head moving side to side, (4) head moving up and down, (5) talking aloud (reading a prepared paragraph), (6) bending at the waist as if touching their toes, and (7) normal breathing.

Strengths/Concerns/Limitations/Arising Questions/Implications:

- Academic source
- Not about covid19 specifically -- may be different micron size??
- Study discusses the “fit factor” -- a critical piece around design.
 - “The median-fit factor of the homemade masks was one-half that of the surgical masks.”

Aiello et al (2010) [Mask use, hand hygiene, and seasonal influenza-like illness among young adults: a randomized intervention trial](#)

Article date: Feb 2010

Reviewed by: MH

Research Questions you’re answering:

- Are DIY Face masks effective? Should the average person wear a mask? When might they be more helpful or harmful?

Summary notes from article/source:

- **From abstract.** Our study examined whether use of face masks and hand hygiene reduced the incidence of influenza-like illness (ILI).
- We observed significant reductions in ILI during weeks 4-6 in the mask and hand hygiene group, compared with the control group, ranging from 35% (confidence interval [CI], 9%-53%) to 51% (CI, 13%-73%), after adjusting for vaccination and other covariates.
- **Face mask use alone showed a similar reduction in ILI compared with the control group, but adjusted estimates were not statistically significant. Neither face mask use and hand hygiene nor face mask use alone was associated with a significant reduction** in the rate of ILI cumulatively.
- These **findings suggest that face masks and hand hygiene may reduce respiratory illnesses in shared living settings and mitigate the impact** of the influenza A(H1N1) pandemic.

Strengths/Concerns/Limitations/Arising Questions/Implications:

- Academic article
- Face mask *alone* may not be statistically significant, but with hand hygiene showed significant reduction. Can reduce in **shared settings**? Suggests can be useful for preventative measure

Cowling et al (2009) [Facemasks and hand hygiene to prevent influenza transmission in households: a cluster randomized trial](#)

Article date: Oct 2009

Reviewed by: MH

Research Questions you're answering:

- Are DIY Face masks effective? Should the average person wear a mask? When might they be more helpful or harmful?

Summary notes from article/source:

- **From abstract.**
- Hand hygiene with or without facemasks seemed to reduce influenza transmission, but the differences compared with the control group were not significant.
- "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 inter pandemic influenza."
- "Although our results suggest a benefit of hand hygiene and facemasks in combination if applied early, our study cannot precisely distinguish the relative contributions of the 2 interventions"
-

Strengths/Concerns/Limitations/Arising Questions/Implications:

- Academic source
- Hand hygiene has a significant impact on reducing transmission; facemasks not significant unless implemented within 36 hours of symptoms.
- Perhaps we only recommend them for people exhibiting symptoms to prevent community transmission? But covid has asymptomatic transmission

Suess et al. (2012) [The role of facemasks and hand hygiene in the prevention of influenza transmission in households: results from a cluster randomised trial; Berlin, Germany, 2009-2011](#)

Article date: Jan 2012

Reviewed by: MH

Research Questions you're answering:

- Are DIY Face masks effective? Should the average person wear a mask? When might they be more helpful or harmful?

Summary notes from article/source:

- **From abstract:** Results suggest that household transmission of influenza can be reduced by the use of NPI (non-pharmaceutical interventions), such as facemasks and intensified hand hygiene, when **implemented early and used diligently**. Concerns **about acceptability and tolerability of the interventions should not be a reason against their recommendation**
- “ In all stratified analyses (by influenza type, season, and implementation within 36 h after symptom onset) SAR of the M group was approximately reduced by 50% compared to the control group. “
- **On fit:**
 - If masks intended for participants younger than 14 years did not fit properly (as assessed by study personnel during the first household visit), we asked them to wear adult masks instead.

Strengths/Concerns/Limitations/Arising Questions/Implications:

- Academic source
- A further limitation of our study is that we cannot determine whether a possible protective effect of wearing facemasks is more attributable to their use by index patients or by household contacts (or both), nor can we say if intensified hand hygiene provides any additional protection.

Dato et al. (2006) [Simple Respiratory Mask](#)

Article date: June 2006

Reviewed by: MH

Research Questions you're answering:

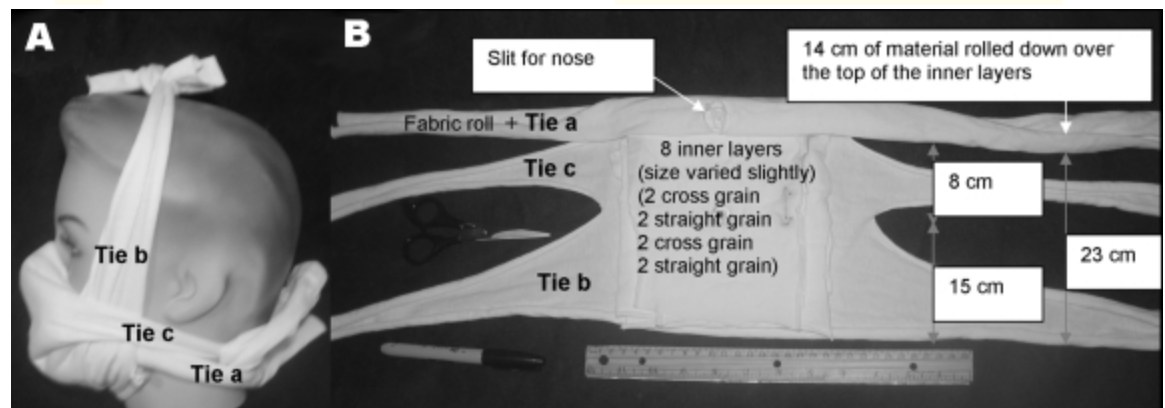
- Are DIY Face masks effective? Should the average person wear a mask? When might they be more helpful or harmful?
- What are important design specs to consider for choosing a DIYMaskTO tutorial?
- Which materials are most effective in preventing Covid19

Summary notes from article/source:

- **Safety/effectiveness:**
 - “Quality commercial masks are not always accessible, but anecdotal evidence has showed that handmade masks of cotton gauze were protective in military barracks and in healthcare workers during the Manchurian epidemic (6,7). **A simple, locally made, washable mask may be a solution if commercial masks are not available.**”
- **Materials & Design Specs:**
 - A Hanes Heavyweight 100% preshrunk cotton T-shirt (made in Honduras) (<http://www.hanesprintables.com/Globals/Faq.aspx>) **was boiled for 10**

minutes and air-dried to maximize shrinkage and sterilize the material in a manner available in developing countries.

- When made by naive users, this mask may be less effective because of variations in material, assembly, facial structure, cultural practices, and handling.
- **Prototype mask.** A) Side view, B) Face side. This mask consisted of 1 outer layer ($\approx 37 \text{ cm} \times 72 \text{ cm}$) rolled and cut as in panel B with 8 inner layers ($< 18 \text{ cm}^2$) placed inside (against the face). The nose slit was first placed over the bridge of the nose, and the roll was tied below the back of the neck. The area around the nose was adjusted to eliminate any leakage. If the seal was not tight, it was adjusted by adding extra material under the roll between the cheek and nose or by pushing the rolled fabric above or below the cheekbone. Tie b was tied over the head. A cloth extension was added if tie b was too short. Finally, tie c was tied behind the head. The mask was then fit tested.



Strengths/Concerns/Limitations/Arising Questions/Implications:

- Academic source
- Suggestion for how we might **pre-treat material** when making the mask

[CDC \(Mar 5, 2020\) Guidelines and Recommendations -- Use of Mask to Control Influenza Transmission](#)

Article date: n.d.

Reviewed by: MH

Research Questions you're answering:

- Are DIY Face masks effective? Should the average person wear a mask? When might they be more helpful or harmful?

Summary notes from article/source:

- During periods of increased acute respiratory infections in the community, **coughing patients and anyone suspected of having influenza should wear a mask at all times until they are isolated in a private room.**

- **Masks should be worn by these patients until:**
 - Determined that the **cause of symptoms is not an infection** that requires isolation precautions or
 - the patient has been appropriately isolated, either by placement in a private room or in some circumstances by placement in a room with other patients with the same infection (cohorting). The patient does not need to wear a mask while isolated, except when being transported outside the isolation room.
- Adults can shed influenza virus 1 day before symptoms appear and up to approximately 5 to 7 days after onset of illness; **thus, the selective use of masks (e.g., in proximity to a known symptomatic person) may not effectively limit transmission in the community.**
- If such symptomatic persons cannot stay home during the acute phase of their illness, **consideration should be given to having them wear a mask in public places when they may have close contact with other persons.** In addition, **masks are recommended for use by symptomatic, post-partum women while caring for and nursing their infant**

Strengths/Concerns/Limitations/Arising Questions/Implications:

- Government source
- CDC is questionable in its reliability given slow to respond and confusing recommendations

Milton et al (2013) [Influenza Virus Aerosols in Human Exhaled Breath: Particle Size, Culturability, and Effect of Surgical Masks](#)

Article date: Mar 2013

Reviewed by: MH

Research Questions you're answering:

- Are DIY Face masks effective? Should the average person wear a mask? When might they be more helpful or harmful?

Summary notes from article/source:

- **Abstract.** The CDC recommends that healthcare settings provide influenza patients with facemasks as a means of reducing transmission to staff and other patients, and a recent report suggested that surgical masks can capture influenza virus in large droplet spray. However, there is minimal data on **influenza virus aerosol shedding**, the infectiousness of exhaled aerosols, and none on the impact of facemasks on viral aerosol shedding from patients with seasonal influenza.
- Surgical masks **worn by patients reduce aerosols shedding of virus.** The abundance of viral copies in fine particle aerosols and evidence for their infectiousness suggests an important role in

seasonal influenza transmission. Monitoring exhaled virus aerosols will be important for validation of experimental transmission studies in humans.

Strengths/Concerns/Limitations/Arising Questions/Implications:

- Academic source
- Aerosol exposure may be more relevant in hospital settings where mechanical ventilation is being used; less in community settings

Uchida et al (2017) [Effectiveness of vaccination and wearing masks on seasonal influenza in Matsumoto City, Japan, in the 2014/2015 season: An observational study among all elementary schoolchildren](#)

Article date: Mar 2017

Reviewed by: MH

Research Questions you're answering:

- Are DIY Face masks effective? Should the average person wear a mask? When might they be more helpful or harmful?
- Who would these masks be for? For what purpose(s) will they be used?

Summary notes from article/source:

- **From abstract.** The result showed that vaccination (odds ratio 0.866, 95% confidence interval 0.786–0.954) and **wearing masks (0.859, 0.778–0.949) had significant protective association.** Hand washing (1.447, 1.274–1.644) and gargling (1.319, 1.183–1.471), however, were not associated with protection.
- In the natural setting, hand washing and gargling showed a negative association, which may have been due to inappropriate infection control measures or aggregating infected and non-infected children to conduct those measures. These results may indicate a pathway for influenza transmission and explain why seasonal influenza control remains difficult in school settings. **The overall effectiveness of vaccination and mask wearing was 9.9% and 8.6%, respectively.**
- After dividing children into higher (grades 4–6) and lower (grade 1–3) grade groups, the effectiveness of vaccination became greater in the lower grade group, and the **effectiveness of wearing masks became greater in the higher grade group.**

Strengths/Concerns/Limitations/Arising Questions/Implications:

- Academic source
- To investigate -- should we not recommend mask wearing for certain age group? Maybe children who are too young would increase risk?

Neilson (2016) [The surgical mask is a bad fit for risk reduction](#)

Article date: May 2016

Reviewed by: MH

Research Questions you're answering:

- Are DIY Face masks effective? Should the average person wear a mask? When might they be more helpful or harmful?

Summary notes from article/source:

- **From abstract.** The widespread misconception about the use of surgical masks — that wearing a mask protects against the transmission of virus — is a problem of the kind theorized by German sociologist Ulrich Beck... The surgical mask communicates *risk*.
- the Public Health Agency of Canada (PHAC) does **not recommend the use of masks by well individuals in pandemic situations, acknowledging that the mask has not been shown to be effective in such circumstances**. However, this stance is **complicated by the PHAC's supporting reasons, which relate to problems of supply, cost, distribution and feasibility: panic might occur if the availability of masks were limited; public purchase of masks might limit the availability of masks in health care settings where they are required; and not all members of the public can afford to purchase masks** — if masks are recommended by public health authorities, there could be an expectation that they will be publicly funded and made available by public health programs.

Strengths/Concerns/Limitations/Arising Questions/Implications:

- Academic source, peer reviewed
- Interesting sociological concern -- facemask can *communicate* risk -- maybe this is what we want considering how contagious covid19 is? But does not discuss health/safety impacts.

Burgess & Horii (2012) [Risk, ritual and health responsabilisation: Japan's 'safety blanket' of surgical face mask-wearing](#)

Article date: Mar 2012

Reviewed by: MH

Research Questions you're answering:

- Are DIY Face masks effective? Should the average person wear a mask? When might they be more helpful or harmful?

Summary notes from article/source:

- **Abstract:** A historical analysis suggests that an originally collective, targeted and science-based response to public health threats has **dispersed into a generalised practice lacking a clear end or purpose. (in Japan)**
- Their widespread usage is clearly not driven by evidence of universal effectiveness. While uncertainty remains, an international consensus recognises **only some possible effectiveness in reducing disease transmission in healthcare settings** ([Center for](#)

Disease Control and Prevention 2009, Cowling et al. 2010, World Health Organization 2009). While it can be intuitively imagined **that filtering breath in this way may help to reduce infection transmission, it is actually touch that is the more important factor.** It may be that insofar as masks make it harder to rub noses and thereby to spread an infection to the hands that they have some effectiveness. It is more likely that simply washing hands is more effective in relation to an actual disease threat. Mask-wearing affirms that social responses to disease are rarely driven by scientific evidence alone; as we discuss below, historically, symbolic dimensions can be more important (Alcabes 2009, Tones 2010).

- Like other forms of risk protection, **masks are not unconditionally useful and can have the opposite effect to the one intended.** Unless there is a **complete seal around the mask it is useless against the penetration of a virus, making any protective function illusory.** Further, they are uncomfortable and likely to be frequently adjusted by the hands without the wearer even noticing. What's more, the **area covered by the mask can become wet with saliva and the mask itself may become moist, encouraging bacteria.** This is not to say that the less than ideal, even counterproductive nature of mask-wearing is unique. Covering the mouth with the hand when sneezing or coughing, as it is polite to do in western countries, is also likely to spread germs rather than contain them. What is defined as healthy behaviour is rarely consistent, being defined and constituted by a wide range of beliefs, pressures and preferences at any one time.

Strengths/Concerns/Limitations/Arising Questions/Implications:

- Academic source
- Interesting article explaining why Asian countries might wear masks more predominantly -- not due to unconditional effectiveness but historical and sociocultural contexts.

Tufekci NYT (Mar 17 2020) [Why Telling People They Don't Need Masks Backfired](#)

Article date: Mar 2012

Reviewed by: MH

Research Questions you're answering:

- Are DIY Face masks effective? Should the average person wear a mask? When might they be more helpful or harmful?

Summary notes from article/source:

- Third, of course masks work — maybe not perfectly and not all to the same degree, but they provide some protection. Their use has always been advised as part of the standard response to being around infected people, especially for people who may be vulnerable. World Health Organization officials wear masks during their news briefings.
- However, **even surgical masks protect a bit more than not wearing masks at all. We know from flu research that mask-wearing can help decrease transmission rates along with frequent hand-washing and social-distancing.** Now that we are facing a **respirator mask shortage**, the **federal Centers for Disease Control and Prevention is recommending that**

surgical masks are “[an acceptable alternative](#)” for health care workers — again, obviously because some protection, even if imperfect, is better than none. In the face of this, publicly presenting an absolute answer — “You don’t need them” — for something that requires a qualified response just makes people trust authorities even less.

- Hong Kong health officials [credit universal mask wearing](#) as part of the solution and [recommend](#) universal mask wearing. In fact, Taiwan responded to the coronavirus by immediately [ramping up mask production](#).
- Sixth, masks are an important signal that it’s not business as usual as well as an act of solidarity.

Strengths/Concerns/Limitations/Arising Questions/Implications:

- News source (NYT Opinion), but cites academic sources
- Bio of author: Dr. Tufekci is a professor of information science who specializes in the social effects of technology.
- Includes questionable phrasing like “again *obviously*, some protection is better than none”

CDC (2009) [Interim Recommendations for Facemask and Respirator Use to Reduce 2009 Influenza A \(H1N1\) Virus Transmission](#)

Article date: Sept 2009

Reviewed by: MH

Research Questions you’re answering:

- Are DIY Face masks effective? Should the average person wear a mask? When might they be more helpful or harmful?

Summary notes from article/source:

- **Facemasks:** Unless otherwise specified, the term “facemasks” refers to disposable facemasks cleared by the U.S. Food and Drug Administration (FDA) for use as medical devices. This includes facemasks labeled as surgical, dental, medical procedure, isolation, or laser masks. Such facemasks have **several designs**.
 - One type is **affixed to the head with two ties, conforms to the face with the aid of a flexible adjustment for the nose bridge, and may be flat/pleated or duck-billed in shape.**
 - Another type of facemask is **pre-molded, adheres to the head with a single elastic band, and has a flexible adjustment for the nose bridge.**
 - A third type is **flat/pleated and affixes to the head with ear loops.**
 - Facemasks cleared by the FDA for use as medical devices have been determined to have specific levels of protection from penetration of blood and body fluids. **Facemasks help stop droplets from being spread by the person wearing them. They also keep splashes or sprays from reaching the mouth and nose of the person wearing the facemask.**

- They are **not designed to protect against breathing in very small particle aerosols that may contain viruses**. Facemasks **should be used once and then thrown away in the trash**.
- In **community and home settings, the use of facemasks and respirators generally are not recommended**. However, for certain circumstances as described in [Table 1](#), a **facemask or respirator may be considered, specifically for persons at increased risk of severe illness from influenza**.

Table 1

Setting	Persons not at increased risk of severe illness from influenza (Non-high risk persons)	Persons at increased risk of severe illness from influenza (High-Risk Persons) 3
Community		
No 2009 H1N1 in community	Facemask/respirator not recommended	Facemask/respirator not recommended
2009 H1N1 in community: not crowded setting	Facemask/respirator not recommended	Facemask/respirator not recommended
2009 H1N1 in community: crowded setting	Facemask/respirator not recommended	Avoid setting. If unavoidable, consider facemask or respirator 4 5
Home		
Caregiver to person with influenza-like illness	Facemask/respirator not recommended	Avoid being caregiver. If unavoidable, use facemask or respirator 4 5
Other household members in home	Facemask/respirator not recommended	Facemask/respirator not recommended
Occupational (non-health care)		
No 2009 H1N1 in community	Facemask/respirator not recommended	Facemask/respirator not recommended
2009 H1N1 in community	Facemask/respirator not recommended but could be considered under certain circumstances 4 5	Facemask/respirator not recommended but could be considered under certain circumstances 4 5
Occupational (health care) 6		
Caring 7 for persons with known, probable or suspected 2009 H1N1 or influenza-like illness	Respirator	Consider temporary reassignment. Respirator

Strengths/Concerns/Limitations/Arising Questions/Implications:

Li & Zuoyan, StraitsTimes (Mar 10 2020) [Q&A with HK microbiologist Yuen Kwok-yung who helped confirm coronavirus' human spread](#)

Article date: Mar 10 2020

Reviewed by: MH

Research Questions you're answering:

- Are DIY Face masks effective? Should the average person wear a mask? When might they be more helpful or harmful?

Summary notes from article/source:

- **Interview w/ HK doctor:**
- "We can only rely on telling everyone to wear a mask, wash their hands frequently, use alcoholic sanitiser. **I had called for everyone to wear a mask when I was in Beijing, but many people disagreed, saying that the World Health Organisation (WHO) said healthy people don't need to wear masks unless they go to crowded places.** Nevertheless, if people wear masks only when they feel sick, then the eight infected people on the Diamond Princess would have transmitted it to others because they were not feeling uncomfortable. **Wear a mask to protect not only yourself but also others, because if you are infected but asymptomatic, you could still stop the spread by wearing a mask.**
- In our experiments previously, we found 100 million virus strands in just one milliliter of a patient's saliva. Therefore, scenarios with the potential for exchanging saliva are generally quite dangerous. **The temporary success of virus control in Hong Kong this time is not only due to population controls, but also contributed by the early advocacy for mask-wearing, hand-washing, and social distancing.** Otherwise, with such a dense population in Hong Kong, the epidemic would very likely have spread the same way as in Italy or Daegu in South Korea."

Strengths/Concerns/Limitations/Arising Questions/Implications:

- Hong Kong has had high success of preventing transmission. This presumably refers to professionally manufactured surgical face masks, NOT hand-made *cloth masks*
- Updated source directly relevant to covid19 response

Van der Sande et al (2008) [Professional and Home-Made Face Masks Reduce Exposure to Respiratory Infections among the General Population](#)

Article date: Jul 2008

Reviewed by: MH

Research Questions you're answering: Are DIY Face masks effective?

Should the average person wear a mask?

When might they be more helpful or harmful?

Which materials to use?

Summary notes from article/source:

- **From abstract:** All types of masks reduced aerosol exposure, relatively stable over time, unaffected by duration of wear or type of activity, but with a high degree of individual variation. **Personal respirators were more efficient than surgical masks, which were more efficient than home-made masks.** Regardless of mask type, **children were less well protected. Outward protection (mask wearing by a mechanical head) was less effective than inward protection (mask wearing by healthy volunteers).**
- Any type of general mask use is likely to decrease viral exposure and infection risk on a population level, in spite of imperfect fit and imperfect adherence, **personal respirators providing most protection.** Masks worn by patients **may not offer as great a degree of protection against aerosol transmission.**
- “It is also clear that **home-made masks such as tea cloths** may still confer a significant degree of protection, albeit less strong than surgical masks or FFP2 masks.

Strengths/Concerns/Limitations/Arising Questions/Implications:

- Academic source

[Macintyre et al \(2015\) A cluster randomised trial of cloth masks compared with medical masks in healthcare workers](#)

Article date: 2015

Reviewed by: MH

Research Questions you’re answering: Are cloth masks safe?

Summary notes from article/source

- **From abstract:**
 - The aim of this study was to **compare the efficacy of cloth masks to medical masks in hospital healthcare workers (HCWs).**
 - Hospital wards were randomised to: medical masks, cloth masks or a control group (usual practice, which included mask wearing). Participants used the mask on every shift for 4 consecutive weeks.
 - This study is the first RCT of cloth masks, **and the results caution against the use of cloth masks. This is an important finding to inform occupational health and safety. Moisture retention, reuse of cloth masks and poor filtration may result in increased risk of infection.** Further research is needed to inform the widespread use of cloth masks globally. **However, as a**

precautionary measure, cloth masks should not be recommended for HCWs, particularly in high-risk situations, and guidelines need to be updated.

- **Other limitations:**

- The **physical properties of a cloth mask, reuse, the frequency and effectiveness of cleaning, and increased moisture retention**, may potentially increase the infection risk for HCWs. The **virus may survive on the surface of the facemasks**,²⁹ and modelling studies have quantified the contamination levels of masks.³⁰ Self-contamination through repeated use and improper doffing is possible. For example, a **contaminated cloth mask may transfer pathogen from the mask to the bare hands of the wearer**

- **CLEANING:**

- They were **asked to wash cloth masks with soap and water every day after finishing the shifts**. Participants were supplied with written instructions on how to clean their cloth masks.

- **Materials / Specs:**

- Masks used in the study were locally **manufactured medical (three layer, made of non-woven material) or cloth masks (two layer, made of cotton)** commonly used in Vietnamese hospitals.
- The protection afforded by gauze masks **increases with the fineness of the cloth and the number of layers**,³⁷ indicating potential to develop a more effective cloth mask, for example, with **finer weave, more layers and a better fit**.

Strengths/Concerns/Limitations/Arising Questions/Implications:

- Another limitation of this study is **the lack of a no-mask control group and the high use of masks in the controls, which makes interpretation of the results more difficult**.
- In addition, the quality of paper and cloth masks varies widely around the world, so the results may not be generalisable to all settings

Canini et al (2010) Surgical mask to prevent influenza transmission in households: a cluster randomized trial.

Reviewed by: MH

Research Questions you're answering: Effectiveness of face masks

Summary notes from article/source

We evaluated the effectiveness of facemask use by index cases for limiting influenza transmission by large droplets produced during coughing in households.

“In various sensitivity analyses, we did not identify any trend in the results suggesting effectiveness of facemasks.”

Our findings are consistent with these results, suggesting a low effectiveness, if any, of facemasks when used alone to limit influenza transmission in a closed-setting.

Specs/ Design considerations:

- Thirty-eight (75%) patients from the intervention arm **reported discomfort** with mask use ([Table 4](#)). The three main causes of discomfort were **warmth (45%), respiratory difficulties (33%) and humidity (33%)**. Children wearing children facemasks reported feeling pain more frequently (3/12) than other participants wearing adult facemasks (1/39) ($p=0.036$).

Strengths/Concerns/Limitations/Arising Questions/Implications:

This study should be interpreted with caution since the lack of statistical power prevents us to draw formal conclusion regarding effectiveness of facemasks in the context of a seasonal epidemic.

However, as the new H1N1v emerged and because the French national preparedness included mass distribution of surgical facemasks in households, methodological and ethical concerns about the possibility to pursue the trial occurred.

Robertson, Smart Air Filters (Mar 4, 2020) [Can DIY Masks Protect Us from Coronavirus?](#)

Article date: Mar 4 2020

Reviewed by: MH

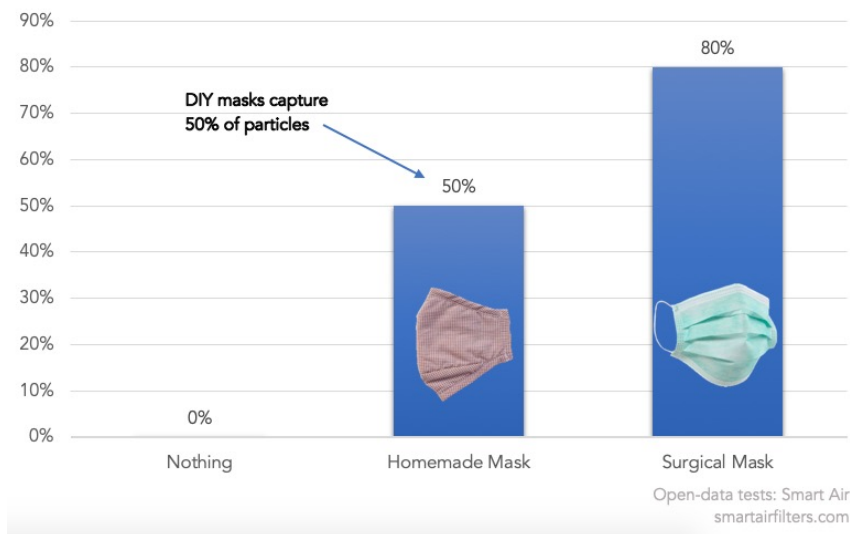
Research Questions you're answering: Which materials are most effective in preventing Covid19?

Summary notes from article/source:

- **Effectiveness of materials:** The homemade cotton masks captured 50% of 0.02-1 micron particles, compared with 80% for the surgical mask. Although the surgical masks

captured 30% more particles, the cotton masks did surprisingly well. The researchers concluded that homemade masks would be better than nothing.

Homemade mask effectiveness compared to surgical masks

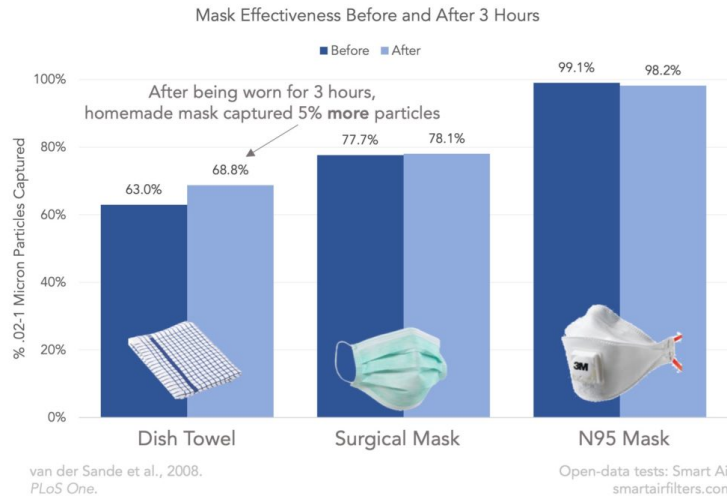


- The tea cloth mask captured 60% of the 0.02 – 1 micron particles. Not surprisingly, the surgical mask and N95 mask captured more particles, but the data shows homemade mask was far from useless at capturing virus-sized particles.

Homemade Mask Captures 60% of Sub-Micron Particles



- **How Long Can You Wear DIY Masks for?**
- Next, they tested the DIY masks' effectiveness after people had worn them for 3 hours. The results showed that moisture and time had very little impact on effectiveness for any of the masks. In fact, the homemade masks actually captured 5.8% more virus-sized particles after 3 hours. Thus, wearing them for several hours seems to have little impact on their effectiveness.



- Do Homemade Masks Work for Children?

- Next, they tested homemade masks with 11 children 5 to 11 years old. When kids wore the homemade masks, they removed just 52% of the 0.02 – 1 micron particles. That means the masks were roughly 15% less effective on kids than on adults.
- Interestingly, the surgical masks and FFP2 (N92) masks also did worse on children. This fits with a Smart Air [test of children's masks in India](#) that found lower effectiveness on children than adults. The data suggests that it is harder to fit masks on children's faces.

Strengths/Concerns/Limitations/Arising Questions/Implications:

- **Author bio: Paddy Robertson**
 - Paddy is the CEO of Smart Air, running operations from Beijing. He's has a Masters in aeronautical engineering from Bristol University, UK having specialised in aerodynamics. An advocate for open data, free information and transparent business, he spends his spare time promoting honest business and social enterprise
- "The results showed that moisture and time had very little impact on effectiveness for any of the masks." -- **while this may be true, some argue moisture would lead to accumulation of bacteria.**

Robertson, Smart Air Filters (Mar 8 2020) [What Are The Best Materials for Making DIY Masks?](#)

Article date: Mar 8 2020

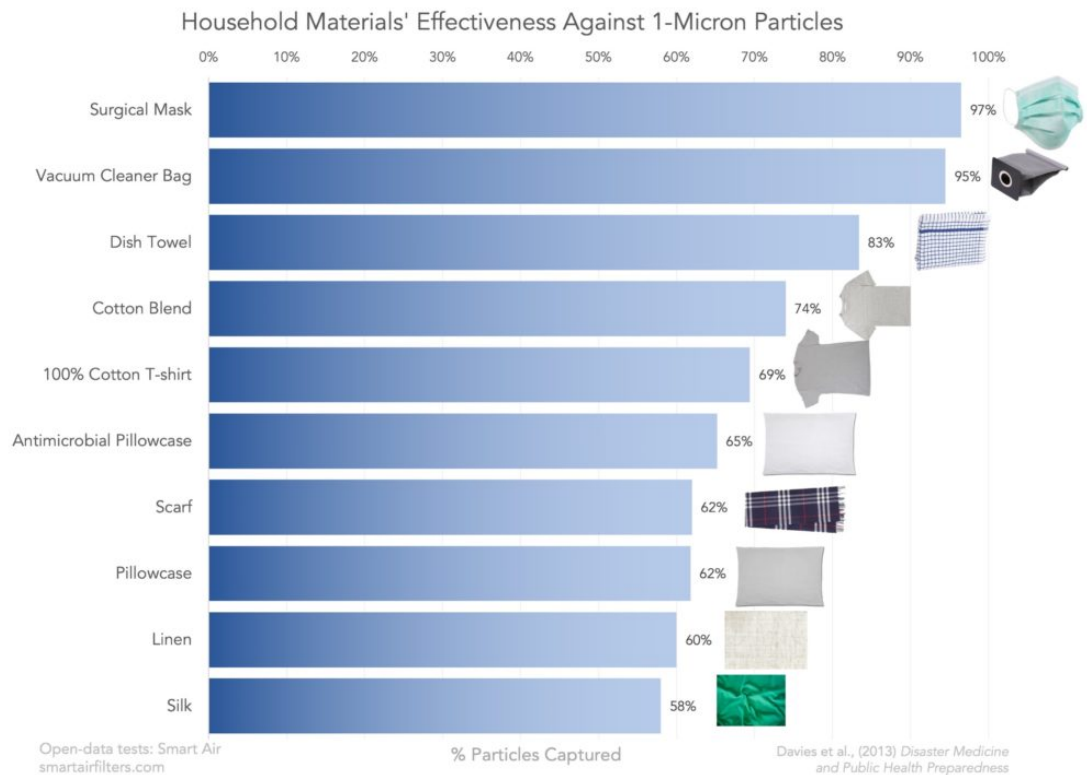
Reviewed by: MH

Research Questions you're answering:

- Which materials are effective for face masks?

Summary notes from article/source:

- Not surprisingly, the **surgical mask performed best**, capturing 97% of the 1-micron bacteria. Yet every single material filtered out at least 50% of particles. The top performers were the vacuum cleaner bag (95%), the dish cloth (“tea towel” in the UK! 83%), the cotton blend shirt (74%), and the 100% cotton shirt (69%).



- - **Are Two-Layered DIY Masks More Effective?**
- If the problem is filtration effectiveness, would the masks work better if we made two layers? The scientists tested virus-size particles against double-layered versions of the dish towel, pillow case, and 100% cotton shirt.
- Instead, they concluded the pillowcase and the 100% cotton t-shirt are the best materials for DIY masks. Why?

- - **The Importance of DIY Mask Breathability**
- The answer lies in **breathability**. **How easy it is to breathe through your mask is an important factor that will affect how comfortable it is.** And comfort isn't merely a luxury. **Comfort will influence how long you can wear your mask.**
- Fortunately, in addition to particle effectiveness, the researchers tested the **pressure drop** across each type of fabric. This gives us a good indication of how easy it is to breathe through each material. As a benchmark, they compared breathability of each DIY mask material to the surgical mask.



- Although the **tea towel and the vacuum bag captured the most particles, they were also the hardest to breath through**. With two layers, the tea towel was over twice as hard to breathe through as the surgical mask. In contrast, the pillow case, t-shirt, scarf, and linen were all easier to breathe through than the surgical mask.
- **Based on particle capture and breathability, the researchers concluded that cotton t-shirts and pillow cases are the best choices for DIY masks**

SUMMARY --

Bottom line: Test data shows that the best choices for DIY masks are cotton t-shirts, pillowcases, or other cotton materials.

These materials filter out approximately 50% of 0.2 micron particles, similar in size to the coronavirus. They are also as easy to breathe through as surgical masks, which makes them more comfortable enough to wear for several hours.

Doubling the layers of material for your DIY mask gives a very small increase in filtration effectiveness, but makes the mask much more difficult to breathe through.

Strengths/Concerns/Limitations/Arising Questions/Implications:

- Great summary / synthesis / visualisation of one* study

Abedi, Global News (Mar 17 2020) [Coronavirus: Canadian doctors call for smarter use of medical gear amid supply concerns](#)

Article date: Mar 17, 2020

Reviewed by: MH

Research Questions you're answering:

Can masks be harmful?

How scarce are surgical masks actually in our context (Toronto, Ontario, Canada)? Are hospitals reporting shortages? What is the need?

Summary notes from article/source:

- The government is seeking suppliers to provide a range of critical items, including surgical masks, gloves and goggles, which help protect the nurses and doctors who treat contagious patients.
- The search for suppliers also coincides with **concerns that some of the existing equipment in Canadian hospitals is going missing, without explanation**.
- The WHO estimated roughly 89 million medical masks will be needed each month for the COVID-19 response, along with 76 million examination gloves and more than one million goggles.
 - Overall, it estimated that protective equipment supplies need to be increased by 40 per cent worldwide to meet demands of the pandemic.
- Canada has a [national emergency stockpile](#), which includes medical equipment and supplies, pharmaceuticals, and social service supplies such as beds.

- Earlier this month, the federal Ministry of Public Services and Procurement put a callout for Canadian manufacturers who are able to help the government's supply during the pandemic.
- Posted on March 12, [the callout reads](#): "In support of the Government of Canada's whole-of-government response to Coronavirus disease (COVID-19), we are asking suppliers about their ability to provide products and services."
- Public use of supplies also a concern
 - In British Columbia, seniors care providers [have also warned](#) members of the **public to stop buying and hoarding protective equipment after a care worker tested positive for COVID-19 at the Lynn Valley Care Centre** — a nursing home struck with an outbreak that has led to several fatalities.
- The same advice has been given to Canadians by officials, including chief public health officer of Canada Dr. Theresa Tam.
 - **"Wearing masks when you're well is not an effective measure. Sometimes it can actually present some risks, as you're putting your fingers up and down on your face, removing your mask, putting them next to your eyes," Dr. Tam said at an earlier media briefing.**
 - She noted masks are more useful for people who are "actually sick."

Strengths/Concerns/Limitations/Arising Questions/Implications:

- Global News article

[Martell & Warburton, Global News \(Mar 9 2020\): Roughly 55 million N95 masks in Ontario expired before coronavirus hit](#)

Article date: Mar 9, 2020

Reviewed by: MH

Research Questions you're answering:

How scarce are surgical masks actually in our context (Toronto, Ontario, Canada)? Are hospitals reporting shortages? What is the need?

Summary notes from article/source:

- Thirteen years ago, Ontario stockpiled some 55 million N95 masks and other medical equipment after the province bore the brunt of the SARS epidemic in Canada in 2002 and 2003. But provincial officials have confirmed that the masks in the stockpile have passed their expiration date and sidestepped questions about how many masks, including expired ones, remain.
- Ontario, which includes Canada's largest city Toronto, said in 2007 it would buy 55 million [N95 masks](#) and other medical supplies to prepare for future epidemics. A report by the province's auditor general, completed in December 2017, found that more than 80 percent of that stockpile had expired.

- In a Monday letter to provincial premiers, Prime Minister Justin Trudeau and Deputy Prime Minister [Chrystia Freeland](#) said the federal government is “already leading a bulk procurement of personal protective equipment.

Strengths/Concerns/Limitations/Arising Questions/Implications:

[Wright & Neustaeter, CTV News \(Mar 20 2020\) Doctors call for 'war-like effort' to prevent medical supply shortages in Canada](#)

Article date: Mar 20, 2020

Reviewed by: MH

Research Questions you’re answering: How scarce are surgical masks actually in our context (Toronto, Ontario, Canada)? Are hospitals reporting shortages? What is the need?

Summary notes from article/source:

- "We are running short on supplies and given that we are just at the beginning of this crisis, we're quite fearful of what is going to happen if we run out of supplies," Dr. Michelle Cohen said in a Skype interview from Burlington, Ont. with CTV's Heather Wright
- Canada's Health Minister Patty Hajdu reiterated, [in a statement released Wednesday](#), that Canada has a stockpile of critical supplies that can be moved from province-to-province depending on need.
- Health Canada has waived some of its usual regulatory requirements to increase supplies of hand sanitizers, disinfectants, swabs and protective equipment such as masks and gowns, [The Canadian Press reports](#).
- Due to "unprecedented demand" for such products, Health Canada said it will temporarily allow them to be sold in this country even if they don't meet the normal regulatory requirements.

Concerns/Limitations/Arising Qs/Comments/Implications:

- Perhaps more relevant for makers / 3D printers who want to supply directly to hospitals

[Chen, Inkstone News \(Mar 10 2020\) Coronavirus: health researchers urge global authorities to consider broadening use of face masks](#)

Article date: Mar 10 2020

Reviewed by: MH

Research Questions you’re answering: Are masks for community use safe?

Summary notes from article/source:

- China recognizes the need to control the spread of the disease, known as Covid-19, by asymptomatic patients, Dr DJ Hamblin-Brown, vice-president of medical affairs at United Family Healthcare in Beijing, told *Inkstone*.

- But Professor Yuen Kwok-yung, a microbiologist at the University of Hong Kong and an advisor to the city's Covid-19 taskforce, has argued for a broadened use of the mask.
- "Wearing a mask not only protects yourself, but also protects others in case you are an asymptomatic patient," Yuen told the Chinese news outlet *Caixin*.
- A [2014 study in Japan](#) showed that wearing face masks can reduce one's chances of getting the flu.
- And a 2016 analysis of 25 studies conducted between 1999 to 2014 about the [use of face masks during the hajj](#), an Islamic gathering attracting more than 2 million people every year, concluded that masks offered "significant protectiveness" against respiratory infections.
- "You can use a handkerchief or scarf and it will prevent droplet spread as well as a surgical mask. These should, and can, be washed daily at 60°C (140°F) and preferably not handled when in use."
- Brown said the public should avoid hoarding or using heavy-duty protective gear such as N95 masks, as they should be reserved for health workers.
- On March 4, South Korea's Ministry of Food and Drug Safety revised its guidelines on face masks to recommend the reuse of cotton or disposable face masks as a temporary measure.

Concerns/Limitations/Arising Qs/Comments/Implications:

- News article, but cites research

[Leung et al \(Mar 3, 2020\) Mass Masking in the COVID-19 epidemic: people need guidance](#)

Article date: Mar 3 2020

Reviewed by: MH

Research Questions you're answering: Are masks for community use safe?

Summary notes from article/source:

- WHO recommends against wearing masks in community settings because of lack of evidence.² However, absence of evidence of effectiveness should not be equated to evidence of ineffectiveness, especially when facing a novel situation with limited alternative options. It has long been recommended that for respiratory infections like influenza, affected patients should wear masks to limit droplet spread. If everyone puts on a mask in public places, it would help to remove stigmatisation that has hitherto discouraged masking of symptomatic patients in many places. Furthermore, transmission from asymptomatic infected individuals has been documented for COVID-19, and viral load is particularly high at early disease stage.^{4, 5} Masking, as a public health intervention, would probably intercept the transmission link and prevent these apparently healthy infectious sources.
- Disposable surgical masks and their technical specifications were designed specifically for the protection of health-care workers during occupational exposures. Cloth masks were used by

surgeons successfully during operations before disposable masks were available. In real life, most people in all seriously affected areas are reusing their disposable masks.

Concerns/Limitations/Arising Qs/Comments/Implications:

- Academic source

Davison, Forkast News (Feb 25 2020) [Mask Hysteria: Face mask do's and don'ts for the coronavirus](#)

Article date: Mar 3 2020

Reviewed by: MH

Research Questions you're answering: Are masks for community use safe? What materials would be best?

Summary notes from article/source:

Common face mask use mistakes

- A mask is worn upside down, only over the nose, not pulled under the chin, or worn only over the mouth, leaving the nose exposed. Even the best mask won't protect if worn incorrectly.
- A user constantly touching and fiddling with the mask's filter surface, which **cross-contaminates fingers** and subsequent surfaces. A contaminated finger will cross-contaminate the next **SEVEN surfaces** it touches, e.g. phones, ipads, keypads.
- Pulling a face mask under the chin for conversation or eating, and then putting the mask back up again.
- Reusing or recycling masks.
- Wearing the same mask for too long. The longer a mask has been worn around others, the more concentrated the infectious load becomes.
- Relying on N95 masks. When worn properly, these respirator masks get very hot inside and are very **difficult to breathe** in due to the pressure change between the air inside and the outside atmosphere.

Masks to avoid

- An inferior mask made of fabric, paper or plastic, or a dust or allergy mask is chosen and worn into a high-risk area.
- A Pitta mask with an "N95 insert."

- Homemade masks and face shields crafted from fruit, raincoats, women's underwear, cardboard boxes, plastic bottles and other household items
- **[SPECS & MATERIALS]** In addition to the barrage of filtration, bacterial, droplet, pressure, splash and flammability testing that a proper surgical face mask must undergo; it must be emphasized that NO COMPONENT of a medical-grade surgical mask is made of paper. **Surgical masks are composed of three to four layers — including spun-bond or meltblown polypropylene (the filter layer), a high-density non-woven layer of polypropylene cellulose/polyester, and layer(s) of melt-blown polypropylene filter material toward the face side**

Concerns/Limitations/Arising Qs/Comments/Implications:

- Author made this claim which is untrue:
 - “A systematic review of the research literature, such as the [Journal of the American Medical Association](#), shows that properly worn surgical face masks and N95 respirators are equivalent to each other. However, given the real-life user difficulties with N95 respirator masks, the most practical for consumer use would be an ASTM-F2100 surgical facemask.”

[Barahseed et al \(2016\) Uptake and effectiveness of facemask against respiratory infections at mass gatherings: a systematic review](#)

Article date: Jun 2016

Reviewed by: MH

Research Questions you're answering: Are masks for community use safe?

Summary notes from article/source:

- Approximately half of the attendees of mass gatherings use facemask
- Facemask seems to be effective against respiratory infections at Hajj
- Effectiveness of facemask against specific respiratory infections is not proven
- International public health agencies, including World Health Organization (WHO), have issued guidelines on mass gathering preparedness to minimise the possible risks.⁶
- **Lit review on effectiveness:**

- In regards to the effectiveness of facemask, four out of thirteen studies demonstrated significant effect against respiratory infections,^{18, 20, 22, 28} two others showed some effect but did not reach statistical significance.^{25, 26} One study assessed its effectiveness against fever but ruled out its protectiveness,³⁹ and the other six studies did not show effectiveness but results were not statistically significant.^{24, 30, 31, 32, 37, 40} The pooled data from all studies revealed significant protectiveness of facemasks against respiratory infections in general at Hajj (relative risk [RR] = 0.89, 95% CI: 0.84-0.94, $p < 0.01$) (Table 2).

Concerns/Limitations/Arising Qs/Comments/Implications:

Modeling the Effectiveness of Respiratory Protective Devices in Reducing Influenza Outbreak

Reviewed by: MH

Research Questions you're answering: Are masks for community use safe? Should the average person wear masks?

Summary notes from article/source:

- **Abstract.** In this article, a risk assessment model previously developed in general form was **used to estimate the effectiveness of different types of protective equipment in reducing the rate of infection in an influenza outbreak.**
- It was found that a 50% compliance in donning the device resulted in a significant (at least 50% prevalence and 20% cumulative incidence) reduction in risk for fitted and unfitted N95 respirators, high-filtration surgical masks, and both low-filtration and high-filtration pediatric masks. An 80% compliance rate essentially eliminated the influenza outbreak. The results of the present study, as well as the application of the model to related influenza scenarios, are potentially useful to public health officials in decisions involving resource allocation or education strategies.

[Moon, Fb Post \(Mar 14, 2020\) Long post regarding use of masks in the community](#)

Reviewed by: MH

Research Questions you're answering: Are masks for community use safe? Should the average person wear masks?

Summary notes from article/source:

- I do not recommend wearing a mask outside of clinical or direct caregiving settings as a respiratory infection prevention method.
- General Public: + Respiratory masks are not recommended for general protective use in the community but are recommended for people who are already experiencing symptoms of respiratory infection to contain potentially infectious respiratory secretions
 - **Why health care workers recommended?** Healthcare workers are trained to properly use
- The risk in public use of masks is that adherence to these steps cannot be assured, there is not wide availability of masks to allow the changing of masks after each task, and using a mask for a prolonged period of time is not an adequate prevention method as it increases the risk of contaminating a mask – potentially increasing the risk of infection transmission as contaminated masks are strapped to the wearers face.
- **Potential risk:**
 - *** Using and adjusting a mask without performing effective hand hygiene prior to touching the mask or your face risks bringing infectious organisms from your hands to the mask ***
 - This happens because people touch their face and/or mask without performing hand hygiene – or perform hand hygiene ineffectively and miss washing their thumbs or sides of fingers. Contaminated hands touching the face is a major route of transmission risk for many types of infection; a contaminated mask is even worse as there is increased opportunity to inhale pathogens if a person wears a mask for a long time.
- Discouraging mask because of supply chain risks
 - In addition – there is a real risk of healthcare facilities running low on masks and the supply chain has been disrupted by consumers buying masks regardless of where you purchase them (yes, even healthcare facilities and clinics will buy off-the-shelf consumer products from a drug store or conventional merchant in a pinch). Healthcare will get more masks eventually, but healthcare workers are at high risk of infection transmission during patient interactions and any disruption in personal protective equipment availability increases these risks.
- With that said – if you are experiencing symptoms or are suspected or confirmed to have a droplet transmissible respiratory infection – here's how to do it:
 - · Educate yourself on how to to wear mask appropriately perform hand hygiene effectively (20-30 seconds for alcohol-based hand rub, and 40-60 seconds for soap and water) DON'T FORGET TO WASH YOUR THUMBS – attached is a healthcare document from WHO with effective technique:
https://www.who.int/gpsc/5may/Hand_Hygiene_Why_How_and_When_Brochure.pdf

- · Educate yourself on how to wear a mask appropriately; ensure it covers your nose and mouth and ensure that the mask is not donned backward
- · Perform hand hygiene prior to donning a mask or touching your supply of masks
- · Do not touch your face or adjust your mask after putting it on without performing effective hand hygiene; perform effective hand hygiene again after adjusting the mask
- · Perform only a single activity with a mask on before performing hand hygiene and then discarding the mask in a waste receptacle that is contained and does not risk contaminating other surfaces – perform hand hygiene again after removing the mask
- **Q: in comments re: grassroots outreach:**
 - “ recommend ensuring that anyone performing community work be excluded from duties if they feel even light onset of respiratory or enteric symptoms, unexplained rash, or fever. Equip outreach workers with ample supply of hand hygiene product and promote frequent use. Maintain distance from community members and establish measures if delivering supplies to limit interaction to deliverance of supplies outside of living spaces either within the community or residential. If any direct care or touch contact is involved; utilize infection prevention and control guidance for persons working in long-term and community/home care settings.

Concerns/Limitations/Arising Qs/Comments/Implications:

- Author w/ relevant expertise: “I’m a specialist in Infection Prevention and Control with experience in oncology and immunocompromised clinical care. I was part of a team that instituted a universal patient and visitor masking policy in high-risk oncology clinic areas that asked all patients and visitors to perform hand hygiene and wear a mask while in clinic.”
- “ I recommend always to refer to public health guidance for most up to date recommendations.” -- public health guidance especially in canada is *not* almost up to date.

Todd, Facebook post (Mar 21, 2020) [MASK MATERIALS MATTER - Revision 1 \(re: polyester outermost layer\)](#)

Article date: Mar 21 2020

Reviewed by: MH

Research Questions you’re answering: What materials should we use?
Design specs?

Summary notes from article/source:

- **Design:**
 - “The complex layering and overlapping of these thin plastic filaments creates a thicket-like maze that can trap particles”

- It appears that there may be three separate types of polypropylene fabrics in the facemask: a breathable type for next to mouth, a microfiber filtering type in the middle, and a barrier type on the side facing the world.
- **I believe that a 3-layer, re-useable design (a pleated cloth pocket into which a disposable filter inserted) offers the best balance of DIY effort and practical medical protection.**
- Materials
 - Polypropylene has two great properties for repelling viruses: it is negatively charged, and it is water-repellent
 - Outermost layer⁵: microfiber, soft, woven polyester made of textured yarn (do not have a shiny, stiff appearance, and that that look and feel like cotton).
 - previously suggested a particular cottony feeling shower curtain liner (not vinyl or PEVA sheeting) with a dimpled surface texture
 - Some folks suggested **polyester microfiber bed sheets** as this layer. i don't have any on hand, but the more I think about it, the more I agree that those are likley to be the better go-to fabric for the outermost layer.
 - Bedding has to be breathable by definition to sell well. Look for **"brushed microfiber" polyester**. Ignore the thread counts - those have become too hard to interpret to be meaningful.
 - Why: Negatively-charged and water-repellent; polyester yarns that are textured to feel cottony (brushed) are likely to be more breathable as well.
 - Disposable filtration layer: Swiffer-type heavy-duty sweeper refills⁶, unscented
 - Why: Easy for medical personnel to find and cut up as replacement filter layer; designed as particle trapper, and just might be made of polypropylene
 - Next to nose/mouth layer: Either cotton flannel, OR another layer of the brushed polyester microfiber
 - Why cotton: porous, more comfortable, positive charge, virus will be attracted to cotton. B/c cotton absorbent, will pull moisture out of virus, "dies" faster. If wet, uncomfortable.
 - Why flannel: fabric structure more effective at trapping virus.
 - Why polyester: reduce manufacturing time; reduce trouble finding. Might be more comfortable
 - Why dimpled: dimpling increases distance a virus has to travel to escape amsk; more surface area to trap virus marticles.
 - Increases skin comfort & breathability by not touching skin

⁵ Suggested https://www.amazon.com/dp/B07BMQ8RVL/ref=psdc_13749851_t3_B077PQCLHD

⁶ Example:

https://www.amazon.com/Swiffer-Sweeper-Refills-Cleaning-Unscented/dp/B07622VSV3/ref=sr_1_5?dchild=1&keywords=Swiffer+refills&qid=1584857774&s=home-garden&sr=1-5

- **Design:**
 - Consider outer layer different colour than inner so wearer does not have to think too much
 - Wash cotton before to preshrink
 - Do NOT use fabric softeners/dryer sheets as they impart positive charge for fabrics which will be a virus attractant

Concerns/Limitations/Arising Qs/Comments/Implications:

- Author is a textile scientist w/ expertise in military & protective clothing & equipment

[Taiwanese Doctor Teaches How To DIY Cloth Face Mask With Air Filter, So No Need To Scramble At Stores](#)

Article date: Feb 14, 2020

Reviewed by: MH

Research Questions you're answering: What materials should we use?

Summary notes from article/source:

- Surgical masks are made from "melt-blown, non-woven fabric". They have a 3-layer structure comprising materials like:
 - Waterproof non-woven layer (front)
 - Microfibre melt-blown non-woven fabric (middle)
 - Ordinary non-woven fabric (back)
- **Safety:**
 - The sealing effect of surgical masks is not 100% because oxygen still enters from the side of the mask. However, N95 surgical masks should only be used during important moments.

Krishnan (2017) [Respiratory protection face masks and respirators](#)

Article date: Oct 2017

Reviewed by: MH

Research Questions you're answering: What materials should we use?

Design considerations?

Summary notes from article/source

- **Design requirements**
 - Fluid proof & splash resistant to blood/body fluids
 - Pleats/folds -- to allow user to expand mask to cover nose and under chin (commonly 3 pleated)

- Stability during **breathing** -- should maintain shape during breath
- Minimum pore size for efficient filtration
- Higher filtration: 3 ply material made of melt-blown placed between spun bonded, non-woven fabric.
 - Melt-blown material acts as filter that stops microbes from entering/exiting the mask
- Optional additional filtration media
- **Ergonomic requirements**
 - Breathable and less breathing resistance
 - Loosely cover mouth and nose
 - Two headbands, nose foam, nose clip
 - Elastic strap band instead of tie on
 - Soft materials, comfortable to wear
 - Light in weight
- **Spun bonded non woven fabric:** polyethylene terephthalate (PET) and polypropylene. **Bonding method:** thermal or resin; should be throughout web
- **Benefits:** soft on skin, disposable, air permeable, water proof, can be sanitized, easy to stitch
- **What should I know before using surgical masks?**
 - Will not fully protect you from being infected
 - Must be changed when wet with saliva or other bodily fluids; will lose protective properties
 - Never reuse, wash, or disinfect surgical masks
 - Never share with others
 - Place used/soiled masks into plastic bag to prevent dripping
- **Diff b/w masks & respirators:** surgical masks PREVENT droplets being expelled into environment by wearer; & protect patients. Respirators used to reduce contact of wearer to airborne contaminants

[CDC: Strategies for Optimizing the Supply of Facemasks](#)

Article date: Mar 17, 2020

Reviewed by: Sebastian

Research Questions you're answering: What can healthcare workers do to protect themselves when no masks are available?

Summary notes from article/source:

- If using a homemade face mask, you should also have a face shield.

- How to balance ease of use & production vs. effectiveness? Do they require a sewing machine? 3D printing machine?
- Which tutorials are most clear? Which tutorials might cause harm and we would want to discourage?

You can also visit the [working synthesis doc, to review the findings around materials & design criteria](#).

REVIEWED DESIGNS

TEMPLATE: Design Title (hyperlinked):

Reviewed [date]

Reviewed by: [your name, if you wish]

Design specs & tutorial summary

Pros of Tutorial

Cons of Tutorial

Suggested modifications & other comments

[Plastic bottle face masks](#)

Reviewed: Sat Mar 21

Reviewed by: Sebastian

Tutorial summary:

- Cut bottom off of a PET soda bottle, slice bottle down the middle, cover edges with duct tape, strap to face. Top third of bottle faces down; can be filled with arbitrary filter material (cotton balls, tissue paper, pillow stuffing, etc.). Serves both as a breathing mask and as a full-face visor.

Advantages:

- Protects eyes
- Eliminates risk of transferring viruses to face or filter material during adjustment

Reasons you would not recommend:

- Cumbersome, uncomfortable, ridiculous-looking
- Requires you to already have a dust mask

Other:

- I think this, as well as the SCMP version using the visor made from a plastic binder, are both worth considering for situations in which the risk of airborne-droplet transmission and/or face-touching seems high, but no proper PPE is available.

[Plastic binder visor](#)

Reviewed Sat Mar 21

Reviewed by: Sebastian

Tutorial summary:

- Cut transparent plastic file folder in half, clip to glasses

Advantages:

- Protects eyes

Reasons you would not recommend:

- Requires glasses
- Even transparent folders typically distort or blur vision
- Does not form a seal around the face
- Does not prevent you from touching face

[5-Gallon water bottle space helmet](#)

Reviewed Mon Mar 23

Reviewed by: Sebastian

Tutorial summary:

- Cut bottom off 5-gallon water bottle, place over head

Advantages:

- Foolproof, minimal effort design
- easy to clean
- Could easily add makeshift air filter contraption to bottle neck opening

Reasons you would not recommend:

- Poor seal around the bottom

[Taiwanese Doctor Teaches How To DIY Cloth Face Mask With Air Filter, So No Need To Scramble At Stores](#)

Reviewed: Mar 22

Reviewed by: MH

Design specs & tutorial summary

- This mask's secret weapon lies in the middle layer. He inserted an item that could act as a filter or a "microfibre melt-blown non-woven fabric."
- The doctor placed a "non-woven cloth" in the opening of the mask. In this example, he **inserted wet tissues that were dried, but using toilet paper is fine too.**
- "People can also use "non-woven cloth" found in rags, diapers, gauze, wet tissues, tampons as filters too."

Pros of Tutorial

- Includes pattern

Cons of Tutorial

- Instructions not super clear

Suggested modifications & other comments

[HK Mask Pattern](#)

Reviewed: Mar 22

Reviewed by: MH

Design specs & tutorial summary

- The main body is composed of three layers: the inner and outer layers. The inner and outer cotton covers need to be cleaned and ironed daily.
 - The middle layer is a disposable filter element (filter cloth) that blocks the droplets. Immediately after replacing the middle filter cloth use.

Pros of Tutorial

- Includes different patterns for adults -- women, men, children, babies

Cons of Tutorial

- Instructions not in English

Suggested modifications & other comments

Translation? Suggest variety of filter

[Simple Improvised Mask Procedure](#)

Reviewed:

Reviewed by: MH

Design specs & tutorial summary

- SIMPLE IMPROVISED MASK PROCEDURE
- INCREASING THE EFFECTIVENESS AND STERILITY OF IMPROVISED CLOTH MASKS
- SALT AND SURFACTANT MEDIATED VIRAL DEACTIVATION
 - Treating the outer cloth strips with salt and surfactants will radically decrease the lifespan of the virus through evaporative salt recrystallization and surfactant lipophilicity, increasing sterility of mask handling greatly, important as the virus can live on fabric surfaces for 2-4 or more days, depending on conditions and material
- N95 ELECTROSTATIC CHARGE PRESERVATION
- DISINFECTANT AND DECONTAMINATION PROCEDURES

Pros of Tutorial

- Well-cited & materials/construction are backed up by sources

Cons of Tutorial

Suggested modifications & other comments

SOURCES TO REVIEW:

SAFETY & EFFECTIVENESS SOURCES

<https://pubmed.ncbi.nlm.nih.gov/22188875/>

<https://www.sciencedirect.com/science/article/abs/pii/S0195670113000698>

DIY Masks Literature Review: https://www.appropedia.org/DIY_masks

Appropedia Simple Masks:

https://www.appropedia.org/Simple_masks?fbclid=IwAR1ZMMFcD5Kg6nuAtpelrdZMrSOhbUhCB8LcSDAK8VsIF5lqLqfmAx1T95A

Open Source Covid19 Medical Supplies - Surgical Face Masks Document

<https://docs.google.com/document/d/1TKkGWLQcFaQYyN9NIyd8gkdkgCkhHmWns3ZEclbOJsQ/edit#heading=h.9v5jcrmbqbt>

Masks Protect Against Colds, Flu

<https://www.livescience.com/7661-masks-protect-colds-flu.html>

Can masks protect people from the coronavirus?

<https://smartaifilters.com/en/blog/coronavirus-pollution-masks-n95-surgical-mask/?rel=1>

Universal and reusable virus deactivation system for respiratory protection (journal article on masks w/ salt filter)

<https://www.nature.com/articles/srep39956?fbclid=IwAR16wiJL0TzRn5LF1k2NZwFKy88LLThe2NBNO5VXRbcNabweifgypVcFhk>

N95 Masks vs. Surgical Masks: Which Is Better at Preventing The Coronavirus?

<https://smartaifilters.com/en/blog/n95-mask-surgical-prevent-transmission-coronavirus/?rel=1>

Can a face mask stop coronavirus? Covid-19 facts checked

<https://www.theguardian.com/world/2020/mar/18/face-mask-coronavirus-covid-19-facts-checked>

Effectiveness of surgical masks against influenza bioaerosols

<https://www.sciencedirect.com/science/article/abs/pii/S0195670113000698>

The No. 1 way to prevent coronavirus isn't wearing a face mask

<https://www.cbsnews.com/news/coronavirus-prevention-face-mask-not-helpful-wash-hands/>

TUTORIALS TO REVIEW:

Face mask sewing pattern

<https://www.craftpassion.com/face-mask-sewing-pattern/?fbclid=IwAR3B4QI76fteWjRwsRq5lp-bPlifKJhvMGGjWRqTLP18BSZg5WbH-1SZkfY>

Project Cloth Masks <https://www.project-cloth-masks.com/make-a-mask>

A.B. Mask - for a Nurse by a Nurse

<https://www.instructables.com/id/AB-Mask-for-a-Nurse-by-a-Nurse/?fbclid=IwAR11J0vKwgYp7SeuqfI0jk66FB8PnllpzFo2DA6V0n6oJY8lsdYaKB-ckAQ#discuss>

Making a home made mask:

https://imgur.com/gallery/kdPQV1n?fbclid=IwAR1JxtFTR1hIKDfxI0KzfoOCVrnFz8aurV71uA9_n67HVZ82wLqsZS3QGXI

DIY Surgical Mask:

https://docs.google.com/document/d/1vhJP_f8_0AHFZaMpAHAsX1sU8Ag9pd5WE8lsU4FDK3I/edit?fbclid=IwAR3f_si6Nbup8vkvYiKMa0tOPPyW2B4HR3YprAxZPzscg7K9VcEnQHASFFw

Salt Mask:

https://robots-everywhere.com/re_wiki/pmwiki.php?n=Cookbook.SaltMask&fbclid=IwAR0sV7MOWF2jDJ1T57fCgY8LDL5XJNYimoywDOZPoCLmJDDgnPWDQj0YAYA

Plastic bottle face masks (I've also seen these with cotton balls or other stuffing, instead of the surgical mask):

<https://www.artofmanliness.com/articles/make-improvised-gas-mask/>

Free sewing pattern (from Japan): <https://www.cottontimemagazine.com/page/10>

How to Make an N95 Mask out of a BRA DIY Do it Yourself Respirator Mask In My Opinion

<https://www.youtube.com/watch?v=Dy59oQArwXI&feature=youtu.be>

HOW TO MAKE FACE MASK WITH FILTER POCKET AND ADJUSTABLE WIRE | SEWING TUTORIAL <https://www.youtube.com/watch?v=BCJcE-r7kcg>

DIY Covid-19 Fabric Mask (with Filter Pocket) Sewing Tutorial
https://www.youtube.com/watch?v=S9RWII2-5_4

DIY Cloth Face Masks

https://www.instructables.com/id/DIY-Cloth-Face-Mask/?fbclid=IwAR3hQ6wi0vamshIMep8Kit6Y-_iqv5aV33KbQykChE4ERwfvbtPH7b6HsEM

How To Make A No Sew DIY N95 Type Protective Face Mask | Coronavirus | Covid-19

<https://www.youtube.com/watch?v=6T787NV6FpA&feature=youtu.be>

- *Well-researched, but for single-use throwaway. Maybe better for frontline medical staff*

How to make a face mask:

<https://www.deaconess.com/How-to-make-a-Face-Mask/Documents-Mask/Mask-Information>

Face Mask Sewing Pattern

https://www.craftpassion.com/face-mask-sewing-pattern/?fbclid=IwAR0nKZABN-bTLU4VRwB5XC-s9rMTvYjio_o0M1PKhKfKQ33RqaiabmFACE MASK SEWING PATTERNxDork

Heres' a DIY for how to make your own face masks:

<https://www.bkreader.com/2020/03/07/heres-a-diy-way-to-make-your-own-protective-face-mask/>

Tutorial from Despereaux's Treasures:

https://www.facebook.com/DespereauxsTreasures/posts/2653033771578768?hc_location=ufi

Tutorial with a lot of citations

<https://www.facebook.com/groups/futurefossils/permalink/1101698020192167/>

How to make your own mask: Hong Kong scientists reveal temporary solution for those unable to get protective gear because of panic buying and price-gouging

<https://www.scmp.com/week-asia/health-environment/article/3075164/south-koreas-coronavirus-response-opposite-china-and>

RELATED INFO:

Coronavirus: Deaconess will ask public to sew CDC-compliant face masks for staff

<https://www.courierpress.com/story/news/2020/03/18/coronavirus-deaconess-ask-public-provide>

[-medical-face-masks/2865273001/?fbclid=IwAR2c3hFj1cGvY3ZhuG_Jym3NETX8xZbFYRhI6lY3qX5_EzZsHfixwvW6QUA](https://www.facebook.com/medical-face-masks/2865273001/?fbclid=IwAR2c3hFj1cGvY3ZhuG_Jym3NETX8xZbFYRhI6lY3qX5_EzZsHfixwvW6QUA)

Hong Kong making reusable facemasks:

https://smartairfilters.com/en/blog/diy-homemade-mask-protect-virus-coronavirus/?fbclid=IwAR15c2zAYQnXEF4uc0k1Q4akhijYtCT49U0y0j57p8lWR_MwgNN2T947Xo

Hospital Workers make Masks From Office Supplies Amid U.S. Shortage

<https://www.bloomberg.com/news/articles/2020-03-18/hospital-makes-face-masks-covid-19-shields-from-office-supplies>

Coronavirus: Canadian doctors call for smarter use of medical gear amid supply concerns <https://globalnews.ca/news/6683058/coronavirus-canada-doctors-equipment/>

"The WHO estimated roughly 89 million medical masks will be needed each month for the COVID-19 response, along with 76 million examination gloves and more than one million goggles.

Overall, it estimated that protective equipment supplies need to be increased by 40 per cent worldwide to meet demands of the pandemic."

Japan gets creative as mask shortages continue amid COVID-19 spread

<https://www.japantimes.co.jp/news/2020/02/25/national/japan-mask-shortages-covid19/#.XnMTXJNKiRs>

Hospital staff crafts masks from office supplies during coronavirus shortage

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3373043/?fbclid=IwAR2sCuXWSr68_msua-rLZ_39YFI4tGD_4TnljFygOTkPMqyN1yUUsqdSYWQ

#WearAFuckingFacemask Website lol <https://wearafuckingmask.com/>

This tweet claims Canadian hospitals will run out of PPE items including masks and gowns based on current use, in 2 weeks:

<https://twitter.com/drmwarner/status/1241356039804633088>