

Face coverings in the community and COVID-19: a rapid review

Supplementary material – data extraction

Table S1. Observational studies

Reference	Study design	Methods	Key findings in relation to masks use in the community	Comments
Cheng et al, 2020 (1) In press 'The role of community-wide wearing of face mask for control of coronavirus disease 2019 (COVID-19) epidemic due to SARS-CoV-2'	<u>Study type:</u> epidemiological study. <u>Participants:</u> Hong Kong Special Administrative Region (HKSAR). <u>Objective:</u> to assess the effect of community-wide mask usage to control COVID-19 in HKSAR. <u>Settings:</u> community.	<ul style="list-style-type: none"> - Patients with respiratory symptoms at outpatient clinics or hospital wards were screened for COVID-19 per protocol. - Epidemiological analysis was performed for confirmed cases. - Compliance of face mask usage was monitored by 69 University staff members during their morning commute among the first 50 persons they saw and over 3 consecutive days (6-8 April 2020). - Incidence of COVID-19 (per million population) in HKSAR was compared to that of non-mask-wearing countries which are comparable with HKSAR in terms of population density, healthcare system, BCG vaccination and social distancing measures but not community-wide masking. 	<ul style="list-style-type: none"> - Within first 100 days (31 December 2019 to 8 April 2020), 961 COVID-19 patients were diagnosed in HKSAR. - Compliance of face mask usage in April: 10,050 persons were observed, of which 337 (3.4%) did not wear face mask. - 11 COVID-19 clusters were observed in recreational 'mask-off' settings compared to only 3 in workplace 'mask-on' settings (p=0.036). - The incidence of COVID-19 in HKSAR was significantly less than that of the selected countries in Asia, Europe (including UK), and North America, where face mask usage was not universally adopted in the community. - The authors concluded that community-wide mask wearing may contribute to the control of COVID-19. 	<p><u>Authors-identified limitations</u></p> <ul style="list-style-type: none"> - Mask-off settings in the family were not analysed. - Type of mask used in the community cannot be controlled, and compliance (no touching, hand-washing before and after, etc) cannot be assessed. - Mask compliance cannot be directly counted for every community settings. <p><u>Notes from the review team</u></p> <ul style="list-style-type: none"> - No information provided on whether the results were adjusted for potential confounding factors. - There is a potential risk of bias in the methods used to ascertain the exposure (mask usage); however, this risk is lower in this study than in some of the other studies identified.
Fan et al, 2020 (2) In press	<u>Study type:</u> epidemiological study / case report.	<ul style="list-style-type: none"> - Screening (temperature, symptom questionnaire and epidemiological history) and SARS-CoV-2 test (PCR, oral/nasopharynx swab) performed at the airport upon arrival. 	<ul style="list-style-type: none"> - 37 out of 311 returnees (12%) tested positive. All were international Chinese students from 2 universities (1 in Qom province and 1 in Golestan province). 	<p><u>Authors-identified limitations</u></p> <ul style="list-style-type: none"> - Scarcity of literature about demographics and clinical aspects of COVID-19 in Iran.

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<p>'The epidemiology of reverse transmission of COVID-19 in Gansu Province, China'</p>	<p><u>Participants:</u> 311 citizens evacuated from Iran to the quarantine centre of Gansu Province; 82% were students, median age 23 years old.</p> <p><u>Settings:</u> community.</p> <p><u>Objective:</u> to report the epidemiological characteristics and the clinical features of these 31 citizens to provide critical and objective information to help control the spread of COVID-19 to other provinces and countries.</p>	<p>- Those testing positives were admitted to hospital, and the others were isolated for 14-day.</p> <p>- Demographic data, including sex, age, occupation, nationality and exposure history were provided by Gansu Provincial Centre for Disease Control and Prevention, and clinical data were provided by Lanzhou Pulmonary Hospital and Gansu Provincial Hospital.</p> <p>- Geographical analysis (spatial distribution) and statistical analysis performed.</p>	<p>- Higher rate of infection observed amongst the returnees from Qom (15%) and Golestan provinces (30%), compared to Tehran (3%). Note: at the time of evacuation, Qom and Tehran reported larger number of infections in local population (>400) compared to Golestan province (100-199).</p> <p>- Significant positive correlation between the incidence of infection and male sex ($\chi^2=11.615$, $p=0.001$), younger age (16–30 y) ($p=0.014$), Hui/other races ($p=0.026$), or residing in a dormitory ($\chi^2=4.088$, $p=0.043$).</p> <p>- Wearing a facemask while in Iran also increased the risk for COVID-19 infection: 24% amongst those wearing mask vs 10% in those not wearing masks ($\chi^2=7.902$, $p=0.005$).</p> <p>- Authors' comments on these results:</p> <ul style="list-style-type: none"> • source of infections may be from University (dormitories in shared facilities) and/or Mosques • it is possible that those wearing masks i) were involved in higher risks activities e.g. dormitories, classes, mosques or ii) neglected other measures e.g. social distancing and hygiene; or that iii) masks may not have been P2/N95 and/or may not have been used adequately. 	<p>- Spatial risk factors in Iran and potential risk in China difficult to assess due to the low number of cases and short study period.</p> <p><u>Comments by the review team</u></p> <p>- No information provided on whether the results were adjusted for potential confounding factors. E.g. not clear whether the association between mask and increased risk would still be significant if controlled for 'residing in a dormitory'.</p> <p>- The population studied here is not representative of the general population (international students).</p> <p>- Overall, this study was judged as being at high risk of bias.</p>

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<p>Hunter et al, 2020 (3) PREPRINT</p> <p>‘Impact of non-pharmaceutical interventions against COVID-19 in Europe: a quasi-experimental study’</p>	<p><u>Study type:</u> epidemiological study.</p> <p><u>Participants:</u> 30 European countries (including UK).</p> <p><u>Settings:</u> country-level / community.</p> <p><u>Objective:</u> to analyse the different approaches to and timing of restrictions in the different countries and identify what effects such restriction may have had on the control of the epidemic.</p>	<p><u>Data analysis:</u> 2 sets of analyses conducted:</p> <p>1) multi-level mixed effects regression analysis, using a mixed effects negative binomial regression model with cases or deaths on a specific day as the outcome variable, country population as the exposure variable, country as a mixed affect, and days from start of the epidemic as a fixed effect.</p> <p>2) R modelling using Bayesian generalised additive mixed models (GAMM) to adjust for spatial dependency in disease between nation states.</p> <p><u>Data source:</u> the European Centre for Disease Control (ECDC) for data on case numbers (up to 24 April 2020), the Institute of Health Metrics and Evaluation (IHME) website and published sources for dates of initiation of various control strategies.</p>	<p>- The exposure-response relationships estimated by the models show that the use of face coverings initially seemed to have had a protective effect but that, after day 15 of the face covering advisories or requirements, the number of cases started to rise. Similar patterns were observed for the relationship between face coverings and deaths.</p> <p>- The authors noted that there was even a suggestion that they may actually increase risk, but they estimated that the data on face coverings were too preliminary to be reliable (due to recent introduction) and should not be used to inform public policy.</p> <p>- The authors concluded that the wearing of facemasks or coverings in public was not associated with any independent additional impact.</p>	<p><u>Authors-identified limitations</u></p> <ul style="list-style-type: none"> - Hard to separate out individual intervention effects due to collinearity and to many interventions having been implemented in different ways and at different points in the local epidemic. - Many subtle variations in how control measures were implemented could not be captured in this model. Lack of direct observation of these variations may have biased the results. <p><u>Notes from review team</u></p> <ul style="list-style-type: none"> - The authors described their study as being a quasi-experimental study, although it used a similar design to the country-level epidemiological studies reported here. - A number of factors were adjusted for in the model, but residual confounding cannot be ruled out. - The potential risk of bias in the methods used to ascertain the exposure is high as mask usage was assessed based on national policies.

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<p>Kenyon, 2020 (4) PREPRINT</p> <p>‘Widespread use of face masks in public may slow the spread of SARS CoV-2: an ecological study’</p>	<p><u>Study type:</u> epidemiological study.</p> <p><u>Participants:</u> 49 countries (including UK).</p> <p><u>Settings:</u> country-level / community.</p> <p><u>Objective:</u> to assess if there is ecological level evidence that countries that promoted face mask usage in public had a lower number of COVID-19 diagnoses per capita.</p>	<p><u>Hypothesis:</u> population level usage of face masks may be negatively associated SARS CoV-2 spread.</p> <p><u>Statistical analysis:</u> linear regression was used to assess at country level the association between COVID-19 diagnoses per inhabitant and the national promotion of face masks in public (coded as a binary variable), controlling for the age of the COVID-19 epidemic and testing intensity.</p> <p><u>Data source:</u> ECDC (up to 29 March 2020) and national documents/ guidance</p>	<ul style="list-style-type: none"> - Out of the 49 countries, 8 advocated wearing face masks in public: China, Czechia, Hong Kong, Japan, Singapore, South Korea, Thailand and Malaysia. - In multivariate analysis, face mask use was negatively associated with number of COVID-19 cases/inhabitant (coef. -326, 95% CI -601 to -51, p=0.021). - The analyses were repeated excluding Czechia (only country to introduce universal face masks late in the epidemic), which slightly strengthened the association between COVID-19 cases and face mask usage. - The authors concluded that whilst these results are susceptible to residual confounding, they do provide ecological level support to the individual level studies that found face mask usage to reduce the transmission and acquisition of respiratory viral infections. 	<p><u>Authors-identified limitations</u></p> <ul style="list-style-type: none"> - Lack of accurate data to control for confounders such as contact tracing or isolation; if these were responsible for slower spread, this model would have falsely attributed this effect to face masks. - It was not possible to quantitate the intensity of face mask use per country, resulting in a crude binary classification of face mask usage. <p><u>Notes from the review team</u></p> <ul style="list-style-type: none"> - Results were adjusted for only 2 factors and are likely to be subject to confounding. - The potential risk of bias in the methods used to ascertain the exposure is high as mask usage was assessed based on national policies (coded as 0 or 1).
<p>Leffler et al, 2020 (5) PREPRINT</p> <p>‘Association of country-wide coronavirus mortality with demographics, testing,</p>	<p><u>Study type:</u> epidemiological study.</p> <p><u>Participants:</u> 198 countries.</p> <p><u>Settings:</u> country-level / community.</p>	<p><u>Hypothesis:</u> in countries where mask use was either an accepted cultural norm or favoured by government policies on a national level, the per-capita mortality might be reduced, as compared with remaining countries.</p> <p><u>Statistical analysis:</u> significant predictors of per-capita coronavirus mortality in the univariate analysis</p>	<ul style="list-style-type: none"> - In some Asian countries, masks were used extensively by the public from the beginning of the outbreak. Despite the fact that the outbreak tended to appear quite early in these countries, they had experienced a low per-capita coronavirus mortality by 9 May 2020. - Multivariable analyses with obesity data (194 countries): 	<p><u>Authors-identified limitations</u></p> <ul style="list-style-type: none"> - Evidence concerning the actual levels of mask-wearing by the public are not available for most countries, especially in Western countries where mask-wearing is recommended rather than mandatory. - Source of mortality data is often from governments which

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lockdowns, and public wearing of masks (Update June 2, 2020)'	<u>Objective:</u> to assess the impact of masks on per-capita COVID-19-related mortality.	<p>were analysed by stepwise backwards multivariable linear regression analysis. Potential predictors analysed included age, sex ratio, obesity prevalence, temperature, urbanization, smoking, duration of infection, lockdowns, viral testing, contact tracing policies, and public mask-wearing norms and policies.</p> <p><u>Data source:</u> Worldometers Database (9 May 2020). Countries were included if either:</p> <ol style="list-style-type: none"> 1) coronavirus testing data were available by May 9, 2020 2) testing and lockdown policies had been graded by the University of Oxford Coronavirus Government Response Tracker. <p>Additional data were obtained from ECDC and other public databases.</p> <p><u>Assumption made:</u> the date of each country's initial infection was estimated as the earlier of: i) 5 days before the first reported infection, or ii) 23 days before the first death.</p>	<ul style="list-style-type: none"> • 'duration since masks were recommended' significant predictor of the logarithm of each country's per-capita coronavirus mortality ($p < 0.001$) • in countries not recommending masks, the per-capita mortality tended to increase each week by 47.4%; in countries recommending masks: 9.0%; under lockdown (without masks): 38.7%. <p>- Multivariable analyses with obesity and testing data (179 countries):</p> <ul style="list-style-type: none"> • 'duration since masks were recommended' continued to be a significant predictor ($p \leq 0.001$) • 49.1% increase in per-capita mortality each week in countries without masks; in countries where masks were recommended: 13.1% <p>- Multivariable analyses with containment, testing and health policies data (161 countries):</p> <ul style="list-style-type: none"> • 'duration that masks were recommended' was independently predictive of per-capita mortality • weekly increase in per-capita mortality was 26.68%; when masks were worn: 0.4% <p>- The authors concluded that these results support the universal wearing of masks by the public to suppress the spread of the coronavirus.</p>	<p>may not have the resources to provide a full accounting of their public health crises, or an interest in doing so.</p> <p>- Country-wide analyses are subject to the ecologic fallacy.</p> <p><u>Notes from the review team</u></p> <p>- A number of factors were adjusted for in the model, but residual confounding cannot be ruled out.</p> <p>- The potential risk of bias in the methods used to ascertain the exposure is high as mask usage was assessed based on national policies.</p> <p>- The list of the 198 countries included was not provided, although it can be assumed that UK was one of them.</p> <p>- The authors noted that given the low levels of coronavirus mortality in the Asian countries which adopted widespread public mask usage, it seems highly unlikely that masks are harmful. However, it is not clear whether these observations are transferable to European countries, among other due to cultural differences.</p>

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<p>Wang et al, 2020 (6) Accepted manuscript</p> <p>'Reduction of secondary transmission of SARS-CoV-2 in households by face mask use, disinfection and social distancing: a cohort study in Beijing, China'</p>	<p><u>Study type:</u> retrospective cohort study.</p> <p><u>Participants:</u> 335 people in 124 families with at least one laboratory-confirmed case of COVID-19 in Beijing, China.</p> <p><u>Setting:</u> households.</p> <p><u>Objective:</u> to study the use of NPIs such as face masks, social distancing and disinfection in the household setting to inform community epidemic control and prevent transmission of COVID-19 in households.</p>	<p>Families with and without secondary transmission were compared for various measured risk factors, preventive interventions and exposures in order to analyse the predictors of household transmission.</p> <p><u>Duration:</u> 28 February to 27 March 2020</p> <p><u>Outcome:</u> secondary transmission of SARS-CoV-2 within the family.</p> <p><u>Data collection:</u> 3-part structured questionnaire (by telephone?). Data on primary case extracted from epidemiological reports from the Beijing Center for Disease Prevention and supplemented by telephone interview.</p> <p><u>Statistical analyses:</u> multivariable logistic regression model to identify risk factors associated with SARS-CoV-2 household transmission.</p>	<p>- Secondary attack rate in family: 23.07% (77/335)</p> <p>- 4 factors were significantly associated with secondary transmission:</p> <ul style="list-style-type: none"> • increased risk: primary case having diarrhoea; and daily close contact with primary case • reduced risk: frequent use of chlorine or ethanol-based disinfectant in households and family members (including the primary case); wearing a mask at home before the primary case developed illness <p>- Face mask use by the primary case and family contacts before the primary case developed symptoms was 79% effective in reducing transmission (OR=0.21, 95% CI 0.06 to 0.79).</p> <p>- Wearing a mask after illness onset of primary case was significantly protective in univariate analysis but not in multivariate analysis.</p>	<p><u>Authors-identified limitations</u></p> <ul style="list-style-type: none"> - Telephone interview has limitations e.g. recall bias. - The evaluation results of mask wearing were reliable, but data on the concentration of disinfectant used by families were not collected. <p><u>Notes from the review team</u></p> <ul style="list-style-type: none"> - Based on its design, this study might be less subject to bias than the other observational studies identified, among other due to: <ul style="list-style-type: none"> • exposure assessed in a more reliable way (at individual level rather than based on national policies) • the results are still subject to residual confounding, but probably less than the epidemiological studies - The results from this study, conducted in Chinese households, might not be applicable to the UK context.
<p>Zeng et al, 2020 (7) In press</p> <p>'Epidemiology reveals mask wearing by the</p>	<p><u>Study type:</u> epidemiological study.</p> <p><u>Participants:</u> China, South Korea, Italy and Spain.</p>	<p><u>Data analysis:</u> the generalized additive model (GAM) was used to generate the epidemiological curves (daily infection and daily reported) and simulate infection curves with reported incubation period.</p>	<p>- In China, mandatory mask wearing by the public likely played an important role in stopping the spread of the disease. The combination of the measures taken (mask wearing, city lockdown and medical resources) collectively contained the epidemic and</p>	<p><u>Authors-identified limitations</u></p> <p>None reported.</p> <p><u>Notes from the review team</u></p> <ul style="list-style-type: none"> - This study seems to be mainly based on visual assessment of the epidemiological curves with

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public is crucial for COVID-19 control'	<p><u>Settings:</u> country-level / community.</p> <p><u>Objective:</u> to analyse the epidemiological features of China, South Korea, Italy and Spain to find out the relationship of major public health events and epidemiological curves.</p>	<p><u>Data source:</u> from publicly available sources.</p> <p><u>Assumptions made:</u> the interval from symptom onset to report was ~8 days and the median of the incubation period was 5.2 days (95% CI: 4.1 to 7.0).</p>	<p>dramatically reduced the number of infected cases.</p> <ul style="list-style-type: none"> - In South Korea, the epidemic was predominantly confined to spread within religious groups and not to the wider community. This may be because of the general practice of mask wearing by the public, based on 1) sales numbers and 2) 10 days after government instructed face-wearing by the public, the number of daily reported cases declined. - The authors noted that the epidemic could not be satisfactorily contained in Italy and in Spain, due to the shortage of medical resources, non-mandatory advice on wearing of masks and the people are not adapted to wearing masks. - The authors concluded that their analysis supports the importance of mask wearing by the public. 	<p>the date of introduction of the different measures; confounding factors were not considered.</p> <ul style="list-style-type: none"> - The potential risk of bias in the methods used to ascertain the exposure is high as mask usage was assessed based on national policies or news articles. - The conclusions for Spain and Italy seem to be more an opinion than based on data. - Overall, this study was judged as being at high risk of bias.

Table S2. Modelling studies

Reference	Model Characteristics	Scenarios/Models & Outcome Measures	Key findings relating to use/efficacy of masks.
<p>Barr, G., May 2020 (8) PREPRINT</p> <p>‘A model showing the relative risk of viral aerosol infection from breathing and the benefit of wearing masks in different settings with implications for COVID-19’</p>	<p><u>Model:</u> Basic Model</p> <p><u>Model calibration data:</u> N/A</p> <p><u>Model Parameters:</u></p> <ul style="list-style-type: none"> - Infectious dose - Viral density in aerosol particles - Particle exhalation per Litre for an infectious person - Volume of air expired per minute by infectious person - Volume of air inspire per minute for non-infected person - Mask - No Mask - Distance between persons <p><u>Mask parameters:</u></p> <ul style="list-style-type: none"> - Cloth mask - Surgical mask - FFP3 mask - Inspiratory filtration factor for infected person breathing out - Filtration factor for non-infected person breathing in <p><u>Author-identified limitations:</u> This is a comparative analysis and not an actual situation. Assumptions made on parameters could be less or more than what is actually the case. E.g. min/max infectious dose. Account for decay of aerosol is</p>	<p><u>Scenarios:</u></p> <p>A. Close by, breathing the exhaled air of an infectious person with no dilution. Both breathing normally</p> <ul style="list-style-type: none"> - Non-infected wearing surgical mask - Both wearing surgical mask - Non-infected wearing surgical mask + Infected wearing FFP3 mask - Non-infected wearing FFP3 mask + Infected wearing surgical mask - Both wearing cloth mask <p>B. 2 people in car, one infected, 2m apart, no ventilation, fresh uncontaminated air at the start.</p> <ul style="list-style-type: none"> - No masks - Non-infected wearing surgical mask - Non-infected wearing FFP3 - Both wearing surgical mask - Both wearing cloth mask <p>C. 2 people in confined space such as car 2m³, one infected person already present for 3 hours and no ventilation.</p> <ul style="list-style-type: none"> - No masks - Non-infected wearing FFP3 - Non-infected wearing surgical mask - Non-infected wearing cloth mask - Both wearing surgical mask from the start <p>Ventilation introduced at start of 3 hours as described above.</p> <ul style="list-style-type: none"> - Non-infected with no mask 	<ul style="list-style-type: none"> - Wearing a mask is beneficial at every aspect of infection modality, when compared to no masks. - For two people wearing masks, the protection is multiplicative, not additive. Increase in protection is 17-fold if infectious and non-infected both wear a mask, compared to no mask at all. This protection is increased by only 2.8-fold if only the non-infected wears a surgical mask - Wearing a mask will reduce the number of infectious particles which could mean reducing chance of infection or having a milder infection. - All masks reduce Infectious Dose if worn by a non-infected person. - The effects of social distancing in confined areas, such as work place, can be time limited if one person is infected. This time can be extended over a longer period with use of masks and air replacement. An infectious and non-infected both wearing surgical masks in this environment has a beneficial effect greater than equivalent of 200 litres per minute air replacement. These effects combined made an extremely large difference.

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	estimated as it can be greatly affected by particle size and humidity.	<ul style="list-style-type: none"> - Non-infected with cloth mask D. Infected person in a room or working in small shop 30m³ for 3 hours, no ventilation. - Non-infected with no mask - Non-infected with cloth mask 	
<p>Brauner, J. et al. June 2020 (9) PREPRINT</p> <p>'The effectiveness and perceived burden of nonpharmaceutical interventions against COVID-19 transmission: A modelling study with 41 countries.'</p>	<p><u>Model:</u> Semi-mechanistic Bayesian hierarchical model</p> <p><u>Model Calibration data:</u> Epidemic Forecasting Global NPI Database (EFGNPI)</p> <p><u>Data Characteristics:</u></p> <ul style="list-style-type: none"> - Data from 67 countries on general population - 1700 events - Distilled in to 24 classes of NPI <p><u>Setting:</u> Country-specific Community and publicly accessed facilities and/or environments</p> <p><u>Model parameters:</u></p> <ul style="list-style-type: none"> - Nine defined Non-pharmaceutical interventions (NPI) including Mask-wearing - Growth rate of new infections - Infection rate of infections that are confirmed positive or lead to a reported death. - Observation for confirmed cases - Observation model for deaths 	<p><u>Outcome:</u></p> <ul style="list-style-type: none"> - Growth reductions of NPIs when compared to growth rate without NPIs of Basic reproduction number (R_0) - Effectiveness-burden-ratio 	<ul style="list-style-type: none"> - Each NPI in the model reduces R_0 by a multiplicative factor and assumes no interaction between different NPIs. - All NPIs except mask-wearing had a >95% posterior probability of being effective. - Mask-wearing was observed as a more preferable NPI against all others over a 50 week period, except for 'gatherings limited to 1000 people or less'. - While these observations were made, the author concluded that there is insufficient data to make claims about the effectiveness for mask-wearing from this model.

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	<p>- Preference elicitation (survey data)</p> <p><u>Mask parameters:</u> Satisfying one, or both of:</p> <ul style="list-style-type: none"> - A country has implemented a policy of requiring mask usage among the general public, sometimes limited to certain domains like a duty to wear masks in public transport and supermarkets. - Survey reports indicate that over 60% of people were wearing masks in public. <p><u>Author-identified limitations:</u> Mask-wearing NPIs had the least available data which may explain the lack of observed effect.</p>		
<p>Chen, Y., & Dong, M. June 2020 (10) PREPRINT 'How Efficient Can Non-Professional Masks Suppress COVID-19 Pandemic?'</p>	<p><u>Model:</u> Monte Carlo simulation</p> <p><u>Model calibration data:</u> N/A</p> <p><u>Model Parameters:</u></p> <ul style="list-style-type: none"> - No mask use - Cotton face mask (non-professional) - Mask Aerosol Block Rate (ABR) - Virus Penetration Rate (VPR) - Aerosol diameter - Transmission rate (R_0) - Contact rate (C) <p><u>Mask Parameters:</u> Pore size and density (μm)</p> <p><u>Setting:</u> Social network</p>	<p><u>Simulation:</u></p> <ul style="list-style-type: none"> - ABR and VPR performance of masks of variable pore density - COVID-19 pandemic simulation in a Social Network with no NPI measures. - COVID-19 Pandemic simulation in a Social Network introducing Five types of face mask <p>A+: VPR = 20%, Pore Size= 20μm) A: VPR = 50%, Pore Size= 37.3μm) B: VPR = 60%, Pore Size= 49.4μm) C: VPR = 70%, Pore Size= 70.7μm) D: VPR = 80%, Pore Size= 110.3μm)</p> <p><u>Outcome</u></p> <ul style="list-style-type: none"> -Change in Basic reproduction number (R_0) 	<ul style="list-style-type: none"> - VPR was lowest, and ABR highest, when using masks with smaller Pore Diameters. - Non-professional ($20 \mu\text{m} \leq \text{Pore size} \leq 120 \mu\text{m}$) masks satisfy VPR and ABR; $50.71\% \leq \text{VPR} \leq 90.33\%$, and $6.15\% \leq \text{ABR} \leq 32.92\%$, respectively. Detailing that masks with Pore diameter 120 μm can block 6.15% aerosols and 9.67% viruses, whereas face masks with pore diameter 20 μm can block 32.92% aerosols and 49.29% viruses. - Exploitation of face masks, even those with large pores, appear to be effective at reducing R_0. - With Class A+ Face masks, the outbreak curve can be flattened both at the beginning of COVID-19 Pandemic, or one-week after the outbreak. This assumes full population coverage. - Exploitation of Class A+ masks since day 7, day 14, and day 17 of outbreak revealed a much

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	<p><u>Author-identified limitations:</u> None disclosed</p>		<p>stronger suppressive effect on R_0 over time, even compared to exploitation on day 21, 4 days later.</p>
<p>Chernozhukov, V. et al. May 2020 (11) PREPRINT</p> <p>‘Causal impact of masks, policies, behaviour on early COVID-19 Pandemic in the U.S’</p>	<p><u>Model:</u> Causal model with SIR-based case growth model.</p> <p><u>Model Calibration data:</u></p> <ul style="list-style-type: none"> - New York Times daily COVID-19 Cases and Deaths - John Hopkins University CSSE Reported Cases and Deaths - COVID Tracking project reported cases and deaths. - COVID Tracking project number of tests. <p><u>Setting:</u> General population, Employees of public-facing businesses, U.S</p> <p><u>Model parameters:</u> Dynamic impact of policy on spread of COVID19 Policies:</p> <ul style="list-style-type: none"> - State of emergency - Mandatory face masks for employees of public-facing businesses - Stay at home order, - Closure of school - Closure of restaurant, except take out, - Closure of movie theaters - Closure of non essential businesses. - Effect of behaviour on spread of covid19 <p>Behaviour:</p>	<p>-The effect of the model parameter variables were inputted to the model to evaluate their dynamic impact of the spread of COVID19 infection.</p> <p><u>Outcome:</u></p> <ul style="list-style-type: none"> - Basic reproduction rate (R_0) - Reported cases 	<ul style="list-style-type: none"> - Mandating the use of masks by employees that work for public-facing businesses could potentially affect the COVID-19 transmission directly. - Weekly policies and behaviour variables were highly correlated, except for the ‘Masks for employees’ policy. Their effects however, are difficult to separate. - The effect of policies and behaviour on case growth showed a reduction in cases only for the ‘Wearing face masks’ policy and was the only policy to meaningfully affect case growth when behaviours remained constant.

Reference	Model Characteristics	Scenarios/Models & Outcome Measures	Key findings relating to use/efficacy of masks.
	<ul style="list-style-type: none"> - Intensity of visit to transit, grocery, retail, and work place. - Growth and log rate of tests. <p><u>Mask parameters:</u> Introduction (time) of mandated use of masks by employees of public-facing businesses</p> <p><u>Author-identified limitations:</u> None declared</p>		
<p>Eikenberry, S., et al. April 2020 (12)</p> <p>'To mask or not to mask: Modelling the potential for face mask use by the general public to curtail the COVID-19 Pandemic'</p>	<p><u>Model:</u> Compartmental</p> <p><u>Model Calibration data:</u> US Census (2019)</p> <p><u>Model Parameters:</u></p> <ul style="list-style-type: none"> - No mask use - Epidemiological factors (R_0) - Mask efficiency - Mask use <p><u>Mask Parameters:</u></p> <ul style="list-style-type: none"> - Cloth (20-80% efficiency) - Surgical (70-90% efficiency) - N95 (>95% efficiency) <p><u>Data Characteristics:</u> General population (Asymptomatic)</p> <p><u>Setting:</u> New York & Washington State – General public</p> <p><u>Author-identified limitations:</u></p>	<p><u>Baseline Scenario:</u> No mask used and Basic reproduction number (R_0)</p> <p><u>Comparator Scenarios:</u></p> <ul style="list-style-type: none"> - General population mask uptake (%) & mask effectiveness (%) with fixed & variable transmission rates. - All symptomatic persons wear mask + variable general population mask uptake (20%, 40%, 60%, 80%) + variable mask effectiveness (20%, 40%, 60%, 80%). - General population mask coverage + Mask efficiency of outgoing or incoming transmission blocking. <p><u>Outcome:</u></p> <ul style="list-style-type: none"> - Change in number of deaths, peak hospitalisation, & SARS COV2 Infection rate - Basic reproduction number (R_0) - Simulated future deaths. 	<ul style="list-style-type: none"> - In a hypothetical scenario, In Washington and New York states, immediate near universal (80%) uptake of moderately (50%) effective masks could prevent 17-45% of projected deaths over two months. Further, peak daily death rate may reduce by 34-58% - Broad adoption of even relatively ineffective face masks may meaningfully reduce community transmission of COVID-19. - Relative benefit may increase as masks can synergise with other public health measures. - The R_0 decreased when masking symptomatic individuals. This improve when sequentially increasing the total population mask coverage and the effectiveness of the mask used. Masking the general population also yielded increased benefits when 25%, 50%, and 75% of general population were assume asymptomatic. - Masks found to be useful in preventing illness in healthy persons and preventing asymptomatic transmission.

Reference	Model Characteristics	Scenarios/Models & Outcome Measures	Key findings relating to use/efficacy of masks.
	<p>Results should be interpreted with caution, owing to potentially high non-compliance of mask wearing, uncertainty on effectiveness of home masks, and some uncertainties around infection transmission mechanisms.</p>		
<p>Gosce, L., et al, May 2020 (13) In Press</p> <p>‘Modelling SARS-COV2 Spread in London: Approaches to Lift the Lockdown’</p>	<p><u>Model:</u> SEIR deterministic compartmental with a daily-time step</p> <p><u>Model Calibration data:</u> Public Health England (PHE) National Health Service (NHS) Transport for London (TFL)</p> <p><u>Model Parameters:</u> Symptom status (asymptomatic vs symptomatic) in i) General population ii) By age group iii) By borough</p> <p><u>Mask Parameters:</u> Face masks – estimated at 30% efficacy transmission prevention. Face coverings – estimated at 10% efficacy transmission prevention.</p> <p><u>Data Characteristics:</u> General population</p> <p><u>Setting:</u> Urban, City (London) – General population</p> <p><u>Author-identified Limitations:</u> Improving available data in Hospital admission & testing and community testing would allow a more precise calibration of mortality and notification rates and estimates on size of the epidemic within the model.</p>	<p><u>Baseline Scenario:</u> Comparator scenarios compared with Lockdown being lifted on May 8th 2020 with no further intervention.</p> <p><u>Comparator scenarios:</u></p> <ul style="list-style-type: none"> - A City-wide lockdown continuation, comparing impact with an early removal of lockdown limitations. - Universal testing (once, twice, or three times per week) when less stringent social distancing than full lockdown is in place (e.g business reopen but people encouraged to work from home) - Shielding vulnerable groups (Ages > 60 years) in context of lifting of lockdown more generally. - Impact of combining universal testing & face coverings use without lockdown - Universal testing, isolation of infectious cases and their contacts & use of face coverings during lockdown. <p><u>Outcome:</u></p> <ul style="list-style-type: none"> - Change in number of deaths & SARS COV2 Infections - Basic reproduction number (R_0) 	<ul style="list-style-type: none"> - Lifting lockdown with no additional intervention yielded the greatest change in deaths (14.5-fold) and highest rate of infection ($R_0=2.56$) - Weekly universal testing was more effective under lockdown compared to without lockdown & with face coverings (0.42-fold, $R_0=0.5$; 11.4-fold, $R_0=1.92$ respectively) - Weekly universal testing under lockdown improved further when face coverings were used (0.45-fold, $R_0=0.44$) and when face covering and contact tracing was used (0.48-fold, $R_0=0.27$) - Efficacy of mask use greatly improved change in deaths and infection rate where lockdown was lifted and no additional intervention put in place (30% mask, 30% face covering: 12.34-fold, $R_0=2.23$; 50/50: 8.86-fold, $R_0=1.59$; 80/50: 8.26-fold, $R_0=1.53$; 80/80: 0.26-fold, $R_0=0.64$)

Reference	Model Characteristics	Scenarios/Models & Outcome Measures	Key findings relating to use/efficacy of masks.
<p>Hoertel, N. et al. May 2020 (14) PREPRINT</p> <p>‘Lockdown exit strategies and risk of a second epidemic peak: a stochastic agent-based model of SARS-COV-2 epidemic in France’</p>	<p><u>Model:</u> Stochastic agent-based microsimulation model</p> <p><u>Model calibration data:</u> Calibrated based on two-sample Kolmogrov-smirnov test and visual comparison of predicted & observed curves of cumulative incidence, ICU admissions, ICU bed occupancy and cumulative mortality.</p> <p><u>Setting:</u> General population, France</p> <p><u>Model parameters:</u></p> <ul style="list-style-type: none"> - 194 parameters were included in the Stochastic ADM including: - Individual and disease characteristics based on prior studies and model calibrations (n=161) - Social contacts based on prior studies (n=11) - Social contacts where no data were available (n=22) - Diagnosed cases assumed to be quarantined. <p><u>Mask Parameters</u> A 50% reduction in risk of transmission of infection between individuals was assumed if all individuals either adhered to social distancing or wore masks. If both measures applied, this risk reduction increased to 75%.</p> <p><u>Author-identified limitations:</u></p>	<p><u>Scenario considerations:</u> In all scenarios, the following were considered, based on statements from the French government:</p> <ul style="list-style-type: none"> - Quarantine and restrictions for school, work, and public transport will be lifted on May 11th. - Restaurants and bars will remain closed from May 11th until June 11th - Attendance to cinemas, museums and public events will be authorised on July 11th. <p><u>Baseline Scenario:</u> 8-week quarantine + no specific post-quarantine measures</p> <p><u>Comparator Scenario Components:</u></p> <ul style="list-style-type: none"> - Natural course of epidemic if no quarantine ordered. - Effect of 8-week quarantine and a 16-week quarantine - Post-quarantine protection measures, including social distancing and mask-wearing. - Post-quarantine shielding of individuals vulnerable to severed SARS-COV-2 infection. - Components compiled in to seven separate scenarios. <p>- Microsimulation performed on 500,000 individuals, extrapolated to French population (n=67m)</p> <p><u>Outcome:</u></p>	<ul style="list-style-type: none"> - Social distancing along slowed the epidemic after an 8-week quarantine by flattening the cumulative incidence curve and a 20% decrease in cumulative mortality. Combined with mask-wearing, the curve was further flattened and the decrease in cumulative mortality increased to 60% compared to absence of post-quarantine measures. - While effective, it is unlikely that this combination of measures alone would be effective in preventing a second epidemic peak. - Mask-wearing only resulted an additional 19% in cumulative mortality compared to partial adherence to shielding vulnerable populations (defined at 50%). - As such, combining measures of social distancing, mask wearing, and full or partial shielding of vulnerable populations would result in a greater reduction of cumulative deaths if a lockdown were lifted.

Reference	Model Characteristics	Scenarios/Models & Outcome Measures	Key findings relating to use/efficacy of masks.
	Potential for bias in diagnosis and mortality rates. Approximations made in some of the parameters used in the model.	<ul style="list-style-type: none"> - Cumulative incidence of COVID19 - Cumulative mortality of COVID19 - ICU-bed occupancy 	
<p>Javid, B., & Balaban, N. June 2020 (15)</p> <p>‘Impact of population mask wearing on COVID-19 post lockdown.’</p>	<p><u>Model:</u> Simplified SIR model</p> <p><u>Model calibration data:</u> None mentioned</p> <p><u>Setting:</u> General population of Israel post lockdown</p> <p><u>Model Parameters:</u></p> <ul style="list-style-type: none"> - Infection rate - Recovery rate - Critical Deterioration rate - Death rate - Recovery of critically ill - Total population size - Max number of ICU beds <p><u>Mask Parameters:</u> An assumed 8 or 16% mask efficiency was calculated, based on existing literature.</p> <p><u>Author-defined limitations:</u> The model is relatively straight forward, basic, and assumes a high compliance of mask-wearing.</p>	<p><u>Baseline model:</u> A model where no parameters of masks were used was run to give an estimate of the progression of disease after lockdown, given the estimated parameters, and its effect on the outcomes. This was done for multiple value of R_0</p> <p><u>Comparator models:</u> The same model was ran again separately, including parameters on effectivity of masks (8% and 16%), assuming a fixed adherence to mask-wearing within the population.</p> <p><u>Outcome:</u></p> <ul style="list-style-type: none"> - Number of critically ill patients - Cumulative mortality - Change in Basic reproduction number (R_0) 	<ul style="list-style-type: none"> - The model intended to show the impact of reducing infectivity (by use of masks) at high or low values of R_0. - When the R_0 was high (2.2), there was a minor effect of mask use (for both 8% and 16% effective masks) in reducing the number of deaths, or critically ill patients. - When R_0 approached 1 (1.3 in the model), the effect of mask use was greater for both 8% and 16%-effective masks.
<p>Kot, A., May 2020 (16)</p> <p>PREPRINT</p>	<p><u>Model:</u> Respiratory Virus epidemiological using Compartmental SIR</p> <p><u>Model Calibration data:</u> None mentioned</p> <p><u>Setting:</u></p>	<p><u>Baseline model:</u> The model is run for linear, exponential and approximate Beta-Poisson dose response functions that determine the critical efficiency of a mask to push the</p>	<ul style="list-style-type: none"> - The findings of this model present estimates for critical effectiveness of masks in a population where no other non-pharmaceutical interventions are implemented. - Considering when $R_0=2.5$, and with a linear-dose response, the critical mask efficiency is

Reference	Model Characteristics	Scenarios/Models & Outcome Measures	Key findings relating to use/efficacy of masks.
<p>‘Critical levels of mask efficiency and of mask adoption that theoretically extinguish respiratory virus epidemics.’</p>	<p>General population and public use</p> <p><u>Model parameters:</u></p> <ul style="list-style-type: none"> - Basic Reproduction Number (R_0) - Mask efficiency - Mask adoption levels - Linear or non-linear probability of infection - Ocular route infection transmission contributions <p><u>Mask Parameters:</u></p> <p>Estimates of measures of most-penetrating particle-size, and evidence from current literature are used to determine efficiency of masks (0-1). In this study, the minimal effective mask efficiency to eradicate the epidemic, given a value for R_0 is considered (critical efficiency) so no definitive type of mask is named, though some numerical examples are comparable to that of Surgical masks.</p> <p><u>Author-defined limitations:</u></p> <p>SIR models assume homogeneous populations with fixed contacts per day and fixed probability of infection.</p>	<p>R_0 of an epidemic below 1, theoretically eradicating the disease.</p> <p><u>Outcome:</u></p> <ul style="list-style-type: none"> - Peak infection - Cumulative infection - Basic reproduction number (R_0) 	<p>calculated to be 0.5, with a mask adoption level of 80% of the population in order to reduce the R_0 to below 1.</p> <ul style="list-style-type: none"> - The estimate is below that of an N95 mask, but well above that of some fabric masks. - Considering Surgical masks of efficiency 0.58 and given $R_0=2.5$, 73% mask adoption in the population would be required. For $R_0=3$ and $R_0=4$, 80% and 90% population mask adoption levels would be required to theoretically extinguish the disease. - For practical means of population-wide adoption of masks that meet critical effectiveness, A nylon overlay can raise the efficiency of several fabric masks above that of a baseline surgical mask. Subsequently, a Nylon-lined surgical mask is equivocally improved in its effectiveness.
<p>Ngonghala, C. et al. July 2020 (17)</p> <p>‘Mathematical assessment of the impact of non-pharmaceutical interventions on</p>	<p><u>Model:</u> Novel Kermack-McKendrick-type</p> <p><u>Model Calibration data:</u></p> <p>New York State real-time assessment and estimate data of the burden on COVID-19. Data is stratified by mutually exclusive compartments of combined elements of susceptibility, quarantine status,</p>	<p><u>Baseline Model:</u></p> <p>Baseline epidemiological parameters were estimated or fitted to the model using available COVID19 data and sources from the available literature.</p> <p><u>Simulation:</u></p>	<ul style="list-style-type: none"> - The combined effect of face-mask strategies (even with masks of relatively low efficacy) and social distancing strategies have a greater effect on reducing burden of disease than each intervention individually. - When run with various values of mask efficiency and coverage, the model showed a marked decrease in the number of hospitalisations both

Reference	Model Characteristics	Scenarios/Models & Outcome Measures	Key findings relating to use/efficacy of masks.
<p>curtailing the 2019 novel Coronavirus'</p>	<p>symptomatic status, Hospitalisation, and recovery.</p> <p><u>Setting:</u> Community – General Public</p> <p><u>Model parameters:</u> 18 Epidemiological, parameters were added to the model, including proportion of the population who wear masks in a public place (mask compliance), and efficacy of face-masks to prevent acquisition of infection by susceptible individuals</p> <p><u>Mask parameters:</u> For mask efficacy probability estimates (0-1) were derived from available literature on previously conducted clinical trials that assess inward efficiency of cloth masks, optimal material masks, surgical masks, and N95 masks. The resulting parameter was a combined probability estimate of all masks.</p> <p><u>Author-defined limitations:</u> None identified</p>	<p>The simulation then ran to assess the population-level impact of the 18-various control and mitigation measures in New York state. The simulation also ran the same simulations with calibrated and estimated R_0 for the US country as a whole.</p> <p><u>Outcome:</u> The model estimated the effect of non-pharmaceutical interventions on number of hospitalisations and cumulative deaths arising from COVID-19 infection. The model also examined Change in R_0 as a result of the effect of non-pharmaceutical interventions.</p>	<p>in New York state, and in the US. Using a mask of efficacy 50% or greater may greatly flatten the pandemic curve.</p> <ul style="list-style-type: none"> - Although less efficacious masks may not lead to eradication of COVID19, a population adherence of 75%, wearing masks that are 25% effective, for example, could greatly reduce the burden of COVID19 by reducing state and country-wide hospitalisations by 63% and 64% respectively. - Disease elimination would be feasible, but relies on a 70% or greater population adherence to mask-wearing. - Mask-wearing in public (Mask efficacy $\geq 50\%$) with strict social distancing measures, reduce the required proportion of population adherence to mask-wearing down to 30%, leading to disease elimination in New York state.
<p>Silva, T. et al. May 2020 (18) PREPRINT 'Quantitative analysis of the Effectiveness of Public Health Measures of COVID-19 Transmission'</p>	<p><u>Model:</u> Spectral network analysis</p> <p><u>Model Calibration Data:</u> Brazilian State health department COVID-19 Epidemiological bulletins Brazilian Institute of Geography and Statistics</p> <p><u>Data Characteristics:</u> 60,021 city time bulletins</p>	<p><u>Baseline Model:</u> Using the COVID-19 network transmission model, evolution and spread of COVID-19 is simulated in every city of the network, simulating the course that was taken in real life.</p> <p><u>Comparator Model:</u> Network structure is then changed to simulate the omission of public health</p>	<ul style="list-style-type: none"> - Social isolation and the use of masks can effectively reduce the transmission rate of COVID-19 in Brazil. - There was a drastic change in the graph spectrum of intercity transmission network of Brazil following an incubation period and introduction of use of mask recommendations. - The spectrum then reduced, indicating that the R_0 was reducing due to imposed government public health policies.

Reference	Model Characteristics	Scenarios/Models & Outcome Measures	Key findings relating to use/efficacy of masks.
	<p>2,754 cities</p> <p><u>Setting:</u> Urban, city – Brazil, General Public</p> <p><u>Model parameters:</u></p> <ul style="list-style-type: none"> - COVID-19 Network transmission based off available real-life data - Three-day smoothing filter applied to alleviate concerns with late contamination. <p><u>Mask parameters:</u> Recommended use of masks by State government and Health Departments as a predictor for changes in</p> <p><u>Author-defined limitations:</u> None disclosed</p>	<p>policies in the above model as to observe transmission without government interventions.</p> <p><u>Outcome:</u></p> <ul style="list-style-type: none"> - Changes in Basic reproduction number (R_0) - Change in COVID-19 Epidemic peaks within cities. 	<ul style="list-style-type: none"> - The model does not give an isolated causal impact of the use of masks recommendation, nor of the quarantine measures. Data presented helps to understand a combined effect of Public Health policy change. - It was observed however, that introduction of masks reduced growth rates in cities with relatively low social distancing indices, though a causal effect cannot be inferred. - There is a suggestion that use of masks may be a more effective measure than social isolation, however the term 'social isolation' and 'social distancing' have been used interchangeably throughout this study and it is unclear to what results support this notion.
<p>Tian, L. et al. April 2020 (19) PREPRINT</p> <p>'Calibrated intervention and containment of the COVID-19 Pandemic'</p>	<p><u>Model:</u> Simple novel quantitative model with compartmentalised pre-symptomatic groups (Non-infectious latent followed by infectious pre-symptomatic)</p> <p><u>Model Calibration data:</u> Combined data sets from two existing literature sources. 159 infection cases and validated against a serial interval study on 468 infection pairs.</p> <p><u>Setting:</u> Not declared</p> <p><u>Model parameters:</u></p> <ul style="list-style-type: none"> - Probability of individual infected being in each of the disease phases (latent, Pre- 	<p><u>Baseline Model:</u> Transmission of COVID-19 during disease progression is predicted using the model parameters of probabilities of infection, reproduction, probability of symptom grouping at a given time, percentage of the population who are infected at each phase of the epidemic and other model parameters to give an estimated baseline R_0 of 3.86</p> <p><u>Model Variables:</u></p> <ul style="list-style-type: none"> - The estimated change of the outcome due to the following (individually or in combination): - Contact tracing, 	<ul style="list-style-type: none"> - Mask wearing at 96% alone could flatten an epidemic growing at a rate of 0.3/day by bring down R_0 from a base value of 3.68 to 1. - When combined with contact tracing, the two effects multiply, and as such, a lower proportion of the general public wearing masks is needed. For example, contact tracing at 60% efficiency, within 4 days of infection confirmation and 70% of general public wearing masks yields the same result as 96% of the population wearing masks. - This can be further lowered if contact tracing can be done within 2 days of infection. - Where contact tracing measures can not be implemented effectively, strict social distancing and stay at home regulations, and mask-wearing

Reference	Model Characteristics	Scenarios/Models & Outcome Measures	Key findings relating to use/efficacy of masks.
	<p>symptomatic infectious without symptom, symptomatic)</p> <ul style="list-style-type: none"> - Reproduction rate and R_0 - Exponential growth/decay - Allows for transformation of symptom onset time distribution. <p><u>Mask parameters:</u> Efficacy of a masks ability to trap particles The percentage of the population wearing masks.</p> <p><u>Author-identified limitations:</u> The model does not account for the role played by asymptomatic carriers. Assumptions have been made on some parameters where data is lacking.</p>	<ul style="list-style-type: none"> - Wearing masks, - Other measures <p><u>Outcome:</u></p> <ul style="list-style-type: none"> - Reduction of R_0 	<p>could reduce transmission by both symptomatic and asymptomatic viral carriers.</p>
<p>Worby, C., & Chang, H. April 2020 (20) PREPRINT</p> <p>‘Face mask use in the general population and optimal resource allocation during the COVID-19 pandemic.’</p>	<p><u>Model:</u> Both a Resource Allocation Model and a Supply & demand model were used to explore the population-level effects of distributing facemasks to different subpopulations, as well as the supply & demand dynamics during an epidemic.</p> <p>Both models share a SIERD model structure. Compartments partitioned in to: Wearing mask, and Not wearing mask.</p> <p><u>Model calibration data:</u> None mentioned</p> <p><u>Setting:</u> General population setting (no specific country)</p>	<p><u>Resource allocation Model scenarios:</u> The models simulate different distribution proportions of masks among a population and its effect on relative deaths throughout an epidemic. Modelled each are:</p> <ul style="list-style-type: none"> - A naïve distribution of masks to the susceptible population at the start of the epidemic. - A naïve distribution of masks to the susceptible population at the start of the epidemic with priority coverage of the elderly. - All masks made available to confirmed detected infected individuals - 25% of susceptible population wear masks at the start of the epidemic, 	<ul style="list-style-type: none"> - Reduction in total deaths increased with mask effectiveness and availability. - Even a 10% adoption could result in 5% fewer deaths, with reduction in deaths increasing when adoption rate increases. - Naïve distribution of masks was the most suboptimal approach, unless resources are plentiful. - Providing masks only to confirmed infected cases was an effective strategy when resources were limited, and containment was high. However, as many infections aren’t detected, this strategy struggles to meet practical needs. - Providing masks of 50% effectiveness to all detected infectious cases, death could be reduced by 30%. This is achievable with resources to reach 25% of the population.

Reference	Model Characteristics	Scenarios/Models & Outcome Measures	Key findings relating to use/efficacy of masks.
	<p><u>Model parameters:</u></p> <ul style="list-style-type: none"> - Epidemiological baseline parameters including: - Basic reproduction number (R_0) - 14-day recovery period - Varied proportion of Asymptomatic cases - Mild/asymptomatic cases - Resources allocation model parameters: <ul style="list-style-type: none"> Proportion of people aged 70+ - Death rate among symptomatic in 70+ and in under 70. - Detection of non-severe infections. - Supply & Demand model parameters: <ul style="list-style-type: none"> - Average time wearing disposable mask - Daily mask production - Ratio of rate of symptomatic-infected wearing mask to rest of population. <p><u>Mask parameters:</u></p> <ul style="list-style-type: none"> - Varied relative transmissibility with mask (=0.5 if not specified) - Varied relative susceptibility with mask (=0.5 if not specified). <p><u>Author-defined limitations:</u></p> <p>Model assumes some parameters are perfect, such as complete detection of symptomatic cases, or compliance with mask wearing. Model does not account for other Non-pharmaceutical interventions.</p>	<p>prioritising the elderly. Remaining masks distributed to detected infectious individuals until supplies are diminished.</p> <ul style="list-style-type: none"> - As above with 50% distribution to susceptible population. - As above with 75% distribution to susceptible population. <p><u>Outcome:</u></p> <ul style="list-style-type: none"> - Relative deaths - Proportion of population infected. - Basic reproduction number (R_0) 	<ul style="list-style-type: none"> - A balance of provision of masks to the elderly and confirmed infectious persons yielded the greatest reduction in deaths. This balance shifts according to the effectiveness of masks distributed and assumes 40% resource coverage. - For population coverage of masks, a smaller supply of highly effective masks achieved similar reduction in deaths as a greater supply of less effective masks. (65% death reduction with 15% coverage of 75%-effective masks; 30% reduction with 25% coverage of intermediate mask [% not given]; 10% reduction with 30% coverage of 25% effective mask.

Table S3. Laboratory studies

Reference	Method & Materials	Experiment Characteristics	Key findings
<p>Aydin et al, 2020 (21) PREPRINT</p> <p>‘Performance of fabrics for home-made masks against spread of respiratory infection through droplets: a quantitative mechanistic study’</p>	<p><u>Mask types:</u> cloth/homemade.</p> <p><u>Mask materials:</u> 10 different fabrics (100% cotton, 100% polyester, several combinations of cotton and polyester, used dishcloth, and silk) assessed, 3-layered commercial medical mask used as a benchmark material.</p> <p><u>Objective:</u> to evaluate medical masks along with 10 regular household fabrics for their droplet blocking efficiency against high and low velocity droplets in a laboratory setting.</p> <p><u>Author-defined limitations:</u> none reported.</p>	<p><u>Experimental set-up:</u> the droplets that penetrate the fabric were collected in a petri dish placed at 25mm of the fabric. A high-speed camera was also used to record the motion of the droplets.</p> <p><u>Aerosol simulation details:</u> To generate droplets with high initial velocity, a metered-dose inhaler was used and the nozzle of the inhaler loaded with 10µl of a suspension of 100nm diameter fluorescent beads in distilled water. The fluorescent beads serve two purposes: (1) mimic SARS-CoV-2 virus (70-100nm-diameter) in terms of size, and (2) allow to quantify the blocking efficiency of the fabric samples.</p> <p>Breathability was also measured (set-up not described here).</p>	<p>- Blocking efficiency at 25mm of selected materials:</p> <ul style="list-style-type: none"> • medical mask: 96.3% • used shirt (100% cotton): 91.1% • new quilt cloth (100% cotton): 60.1% • used shirt (75% cotton/25% polyester): 42.6% • used shirt (70% cotton/30% polyester): 90.1% • new t-shirt (60% cotton/40% polyester): <ul style="list-style-type: none"> ○ 1 layer: 43.3% ○ 2 layers: 98.6% ○ 3 layers: 99.98% • new quilt cloth (35% cotton/65% polyester): 71.8% • new bed sheet (100% polyester): 83.1% • used dishcloth (85% polyester/15% nylon): 97.9% • used silk shirt: 91.3% • used silk shirt: 92.3% <p>- The authors concluded that most home fabrics with one layer can block both high and low impact droplets reasonably well and that, with 2 or 3 layers, their blocking efficiency may exceed that of medical masks while still having comparable or higher breathability.</p> <p>- The authors also discussed the underlying mechanism of droplet blocking by hydrophobic home fabrics, when medical masks are made of hydrophobic fabric.</p>
<p>Carnino et al, 2020 (22) Pre-proof</p>	<p><u>Mask types:</u> cloth/homemade.</p> <p><u>Mask materials:</u> kitchen paper towel, laboratory paper towel and the middle filter layer of a standard surgical mask.</p>	<p><u>Experimental set-up:</u> fluorescently labelled particles of 70-90nm (similar size to the SARS-CoV-2) were placed into contact on the material to test, and particle penetration through the material</p>	<p>- Fluorescence images show that the 3 materials don't properly filter the particles when untreated.</p> <p>- Materials treated with NaCl + TWEEN20 show a dramatical decreased penetration of nanoparticles.</p>

Reference	Method & Materials	Experiment Characteristics	Key findings
<p>'Pretreated household materials carry similar filtration protection against pathogens when compared with surgical masks'</p>	<p><u>Objective:</u> to assess the filtration ability of readily available materials pretreated with a salt-based solution.</p> <p><u>Author-defined limitations:</u> none reported.</p>	<p>was then assessed using a fluorescence microscope.</p> <p>Salt-based soaking treatment was based on protocol described by Quan et al (23) and consist of mixing 30g of NaCl with 100ml of distilled water, stirring at 90°C and 400rpm until full dissolution. 1 mL of TWEEN20 (a polyoxyethylene sorbitol ester and nonionic surfactant) was then added. The material to test was soaked for 5 minutes in this solution and then soaked overnight.</p> <p>2 samples were tested for each material</p>	<p>- Materials treated with NaCl only were less effective in filtering the particles than when treated with NaCl + TWEEN20, but were still showing a notable decrease in particles penetration compared to not treatment.</p> <p>- Additional tests using <i>E. Coli</i> bacteria suggested that presoaking the filter materials in either solution effectively prevents penetration of larger bacteria as well.</p> <p>- For handmade masks, the authors recommended, based on their results, to use a salt-soaked paper towel sandwiched between 2 fabric materials (inner and outside layers).</p>
<p>Foschini et al, 2020 (24) PREPRINT</p> <p>'Aerosol blocking assessment by different types of fabrics for homemade respiratory masks: spectroscopy and imaging study'</p>	<p><u>Mask types:</u> medical and cloth/homemade.</p> <p><u>Mask materials:</u> N95 mask, surgical mask, confectioner mask, 97 % cotton fabric, 100 % cotton fabric, unwoven fabric, multi-use wipes, legging fabric, elastane fabric, paper coffee, paper towel, etc.</p> <p><u>Objective:</u> to assess the relative efficiencies of commercial respiratory masks (medical masks) and homemade fabric masks.</p> <p><u>Author-defined limitations:</u> none reported.</p>	<p><u>Experimental set-up:</u> 2 optical methodologies were used to quantify the % of aerosol retention by the fabric through optical scattering measurements: 1 using white light scattering measurement before and after the mask, 1 using spatial frequency domain imaging (SFDI) technique.</p> <p><u>Aerosol simulation details:</u> a piezoelectric nebulizer was used to create the aerosol from distilled water. The aerosol was then transported through a line attached to a vacuum cleaner, to which a valve for pressure and flow control were added.</p>	<p>- Aerosol blocking efficiency (average of both results):</p> <ul style="list-style-type: none"> • N95 mask: 99.95% • Surgery mask: 99.7% • Coffee filter: 99.6% • 2-layer cotton: 66% • 2-layer knitted cotton: 64.2% • confectioner mask: 51% • 1-layer cotton: 46.5% • 2-layer TNT: 46.3% • 2-layer multi-use wipes: 46.3% • 1-layer multi-use wipes: 34.9% • 1-layer knitted cotton: 34.9% • 1-layer TNT: 26.05% <p>- Paper towels were disqualified due to integrity problems with increased humidity.</p>

Reference	Method & Materials	Experiment Characteristics	Key findings
		<p>Size of aerosols generated was not specified.</p>	<p>- Overall, both techniques showed that fabrics and meshes having some elasticity showed less performance than cotton, because the elastic deformations increases air passage. - Legging fabric performed well but was not included in the results due to breathing difficulty.</p>
<p>Konda et al, 2020 (25) 'Aerosol Filtration Efficiency of Common Fabrics Used in Respiratory Cloth Masks'</p>	<p><u>Mask types:</u> cloth/homemade. <u>Mask materials:</u> 15 different types of fabrics tested, including cotton, silk, chiffon, flannel, various synthetics, and their combination. N95 respirators and surgical masks tested for comparison. <u>Objective:</u> to assess the performance of various commonly available fabrics used in cloth masks and to evaluate filtration efficiencies as a function of aerosol particulate sizes in the 10nm to 10µm range (respiratory infection: droplets <5µm considered primary source of transmission and droplets <1µm tend to stay as aerosol in environment for up to 8h). <u>Author-defined limitations:</u> none reported.</p>	<p><u>Experimental set-up:</u> the aerosol is sampled before and after it passes through the material being tested. The pressure difference is measured by a manometer and the aerosol flow velocity is measure by a velocity meter. Particle sizes and concentration are measured using particle analyzers (OPS and Nanoscan), and the resultant particle concentrations are used to determine filter efficiencies. Test specimen (mask) is held in place using a clamp for better seal. Two circular holes with a diameter of 0.635 cm are used to simulate the effect of gaps (= improper fit of the mask) on the filtration efficiency. <u>Aerosol simulation details:</u> particles in the range of 10nm to 10µm produced by an NaCl aerosol generator and passed through the material to test. <u>Flow rates:</u> 1.2 and 3.2 CFM, representative of respiration rates at rest (~35 L/min) and during moderate exertion (~90 L/min), respectively.</p>	<p>- Single layer: filtration efficiencies ranged from 5 to 80% and 5 to 95% for particle sizes of <300 nm and >300 nm, respectively. Materials such as satin and synthetic silk did not provide strong filtration protection (<30%). - Cotton, the most widely used material for cloth masks, performs better at higher weave densities (threads per inch, TPI): a 600 TPI cotton showed >65% efficiency at <300 nm and >90% efficiency at >300 nm, while a 80 TPI cotton had efficiencies varying from ~5 to ~55% across the entire range of particle sizes. Cotton quilt also provided excellent filtration s (>80% for <300 nm and >90% for >300 nm). - Fabrics with moderate electrostatic discharge values (silk with 1, 2 and 4 layers, chiffon and flannel) were also assessed. In all cases, the performance in filtering nanosized particles <300 nm is superior to performance in the 300 nm to 6 µm range and particularly effective below ~30nm, consistent with the expectations from the electrostatic effects of these materials. 4-layer silk composite offers >80% filtration efficiency across the entire range, from 10 nm to 6 µm - Hybrid approaches (600 TDI cotton + 2-layer silk; 600 TDI cotton + 2-layer chiffon; 600 TDI cotton + 1-layer flannel) combined effects of electrostatic and physical filtering, all resulting in increased efficiency: >80% (for particles <300 nm) and >90%</p>

Reference	Method & Materials	Experiment Characteristics	Key findings
		Each sample was tested 7 times.	(for particles >300 nm). These cloth hybrids are slightly inferior to the N95 mask above 300 nm, but superior for particles smaller than 300 nm. - Gaps (as caused by an improper fit of the mask) can result in over a 60% decrease in the filtration efficiency, with similar trends observed in surgical masks and cotton/silk hybrid sample, and at both high and low flow rates.
<p>Ma et al, 2020 (26)</p> <p>'Potential utilities of mask-wearing and instant hand hygiene for fighting SARS-CoV-2'</p>	<p><u>Mask types:</u> medical and homemade masks.</p> <p><u>Mask materials:</u> 1-layer polyester cloth, 1 1-layer polyester cloth + 4-layer kitchen paper, medical masks, N95 masks.</p> <p><u>Objective:</u> to evaluate the efficacy of 3 types of masks and instant hand wiping using the avian influenza virus to mock the coronavirus.</p> <p><u>Author-defined limitations:</u> none reported.</p>	<p><u>Experimental set-up:</u> open syringes were wrapped with the tested masks. The air containing the aerosols was inhaled into and out of the syringes through the piston movement 100 times, to mock human breath. The syringes were filled with alcohol to collect the virus passing through the masks, then quantified by RT-PCR.</p> <p><u>Aerosol simulation details:</u> a nebulizer was used to produce aerosols with a median diameter of 3.9µm (65% of the aerosol had diameters <5.0µm). The aerosols contained the avian influenza virus (diameter: 80 to 120 nm).</p> <p>Each treatment was conducted independently for 4 times.</p>	<p>- N95 masks, medical masks, and homemade masks made of 4-layer kitchen paper and one-layer cloth could block 99.98%, 97.14%, and 95.15% of the virus in aerosols compared with the polyester cloth.</p> <p>- Instant hand wiping using a wet towel soaked in water containing 1.00% soap powder, 0.05% active chlorine, or 0.25% active chlorine from sodium hypochlorite removed 98.36%, 96.62%, and 99.98% of the virus from hands, respectively.</p> <p>- Based on their results and on the experience from 7 countries, the authors propose the approach of mask-wearing plus instant hand hygiene to slow the exponential spread of the virus.</p>
<p>Rodrigues-Palacios et al, 2020 (27)</p> <p>'Textile Masks and Surface Covers – A 'Universal Droplet Reduction Model'</p>	<p><u>Mask types:</u> cloth/homemade.</p> <p><u>Mask materials:</u> 6 household textiles, including 100% combed cotton (T-shirt material), 100% polyester microfiber 300-thread count fabric (pillow case), two loosely woven 'homespun' 100% cotton fabrics (140</p>	<p><u>Experimental set-up:</u> droplets passing through the tested material were quantified using Petri-dishes placed on a table every 30 cm (from 0 to 180cm). Plates remained open for 10 minutes to allow droplet landing.</p>	<p>- All textiles reduced the number of droplets reaching surfaces, restricting their dispersion to <30cm, when used as single layers. When used as double-layers, textiles were as effective as medical mask/surgical-cloth materials, reducing droplet dispersion to <10cm, and the area of circumferential contamination to ~0.3%.</p>

Reference	Method & Materials	Experiment Characteristics	Key findings
<p>Against Respiratory Pandemics’</p>	<p>GSM, 60x60-thread count; and 115 GSM, 52x48-thread count), and ‘dry technology’ 100% polyester common (sport jerseys). Medical masks and surgical cloth material tested for comparison.</p> <p><u>Objective:</u> to assess household textiles to quantify their potential as effective environmental droplet barriers (EDBs).</p> <p><u>Author-defined limitations:</u> none reported.</p>	<p><u>Sneeze simulation details:</u> household spray bottles were filled with aqueous suspension of probiotics; nozzles were adjusted to produce cloud and jet-propelled droplets that match the visual architecture of droplet formation.</p> <p>Droplet size: 20-900µm (peak at 70-100 µm)</p> <p>Each experiment was conducted in duplicate.</p>	<p>The least-effective textile as single-layer (most-‘breathable’, 100%-cotton homespun-115 material) achieved a 90-99.998% droplet retention improvement when used as two-layers.</p> <p><i>To note that droplets were bigger than what was used in most experiments.</i></p>
<p>Wang et al, 2020 (28) PREPRINT</p> <p>‘Selection of homemade mask materials for preventing transmission of COVID-19: a laboratory study’</p>	<p><u>Mask types:</u> cloth/homemade.</p> <p><u>Mask materials:</u> 17 materials and 15 combinations of paired materials.</p> <p><u>Objective:</u> to combine the comprehensive literature and expert advice to screen the materials of homemade masks with good accessibility, and, through laboratory performance testing, to select materials suitable for homemade masks to protect against respiratory infectious diseases.</p> <p><u>Author-defined limitations:</u></p> <ul style="list-style-type: none"> - The study did not test the flame retardant properties, skin irritation, and delayed-type hypersensitivity of the materials. - Samples tested in the study were only the original materials rather than the masks made of these materials. - Most the materials were purchased from local supermarkets, thus testing results of 	<p><u>Material selection:</u> Pubmed and Embase were systematically searched to identify civilian homemade mask materials under the epidemic of H5N1 and SARS, including T-shirts, scarves, tea towels, pillowcases, antibacterial pillowcases, vacuum cleaner dust bags, linen, silk, etc. 6 papers were identified, and a panel of 8 experts (from different fields) determined the candidate materials.</p> <p><u>Experimental set-up:</u> standard procedures were implemented, using a TSI 8130 Automated Filter Tester to test particle filtration efficiency. Material pretreatment: 24h in an environment with a relative humidity of 85% and at 38C; test conducted within 2h after pretreatment.</p>	<ul style="list-style-type: none"> - 17 materials were selected: T-shirt, fleece sweater, outdoor jacket, down jacket, sun-protective clothing, jeans, hairy tea towel, granular tea towel, non-woven fabrics shopping bag, vacuum cleaner dust bag, diaper, sanitary pad, non-woven shopping bag, vacuum cleaner bag, pillowcase (3 different types), medical non-woven fabric, and medical gauze. - Only 1 material (medical non-woven fabric) met the standards of particle filtration efficiency ($\geq 30\%$), pressure difference ($\leq 49\text{Pa}$) and resistance to surface wetting. None met the standard of bacterial filtration efficiency ($\geq 95\%$). - 3 double-layer materials (double-layer medical non-woven fabric; medical non-woven fabric plus non-woven shopping bag; medical non-woven fabric plus granular tea towel) met all the standards of pressure difference, particle filtration efficiency, and resistance to surface wetting, and were close to the standard of the bacterial filtration efficiency. <p>Particle filtration efficiency results of interest</p>

Reference	Method & Materials	Experiment Characteristics	Key findings
	<p>these materials could be greatly affected by their types, batches, and manufacturers.</p> <ul style="list-style-type: none"> - Mask performance on wearing time, wearing frequency, and environment were not tested because no molded masks were made. - All the data were based on laboratory testing, its actual effectiveness in real-world setting still need to be assessed. 	<p><u>Aerosol simulation details:</u> $0.075 \pm 0.02 \mu\text{m}$ (count median diameter) NaCl aerosols.</p> <p><u>Flow rate:</u> 30L/min</p> <p>5 samples were tested for each material.</p> <p>Materials were tested in 4 key areas:</p> <ul style="list-style-type: none"> • pressure difference • particle filtration efficiency • bacterial filtration efficiency • resistance to surface wetting <p>Findings reported are mainly related to the particle filtration testing.</p>	<ul style="list-style-type: none"> - Single-layer homemade masks: <ul style="list-style-type: none"> • T-shirt: 11-14% • Fleece sweater: 5-6% • Hairy tea towel: 22-24% • Granular tea towel: 11-13% • Non-woven shopping bag: 12-17% • Pillowcase: 0% • Medical non-woven fabric: 42% • Medical gauze 4 layers: 2-3% • Medical gauze 16 layers: 12-15% - Double-layer homemade masks: <ul style="list-style-type: none"> • Fleece sweater + T-shirt: 19-21% • Non-woven shopping bag + T-shirt: 24-27% • Medical non-woven fabric + T-shirt: 50-53% • Medical non-woven fabric + Fleece sweater 48-52% • Medical non-woven fabric 2-layer: 24-27%
<p>Zhao et al, 2020 (29) Just accepted</p> <p>‘Household materials selection for homemade cloth face coverings and their filtration efficiency enhancement with triboelectric charging’</p>	<p><u>Mask types:</u> cloth/homemade.</p> <p><u>Mask materials:</u> common household materials of natural and synthetic origin, such as cotton, polyester, silk, nylon and cellulose. PPE material (respirator media and 2 medical face mask media) tested for comparison.</p> <p><u>Objective:</u> to evaluate the filtration efficiency and pressure drop of natural and synthetic materials using a modified procedure for N95 respirator approval.</p> <p><u>Author-defined limitations:</u></p> <ul style="list-style-type: none"> - The testing did not account for real-world scenarios where the leakage around the 	<p><u>Experimental set-up:</u> modified version of the NIOSH standard test procedure, using Automated Filter Tester 8130A. Fabric samples were not preconditioned in any way.</p> <p><u>Aerosol Simulation Details:</u> $0.075 \pm 0.02 \mu\text{m}$ (count median diameter) NaCl aerosols.</p> <p><u>Flow rate:</u> 32L/min</p> <p>3 samples were tested for each material (except for cotton, only twice).</p>	<ul style="list-style-type: none"> - Filtration efficiency: <ul style="list-style-type: none"> • Respirator media: 96% • Medical face mask media: 19-33% • Polypropylene spunbond: 6% • Polypropylene spunbond 5 layers: 24% • Cotton T-shirt: 5% if woven, 22% if knit • Cotton sweater (knit): 26% • Polyester (knit, toddler wrap): 18% • Silk (napkin, woven): 5% • Nylon (exercise pants, woven): 23% • Cellulose (paper towel, bonded): 10% • Cellulose (tissue paper, bonded): 20% • Cellulose (copy paper, bonded): 99.8% - Authors’ comments:

Reference	Method & Materials	Experiment Characteristics	Key findings
	<p>edges of the face cover may significantly impact the actual effectiveness.</p>	<p>Optical images obtained by SEM to assess the microscopic structure of the materials. (not reported here).</p> <p>Testing was also performed after triboelectric charging (by rubbing the sample for 30s using latex gloves) to positively impact the filtration properties of the materials.</p>	<ul style="list-style-type: none"> • Some of the cotton materials had similar filtering properties to some grades of medical face masks. • The cotton should be woven/knit at a high density. If a lower density cotton is used, it may be best to use multilayers. • Paper towel or tissue paper may be suitable to use as a disposable media in some homemade facial coverings, such as between cotton for an increase in filtration efficiency <p>- Triboelectric charging: all 3 cotton samples had a decreased or unchanged filtration efficiency, while all other samples had an increase in filtration efficiency.</p> <p>- The authors commented that the differences in results compared to (25) may arise from differences in instrumentation, testing method, and source of material.</p>

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