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Mask Wearing by the Public

Among healthy adults, do masks other than the N-95 (e.g. standard respiratory precaution masks, makeshift masks from scarves) protect from COVID-19 acquisition as well as N-95 masks?

Key Findings:

Science behind Mask Wearing

- One study found the average jet distance traveled by the droplets of an uncovered cough (I.e. no mask) to be ~8ft while the average jet distance traveled by a cough covered with a two-layer stitched mask made of quilting cotton to be 2.5in. The droplets from a cough covered by a single-layer bandana style covering had an average jet distance of 3ft7in. [8]
- Surgical masks and unvented KN95 respirators have been found to reduce outward particle transmission during speaking by 90% and during coughing by 74% [12]
- Masking has been found to block around 94% of viruses that may otherwise remain airborne after 10 seconds [24]
- Multiple studies have shown that public use of non-woven face masks protects against respiratory infections including MERS CoV, SARS-CoV, and SARS-CoV2[13, 21]
- A systemic review of 19 randomized controlled trials found masks to be effective in the community with and without hand hygiene in preventing transmission but are more protective when used in unison [15]
- WHO guidelines released in June of 2020 cite evidence supporting the ability of masks to protect healthy individuals living in households with close contacts who are COVID positive.
    - Household transmission of influenza is reduced by the use of facemasks and intensified hand hygiene (adjusted odds ratio 0.16, 95% CI, 0.03-0.92). [7]
- Evidence shows that close contact may be required for viral transmission to occur – masks provide a barrier in situations where social distancing cannot be maintained and help to prevent transmission. [4, 23]
- One preprint systematic review found that wearing facemasks can be protective against primary infection from community contact and protective against household transmission.[5]

Comparing Mask Materials

- Studies have evaluated how various cloth formulations compare against medical masks and N95 masks.[2-6]
    - Of the peer-reviewed studies, researchers found that, although N95 masks are superior, homemade masks still showed efficacy in blocking particle transmission or spread of viral droplets.[1–3]
    - A recently published study comparing the fitted filtration efficiency of consumer grade masks and procedural masks found that publicly available consumer grade masks are nearly equivalent to or better than non-N95 respirator medical masks [31]
    - Another study found that while most masks, including both cloth and surgical, offer substantial protection against foreign droplet transfer, they don't provide complete

protection especially in the absence of social distancing, and may allow sneeze and cough droplets to pass through. An exception to this was fitted N-95 masks. [32]

- One study evaluated the types of fabrics used in homemade masks against an experimental setup that modeled viral droplet transmission and found that cotton towels and scarf materials had a higher resistance level than other tested fabrics.[2,3]
- A systematic review found three fabrics with a filtration efficiency >90% including a hybrid of cotton/ chiffon (95% CI 95.2 to 98.8), hybrid of cotton/ silk (95% CI 92.2 to 95.8), and cotton quilt (95% CI 94.2 to 97.8) [28].
- The efficiency of cloth masks is highest when made of hybrid fabrics and cotton quilt with multiple layers [28] with one studying finding that three or four layers is most effective [33]
- One peer reviewed study suggested that single layered neck-gaiters might be counterproductive due to their ability to shrink droplet size and prolong viral airborne time when compared to no mask.[10]
- A pre-print study found that face shields are only 2% effective at blocking aerosols compared to 51% with a 3-ply cloth face mask, 59% with a procedural mask, and 99% with a N95 respirator. [18]
- Masks with breathing valves or vents are not recommended due to their inability to prevent the transmission of respiratory droplets from the wearer.[11]

Impact of Mask Wearing on Community Disease Transmission

- Across multiple studies, mask mandates have consistently been associated with significantly lower COVID-19 growth rates [1, 17, 21, 25, 26, 29]
- The CDC has stated that mask use not only offers personal protection to the mask wearer but also functions as source control of disease transmission [30]
- Mask use, even in the context of poor social distancing, has been shown to be effective at reducing transmission of COVID-19 [27]
- A preprint study found that other than a full lockdown, the interventions that had the most impact on controlling infection rates in several countries were closing schools, closing bars, and wearing masks. [16]
- One study found a reduction in hospitalization rates following the implementation of mask mandates, suggesting not only a decrease in disease transmission but also a possible decrease in disease severity with the use of masks [22]

Modeling Studies

- The latest IHME forecasting model predicts that universal mask use could save almost 130,000 additional lives from September 22, 2020 to the end of February 2021 [20]
- A systematic review and meta-analysis conducted to evaluate transmission prevention methods found that face mask usage could result in a large reduction in risk of infection (n=2647; aOR 0·15, 95% CI 0·07 to 0·34, RD −14·3%, −15·9 to −10·7; low certainty), with N95 masks conferring higher protection.[6]
- A pre-print modeling study found that non-medical mask wearing alone by 75% of the population could reduce infections by 38%, hospitalizations by 44%, and deaths by 47% even with only 20% efficacy in preventing disease transmission [19]
- Models show that if 90% of the population uses 70% effective masks, the rate of COVID-19 transmission falls 63%. If only 50% of the population uses 70% effective masks, the rate of

COVID-19 transmission falls 33%. Therefore, although even partially effective masks help reduce transmission rates, regular mask use must be fairly universal to have a significant effect.[9]

Pros and Cons of Mask Wearing

- The advantages of mask usage by healthy individuals in the general public include reduced potential exposure from infected persons before they develop symptoms, a continual reminder for people to remain compliant with other prevention measures like hand-washing, and potential social and economic benefits through the promotion of individual enterprise and community integration. [4]
- The disadvantages of mask usage by healthy individuals include potential increased risk for self-contamination, facial irritation, a false sense of security, lower compliance in pediatric populations, impaired communication, and discomfort for those with respiratory impairment[4].
- 3-layer nonmedical face mask use has not been associated with a decline in oxygen saturation [14]

Overall Recommendations

- Mask wearing by the general public should be accompanied by proper hand hygiene and social distancing practices.
- Wearing homemade face masks can be protective against infection from community contact and protective within household settings against household transmission.[5,6]
- Mask wearing should be especially encouraged in environments in which social distancing is not possible, such as close social encounters, caring for ill members of household and within workplaces. [6, 27]
- Homemade masks do show efficacy in preventing droplet transmission and are most effective when made with hybrid fabrics such as cotton/ chiffon, cotton/ silk, or cotton quilt. Multiple layers of cloth provide additional protection.[1–3, 28]
    - The ideal combination for homemade masks should contain the following layers, from innermost to outermost[6] –
        - Hydrophilic material like cotton
        - Synthetic non-woven material like polypropylene
        - Hydrophobic material like polypropylene, polyester, or polyester blend
- WHO guidelines have been updated to cautiously support the use of mask-wearing in the public. The WHO advises that a risk-based approach should be applied by policy makers that evaluates the following factors: purpose of mask usage, risk of exposure to COVID-19 based on local epidemiology and transmission, vulnerability of the mask wearer and local population, setting in which the population lives, feasibility, and type of mask.[4]

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