Evidence Search Service

Results of your search request

The evidence base around face coverings in preventing transmission of coronavirus and in protecting the wearer from transmission

ID of request: 24352
Date of request: 20th July, 2020
Date of completion: 22nd July, 2020

If you would like to request any articles or any further help, please contact: Isatou N'jie at Isatou.N'Jie@nelft.nhs.uk

Please acknowledge this work in any resulting paper or presentation as: Evidence search: The evidence base around face coverings in preventing transmission of coronavirus and in protecting the wearer from transmission. Isatou N'jie. (22nd July, 2020). ILFORD, UK: Aubrey Keep Library and Knowledge Service.

Sources searched
Cabinet Office (1)
Centers for Disease Control and Prevention (2)
Cochrane Database of Systematic Reviews (2)
EMBASE (1)
European Centre for Disease Prevention and Control (ECDC) (1)
MEDLINE (16)
Ministry of Health New Zealand (1)
World Health Organization (WHO) European Region (1)

Date range used (5 years, 10 years): All
Limits used (gender, article/study type, etc.): English language
Search terms and notes (full search strategy for database searches below):

(COVID-19 OR Covid19 OR coronavirus* OR Coronavirinae OR "corona virus" OR "2019-nCoV" OR "human coronavirus" OR "respiratory syndrome related coronavirus" OR ((Wuhan OR novel) ADJ5 coronavirus).ti,ab OR (human ADJ coronavirus).ti,ab OR ("human influenza" OR "influenza virus" OR "influenza pandemic").ti,ab OR exp *"CORONAVIRUS 229E, HUMAN"/ OR exp *"CORONAVIRUS NL63, HUMAN"/ OR exp *"CORONAVIRUS OC43, HUMAN"/) AND (("fac* cover*" OR "fac* mask*" OR "fac* protect*").ti,ab OR exp *MASKS/)) AND ((Prevent* OR control* OR stop OR reduc*).ti,ab OR (exp *PREVENTION/ OR exp *CONTROL/ OR exp *"DISEASE CONTROL"/))) AND (exp *"VIRUS TRANSMISSION"/ OR exp *"DISEASE TRANSMISSION"/ OR (Transmi* OR spread* OR acqui*).ti,ab)) AND (exp *"SOCIAL DISTANCE"/ OR ("Social distanc*" OR "Physical distanc*").ti,ab)

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For more information about the resources please go to: http://www.nelft.nhs.uk/library .

Summary of Results

I searched Medline, EMBASE, Cochrane Library, WHO Covid19 databases and other grey literature sources including government websites. The search retrieved many useful publications on the topic. However, there weren't many review articles found. I have included case reports, guidelines and other articles that are relevant. I would start by looking at the papers listed below as 'first reads':

- Brooks JT, Butler JC, Redfield RR. Time for universal masking and prevention of transmission of SARS-CoV-2. JAMA. Published online July 14, 2020. doi:10.1001/jama.2020.13107 https://jamanetwork.com/journals/jama/fullarticle/10.1001/jama.2020.13107external icon

- Wiersinga WJ, Rhodes A, Cheng AC, Peacock SJ, Prescott HC. Pathophysiology, Transmission, Diagnosis, and Treatment of Coronavirus Disease 2019 (COVID-19): A Review. *JAMA.* Published online July 10, 2020. https://jamanetwork.com/journals/jama/fullarticle/2768391

- Howard, J.; Huang, A.; Li, Z. Face Masks Against COVID-19: An Evidence Review. *Preprints* 2020, 2020040203 (doi: https://www.preprints.org/manuscript/202004.0203/v1). http://files.fast.ai/papers/masks_lit_review.pdf

Contents

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Centers for Disease Control and Prevention (CDC)
Absence of Apparent Transmission of SARS-CoV-2 from Two Stylists After Exposure at a Hair Salon with a Universal Face Covering Policy - Springfield, Missouri

Ministry of Health, New Zealand
Review of science and policy around face masks and COVID-19

World Health Organization (WHO)
Coronavirus disease (COVID-19) advice for the public: When and how to use masks

D. Original Research

1. A short, animated video to improve good COVID-19 hygiene practices: a structured summary of a study protocol for a randomized controlled trial.
2. Adolescents' face mask usage and contact transmission in novel coronavirus
3. Analysis of a mathematical model for COVID-19 population dynamics in Lagos, Nigeria
4. Applying principles of behaviour change to reduce SARS-CoV-2 transmission.
5. Back to Normal: An Old Physics Route to Reduce SARS-CoV-2 Transmission in Indoor Spaces.
6. Comprehensive review of mask utility and challenges during the COVID-19 pandemic.
7. COVID-19 pandemic and precautionary measures in Pakistan
8. COVID-19 preventive measures showing an unintended decline in infectious diseases in Taiwan
9. Fabrics tested for their ability to filter aerosols
10. Face mask designs following novel coronavirus
11. Homemade cloth face masks as a barrier against respiratory droplets - systematic review Máscaras de tecido na contenção de gotículas respiratórias - revisão sistemática
12. How effective can homemade face masks be?
13. Identifying airborne transmission as the dominant route for the spread of COVID-19.
14. Influence of wind and relative humidity on the social distancing effectiveness to prevent COVID-19 airborne transmission: A numerical study.
15. Knowledge, Attitude, and Practices of Healthcare Workers Regarding the Use of Face Mask to Limit the Spread of the New Coronavirus Disease (COVID-19)
16. Nasopharyngeal wash in preventing and treating upper respiratory tract infections: Could it prevent COVID-19?
17. Non Pharmaceutical Interventions for Optimal Control of COVID-19
18. On respiratory droplets and face masks.
19. Pathophysiology, Transmission, Diagnosis, and Treatment of Coronavirus Disease 2019 (COVID-19): A Review.
20. Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis.
21. Reduction of secondary transmission of SARS-CoV-2 in households by face mask use, disinfection and social distancing: a cohort study in Beijing, China.
22. Social Distancing and Transmission-reducing Practices during the 2019 Coronavirus Disease and 2015 Middle East Respiratory Syndrome Coronavirus Outbreaks in Korea .
23. Strongly Heterogeneous Transmission of COVID-19 in Mainland China: Local and Regional Variation
24. Textile Masks and Surface Covers-A Spray Simulation Method and a "Universal Droplet Reduction Model" Against Respiratory Pandemics.
25. The COVID-19 pandemic: biological evolution, treatment options and consequences
26. The face mask: How a real protection becomes a psychological symbol during Covid-19?

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27. The role of community-wide wearing of face mask for control of coronavirus disease 2019 (COVID-19) epidemic due to SARS-CoV-2.
28. To mask or not to mask: Modeling the potential for face mask use by the general public to curtail the COVID-19 pandemic.
29. Use of Health Belief Model-Based Deep Learning Classifiers for COVID-19 Social Media Content to Examine Public Perceptions of Physical Distancing: Model Development and Case Study.

E. Search History

A. National and International Guidance

Cabinet Office, UK

Face coverings: when to wear one and how to make your own. (2020)

Available online at this link

Explains what face coverings are, their role in reducing the transmission of coronavirus (COVID-19), the settings in which they are recommended, and how they should be safely used and stored. This information is based on current scientific evidence and is subject to change. This information relates to the use of face coverings in public spaces where social distancing is not always possible. It is important to follow all the other government advice on coronavirus (COVID-19) including staying safe outside your home.

Centers for Disease Control and Prevention (CDC)

Considerations for Wearing Cloth Face Coverings: Help Slow the Spread of COVID-19 (2020)

Available online at this link

•CDC recommends that people wear cloth face coverings in public settings and when around people who don't live in your household, especially when other social distancing measures are difficult to maintain. •Cloth face coverings may help prevent people who have COVID-19 from spreading the virus to others. •Cloth face coverings are most likely to reduce the spread of COVID-19 when they are widely used by people in public settings. •Cloth face coverings should NOT be worn by children under the age of 2 or anyone who has trouble breathing, is unconscious, incapacitated, or otherwise unable to remove the mask without assistance.

European Centre for Disease Prevention and Control (ECDC)

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Using face masks in the community (2020)

Available online at this link

Available online at this link

This document provides the ECDC opinion on the suitability of face masks and other face covers in the community by individuals who are not ill in order to reduce potential pre-symptomatic or asymptomatic transmission of COVID-19 from the mask wearer to others. Available in 26 languages.

B. Systematic Reviews

John Wiley

Quarantine alone or in combination with other public health measures to control COVID-19: a rapid review (2020)

Nussbaumer-Streit, B et.al

Available online at this link

Background: Coronavirus disease 2019 (COVID-19) is a rapidly emerging disease that has been classified a pandemic by the World Health Organization (WHO). To support WHO with their recommendations on quarantine, we conducted a rapid review on the effectiveness of quarantine during severe coronavirus outbreaks. Objectives We conducted a rapid review to assess the effects of quarantine (alone or in combination with other measures) of individuals who had contact with confirmed cases of COVID-19, who travelled from countries with a declared outbreak, or who live in regions with high transmission of the disease. Search methods An information specialist searched PubMed, Ovid MEDLINE, WHO Global Index Medicus, Embase, and CINAHL on 12 February 2020 and updated the search on 12 March 2020. WHO provided records from daily searches in Chinese databases up to 16 March 2020. Selection criteria Cohort studies, case-control-studies, case series, time series, interrupted time series, and mathematical modelling studies that assessed the effect of any type of quarantine to control COVID-19. We also included studies on SARS (severe acute respiratory syndrome) and MERS (Middle East respiratory syndrome) as indirect evidence for the current coronavirus outbreak. Data collection and analysis Two review authors independently screened 30% of records; a single review author screened the remaining 70%. Two review authors screened all potentially relevant full-text publications independently. One review author extracted data and assessed evidence quality with GRADE and a second review author checked the assessment. We rated the certainty of evidence for the four primary outcomes: incidence, onward transmission, mortality, and resource use. Main results We included 29 studies; 10 modelling studies on COVID-19, four observational studies and 15 modelling studies on SARS and MERS. Because of the diverse methods of measurement and analysis across the outcomes of interest, we could not conduct a meta-analysis and conducted a narrative synthesis. Due to the type of evidence found for this review, GRADE rates the certainty of the evidence as low to very low. Modeling studies consistently reported a benefit of the simulated quarantine measures, for example, quarantine of people exposed to confirmed or suspected cases averted 44% to 81% incident cases and 31% to 63% of deaths compared to no measures based on different scenarios (incident cases: 4 modelling studies on COVID-19, SARS; mortality: 2 modelling studies on COVID-19, SARS, low-certainty evidence). Very low-certainty evidence suggests that the earlier quarantine measures are implemented, the greater the cost savings (2

modelling studies on SARS). Very low-certainty evidence indicated that the effect of quarantine of travellers from a country with a declared outbreak on reducing incidence and deaths was small (2 modelling studies on SARS). When the models combined quarantine with other prevention and control measures, including school closures, travel restrictions and social distancing, the models demonstrated a larger effect on the reduction of new cases, transmissions and deaths than individual measures alone (incident cases: 4 modelling studies on COVID-19; onward transmission: 2 modelling studies on COVID-19; mortality: 2 modelling studies on COVID-19; low-certainty evidence). Studies on SARS and MERS were consistent with findings from the studies on COVID-19. Authors' conclusions Current evidence for COVID-19 is limited to modelling studies that make parameter assumptions based on the current, fragmented knowledge. Findings consistently indicate that quarantine is important in reducing incidence and mortality during the COVID-19 pandemic. Early implementation of quarantine and combining quarantine with other public health measures is important to ensure effectiveness. In order to maintain the best possible balance of measures, decision makers must constantly monitor the outbreak situation and the impact of the measures implemented. Testing in representative samples in different settings could help assess the true prevalence of infection, and would reduce uncertainty of modelling assumptions. This review was commissioned by WHO and supported by Danube-University-Krems. Plain language summary Does quarantine control coronavirus (COVID-2019) either alone or in combination with other public health measures? Background Coronavirus disease 2019 (COVID-19) is caused by a new virus that has spread quickly throughout the world. COVID-19 spreads easily between people who are in close contact, or through coughs and sneezes. Most infected people suffer mild, flu-like symptoms but some become seriously ill and even die. There is no effective treatment or vaccine (a medicine that stops people catching a specific disease) for COVID-19, so other ways of slowing (controlling) its spread are needed. One of the World Health Organization's (WHO) recommendations for controlling the disease is quarantine. This means separating healthy people from other healthy people, in case they have the virus and could spread it. Other similar recommendations include isolation (like quarantine, but for people with COVID-19 symptoms) and social distancing (where people without symptoms keep a distance from each other physically). What did we want to find out? We wanted to find out whether and how effectively quarantine stops COVID-19 spreading and if it prevents death. We wanted to know if it was more effective when combined with other measures, such as closing schools. We also wanted to know what it costs. Study characteristics COVID-19 is spreading rapidly, so we needed to answer this question as quickly as possible. This meant we shortened some steps of the normal Cochrane Review process. Nevertheless, we are confident that these changes do not affect our overall conclusions. We looked for studies that assessed the effect of any type of quarantine, anywhere, on the spread and severity of COVID-19. We also looked for studies that assessed quarantine alongside other measures, such as isolation, social distancing, school closures and hand hygiene. COVID-19 is a new disease, so, to find as much evidence as possible, we also looked for studies on similar viruses, such as SARS (severe acute respiratory syndrome) and MERS (Middle East respiratory syndrome). Studies measured the number of COVID-19, SARS or MERS cases, how many people were infected, how quickly the virus spread, how many people died, and the costs of quarantine. Key results We included 29 studies. Ten studies focused on COVID-19, 15 on SARS, two on SARS plus other viruses, and two on MERS. Most of the studies combined existing data to create a model (a simulation) for predicting how events might occur over time, for people in different situations (called modelling studies). The COVID-19 studies simulated outbreaks in China, UK, South Korea, and on the cruise ship Diamond Princess. Four studies looked back on the effect of quarantine on 178,122 people involved in SARS and MERS outbreaks (called 'cohort' studies). The remaining studies modelled SARS and MERS outbreaks. The modelling studies all found that simulated quarantine measures reduce the number of people with the disease and the number of deaths. With quarantine, estimates showed a minimum reduction in the number of people with the disease of 44%, and a maximum reduction of 81%. Similarly, with quarantine, estimates of the number of deaths showed a minimum reduction of 31%, and a maximum reduction of 63%. Combining quarantine with other measures, such as

closing schools or social distancing, is more effective at reducing the spread of COVID-19 than quarantine alone. The SARS and MERS studies agreed with the studies on COVID-19. Two SARS modelling studies assessed costs. They found that the costs were lower when quarantine measures started earlier. We cannot be completely certain about the evidence we found for several reasons. The COVID-19 studies based their models on limited data and made different assumptions about the virus (e.g. how quickly it would spread). The other studies investigated SARS and MERS so we could not assume the results would be the same for COVID-19. Conclusion Despite limited evidence, all the studies found quarantine to be important in reducing the number of people infected and the number of deaths. Results showed that quarantine was most effective, and cost less, when it was started earlier. Combining quarantine with other prevention and control measures had a greater effect than quarantine alone. This review includes evidence published up to 12 March 2020.

Physical interventions to interrupt or reduce the spread of respiratory viruses (2011)

Jefferson, T. et.al

Available online at this link

Background: Viral epidemics or pandemics of acute respiratory infections like influenza or severe acute respiratory syndrome pose a global threat. Antiviral drugs and vaccinations may be insufficient to prevent their spread. Objectives To review the effectiveness of physical interventions to interrupt or reduce the spread of respiratory viruses. Search methods We searched The Cochrane Library, the Cochrane Central Register of Controlled Trials (CENTRAL 2010, Issue 3), which includes the Acute Respiratory Infections Group's Specialised Register, MEDLINE (1966 to October 2010), OLDMEDLINE (1950 to 1965), EMBASE (1990 to October 2010), CINAHL (1982 to October 2010), LILACS (2008 to October 2010), Indian MEDLARS (2008 to October 2010) and IMSEAR (2008 to October 2010). Selection criteria In this update, two review authors independently applied the inclusion criteria to all identified and retrieved articles and extracted data. We scanned 3775 titles, excluded 3560 and retrieved full papers of 215 studies, to include 66 papers of 67 studies. We included physical interventions (screening at entry ports, isolation, quarantine, social distancing, barriers, personal protection, hand hygiene) to prevent respiratory virus transmission. We included randomised controlled trials (RCTs), cohorts, case-controls, before-after and time series studies. Data collection and analysis We used a standardised form to assess trial eligibility. We assessed RCTs by randomisation method, allocation generation, concealment, blinding and follow up. We assessed non-RCTs for potential confounders and classified them as low, medium and high risk of bias. Main results We included 67 studies including randomised controlled trials and observational studies with a mixed risk of bias. A total number of participants is not included as the total would be made up of a heterogenous set of observations (participant people, observations on participants and countries (object of some studies)). The risk of bias for five RCTs and most cluster-RCTs was high. Observational studies were of mixed quality. Only case-control data were sufficiently homogeneous to allow meta-analysis. The highest quality cluster-RCTs suggest respiratory virus spread can be prevented by hygienic measures, such as handwashing, especially around younger children. Benefit from reduced transmission from children to household members is broadly supported also in other study designs where the potential for confounding is greater. Nine case-control studies suggested implementing transmission barriers, isolation and hygienic measures are effective at containing respiratory virus epidemics. Surgical masks or N95 respirators were the most consistent and comprehensive supportive measures. N95 respirators were non-inferior to simple surgical masks but more expensive, uncomfortable and irritating to skin. Adding virucidals or antiseptics to normal

handwashing to decrease respiratory disease transmission remains uncertain. Global measures, such as screening at entry ports, led to a non-significant marginal delay in spread. There was limited evidence that social distancing was effective, especially if related to the risk of exposure. Authors' conclusions Simple and low-cost interventions would be useful for reducing transmission of epidemic respiratory viruses. Routine long-term implementation of some measures assessed might be difficult without the threat of an epidemic. Plain language summary Physical interventions to interrupt or reduce the spread of respiratory viruses Although respiratory viruses usually only cause minor disease, they can cause epidemics. Approximately 10% to 15% of people worldwide contract influenza annually, with attack rates as high as 50% during major epidemics. Global pandemic viral infections have been devastating. In 2003 the severe acute respiratory syndrome (SARS) epidemic affected around 8000 people, killed 780 and caused an enormous social and economic crisis. In 2006 a new avian H5N1, and in 2009 a new H1N1 'swine' influenza pandemic threat, caused global anxiety. Single and potentially expensive measures (particularly the use of vaccines or antiviral drugs) may be insufficient to interrupt the spread. Therefore, we searched for evidence for the effectiveness of simple physical barriers (such as handwashing or wearing masks) in reducing the spread of respiratory viruses, including influenza viruses. We included 67 studies including randomised controlled trials and observational studies with a mixed risk of bias. A total number of participants is not included as the total would be made up of a varied set of observations: participant people and observations on participants and countries (the object of some studies). Any total figure would therefore be misleading. Respiratory virus spread can be reduced by hygienic measures (such as handwashing), especially around younger children. Frequent handwashing can also reduce transmission from children to other household members. Implementing barriers to transmission, such as isolation, and hygienic measures (wearing masks, gloves and gowns) can be effective in containing respiratory virus epidemics or in hospital wards. We found no evidence that the more expensive, irritating and uncomfortable N95 respirators were superior to simple surgical masks. It is unclear if adding virucidals or antiseptics to normal handwashing with soap is more effective. There is insufficient evidence to support screening at entry ports and social distancing (spatial separation of at least one metre between those infected and those non-infected) as a method to reduce spread during epidemics.

C. Institutional Publications

Centers for Disease Control and Prevention (CDC)

Absence of Apparent Transmission of SARS-CoV-2 from Two Stylists After Exposure at a Hair Salon with a Universal Face Covering Policy - Springfield, Missouri (2020)

Hendrix MJ, Walde C., Findley K., Trotman R.

Available online at this link

What is already known about this topic? Consistent and correct use of cloth face coverings is recommended to reduce the spread of SARS-CoV-2. What is added by this report? Among 139 clients exposed to two symptomatic hair stylists with confirmed COVID-19 while both the stylists and the clients wore face masks, no symptomatic secondary cases were reported; among 67 clients tested for SARS-CoV-2, all test results were negative. Adherence to the community's and company's face-covering policy likely mitigated spread of SARS-CoV-2. What are the implications for public health practice? As stay-at-home orders are lifted, professional and social interactions in the community will present more opportunities for spread of SARS-CoV-2. Broader implementation of face covering policies could mitigate the spread of infection in the general population.

Ministry of Health, New Zealand

Review of science and policy around face masks and COVID-19 (2020)

Available online at this link

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

World Health Organization (WHO)

Coronavirus disease (COVID-19) advice for the public: When and how to use masks (2020)

Available online at this link

This document provides advice on the use of masks in communities, during home care, and in health care settings in areas that have reported cases of COVID-19. It is intended for individuals in the community, public health and infection prevention and control (IPC) professionals, health care managers, health care workers (HCWs), and community health workers. This updated version includes a section on Advice to decision makers on the use of masks for healthy people in community settings.

D. Original Research

1. **A short, animated video to improve good COVID-19 hygiene practices: a structured summary of a study protocol for a randomized controlled trial.**
   Vandormael Alain Trials 2020;21(1):469.

   OBJECTIVESEntertainment-education (E-E) media can improve behavioral intent toward health-related practices. In the era of COVID-19, millions of people can be reached by E-E media without requiring any physical contact. We have designed a short, wordless, animated video about COVID-19 hygiene practices-such as social distancing and frequent hand washing-that can be rapidly distributed through social media channels to a global audience. The E-E video's effectiveness, however, remains unclear. The study aims to achieve the following objectives. To: 1.Quantify people's interest in watching a short, animated video about COVID-19 hygiene (abbreviated to CoVideo).2.Establish the CoVideo's effectiveness in increasing behavioural intent toward COVID-19 hygiene.3.Establish the CoVideo's effectiveness in improving COVID-19 hygiene knowledge.TRIAL DESIGNThe present study is a multi-site, parallel group, randomized controlled trial (RCT) comparing the effectiveness of the CoVideo against an attention placebo control (APC) video or no video. The trial has an intervention arm (CoVideo),

placebo arm (APC), and control arm (no video). Nested in each trial arm is a list experiment and questionnaire survey, with the following ordering. Arm 1: the CoVideo, list experiment, and questionnaire survey. Arm 2: the APC video, list experiment, questionnaire survey, and CoVideo. Arm 3: the list experiment, questionnaire survey, and CoVideo. For each list experiment, participants will be randomized to a control or treatment group. The control group will receive a list of five items and the treatment group will receive the same five items plus one item about COVID-19 hygiene. We will use the list experiment to reduce response bias associated with socially desirable answers to COVID-19 questions. The questionnaire survey will include items about the participant's age, sex, country of residence, highest education, and knowledge of COVID-19 spread. After completing the list experiment and questionnaire survey, participants in Arms 2 and 3 will receive the CoVideo to ensure post-trial access to treatment.PARTICIPANTSThis will be an online study setting. We will use Prolific Academic (ProA: https://www.prolific.co) to recruit participants and host our study on the Gorilla™ platform (www.gorilla.sc). To be eligible, participants must be between the age of 18 and 59 years (male, female, or other) and have current residence in the United States, the United Kingdom, Germany, Spain, Mexico, or France. Participants will be excluded from the study if they cannot speak English, German, French, or Spanish (since the instructions and survey questions will be available in these 4 languages only).INTERVENTION AND COMPARATORThe intervention is an E-E video about COVID-19 hygiene (CoVideo). Developed by our co-author (MA) for Stanford Medicine, the CoVideo is animated with sound effects, and has no words, speech, or text. The CoVideo shows how the novel coronavirus is spread (airborne, physical contact) and summarizes the public's response to the COVID-19 outbreak. Key components of the CoVideo are the promotion of five hygiene practices: i) social distancing and avoiding group gatherings, ii) frequently washing hands with soap and water or sanitizer, iii) cleaning surfaces at home (e.g., kitchen counters), iv) not sharing eating utensils, and v) avoidance of stockpiling essential goods (such as toilet paper and face masks). The CoVideo, which was designed for universal reach and optimized for release on social media channels, can be viewed at https://www.youtube.com/watch?v=rAj38E7vrS8. The comparators are an APC video (Arm 2) or no video (Arm 3). The APC video is similar in style to the CoVideo; it is also animated with a duration of 2.30 minutes, has sound effects but no words, speech, or text. The video message is about how small choices become actions, which become habits, which become a way of life. It is available at https://www.youtube.com/watch?v=_HEnohs6yYw. Each list experiment will have a control list as the comparator. The control list is needed to measure the prevalence of behavioral intent toward COVID-19 hygiene.MAIN OUTCOMESThis study will measure primary and secondary outcomes related to COVID-19 hygiene. By hygiene, we mean the adoption of behaviors or practices that reduce the chances of being infected or spreading COVID-19. As our primary outcome, we will measure changes in behavioral intent toward five hygiene practices: social distancing, washing hands, cleaning household surfaces, not sharing eating utensils, and not stockpiling essential goods. As a secondary outcome, we will measure knowledge about behaviors that can prevent the spread of COVID-19.RANDOMIZATIONUsing a web-based randomization algorithm, Gorilla will randomly allocate participants to the intervention (CoVideo), placebo (APC), or control (no video) arm (sequence generation) at a 1:1:1 ratio. Within each trial arm, Gorilla will randomly allocate participants at a 1:1 ratio to the control or treatment group. Items in the lists will be randomly ordered to avoid order effects. The presentation order of the list experiments will also be randomized.BLINDINGBecause ProA handles the interaction between the study investigators and participants, the participants will be completely anonymous to the study investigators. The outcome measures will be self-reported and submitted anonymously. All persons in the study team will be blinded to the group allocation.NUMBERS TO BE RANDOMIZEDThe Gorilla algorithm will randomize 6,700 participants to each trial arm, giving a total sample size of 20,100.TRIAL STATUSThe protocol version number is 1.0 and the date is 18 May 2020. Recruitment is expected to

end by 22 June 2020. Thus far, the study investigators have recruited 2,500 participants on ProA. Of these participants, 800 have completed the study on the Gorilla platform.TRIAL REGISTRATIONThe study and its outcomes were registered at the German Clinical Trials Register (www.drks.de) on May 12th, 2020, protocol number: #DRKS00021582. The study was registered before any data was collected.FULL PROTOCOLThe full protocol is attached as an additional file, accessible from the Trials website (Additional file 1). In the interest in expediting dissemination of this material, the familiar formatting has been eliminated; this Letter serves as a summary of the key elements of the full protocol.

Available online at this link

Available online at this link

Available online at this link

2. **Adolescents' face mask usage and contact transmission in novel coronavirus**
Chao Fang-Lin 2020;1:36.

The global outbreak of coronavirus has become an international public health threat. Prevention is of paramount importance to contain its spread. This study observes face mask wearing behavior and contact transmission problems in Taiwan. Teachers track student status in class. In addition to measuring body temperature and regular disinfection, classrooms require ventilation wear mask, provide alcohol spray and avoid sharing the microphone. Both questionnaire surveys and experimental were utilized. A total of 160 adults residing in Taiwan participated in the survey. The dye simulated the possible virus area on the mask surface during usage. Subjects were required to complete a questionnaire and simulate the spread of contact transmission when using a computer. Eighty-one % of respondents reported consistent use of surgical masks several times a day. They reported taking their masks off in relatively safe areas. Most people reported using one mask per day and storing the masks in their pockets. As a result, masks surface become a contamination source. In the contact experiment, ten adults were requested to don and doff a surgical mask while doing a word processing task. The extended contamination areas were recorded and identified by image analysis. The results show an average contamination area of the workspace is significant 530 cm2. When the hand touches the surface of the mask, it may spread the virus to the subsequent contact area.

Available online at this link

3. **Analysis of a mathematical model for COVID-19 population dynamics in Lagos, Nigeria**
Okuonghae D. 2020;:No page numbers.

This work examines the impact of various non-pharmaceutical control measures (government and personal) on the population dynamics of the novel coronavirus disease 2019 (COVID-19) in Lagos, Nigeria, using an appropriately formulated mathematical model. Using the available data, since its first reported case on 16 March 2020, we seek to develop a predicative tool for the cumulative number of reported cases and the number of active cases in Lagos; we also estimate the basic reproduction number of the disease

outbreak in the aforementioned State in Nigeria. Using numerical simulations, we show the effect of control measures, specifically the common social distancing, use of face mask and case detection (via contact tracing and subsequent testings) on the dynamics of COVID-19. We also provide forecasts for the cumulative number of reported cases and active cases for different levels of the control measures being implemented. Numerical simulations of the model show that if at least 55% of the population comply with the social distancing regulation with about 55% of the population effectively making use of face masks while in public, the disease will eventually die out in the population and that, if we can step up the case detection rate for symptomatic individuals to about 0.8 per day, with about 55% of the population complying with the social distancing regulations, it will lead to a great decrease in the incidence (and prevalence) of COVID-19.

Available online at this link

4. **Applying principles of behaviour change to reduce SARS-CoV-2 transmission.**
West Robert Nature human behaviour 2020;4(5):451-459.

Human behaviour is central to transmission of SARS-Cov-2, the virus that causes COVID-19, and changing behaviour is crucial to preventing transmission in the absence of pharmaceutical interventions. Isolation and social distancing measures, including edicts to stay at home, have been brought into place across the globe to reduce transmission of the virus, but at a huge cost to individuals and society. In addition to these measures, we urgently need effective interventions to increase adherence to behaviours that individuals in communities can enact to protect themselves and others: use of tissues to catch expelled droplets from coughs or sneezes, use of face masks as appropriate, hand-washing on all occasions when required, disinfecting objects and surfaces, physical distancing, and not touching one's eyes, nose or mouth. There is an urgent need for direct evidence to inform development of such interventions, but it is possible to make a start by applying behavioural science methods and models.

Available online at this link

5. **Back to Normal: An Old Physics Route to Reduce SARS-CoV-2 Transmission in Indoor Spaces.**
García de Abajo F. Javier ACS nano 2020;:No page numbers.

We advocate the widespread use of UV-C light as a short-term, easily deployable, and affordable way to limit virus spread in the current SARS-CoV-2 pandemic. Radical social distancing with the associated shutdown of schools, restaurants, sport clubs, workplaces, and traveling has been shown to be effective in reducing virus spread, but its economic and social costs are unsustainable in the medium term. Simple measures like frequent handwashing, facial masks, and other physical barriers are being commonly adopted to prevent virus transmission. However, their efficacy may be limited, particularly in shared indoor spaces, where, in addition to airborne transmission, elements with small surface areas such as elevator buttons, door handles, and handrails are frequently used and can also mediate transmission. We argue that additional measures are necessary to reduce virus transmission when people resume attending schools and jobs that require proximity or some degree of physical contact. Among the available alternatives, UV-C light satisfies the

requirements of rapid, widespread, and economically viable deployment. Its implementation is only limited by current production capacities, an increase of which requires swift intervention by industry and authorities.

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6. **Comprehensive review of mask utility and challenges during the COVID-19 pandemic.**
Tirupathi Raghavendra Le infezioni in medicina 2020;28:57-63.

Masks are widely discussed during the course of the ongoing COVID-19 pandemic. Most hospitals have implemented universal masking for their healthcare workers, and the Center for Disease Control currently advises even the general public to wear cloth masks when outdoors. The pertinent need for masks arises from plausible dissemination of the SARS-CoV-2 through close contacts, as well as the possibility of virus transmission from asymptomatic, pre-symptomatic, and mildly symptomatic individuals. Given current global shortages in personal protective equipment, the efficacy of various types of masks: N95 respirators, surgical masks, and cloth masks are researched. To accommodate limited supplies, techniques for extended use, reuse, and sterilization of masks are strategized. However, masks alone may not greatly slow down the COVID-19 pandemic unless they are coupled with adequate social distancing, diligent hand hygiene, and other proven preventive measures.

7. **COVID-19 pandemic and precautionary measures in Pakistan**
Muhammad Anees 2020;1:94.

The current outbreak of Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) has attained the dimensions of a pandemic and World Health Organization (WHO) has declared it a global emergency and given it a name of COVID-19. It may remain asymptomatic, but usually presents as influenza-like symptoms initially. It spreads from zoonotic sources, which are still under investigation. Real Time Polymerase Chain Reaction (RT-PCR) is the only available diagnostic and confirmatory lab assay for SARS-CoV-2. There is no specific antiviral drug or vaccine against SARS-CoV-2, hence infected and suspected cases are dependent on supportive treatment along with few anti-HIV drugs. Evidence suggests that, in Pakistan, all cases have returned from Iran and Saudi Arabia after pilgrimage. The number of patients has been increasing gradually. Almost all of the neighboring countries of Pakistan are suffering from an outbreak. So, a big threat is there. Pakistani health authorities need to take critical action urgently. Moreover, it is necessary to take basic preventive measurements including hand washing, use of face masks, keeping the distance from suspected patients and avoiding unnecessary traveling to overcrowded areas. It is concluded that the developing countries might be at higher risk including Pakistan. Personnel and community-based strategy is required to avoid any serious consequences in Pakistan. We searched relevant studies and papers from Google, Google Scholar, National Institute of Health (Pakistan) and WHO by using various medical subject heading (MeSH) terms including COVID-19, SARS-CoV-2, MERS, Preventive Measurements of COVID etc. All downloaded articles were carefully read and conclusions drawn.

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8. **COVID-19 preventive measures showing an unintended decline in infectious diseases in Taiwan**
Galvin C.J. International journal of infectious diseases : IJID : official publication of the International Society for Infectious Diseases 2020;:No page numbers.

Many communicable diseases may have contact, airborne, and/or droplets transmission. Following the COVID-19 outbreak, Taiwan government implemented the use of masks and sanitizer and other prevention measures, like social distancing for prevention. This public response may have likely contributed significantly to the decline in the outbreak of other infectious diseases.
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9. **Fabrics tested for their ability to filter aerosols**
Anon. 2020;:No page numbers.

Tightly woven cotton, such as that used to make high-thread-count sheets;four layers of silk;and mixtures of fabric, such as cotton and flannel or cotton and chiffon, are good materials for making masks to prevent the spread of the novel coronavirus, SARS-CoV-2, scientists report According to a new study, masks made from these fabrics are good at filtering saltwater aerosols 10 nm to 6 µm—the same size as droplets that are known to spread respiratory viruses (ACS Nano 2020, DOI: 10 1021/acsnano 0c03252) Droplets this size tend to stay suspended in air Last month, upon learning the Centers for Disease Control and Prevention would recommend that people wear face coverings, scientists at the Pritzker School of Molecular Engineering, the University of Chicago, and Argonne National Laboratory decided to test the filtration properties of various fabrics “There was very little scientific data taken with laboratory-grade instruments on this,” says Supratik Guha,

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10. **Face mask designs following novel coronavirus**
Chao Fang-Lin 2020;1:31.

Doctors need to wear complete protective equipment when large numbers of patients flood into the emergency room. Taiwan has so far managed to prevent a large scale community outbreak, city forces wearing face masks on public transportation, and keep social distancing to stem the virus from spreading. The protective device may be contaminated and must be replaced. In the situation of limited resources, how to take care of the physiological needs of the doctor without increasing the chance of contamination during replacement is a consideration. By reducing the chance of contamination during removal and storage, the previous designs were analyzed and improved. We proposed three improved designs to reduce the contact. Design-A features a mask with a water channel that allows the user to remain hydrated without removing the cover. Design-B has a folding pattern that hides the outer surface. Design-C combines the mask with the brim of a cap

which form an extended air-intake area. Through understanding the problem, related product began distribute on the market, Design-D extend the mask usages period with less contact.

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11. **Homemade cloth face masks as a barrier against respiratory droplets - systematic review Máscaras de tecido na contenção de gotículas respiratórias - revisão sistemática**
Taminato Monica 2020;:No page numbers.

Abstract Objective To identify, systematically review, and summarize the best scientific evidence available on the efficacy and safety of homemade cloth face masks for the community Methods The search was conducted using the Cochrane, PUBMED, EMBASE, and LILACS databases, as well as grey literature, using Opengrey A search was also conducted using references from primary and secondary studies that were found No language or time period restrictions were applied All papers that objective was to check efficacy and safety of the use of cloth face masks as protection against viral transmission were included, as well as laboratory studies assessing barriers against particles We excluded studies approaching the use of face masks by healthcare providers Two independent reviewers selected the studies, and discrepancies were decided by a third reviewer Results No randomized clinical trials involving cloth face masks for the general population were found Seven studies assessing different types of cloth to prevent the penetration of droplets at a laboratory level and a review study were included Conclusion Using cloth face masks provides a barrier against droplets when compared with not using any face masks The face mask is an additional preventive mesuare and must be used along with respiratory etiquette, hand hygiene, social distancing, and isolation of cases

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12. **How effective can homemade face masks be?**
Anon. 2020;:No page numbers.

With cases of COVID-19 growing rapidly in the US and evidence mounting that the virus responsible, SARS-CoV-2, can be spread by infected people before they develop symptoms, the US Centers for Disease Control and Prevention recommended April 3 that people wear cloth face coverings in public places This guidance is a shift from the center's previous position that healthy people needed to wear masks only when caring for a sick person The recommendation also follows recent calls by experts on social media and other platforms for the general public to don nonmedical, cloth masks to help reduce the transmission of the novel coronavirus "Members of the general public should wear non-medical fabric face masks when going out in public in one additional societal effort to slow the spread of the virus down," Tom Inglesby, director of the Johns Hopkins Center for Health Security, tweeted March 29 These experts hope the View: PDF ;Full Text HTML

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13. **Identifying airborne transmission as the dominant route for the spread of COVID-19.**
Zhang Renyi Proceedings of the National Academy of Sciences of the United States of America 2020;117(26):14857-14863.

Various mitigation measures have been implemented to fight the coronavirus disease 2019 (COVID-19) pandemic, including widely adopted social distancing and mandated face covering. However, assessing the effectiveness of those intervention practices hinges on the understanding of virus transmission, which remains uncertain. Here we show that airborne transmission is highly virulent and represents the dominant route to spread the disease. By analyzing the trend and mitigation measures in Wuhan, China, Italy, and New York City, from January 23 to May 9, 2020, we illustrate that the impacts of mitigation measures are discernable from the trends of the pandemic. Our analysis reveals that the difference with and without mandated face covering represents the determinant in shaping the pandemic trends in the three epicenters. This protective measure alone significantly reduced the number of infections, that is, by over 78,000 in Italy from April 6 to May 9 and over 66,000 in New York City from April 17 to May 9. Other mitigation measures, such as social distancing implemented in the United States, are insufficient by themselves in protecting the public. We conclude that wearing of face masks in public corresponds to the most effective means to prevent interhuman transmission, and this inexpensive practice, in conjunction with simultaneous social distancing, quarantine, and contact tracing, represents the most likely fighting opportunity to stop the COVID-19 pandemic. Our work also highlights the fact that sound science is essential in decision-making for the current and future public health pandemics.

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14. **Influence of wind and relative humidity on the social distancing effectiveness to prevent COVID-19 airborne transmission: A numerical study.**
Feng Yu Journal of aerosol science 2020;:105585.

It has been confirmed that the coronavirus disease 2019 (COVID-19) can transmit through droplets created when an infected human coughs or sneezes. Accordingly, 1.83-m (6-feet) social distancing is advised to reduce the spread of the disease among humans. This is based on the assumption that no air circulation exists around people. However, it is not well investigated whether the ambient wind and relative humidity (RH) will cause SARS-CoV-2 laden droplets to transport farther in the air, making the current social distancing policy insufficient. To provide evidence and insight into the "social distancing" guidelines, a validated computational fluid-particle dynamics (CFPD) model was employed to simulate the transient transport, condensation/evaporation, and deposition of SARS-CoV-2 laden droplets emitted by coughs, with different environmental wind velocities and RHs. Initial droplet diameters range from 2 to 2000 μm, and the wind velocities range from 0 to 16 km/h, representing different wind forces from calm air to moderate breeze. The comparison between a steady-state wind and a gust with a constant frequency has also been performed. Ambient RHs are 40% and 99.5%. The distances between the two virtual humans are 1.83 m and 3.05 m (6 feet and 10 feet). The facial covering effect on reducing the airborne transmission of the cough droplets has also been evaluated. Numerical results indicate that the ambient wind will enhance the complexity of the secondary flows with recirculation between the two virtual humans. Microdroplets follow the airflow streamlines well and deposit on both human bodies and head regions, even with the 3.05-m (10-feet) separation distance. The rest of the microdroplets can transport in the air farther than 3.05 m (10 feet) due to wind convection, causing a potential health risk to nearby people.

High RH will increase the droplet sizes due to the hygroscopic growth effect, which increases the deposition fractions on both humans and the ground. With the complex environmental wind and RH conditions, the 6-feet social distancing policy may not be sufficient to protect the inter-person aerosol transmission, since the suspending micro-droplets were influenced by convection effects and can be transported from the human coughs/sneezes to the other human in less than 5 s. Thus, due to the complex real-world environmental ventilation conditions, a social distance longer than 6 feet needs to be considered. Wearing masks should also be recommended for both infected and healthy humans to reduce the airborne cough droplet numbers.

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15. **Knowledge, Attitude, and Practices of Healthcare Workers Regarding the Use of Face Mask to Limit the Spread of the New Coronavirus Disease (COVID-19)**
Kumar Jagdesh 2020;:No page numbers.

Introduction Many countries including Pakistan are currently using face masks in their pandemic control plans Being highly prevalent, the correct use of these masks is particularly important, as an incorrect use and disposal may actually increase the rate of transmission The purpose of this study was to investigate the knowledge, attitude, and practices of healthcare workers (HCWs) in wearing a surgical face mask to limit the spread of the new coronavirus disease 2019 (COVID-19) Materials and Methods This survey was conducted by interviewing HCWs using a questionnaire consisting of the basic demographic characteristics, and the knowledge, attitude, and practices regarding the use of surgical face mask to limit the new COVID-19 exposure Each correct answer was scored 1 and each incorrect answer scored 0 The total number of questions was 16, and the final score was calculated and then labeled according to the percentage (out of 16) of correct responses as good (>80%), moderate (60-80%), and poor (<60%) Results A total of 392 participants with a mean age of 42 37 +/- 13 34 years (341 males and 51 females) were included in the study The overall final results were good in 138 (35 2%), moderate in 178 (45 4%), and poor in 76 (19 3%) Around 43 6% of participants knew about the correct method of wearing the masks, 68 9% knew that there are three layers, 53% stated that the middle layer act as a filter media barrier, and 75 5% knew the recommended maximum duration of wearing it The majority (88 2%) of participants knew that a cloth face mask is not much effective, around 79 8% knew that used face mask cannot be re-used, and 44 8% knew about the yellow-coded bag for disposal Conclusions Knowledge, attitude, and practice of HCWs regarding the use of face masks were found to be inadequate Studied HCWs had a positive attitude but moderate-to-poor level of knowledge and practice regarding the use of face mask HCWs and general public awareness campaigns regarding the proper use of face mask by utilizing all social media available resources would be helpful during this pandemic

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16. **Nasopharyngeal wash in preventing and treating upper respiratory tract infections: Could it prevent COVID-19?**
Singh Sheetu 2020;3:246.

Rapid transmission of the severe acute respiratory syndrome coronavirus 2 has led to the novel coronavirus disease 2019 (COVID-19) pandemic. The current emphasis is on preventive strategies such as social distancing, face mask, and hand washing. The technique of nasopharyngeal wash to prevent the virus from inhabiting and replicating in the nasal and pharyngeal mucosa has been suggested to be useful in reducing symptoms, transmission, and viral shedding in cases of viral acute respiratory tract infections. In rapid systematic review, we found studies showing some improvement in prevention and treatment of upper respiratory tract infections. We postulate that hypertonic saline gargles and nasal wash may be useful in prevention and for care of patients with COVID-19. The present evidence emphasizes the need of randomized controlled trials to evaluate the role and mechanism of nasopharyngeal wash in COVID-19.

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17. **Non Pharmaceutical Interventions for Optimal Control of COVID-19**
Zamir Mohammad 2020;:No page numbers.

Background and Objective The outbreak of the current pandemic begun from the first individual of a 55-year old from Hubei province in China, the disease instigated by the new coronavirus spreading across the world Scientists presently speculate this coronavirus, SARS-CoV-2, originated in a bat and by one way or another jumped to another creature, potentially the pangolin, which at that point gave it to people The ailment is currently spreading between individuals with no animal delegate Researchers are struggling to follow the infection back to where it started to become familiar with its spread In the event that, for example, specialists can locate the soonest cases, they might have the option to distinguish the creature have where the infection hides In March and April 2020, researchers detailed that this virus created normally Coronavirus has been become of the serious global phenomena in the recent years and has negative effects in the entire world health and economy The virus is believed to have been associated with a host animal which human contracted Subsequently, human-to-human infection began Through migration as humans have become complex with easy mobility the disease has traveled to the entire continent Now, numerous scientist are going on in the hope of obtaining medication and vaccination to prevent the spread of the disease and mortality of the disease It is important that we obtain quantitative and qualitative information about the etiology of this disease which is crucial Mathematical modeling is capable of providing qualitative information on many parameters that guides the decision making of health practitioners In this work we focus the optimal control of COVID-19 with the help of Non Pharmaceutical Interventions(NPIs) To find the role of factors/parameters in the transmission of the syndrome we find R0;the ratio of reproduction for the proposed model Methods To find the role of parameters in the transmission of the syndrome we find R0;the ratio of reproduction for the proposed model On the basis of sensitivity indices of the parameters we apply Non Pharmaceutical Interventions(NPIs) to control the sensitive parameters and hence formulate the optimal control mode With the help of Hamiltonian and Lagrangian we minimize the density of contaminated stuff and infected human population Results We focus the optimal control of COVID-19 with the help of Non Pharmaceutical Interventions(NPIs) On the basis of sensitivity indices of the parameters we apply Non Pharmaceutical Interventions(NPIs) to control the sensitive parameters and hence formulate the optimal control model The major NPIs are, STAY HOME, SANITIZER (wash hands), EARLY CASE DETECTION (PCR Test) and FACE MASK These NPIs helps in mitigation and reducing the size of outbreak of the disease Conclusion We check the existence of the optimal solution for the system At the end, Using matlab we produce numerical simulations for validation of results of control

variables The results demonstrate that if there is no control (variables/interventios), 900 out 1000 susceptible individuals may be infected (exposed) in very short period As such a circumstances no agency fighting against COVID-19 could be successful due to its limited resources Keywords: Novel coronavirus, Mathematical model, Basic reproduction number, Next generation matrix, Sensitivity analysis, Pontryagin's Maximum Principle, Optimal control

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18. **On respiratory droplets and face masks.**
Dbouk Talib Physics of fluids (Woodbury, N.Y. : 1994) 2020;32(6):063303.

Face mask filters-textile, surgical, or respiratory-are widely used in an effort to limit the spread of airborne viral infections. Our understanding of the droplet dynamics around a face mask filter, including the droplet containment and leakage from and passing through the cover, is incomplete. We present a fluid dynamics study of the transmission of respiratory droplets through and around a face mask filter. By employing multiphase computational fluid dynamics in a fully coupled Eulerian-Lagrangian framework, we investigate the droplet dynamics induced by a mild coughing incident and examine the fluid dynamics phenomena affecting the mask efficiency. The model takes into account turbulent dispersion forces, droplet phase-change, evaporation, and breakup in addition to the droplet-droplet and droplet-air interactions. The model mimics real events by using data, which closely resemble cough experiments. The study shows that the criteria employed for assessing the face mask performance must be modified to take into account the penetration dynamics of airborne droplet transmission, the fluid dynamics leakage around the filter, and reduction of efficiency during cough cycles. A new criterion for calculating more accurately the mask efficiency by taking into account the penetration dynamics is proposed. We show that the use of masks will reduce the airborne droplet transmission and will also protect the wearer from the droplets expelled from other subjects. However, many droplets still spread around and away from the cover, cumulatively, during cough cycles. Therefore, the use of a mask does not provide complete protection, and social distancing remains important during a pandemic. The implications of the reduced mask efficie ncy and respiratory droplet transmission away from the mask are even more critical for healthcare workers. The results of this study provide evidence of droplet transmission prevention by face masks, which can guide their use and further improvement.

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19. **Pathophysiology, Transmission, Diagnosis, and Treatment of Coronavirus Disease 2019 (COVID-19): A Review.**
Wiersinga W. Joost JAMA 2020;:No page numbers.

ImportanceThe coronavirus disease 2019 (COVID-19) pandemic, due to the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has caused a worldwide sudden and substantial increase in hospitalizations for pneumonia with multiorgan disease. This review discusses current evidence regarding the pathophysiology, transmission, diagnosis, and management of COVID-19.ObservationsSARS-CoV-2 is spread primarily via respiratory droplets during close face-to-face contact. Infection can be spread by

asymptomatic, presymptomatic, and symptomatic carriers. The average time from exposure to symptom onset is 5 days, and 97.5% of people who develop symptoms do so within 11.5 days. The most common symptoms are fever, dry cough, and shortness of breath. Radiographic and laboratory abnormalities, such as lymphopenia and elevated lactate dehydrogenase, are common, but nonspecific. Diagnosis is made by detection of SARS-CoV-2 via reverse transcription polymerase chain reaction testing, although false-negative test results may occur in up to 20% to 67% of patients; however, this is dependent on the quality and timing of testing. Manifestations of COVID-19 include asymptomatic carriers and fulminant disease characterized by sepsis and acute respiratory failure. Approximately 5% of patients with COVID-19, and 20% of those hospitalized, experience severe symptoms necessitating intensive care. More than 75% of patients hospitalized with COVID-19 require supplemental oxygen. Treatment for individuals with COVID-19 includes best practices for supportive management of acute hypoxic respiratory failure. Emerging data indicate that dexamethasone therapy reduces 28-day mortality in patients requiring supplemental oxygen compared with usual care (21.6% vs 24.6%; age-adjusted rate ratio, 0.83 [95% CI, 0.74-0.92]) and that remdesivir improves time to recovery (hospital discharge or no supplemental oxygen requirement) from 15 to 11 days. In a randomized trial of 103 patients with COVID-19, convalescent plasma did not shorten time to recovery. Ongoing trials are testing antiviral therapies, immune modulators, and anticoagulants. The case-fatality rate for COVID-19 varies markedly by age, ranging from 0.3 deaths per 1000 cases among patients aged 5 to 17 years to 304.9 deaths per 1000 cases among patients aged 85 years or older in the US. Among patients hospitalized in the intensive care unit, the case fatality is up to 40%. At least 120 SARS-CoV-2 vaccines are under development. Until an effective vaccine is available, the primary methods to reduce spread are face masks, social distancing, and contact tracing. Monoclonal antibodies and hyperimmune globulin may provide additional preventive strategies.Conclusions and RelevanceAs of July 1, 2020, more than 10 million people worldwide had been infected with SARS-CoV-2. Many aspects of transmission, infection, and treatment remain unclear. Advances in prevention and effective management of COVID-19 will require basic and clinical investigation and public health and clinical interventions.

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20. **Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis.** Chu Derek K. Lancet (London, England) 2020;395(10242):1973-1987.

BACKGROUNDSevere acute respiratory syndrome coronavirus 2 (SARS-CoV-2) causes COVID-19 and is spread person-to-person through close contact. We aimed to investigate the effects of physical distance, face masks, and eye protection on virus transmission in health-care and non-health-care (eg, community) settings.METHODSWe did a systematic review and meta-analysis to investigate the optimum distance for avoiding person-to-person virus transmission and to assess the use of face masks and eye protection to prevent transmission of viruses. We obtained data for SARS-CoV-2 and the betacoronaviruses that cause severe acute respiratory syndrome, and Middle East respiratory syndrome from 21 standard WHO-specific and COVID-19-specific sources. We searched these data sources from database inception to May 3, 2020, with no restriction by language, for comparative studies and for contextual factors of acceptability, feasibility, resource use, and equity. We screened records, extracted data, and assessed risk of bias

in duplicate. We did frequentist and Bayesian meta-analyses and random-effects meta-regressions. We rated the certainty of evidence according to Cochrane methods and the GRADE approach. This study is registered with PROSPERO, CRD42020177047.FINDINGSOur search identified 172 observational studies across 16 countries and six continents, with no randomised controlled trials and 44 relevant comparative studies in health-care and non-health-care settings (n=25 697 patients). Transmission of viruses was lower with physical distancing of 1 m or more, compared with a distance of less than 1 m (n=10 736, pooled adjusted odds ratio [aOR] 0·18, 95% CI 0·09 to 0·38; risk difference [RD] -10·2%, 95% CI -11·5 to -7·5; moderate certainty); protection was increased as distance was lengthened (change in relative risk [RR] 2·02 per m; pinteraction=0·041; moderate certainty). Face mask use 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 stronger associations with N95 or similar respirators compared with disposable surgical masks or similar (eg, reusable 12-16-layer cotton masks; pinteraction=0·090; posterior probability >95%, low certainty). Eye protection also was associated with less infection (n=3713; aOR 0·22, 95% CI 0·12 to 0·39, RD -10·6%, 95% CI -12·5 to -7·7; low certainty). Unadjusted studies and subgroup and sensitivity analyses showed similar findings.INTERPRETATIONThe findings of this systematic review and meta-analysis support physical distancing of 1 m or more and provide quantitative estimates for models and contact tracing to inform policy. Optimum use of face masks, respirators, and eye protection in public and health-care settings should be informed by these findings and contextual factors. Robust randomised trials are needed to better inform the evidence for these interventions, but this systematic appraisal of currently best available evidence might inform interim guidance.FUNDINGWorld Health Organization.

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21. **Reduction of secondary transmission of SARS-CoV-2 in households by face mask use, disinfection and social distancing: a cohort study in Beijing, China.**
Wang Yu BMJ global health 2020;5(5):No page numbers.

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22. **Social Distancing and Transmission-reducing Practices during the 2019 Coronavirus Disease and 2015 Middle East Respiratory Syndrome Coronavirus Outbreaks in Korea.**
Jang Won Mo Journal of Korean medical science 2020;35(23):e220.

BACKGROUNDThe absence of effective antiviral medications and vaccines increased the focus on non-pharmaceutical preventive behaviors for mitigating against the coronavirus disease 2019 (COVID-19) pandemic. To examine the current status of non-pharmaceutical preventive behaviors practiced during the COVID-19 outbreak and factors affecting behavioral activities, we compared to the 2015 Middle East respiratory syndrome coronavirus (MERS-CoV) outbreak in Korea.METHODSThis was a serial cross-sectional

population-based study in Korea with four surveys conducted on June 2 and 25, 2015 (MERS-CoV surveys), and February 4, and April 2, 2020 (COVID-19 surveys). Of 25,711 participants selected using random digit dialing numbers, 4,011 participants (aged ≥ 18 years) were successfully interviewed, for the 2020 COVID-19 (n = 2,002) and 2015 MERS-CoV (n = 2,009) epidemics were included. Participants were selected post-stratification by sex, age, and province. The total number of weighted cases in this survey equaled the total number of unweighted cases at the national level. We measured the levels of preventive behaviors (social distancing [avoiding physical contact with others]), and practicing transmission-reducing behaviors such as wearing face mask and handwashing.RESULTSBetween the surveys, respondents who reported practicing social distancing increased from 41.9%-58.2% (MERS-CoV) to 83.4%-92.3% (COVID-19). The response rate for the four surveys ranged between 13.7% and 17.7%. Practicing transmission-reducing behaviors (wearing face masks and handwashing) at least once during COVID-19 (78.8%, 80.2%) also increased compared to that during MERS-CoV (15.5%, 60.3%). The higher affective risk perception groups were more likely to practice transmission-reducing measures (adjusted odds ratio, 3.24-4.81; 95 confidence interval, 1.76-6.96) during both COVID-19 and MERS-CoV.CONCLUSIONThe study findings suggest markedly increased proportions of non-pharmaceutical behavioral practices evenly across all subgroups during the two different novel virus outbreaks in Korea. Strategic interventions are needed to attempt based on preventive behavior works.

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23. **Strongly Heterogeneous Transmission of COVID-19 in Mainland China: Local and Regional Variation**
Wang Yuke 2020;:No page numbers.

Background: The outbreak of novel coronavirus disease 2019 (COVID-19) started in the city of Wuhan, China, with a period of rapid initial spread Transmission on a regional and then national scale was promoted by intense travel during the holiday period of the Chinese New Year We studied the variation in transmission of COVID-19, locally in Wuhan, as well as on a larger spatial scale, among different cities and even among provinces in mainland China Methods: In addition to reported numbers of new cases, we have been able to assemble detailed contact data for some of the initial clusters of COVID-19 This enabled estimation of the serial interval for clinical cases, as well as reproduction numbers for small and large regions Findings: We estimated the average serial interval was 4 8 days For early transmission in Wuhan, any infectious case produced as many as four new cases, transmission outside Wuhan was less intense, with reproduction numbers below two During the rapid growth phase of the outbreak the region of Wuhan city acted as a hot spot, generating new cases upon contact, while locally, in other provinces, transmission was low Interpretation: COVID-19 is capable of spreading very rapidly The sizes of outbreak in provinces of mainland China mainly depended on the numbers of cases imported from Wuhan as the local reproduction numbers were low The COVID-19 epidemic should be controllable with appropriate interventions (suspension of public transportation, cancellation of mass gatherings, implementation of surveillance and testing, and promotion of personal hygiene and face mask use)

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24. **Textile Masks and Surface Covers-A Spray Simulation Method and a "Universal Droplet Reduction Model" Against Respiratory Pandemics.**
Rodriguez-Palacios Alex Frontiers in medicine 2020;7:260.

The main form of COVID-19 transmission is via "oral-respiratory droplet contamination" (droplet: very small drop of liquid) produced when individuals talk, sneeze, or cough. In hospitals, health-care workers wear facemasks as a minimum medical "droplet precaution" to protect themselves. Due to the shortage of masks during the pandemic, priority is given to hospitals for their distribution. As a result, the availability/use of medical masks is discouraged for the public. However, for asymptomatic individuals, not wearing masks in public could easily cause the spread of COVID-19. The prevention of "environmental droplet contamination" (EnvDC) from coughing/sneezing/speech is fundamental to reducing transmission. As an immediate solution to promote "public droplet safety," we assessed household textiles to quantify their potential as effective environmental droplet barriers (EDBs). The synchronized implementation of a universal "community droplet reduction solution" is discussed as a model against COVID-19. Using a bacterial-suspension spray simulation model of droplet ejection (mimicking a sneeze), we quantified the extent by which widely available clothing fabrics reduce the dispersion of droplets onto surfaces within 1.8 m, the minimum distance recommended for COVID-19 "social distancing." All textiles reduced the number of droplets reaching surfaces, restricting their dispersion to <30 cm, when used as single layers. When used as double-layers, textiles were as effective as medical mask/surgical-cloth materials, reducing droplet dispersion to <10 cm, and the area of circumferential contamination to ~0.3%. The synchronized implementation of EDBs as a "community droplet reduction solution" (i.e., face covers/scarfs/masks and surface covers) will reduce COVID-19 EnvDC and thus the risk of transmitting/acquiring COVID-19.

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25. **The COVID-19 pandemic: biological evolution, treatment options and consequences**
Das Sovik 2020;3:No page numbers.

The spread of novel coronavirus SARS-CoV-2, the cause of the pandemic COVID-19 has emerged as a global matter of concern in the last couple of months. It has rapidly spread around the globe, which initially began in the city of Wuhan, People's Republic of China and is hypothesized to originate from the group of Rhinolophus bats. Till date, there has been no clinically proven vaccine against the SARS-CoV-2 and thus the doctors are employing the other well-known techniques, which have previously successfully tackled similar other human coronaviruses. To prevent the further spread of COVID-19, doctors are advising isolation of the infected patients, and also regular washing of hands and the use of face mask for the common people. In the wake of the COVID-19 outbreak, the countries are going for nationwide lockdown as the only preventive measure to avert community transmission of this disease, which is having economic, social and psychological effect on the general mass. Therefore, this comprehensive review article encapsulates the biological evolution of human coronaviruses, probable treatment and control strategies to combat COVID-19 and, its impact on human life.

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26. **The face mask: How a real protection becomes a psychological symbol during Covid-19?**
Goh Yihui Brain, behavior, and immunity 2020;:No page numbers.

'The Mask' has become a byword and a precious possession universally. Except for its use by the medical fraternity, answers to the common questions-whether it provides enough protection, which type is optimal for the general public and who really needs to don it, remain poorly understood. For a frontline healthcare worker, wearing mask is a necessity as an important person protection equipment, it is perhaps the most-powerful psychological symbol for the general public. Surprisingly, it even undermines all other recommended practices of infection control and breaking the transmission chain of Covid-19, like hand washing, personal hygiene and social distancing. 'The mask' has evolved with time and yet there is a need to further improve the design for safety, tolerability and comfort. In this review we present the journey of face mask, originating from the first masks aimed at stopping the bad smell to its industrial use to its all-important place in the medical field. Various types of face masks, their filtration efficiency, reusability and current recommendations for their use are presented.

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27. **The role of community-wide wearing of face mask for control of coronavirus disease 2019 (COVID-19) epidemic due to SARS-CoV-2.**
Cheng Vincent Chi-Chung The Journal of infection 2020;81(1):107-114.

BACKGROUNDFace mask usage by the healthy population in the community to reduce risk of transmission of respiratory viruses remains controversial. We assessed the effect of community-wide mask usage to control coronavirus disease 2019 (COVID-19) in Hong Kong Special Administrative Region (HKSAR).METHODSPatients presenting with respiratory symptoms at outpatient clinics or hospital wards were screened for COVID-19 per protocol. Epidemiological analysis was performed for confirmed cases, especially persons acquiring COVID-19 during mask-off and mask-on settings. The incidence of COVID-19 per million population in HKSAR with community-wide masking 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. Compliance of face mask usage in the HKSAR community was monitored.FINDINGSWithin first 100 days (31 December 2019 to 8 April 2020), 961 COVID-19 patients were diagnosed in HKSAR. The COVID-19 incidence in HKSAR (129.0 per million population) was significantly lower ($p<0.001$) than that of Spain (2983.2), Italy (2250.8), Germany (1241.5), France (1151.6), U.S. (1102.8), U.K. (831.5), Singapore (259.8), and South Korea (200.5). The compliance of face mask usage by HKSAR general public was 96.6% (range: 95.7% to 97.2%). We observed 11 COVID-19 clusters in recreational 'mask-off' settings compared to only 3 in workplace 'mask-on' settings ($p = 0.036$ by Chi square test of goodness-of-fit).CONCLUSIONCommunity-wide mask wearing may contribute to the control of COVID-19 by reducing the amount of

emission of infected saliva and respiratory droplets from individuals with subclinical or mild COVID-19.

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28. **To mask or not to mask: Modeling the potential for face mask use by the general public to curtail the COVID-19 pandemic.**
Eikenberry Steffen E. Infectious Disease Modelling 2020;5:293-308.

Face mask use by the general public for limiting the spread of the COVID-19 pandemic is controversial, though increasingly recommended, and the potential of this intervention is not well understood. We develop a compartmental model for assessing the community-wide impact of mask use by the general, asymptomatic public, a portion of which may be asymptomatically infectious. Model simulations, using data relevant to COVID-19 dynamics in the US states of New York and Washington, suggest that broad adoption of even relatively ineffective face masks may meaningfully reduce community transmission of COVID-19 and decrease peak hospitalizations and deaths. Moreover, mask use decreases the effective transmission rate in nearly linear proportion to the product of mask effectiveness (as a fraction of potentially infectious contacts blocked) and coverage rate (as a fraction of the general population), while the impact on epidemiologic outcomes (death, hospitalizations) is highly nonlinear, indicating masks could synergize with other non-pharmaceutical measures. Notably, masks are found to be useful with respect to both preventing illness in healthy persons and preventing asymptomatic transmission. Hypothetical mask adoption scenarios, for Washington and New York state, suggest that immediate near universal (80%) adoption of moderately (50%) effective masks could prevent on the order of 17-45% of projected deaths over two months in New York, while decreasing the peak daily death rate by 34-58%, absent other changes in epidemic dynamics. Even very weak masks (20% effective) can still be useful if the underlying transmission rate is relatively low or decreasing: In Washington, where baseline transmission is much less intense, 80% adoption of such masks could reduce mortality by 24-65% (and peak deaths 15-69%), compared to 2-9% mortality reduction in New York (peak death reduction 9-18%). Our results suggest use of face masks by the general public is potentially of high value in curtailing community transmission and the burden of the pandemic. The community-wide benefits are likely to be greatest when face masks are used in conjunction with other non-pharmaceutical practices (such as social-distancing), and when adoption is nearly universal (nation-wide) and compliance is high.

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29. **Use of Health Belief Model-Based Deep Learning Classifiers for COVID-19 Social Media Content to Examine Public Perceptions of Physical Distancing: Model Development and Case Study.**
Sesagiri Raamkumar Aravind JMIR public health and surveillance 2020;6(3):e20493.

BACKGROUNDPublic health authorities have been recommending interventions such as physical distancing and face masks, to curtail the transmission of coronavirus disease (COVID-19) within the community. Public perceptions toward such interventions should be identified to enable public health authorities to effectively address valid concerns. The

Health Belief Model (HBM) has been used to characterize user-generated content from social media during previous outbreaks, with the aim of understanding the health behaviors of the public.OBJECTIVEThis study is aimed at developing and evaluating deep learning-based text classification models for classifying social media content posted during the COVID-19 outbreak, using the four key constructs of the HBM. We will specifically focus on content related to the physical distancing interventions put forth by public health authorities. We intend to test the model with a real-world case study.METHODSThe data set for this study was prepared by analyzing Facebook comments that were posted by the public in response to the COVID-19-related posts of three public health authorities: the Ministry of Health of Singapore (MOH), the Centers for Disease Control and Prevention, and Public Health England. The comments made in the context of physical distancing were manually classified with a Yes/No flag for each of the four HBM constructs: perceived severity, perceived susceptibility, perceived barriers, and perceived benefits. Using a curated data set of 16,752 comments, gated recurrent unit-based recurrent neural network models were trained and validated for text classification. Accuracy and binary cross-entropy loss were used to evaluate the model. Specificity, sensitivity, and balanced accuracy were used to evaluate the classification results in the MOH case study.RESULTSThe HBM text classification models achieved mean accuracy rates of 0.92, 0.95, 0.91, and 0.94 for the constructs of perceived susceptibility, perceived severity, perceived benefits, and perceived barriers, respectively. In the case study with MOH Facebook comments, specificity was above 96% for all HBM constructs. Sensitivity was 94.3% and 90.9% for perceived severity and perceived benefits, respectively. In addition, sensitivity was 79.6% and 81.5% for perceived susceptibility and perceived barriers, respectively. The classification models were able to accurately predict trends in the prevalence of the constructs for the time period examined in the case study.CONCLUSIONSThe deep learning-based text classifiers developed in this study help to determine public perceptions toward physical distancing, using the four key constructs of HBM. Health officials can make use of the classification model to characterize the health behaviors of the public through the lens of social media. In future studies, we intend to extend the model to study public perceptions of other important interventions by public health authorities.

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E. Search History

	Source	Criteria	Results
1.	Medline	COVID-19 OR Covid19 OR coronavirus* OR Coronavirinae OR "corona virus" OR "2019-nCoV" OR "human coronavirus" OR "respiratory syndrome related coronavirus" OR ((Wuhan OR novel) ADJ5 coronavirus).ti,ab OR (human ADJ coronavirus).ti,ab OR ("human influenza" OR "influenza virus" OR "influenza pandemic").ti,ab OR exp *"CORONAVIRUS 229E, HUMAN"/ OR exp *"CORONAVIRUS NL63, HUMAN"/ OR "severe acute respiratory syndrome coronavirus 2" OR "SARS-CoV-2" OR "SARS-CoV" OR "SARS Coronavirus" OR "SARS Virus" OR exp *"CORONAVIRUS OC43, HUMAN"/	81402
2.	Medline	("fac* cover*" OR "fac* mask*" OR scar* OR "fac* protect*").ti,ab	163538
3.	Medline	exp *MASKS/	6442
4.	Medline	(2 OR 3)	169182
5.	Medline	exp *"PRIMARY PREVENTION"/	89639
6.	Medline	(Prevent* OR control* OR stop OR reduc*).ti,ab	7148756
7.	Medline	(5 OR 6)	7206371
8.	Medline	(Transmi* OR spread* OR acqui*).ti,ab	979213
9.	Medline	exp *"DISEASE TRANSMISSION, INFECTIOUS"/	40329
10.	Medline	(8 OR 9)	998544
11.	Medline	("Social distanc*" OR "Physical distanc*").ti,ab	3389
12.	Medline	(4 AND 7 AND 10 AND 11)	40
13.	EMBASE	COVID-19 OR Covid19 OR coronavirus* OR Coronavirinae OR "corona virus" OR "2019-nCoV" OR "human coronavirus" OR "respiratory syndrome related coronavirus" OR ((Wuhan OR novel) ADJ5 coronavirus).ti,ab OR (human ADJ coronavirus).ti,ab OR ("human influenza" OR "influenza virus" OR "influenza pandemic").ti,ab OR exp *"CORONAVIRUS 229E, HUMAN"/ OR exp *"CORONAVIRUS NL63, HUMAN"/ OR "severe acute	85819

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	Source	Criteria	Results
		respiratory syndrome coronavirus 2" OR "SARS-CoV-2" OR "SARS-CoV" OR "SARS Coronavirus" OR "SARS Virus" OR exp *"CORONAVIRUS OC43, HUMAN"/	
14.	EMBASE	("fac* cover*" OR "fac* mask*" OR scar* OR "fac* protect*").ti,ab	226267
15.	EMBASE	exp *MASKS/	8191
16.	EMBASE	(14 OR 15)	233458
18.	EMBASE	(Prevent* OR control* OR stop OR reduc*).ti,ab	9248455
19.	EMBASE	exp *PREVENTION/ OR exp *CONTROL/ OR exp *"DISEASE CONTROL"/	572245
20.	EMBASE	(18 OR 19)	9537015
21.	EMBASE	exp *"VIRUS TRANSMISSION"/ OR exp *"DISEASE TRANSMISSION"/	52513
22.	EMBASE	(Transmi* OR spread* OR acqui*).ti,ab	1384965
23.	EMBASE	(21 OR 22)	1410935
24.	EMBASE	exp *"SOCIAL DISTANCE"/	961
25.	EMBASE	("Social distanc*" OR "Physical distanc*").ti,ab	3444
26.	EMBASE	(24 OR 25)	4138
27.	EMBASE	(13 AND 16 AND 20 AND 23 AND 26)	29

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