

- Develop an IPC communication strategy
  - Develop an outbreak communication strategy as it relates to IPC and integrate it with the broader outbreak communication strategy. Work in collaboration with risk communication and community engagement (RCCE) partners.
- Develop surge capacity plans for IPC resources
  - Develop management plans for surge capacity and ways to monitor IPC supplies in collaboration with operations and logistics partners.
- Establish an IPC outbreak task force/working group
  - The task force will serve as the coordinating mechanism for IPC in the context of health emergencies, and especially during the response phase. It will develop, review, adopt and disseminate policies, guidelines, standard operating procedures (SOPs), training material and other IPC outbreak-related activities.
- Develop and/or identify IPC partners
  - Map and develop a network of partners for supporting and implementing IPC activities during an outbreak.
  - Assess IPC outbreak preparedness, readiness and response
    - Assess IPC outbreak preparedness and evaluate the status of outbreak readiness and areas to be adapted or modified based on specific threats of concern through simulation exercises.
    - In the case that an outbreak has occurred undertake an after-action review to identify areas for improvement.

These activities are designed to mitigate the impact of a specific outbreak on the health system and to reduce morbidity and mortality as details on a communicable disease threat are emerging. By flattening the epidemic curve and avoiding a sharp peak of cases, public health officials can better control the impact on the population and on health-care system capacity [129][130][131].

### 3.8 Lessons learned from COVID-19 and potential future strategies for overburdened health systems

Lessons learned from the previous waves of COVID-19, paired with the unpredictability of SARS-CoV-2, highlight the need for health-care facilities to be ready for future increase in cases. During the pandemic, there was a higher demand for patient hospitalization, bed capacity and isolation rooms. This was often in response to a rapid surge of cases, coupled with demands on the health workforce and increased incidence of COVID-19 among health and care workers [132].

During periods of the pandemic when COVID-19 was exerting a significant impact on health-care systems, strategies and novel interventions were needed to address gaps. For example, when health-care facilities experienced a lack of or limited bed capacity, or when they were called on to handle larger numbers of deaths, there were additional demands upon existing infrastructure and resources (i.e. the number of hospital beds, intensive care unit (ICU) beds and equipment) and increased workforce requirements.

When isolation rooms or single-patient rooms were not available, strategies for patient placement included the establishment of dedicated COVID-19 units and isolation units, increasing bed capacity through temporary measures, and cohorting of patients during an outbreak situation for optimal bed utilization. Other examples included the creation of COVID-19 testing and assessment units for screening; limiting points of entry; devising alternative methods of transportation and referral; imposing restrictions on patient transfer and movement; and incorporating other operational considerations, including some related to facility design, patient placement and workflow for implementation of IPC measures.

Agile health systems are required to ensure continuity of services during COVID-19 surges, with planning supported by estimation tools<sup>1</sup> to accurately predict needs for essential supplies, equipment and workforce personnel. A sustainable health workforce requires human resource planning, recruitment, repurposing of responsibilities within the limits of training and skills, and redistributing of roles among health and care workers. There were periods that involved training of staff and reassigning them to other patient-care areas in the health-care facility, as well as considerations for changing working conditions and providing health and care workers with mental health care and psychosocial support. Other strategies included screening and testing protocols for the early return to work of essential staff who were asymptomatic or who had recovered from infections [127].

Access to testing for rapid identification of cases and active surveillance of health worker infections were critical during periods of increased SARS-CoV-2 transmission. IPC managers should work with occupational health services to develop sustainable occupational infection prevention measures, using COVID-19 as a model for outbreak management and timely implementation of control measures.

Beyond human resource needs, health facilities also experienced increased demands for personal protective equipment (PPE) and supplies (including cleaning supplies and equipment, alcohol-based hand rubs [ABHRs], soaps, etc.), stockpiles and contingency plans in the event of shortages. Where there were challenges with PPE availability, the use of PPE was optimized in health-care settings where there were patients with COVID-19. For the protection of workers, the rational use of PPE included strategies for extended use, re-use following reprocessing, and substitution with available equipment.

In addition to investing in the core components of IPC programmes, strengthening IPC health emergency capacity at the national and health-care facility levels will mitigate healthcare-associated transmission risk and contribute to timely outbreak containment.

Issues that must be addressed include strengthening surge capacity to enable health-care facilities to withstand threats that may overwhelm capacity and identifying gaps in current practices that could allow a threat to amplify within the health facility.

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<sup>1</sup> For additional information on essential resource planning for COVID-19 see, [Coronavirus disease \(COVID-19\) technical guidance: Essential resource planning](#).

## 4. Part 2: Mitigation measures in the community

The SARS-CoV-2 pandemic affected both health-care and community settings and led to the implementation of a number of public health and social measures. The role of IPC in health-care settings is a specialized area of practice, a practical, evidence-informed approach to preventing patients and health and care workers from being harmed by avoidable infections [42]. Application of IPC principles in the context of community settings complements public health efforts, basic hygiene practices and mitigation measures to reduce infections, morbidity and pressure on health systems.

Care for persons with COVID-19 was often provided at the community level, in the home, and by community health workers, social care workers, traditional medicine practitioners, and a variety of formal and informal community-based providers, including caregivers.

This section describes mitigation measures for community settings, and the application of IPC principles, operational and implementation considerations to reduce SARS-CoV-2 transmission and the impact of COVID-19 disease.

### 4.1 Introduction to public health and social measures

Mitigation measures have been implemented worldwide throughout the pandemic to suppress SARS-CoV-2 transmission and reduce mortality and morbidity from COVID-19 [60]. Decisions to adjust (tighten, loosen or reintroduce) Public Health and Social Measures (PHSMs) continue to be weighed against the positive and negative health, economic and social impacts these measures have on societies and individuals.

Where there is widespread SARS-CoV-2 transmission, there remains a risk of additional variants, which have the potential to cause more severe illness and possibly lead to the reintroduction of public health and social measures (PHSMs). This may include heightened surveillance of SARS-CoV-2 in the community (see WHO policy brief: COVID-19 surveillance [133]) and monitoring of the effectiveness of vaccination and non-pharmaceutical interventions (NPIs) on the burden of disease in all regions and their impact on public health services and society [1].

#### What are PHSMs?

PHSMs are measures implemented in community settings (outside of health-care facility settings) that consist of the following: personal protective measures (for example, physical distancing, avoiding crowded settings, practicing hand hygiene, respiratory etiquette and mask-wearing); environmental measures (for example, cleaning, disinfection, ventilation); surveillance and response measures (for example, testing, genetic sequencing, contact tracing, isolation and quarantine); physical distancing measures (for example, regulating the number and flow of people attending gatherings; maintaining distance in public or workplaces; restricting domestic movements); and the imposition of international travel-related measures. In this context, it does not include medical countermeasures such as therapeutics or vaccination. Measures should be implemented by the lowest administrative level for which situational assessment is possible and tailored to local settings and conditions. For more information, please refer to the *Considerations for implementing and adjusting public health and social measures in the context of COVID-19* [60].

#### Adjusting PHSMs

As the pandemic continues to evolve, PHSMs should be regularly reviewed and adjusted according to the local epidemiology and its impact on the health system, including the community and the overall economy and society. This requires agile decision-making based on ongoing situational assessments at the most local administrative level possible in a coherent and coordinated manner with neighbouring areas at the subnational and national levels. Such assessments should be based on available data and a risk/benefit approach considering the local epidemiology, the health system's capacity to respond and other contextual considerations (such as upcoming mass gathering events that may alter transmission or the health system's capacity). The choice of epidemiological indicators and their thresholds will depend on a country's data collection capacity, vaccination strategy and coverage, and the overall COVID-19 response strategy [60]. Important dynamic indicators to be considered to determine the local situation are SARS-CoV-2 transmissibility, the seriousness of COVID-19, and the impact on the health system. Assessments based on these key indicators (transmissibility, seriousness of disease and impact) need to be tailored to the local context. As a general principle, core PHSMs (for example, mask use, physical distancing) should be maintained in priority groups, settings and situations, even during periods of low transmission. By combining data regarding the above-mentioned three key indicators, the following situation levels can be identified to describe the local situation:

**Situational level 0:** A situation with no known transmission of SARS-CoV-2 in the preceding 28 days. The health system and public health authorities are ready to respond, but there are no restrictions needed on daily activities.

**Situational level 1:** A situation with minimal transmission, morbidity and health system impact of SARS-CoV-2, with only basic ongoing PHSM needed.

**Situational level 2:** A situation where there is a moderate impact of COVID-19, although there may be a higher impact in specific subpopulations. Additional measures may be required to reduce transmission. However, disruptions to social and economic activities can still be limited, particularly if PHSMs can be targeted strategically to more affected settings.

**Situational level 3:** A situation with a significant impact on the health system and a risk of health services becoming overwhelmed, or unacceptably high morbidity and mortality, despite sufficient remaining health system capacity. A broader combination of PHSMs may need to be put in place to limit transmission, manage morbidity and avoid overwhelming the health system.

**Situational level 4:** An uncontrolled epidemic with very high morbidity/mortality and limited or no additional health system response capacity available, thus requiring extensive PHSMs to avoid overwhelming health services and to limit substantial excess morbidity and mortality.

## 4.2 Mask use

### 4.2.1 Mask use in the community

#### Background

To assist national and global efforts to end the acute phase of the COVID-19 pandemic emergency worldwide, WHO published the 2022 COVID-19 Strategic preparedness, readiness and response plan outlining strategic interventions to support these efforts. The first objective is to reduce and control the incidence of SARS-CoV-2 infections. This is essential to protect individuals from exposure, especially vulnerable individuals at risk of severe disease or occupational exposure to the virus; reduce the probability that new variants will arise; and reduce pressure on health systems. The second objective is to prevent, diagnose and treat COVID-19 to reduce mortality, morbidity and long-term sequelae [134]. These actions may reduce pressure on the virus to evolve and the potential that future variants will emerge while simultaneously reducing the burden on the health system [132].

Masks are one component of a comprehensive package of prevention and control measures to limit the spread of SARS-CoV-2. When aiming to reduce community transmission and mitigate the impact of COVID-19 outbreaks on health and social services, policies developed for mask use should be included as one element of a comprehensive package of preventive measures (physical distancing, ventilation, mask use, hand hygiene, respiratory etiquette and vaccination) to reduce transmission.

Considering the current stage of the pandemic, the GDG considered all available evidence on the effectiveness of mask-wearing [33], the epidemiology of variants of concern (VoCs), transmission (data or patterns where available), the severity of disease and its impact on health systems, vaccine efficacy, access, uptake and potential immune evasion [135]. The complementary strong and conditional recommendations on mask use in the community outline possible scenarios in which mask use may be of benefit.

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Strong recommendation for

Strong recommendation for, low-to-moderate certainty of evidence



WHO recommends the use of a mask for the prevention of SARS-CoV-2 transmission in the community in the following situations:

- when in crowded, enclosed or poorly ventilated spaces<sup>1</sup> [7];
- following a recent exposure to COVID-19 (according to the WHO definition<sup>2</sup>) when sharing a space with others;
- when sharing a space with a person who displays signs or symptoms of COVID-19<sup>3</sup> or is COVID-19-positive;
- for individuals at high risk<sup>4</sup> of severe complications from COVID-19.

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<sup>1</sup> For example, a setting in which it is not possible to physically distance at least 1 metre.

<sup>2</sup> **Exposure:** contact with a probable or confirmed case or linked to a COVID-19 cluster [5][127].

<sup>3</sup> Signs or symptoms of COVID-19 include: cough, general weakness/fatigue, headache, myalgia, sore throat, coryza, dyspnoea, nausea/diarrhoea/anorexia [5]

<sup>4</sup> High risk is defined as: people aged  $\geq 60$  years or those with underlying comorbidities, such as cardiovascular disease or diabetes mellitus, chronic lung disease, cancer, cerebrovascular disease, immunosuppression, obesity or asthma [52].

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## Practical info

### Implementation considerations

The implementation and adjustment of policies on mask use should be based on available scientific data and a risk/benefit approach that considers the local epidemiology, the health system's capacity to respond, and other contextual considerations (events that may alter community transmission or the health system's capacity to respond to a resurgence of cases). The local situation can be determined based on the above-mentioned criteria related to the transmissibility of SARS-CoV-2, the seriousness of the disease and the impact of the virus.

The evidence available on mask use in the community setting is based on the use of medical masks. Fabric (non-medical) masks can be used when access to medical masks is limited. While filtering facepiece respirators have demonstrated a higher filtration level, there is limited evidence to suggest that filtering facepiece respirators should be used in community settings.

The use of exhalation valves on respirators and non-medical masks is discouraged as they do not allow for adequate source control from the wearer. Exhalation valves permit a bypass of the filtration layers when the wearer exhales, thus potentially allowing infectious particles to pass through.

Face shields are considered to provide a level of eye protection only and should not be considered as an equivalent to masks with respect to respiratory protection and/or source control. Current laboratory testing standards assess face shields only for their ability to protect eyes from chemical splashes [136].

### Additional details

For additional information on the environmental impact of mask use (and other PPE), please see the [WHO's Global analysis of health care waste in the context of COVID-19](#) [92].

For information on assessing and improving indoor ventilation, please see WHO's [Roadmap to improve and ensure good indoor ventilation in the context of COVID-19](#) [16].

For additional information on contact tracing and quarantine, please see [Contact tracing and quarantine in the context of COVID-19: interim guidance, 6 July 2022](#) [84].

For the essential parameters concerning fabric (non-medical) and medical masks, see the following [implementation consideration](#).

## Evidence to decision

### Benefits and harms

Substantial net benefits of the recommended alternative

The utilization of masks in community settings is associated with a decreased risk of SARS-CoV-2 infections compared with no mask-wearing. Despite the low-to-moderate certainty of the evidence, GDG members agreed that WHO should issue recommendations, as the net benefits of mask use by the public outweigh the potential harms. The situations outlined above have been identified by consensus as settings and conditions in which masks should always be utilized.

Available evidence includes two open-label RCTs and 10 observational studies. A large (n=342 183) cluster RCT found a mask promotion intervention associated with decreased risk of symptomatic SARS-CoV-2 seroprevalence (adjusted prevalence ratio 0.91, 95% CI 0.82 to 1.00) [137]. An individually randomized RCT (n=6024) found a recommendation to use masks associated with decreased risk of SARS-CoV-2 infection, though the difference was not statistically significant (odds ratio 0.82, 95% CI 0.54 to 1.23); this trial was not designed to evaluate effects of masks as source control [138]. The RCTs had methodological limitations, including open-label design, attrition, incomplete outcome assessment, variable adherence and differential recruitment. The RCTs were consistent and were not downgraded for imprecision (due to the very large total sample size [greatly exceeding any optimum information size threshold] with a precise estimate from one of the trials). Only one trial evaluated a mask recommendation directly [138]. The other evaluated a mask promotion intervention and did not evaluate mask use or a mask recommendation directly [137]; this resulted in suboptimal uptake of mask use and would underestimate the effects of mask use. Therefore, the RCTs were not downgraded for indirectness (See Annex 2).

The observational studies were generally consistent with the RCTs, but had some imprecision, inconsistency and methodological limitations [139][140][141][142][143][144][145][146][147][148]. Although the estimates of the 10 available observational studies were imprecise and had a degree of variability, in addition to other biases intrinsic to observational studies, overall, mask use was associated with a decreased risk of SARS-CoV-2 infection compared to no mask use [139][140][141][142][143][144][145][146][147][148]. Ecological studies identified an association between a reduced number of confirmed cases of COVID-19 and policies requiring the use of masks. No studies assessed the effectiveness of mask use in specific settings (for example, indoor, outdoor, or ventilation status). Overall, the certainty of the evidence (based primarily on the two RCTs, and supplemented by the 10 observational studies) is assessed as *low-to-moderate*.

### Certainty of the Evidence

Available evidence includes two open-label RCTs and 10 observational studies. The cluster RCT explored the use of mask promotion [137], while the other RCT presented an imprecise estimate and was not designed to assess the effectiveness of source control [138]. The observational studies had some imprecision, inconsistency and methodological limitations. Therefore, the certainty of the evidence is reported as *low-to-moderate*.

### Values and preferences

No substantial variability expected

Discussions with GDG members indicated a general preference towards favouring mask use in community settings, although the values and preferences of individuals may vary. Many members indicated that those at high risk of severe disease may find more value in the use of masks compared to other individuals.

**Resources**

No important issues with the recommended alternative

GDG members indicated that the global supply chain for mask manufacturing has improved and would not pose a severe obstacle to community masking. The cost of both medical masks and non-medical masks is relatively low and does not pose a substantial barrier for low- and middle-income countries. However, medical masks should not be reused and should be changed when wet or soiled, potentially requiring the use of multiple masks per day, leading to additional resource implications, such as cost, availability and access. Additionally, there are environmental impacts associated with disposable masks, such as additional waste and litter. Additional considerations are needed for proper disposal.

**Gaps in knowledge and research needs**

Investigations into the benefits and harms of masks and their utilization in the community setting are ongoing and published work has identified this need for continued research. Well-conducted, observational studies and/or RCTs exploring the use of masks versus no masks in various settings (for example, indoor, outdoor, ventilation status) would clarify outstanding questions concerning mask use in community settings. In addition, research investigating the use of masks (including the type of mask and transmission scenarios) in the context of the emerging variants of concern would provide powerful evidence for future recommendations. However, GDG members discussed the challenges associated with obtaining compelling evidence from an RCT on behavioural interventions. Furthermore, with the availability of SARS-CoV-2 immunization and increased natural immunity, further research will be needed on the impact of vaccination and, consequently, the effect that immunization status will have on mask utilization in community settings. Additional research and innovation is needed in the area of reusable and recyclable medical masks that comply with existing standards.

**Equity**

No important issues with the recommended alternative

No issues were documented regarding inequities. Using masks as a preventive measure for SARS-CoV-2 infection may reduce the burden of infection, especially for those at high risk of severe disease [105]. Studies did not examine equity issues, such as providing information on race, gender or vulnerable populations. More studies addressing these aspects should be carried out to inform the decision-making process.

**Acceptability**

Important issues, or potential issues not investigated

Complex issues arise when examining the acceptability of mask use in communities. These include the type of mask recommended, personal preference and ecological impact (environmental impact and waste management) [74][149][150][151]. Members indicated that those individuals at high risk of severe sequelae might find more benefit in mask-wearing compared to other individuals. Furthermore, it has been indicated that members of the general public may not deem mask use as an acceptable public health intervention and, thus, may demonstrate resistance towards masking policies. However, the evidence points to the benefits outweighing the harms. Variability exists in the published studies examining mask compliance.

**Feasibility**

Important issues, or potential issues not investigated

Given the current availability of masks, community masking is likely feasible, despite the acceptability issues mentioned above.

**Justification**

In response to the shift in the epidemiology of COVID-19, GDG members reformulated the recommendations to no longer rely on the local transmission scenario of SARS-CoV-2. Given the sustained SARS-CoV-2 transmission globally, a majority of GDG members agreed that a situational approach to mask use is more appropriate than the previous, transmission-based approach. GDG members indicated that the benefits of mask use outweigh the potential harms as masks are an effective mitigation tool, especially in crowded, enclosed and poorly ventilated settings such as those that are common in public transportation, busy stores, crowded workplaces and educational centres. The GDG decided for this strong recommendation in conjunction with the conditional recommendation on a risk-based approach for mask use, to ensure coverage across all

situations where masking may be beneficial.

Conditional recommendation for

Conditional recommendation for, low-to-moderate certainty of evidence



In situations not addressed by the strong recommendation, WHO suggests a risk-based approach to inform the decision about whether to use a mask for the prevention of SARS-CoV-2 transmission in the community.

Factors that favour mask use:

- COVID-19 epidemiological trends at the community level indicating high or rising transmission or hospitalizations;
- low coverage of COVID-19 vaccination;
- low levels of population immunity to SARS-CoV-2;
- a greater degree of crowding<sup>1</sup>, poorer indoor ventilation and/or the presence of individual risk factors<sup>2</sup>.

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<sup>1</sup> The degree of crowding for the conditional recommendation refers to distances >1 metre, for which there is likely some association between greater distancing and decreased risk.

<sup>2</sup> For the conditional recommendation, in the absence of clear risk factors, one may consider whether one's overall status of health may contribute to an increased risk of severe disease.

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## Practical info

### Implementation considerations

#### Practical considerations for policy-makers:

The potential advantages of mask use by healthy people in the general public include:

- reduced spread of potentially infectious aerosols or droplets from exhaled breath, including from infected people before they develop symptoms [153];
- encouragement of concurrent transmission-prevention behaviours, such as washing hands and not touching the eyes, nose and mouth [154][155][156]; and
- prevention of transmission of other respiratory illnesses, such as tuberculosis and influenza, and a reduction of the burden of these diseases during the pandemic [157].

The potential disadvantages of mask use by healthy people in the general public include:

- headache and/or breathing difficulties, depending on the type of mask used [158][159]; potential physiological changes [160]; development of facial skin lesions, irritant dermatitis or worsening acne when used frequently for long periods of time [159][161][162][163][164];
- difficulty with communicating clearly, especially for persons who are deaf or have poor hearing or use lip reading [165][166];
- poor compliance with mask-wearing, in particular by young children [161][167][168][169][170];
- waste management issues; improper mask disposal leading to increased litter in public places and environmental hazards [171][74]; and
- further disadvantages for, or difficulty wearing masks by, certain members of the population, especially: children; developmentally challenged people; those with mental illness or cognitive impairment; those with asthma, chronic

respiratory or breathing problems; those who have had facial trauma or recent oral maxillofacial surgery; and those living in hot and humid environments [158][161][168].

### Additional details

For additional information on the environmental impact of the use of masks (and other PPE), please see the [WHO's Global analysis of health care waste in the context of COVID-19](#) [74].

For information on assessing and improving indoor ventilation, please see WHO's [Roadmap to improve and ensure good indoor ventilation in the context of COVID-19](#) [7].

For additional information on contact tracing and quarantine, please see [Contact tracing and quarantine in the context of COVID-19: interim guidance, 6 July 2022](#) [127].

For the essential parameters concerning fabric (non-medical) and medical masks, see the following [implementation consideration](#).

### Evidence to decision

#### Benefits and harms

Substantial net benefits of the recommended alternative

The utilization of masks in community settings is associated with a decreased risk of SARS-CoV-2 infections compared with no mask-wearing. Despite the low-to-moderate certainty of the evidence, GDG members agreed that WHO should issue recommendations, as the net benefits of mask use by the public outweigh the potential harms. The situations outlined above have been identified by consensus as settings and conditions in which masks should always be utilized.

Available evidence includes two open-label RCTs and 10 observational studies. A large (n=342 183) cluster RCT found a mask promotion intervention associated with decreased risk of symptomatic SARS-CoV-2 seroprevalence (adjusted prevalence ratio 0.91, 95% CI 0.82 to 1.00) [137]. An individually randomized RCT (n=6024) found a recommendation to use masks associated with decreased risk of SARS-CoV-2 infection, though the difference was not statistically significant (odds ratio 0.82, 95% CI 0.54 to 1.23); this trial was not designed to evaluate effects of masks as source control [138]. The RCTs had methodological limitations, including open-label design, attrition, incomplete outcome assessment, variable adherence and differential recruitment. The RCTs were consistent and were not downgraded for imprecision (due to the very large total sample size [greatly exceeding any optimum information size threshold] with a precise estimate from one of the trials). Only one trial evaluated a mask recommendation directly [138]. The other evaluated a mask promotion intervention and did not evaluate mask use or a mask recommendation directly [137]; this resulted in suboptimal uptake of mask use and would underestimate the effects of mask use. Therefore, the RCTs were not downgraded for indirectness (See Annex 2).

The observational studies were generally consistent with the RCTs, but had some imprecision, inconsistency and methodological limitations [139][140][141][142][143][144][145][146][147][148]. Although the estimates of the 10 available observational studies were imprecise and had a degree of variability, in addition to other biases intrinsic to observational studies, overall, mask use was associated with a decreased risk of SARS-CoV-2 infection compared to no mask use [139][140][141][142][143][144][145][146][147][148]. Ecological studies identified an association between a reduced number of confirmed cases of COVID-19 and policies requiring the use of masks. No studies assessed the effectiveness of mask use in specific settings (for example, indoor, outdoor, or ventilation status). Overall, the certainty of the evidence (based primarily on the two RCTs, and supplemented by the 10 observational studies) is assessed as *low-to-moderate*.

#### Certainty of the Evidence

Available evidence includes two open-label RCTs and 10 observational studies. The cluster RCT explored the use of mask promotion [137], while the other RCT presented an imprecise estimate and was not designed to assess the effectiveness of source control [138]. The observational studies had some imprecision, inconsistency and methodological limitations. Therefore, the certainty of the evidence is reported as *low-to-moderate*.

## Values and preferences

Substantial variability is expected or uncertain

Discussions with GDG members indicated a general preference towards favouring mask use in community settings, although the values and preferences of individuals may vary. Many members indicated that those at high risk of severe disease might perceive the benefits of mask use to be greater compared to other individuals.

## Resources

No important issues with the recommended alternative

Many GDG members noted that the global supply chain for mask manufacturing has improved and would not pose a severe obstacle to community masking. The cost of both medical and non-medical (fabric) masks is relatively low and does not pose a substantial barrier for low- and middle-income countries. However, medical masks should not be reused and should be changed when wet or soiled, potentially requiring the use of multiple masks per day, leading to additional resource implications, such as cost, availability and access. Additionally, there are environmental impacts associated with disposable masks, such as additional waste and litter. Additional considerations are needed for proper disposal.

## Gaps in knowledge and research needs

Investigations into the utilization of masks in the community setting are ongoing, but published work has identified this as an area that needs continued research. Observational studies and/or RCTs designed and conducted with rigorous scientific methods exploring the use of masks versus no masks in various settings (for example, indoor, outdoor, ventilation status) would clarify outstanding questions concerning mask use in community settings. In addition, research investigating the use of masks (including the type of mask and transmission scenarios) in the context of VoCs would provide powerful evidence for future recommendations. However, GDG members discussed the challenges associated with obtaining compelling evidence from an RCT on behavioural interventions. Furthermore, with the availability of SARS-CoV-2 immunization and increases in natural immunity, further research will be needed to reinforce the impact of vaccination and, consequently, the effect immunization status will have on mask utilization in community settings. Additional research and innovation are needed in the area of reusable and recyclable medical masks that comply with existing standards.

## Equity

No important issues with the recommended alternative

No important issues were documented regarding inequities, although this arena would benefit from further investigation.

## Acceptability

Important issues, or potential issues not investigated

Complex issues arise when examining the acceptability of mask use in communities. These include the type of mask recommended, personal preference and ecological impact (environmental impact and waste management) [74][149][150][151]. Members indicated that those individuals at high risk of severe sequelae might find more benefit in mask-wearing compared to other individuals. Furthermore, it has been indicated that members of the general public may not deem mask use as an acceptable public health intervention and, thus, may demonstrate resistance towards masking policies. However, the evidence points to the benefits outweighing the harms. Variability exists in the published studies examining mask compliance.

## Feasibility

Important issues, or potential issues not investigated

Given the availability of masks, community masking is likely feasible.

## Justification

GDG members decided for this conditional recommendation in conjunction with the aforementioned strong recommendation. In addition to situations where masks are strongly advised (when in crowded, enclosed or poorly ventilated spaces; following recent exposure to COVID-19; when sharing a space with a person who displays symptoms of COVID-19 or is COVID-19-positive; and

for individuals at high risk of severe complications from COVID-19), there are additional times when wearing a mask may be beneficial. Although there are limited data on the effectiveness of a risk-based approach and implementation may be a challenge, the benefits of mask wearing outweigh the risks.

Members indicated that masks should be considered when there are high-to-moderate levels of community transmission (situational levels 2 to 4) and low-to-moderate vaccination coverage, while taking into consideration individual risk factors in addition to personal values and preferences based on the perception of the risk and the potential harm and consequences of being affected by COVID-19.

### Implementation considerations

#### Mask management

For any type of mask, appropriate use, storage, cleaning and disposal are essential to ensure that they are as effective as possible and to avoid any increased risk of transmission. Adherence to correct mask management practices varies, reinforcing the need for appropriate messaging [152]. WHO provides the following guidance on the correct use of masks:

- Wash hands thoroughly before putting on the mask.
- Inspect the mask for tears or holes, and do not use a damaged mask.
- Place the mask carefully, ensuring it covers the mouth and nose; adjust to the nose bridge and tie it securely to minimize any gaps between the face and the mask. If using ear loops, ensure these do not cross over as this widens the gap between the face and the mask.
- Avoid touching the mask while wearing it. If the mask is accidentally touched, wash hands thoroughly.
- Remove the mask using the appropriate technique. Do not touch the front of the mask; rather, untie it from behind.
- Replace the mask as soon as it becomes damp with a new, clean and dry mask.
- Either discard the mask or place it in a clean, plastic, resealable bag, leaving it there until it can be cleaned. Do not store the mask around the arm or wrist or pull it down to rest around the chin or neck.
- Wash hands immediately after discarding a mask.
- Do not reuse single-use masks.
- Discard single-use masks after each use and properly dispose of them immediately upon removal.
- Do not remove the mask to speak.
- Do not share your mask with others.
- Wash fabric masks in soap or detergent and preferably hot water (at least 60° Centigrade/140° Fahrenheit) at least once a day. If it is not possible to wash the fabric mask in hot water, then wash it in soap/detergent and room-temperature water, followed by boiling the mask for 1 minute.
- A mask should be replaced by a clean mask at least once daily.

For more information on mask technical specifications, review the following technical document - "[Technical specifications of personal protective equipment for COVID-19](#)", published 13 November 2020.

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Good practice statement



Individuals with any signs or symptoms<sup>1</sup> suggestive of COVID-19 or who test positive for COVID-19 should wear a medical mask when sharing a space with others until the signs or symptoms are resolved or the isolation period is complete.

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<sup>1</sup> Signs or symptoms of COVID-19 include: cough, general weakness/fatigue, headache, myalgia, sore throat, coryza, dyspnoea, nausea/diarrhoea/anorexia [5].

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## Practical info

### Implementation considerations

- Individuals should self-isolate and seek medical advice as soon as they start to feel unwell with potential COVID-19 symptoms (even if symptoms are mild).
- Instructions on how to put on, take off and dispose of medical masks, and how to adequately perform hand hygiene [172] should be followed.
- All additional measures should be followed, particularly respiratory hygiene, frequent hand hygiene, and maintaining a physical distance of at least 1 metre from other persons [173].
- If a medical mask is not available for individuals with suspected or confirmed COVID-19, a fabric mask with fit, filtration and breathability assessed to meet WHO's essential parameters for non-medical masks should be worn by patients as a source-control measure, pending access to a medical mask. The use of a non-medical mask can minimize the projection of respiratory particles from the user [174][175].
- Persons with suspected COVID-19 or mild COVID-19 symptoms should wear a medical mask as much as possible, especially when there is no alternative to being in the same room with other people.
- Caregivers or those sharing living space with anyone with suspected COVID-19 or mild COVID-19 symptoms should wear a medical mask when in the same room as the affected person.

## Justification

GDG members agreed that if an individual who has confirmed or suspected COVID-19 needs to interact with others in or outside of their household, they should wear a medical mask. Members also noted that individuals who have confirmed or suspected COVID-19 should self-isolate for the duration of their isolation period and/or until symptoms resolve. For additional information on contact tracing and quarantine, please see [Contact tracing and quarantine in the context of COVID-19: interim guidance, 6 July 2022 \(who.int\) \[127\]](#).

Good practice statement



Policies aimed at reducing the transmission of SARS-CoV-2 in the community should be revisited, strengthened and updated according to the most recent scientific evidence.

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*Published 13 January 2023.*

## Practical info

Policies may include a package of interventions such as vaccination, ventilation, physical distancing, hand hygiene, respiratory etiquette and mask adherence by the general public. Please refer to the document on IPC in the event of a surge or resurgence in cases of COVID-19 [176].

## Justification

GDG members agreed that national and subnational policy-makers should revisit, strengthen and update local policies according to the most recent scientific evidence to mitigate SARS-CoV-2 transmission in community settings. These policies should be able to be quickly scaled up should COVID-19 incidence increase in the community and if health-care systems are at risk of becoming overwhelmed. Policies should be reviewed as necessary to account for any changes in the local context or new VoC(s).

### 4.2.1.1 Type of mask used by the general public

#### Implementation considerations for policy-makers when providing guidance or setting standards for manufacturers on types of mask used by the general public

##### Implementation considerations

The following mask types are acceptable options for use by the general public:

- disposable medical masks, if the availability of medical masks meeting minimum performance criteria for health workers has been assured<sup>1</sup>;
- non-medical masks that comply with standards for safety and efficacy<sup>2</sup> and can be washed prior to reuse;
- if neither of the above options is available, other types of well-fitting, non-medical masks<sup>3</sup> are acceptable options (according to local policies).

<sup>1</sup> Complying with medical mask standards (at minimum) EN 14683 type I, ASTM F2100 level 1, YY/T 0969, YY 0469 (or equivalent). For requirements for health workers, please see [PPE technical specifications](#).

<sup>2</sup> Complying with the [ASTM F3502-22a](#) Standard Specification for Barrier Face Coverings, standard or a non-medical mask meeting WHO essential parameters (see *Practical information* for more information).

<sup>3</sup> Including homemade, multi-layered masks (see *Practical information* for more information).

Published 13 January 2023.

## Practical info

Table 9. Essential parameters (minimum and preferred thresholds) for manufactured non-medical mask

Essential Parameters	Minimum threshold	Preferred threshold
<b>1. Filtration*</b>		
<b>1.1 Filtration efficiency</b>	70% at 3 µm	>50% at 0.3 µm, without compromising breathability

<b>1.2. Challenge particle</b>	Solid: sodium chloride (NaCl), talcum powder, holi powder, dolomite, polystyrene latex spheres  Liquid: DEHS Di-Ethyl-Hexyl-Sebacat, paraffin oil	Solid: sodium chloride (NaCl), polystyrene latex spheres
<b>1.3. Particle size</b>	Choose either size: 3 µm, 1 µm, or smaller	0.3 µm
<b>2. Breathability</b>		
<b>2.1. Breathing resistance**</b>	≤70 Pa/cm <sup>2</sup>	Adult: ≤ 40 Pa/cm <sup>2</sup>  Children: ≤ 20 Pa/cm <sup>2</sup>
<b>2.2 Exhalation valves</b>	Not recommended	N/A
<b>3. Fit</b>		
<b>3.1. Coverage</b>	Full coverage of nose and mouth; consistent, snug perimeter fit at the nose bridge, cheeks, chin and lateral sides of the face; adequate surface area to minimize breathing resistance and minimize side leakage	Same as current requirements
<b>3.2 Face seal</b>	Not currently required	Seal as good as FFR (respirator)  Fit factor of 100 for N95  Maximum total inward leakage of 25% (FFP1 requirement)  OR  Leakage ratio of ≥5
<b>3.2. Sizing</b>	Adult and child	Should cover from nose bridge to below the chin and cheeks on either side of the mouth  Sizing for adults and children (6-9, 10-12, >12)
<b>3.3 Strap strength</b>		> 44.5 N

\* Smaller particles may result in lower filtration.

\*\* High resistance can cause bypass of the filtration layers of the mask. Unfiltered air will leak out the sides or around the nose on the path of least resistance.

**Table 10. Additional (optional) parameters for manufactured non-medical masks**

<b>Additional parameters</b>	<b>Minimum thresholds</b>
If reusable, the number of wash cycles	5 cycles

Disposal	If majority of mask is compostable, as per EN 13432, EN 14995, ASTM D5511 or other similar standards mimicking landfill or marine environments
Antimicrobial (bacteria, virus, fungus) performance	ISO 18184 (virus) ISO 20743 (bacteria) ISO 13629 (fungus) AATCC TM100 (bacteria)
Chemical safety	Comply with REACH regulation, including inhalation safety

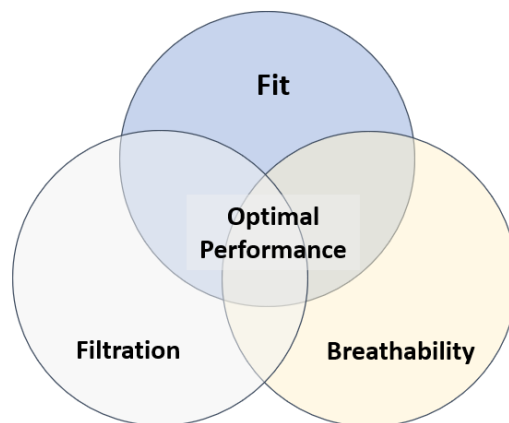
**Standards organizations' performance criteria**

Manufacturers producing masks with consistent standardized performance can adhere to published, freely available guidance from several organizations, including those from ASTM International, the French Standardization Association (AFNOR Group), the European Committee for Standardization (CEN), the Swiss National COVID-19 Task Force, the South Korean Ministry of Food and Drug Safety (MFDS), the Italian National Standards Body (UNI) and the Bangladesh Directorate General of Drug Administration (DGDA).

**Additional criteria:**

- The non-medical mask, including all components and packaging, must be non-hazardous, non-toxic and child-friendly (i.e. has no exposed sharp edges, protruding hardware or rough materials).
- Factory-made EN Type I, ASTM Level 1 medical masks or non-medical masks must be made using a process that is certified to a quality management system (e.g. ISO 13485, ISO 9001).
- Social accountability standards (e.g. SAI SA8000) for multiple aspects of fair labour practices, health and safety of the workforce and adherence to UNICEF's Children's Rights and Business Principles are strongly encouraged.

**Figure 7. Illustration of the three essential parameters of filtration, breathability and fit.**



*Filtration and breathability*

Filtration depends on the filtration efficiency (in %), the type of challenge particle (oils, solids, droplets containing bacteria) and the particle size (see Table 2). Depending on the fabrics used, filtration and breathability can complement or work against each other. Filtration is dependent on the tightness of the weave, fibre and thread diameter. Non-woven materials used for disposable masks are manufactured using processes to create polymer fibres that are thinner than natural fibres such as cotton, and that are held together by partial melting. Breathability is the difference in pressure across the mask and

is typically reported in millibars (mbar) or Pascals (Pa) or normalized to the  $\text{cm}^2$  in  $\text{mbar}/\text{cm}^2$  or  $\text{Pa}/\text{cm}^2$ . Non-medical fabric masks consisting of two layers of polypropylene spunbond and two layers of cotton have been shown to meet the minimum requirements for droplet filtration and breathability of the CEN/TS 17553:2022 guidance. It is preferable not to select elastic material to make masks as the mask material may be stretched over the face, resulting in increased pore size and lower filtration through reuse. Additionally, elastic fabrics are sensitive to washing at high temperatures and may therefore degrade over time.

Coating the fabric with compounds such as wax may increase the barrier and render the mask fluid-resistant; however, such coatings may inadvertently block the pores completely and make the mask difficult to breathe through. In addition to decreasing the mask's breathability, the coating may cause unfiltered air to be more likely to escape from the sides of the mask on exhalation. The coating is therefore not recommended.

#### *Fit: shape and sizing*

Fit is the third essential parameter, and takes into consideration coverage, seal, sizing and strap strength. Fit of masks is currently not defined by any standard except for the anthropometric considerations of facial dimensions (ISO/TS 16976-2) or simplified to mask height mask (South Korean standard for KF-AD). Ideally, the mask should not have contact with the lips, unless hydrophobic fabrics are used in at least one layer of the mask [177]. Leaks where unfiltered air moves in and out of the mask may be attributed to the size and shape of the mask [178].

#### **Optional parameters for consideration**

If reusable:

- biodegradability;
- antimicrobial performance (where applicable); and
- chemical safety (see Practical Info section).

Non-medical masks intended to be reusable should include instructions for washing and maintain initial performance after each wash cycle. Advanced fabrics may be biodegradable or compostable at the end of service life, according to a recognized standard process (e.g. UNI EN 13432, UNI EN 14995 and UNI/PdR 79).

Manufacturers sometimes claim their non-medical masks have antimicrobial performance. Antimicrobial performance may be the result of coatings or additives to the fabric fibres. Treated fabrics must not come into direct contact with mucous membranes; the innermost fabric should not be treated with antimicrobial additives, only the outermost layer. In addition, antimicrobial fabric standards (e.g. ISO 18184, ISO 20743, AATCC TM100, AATCC 100) generally act slowly. The inhibition on microbial growth may not take full effect until after a contact time of 2–24 hours, depending on the standard. The standards have generally been used for athletic apparel and to substantiate claims of odour-control performance. These standards are not appropriate for non-medical cloth masks and may provide a false sense of protection from infectious agents. If claims are made, manufacturers should specify the standard that supports antimicrobial performance, the challenge organism and the contact time.

The use of volatile additives is discouraged as these may pose a health risk when inhaled repeatedly during wear. Certification according to organizations, including OEKO-TEX (Europe) or SEK (Japan), and additives complying with REACH (Europe) or the United States Environmental Protection Agency (EPA), indicate that textile additives are added at safe levels.

#### **Justification**

GDG members agreed with standardizing recommendations for the utilization and specifications of masks for the general public. GDG members expressed concern about being overly prescriptive while the current state of evidence on the quality and effectiveness of non-medical masks continues to evolve, as this may limit the social enterprise of homemade mask production, a standard practice within many WHO Member States. However, GDG members agreed with laboratory evidence confirming that non-medical masks without standardized quality-control processes can have large variabilities in their key parameters (see *practical information* for information on essential parameters for non-medical masks). Members also conveyed the importance of specifying the use of well-fitting masks, as the fit may be an essential parameter for

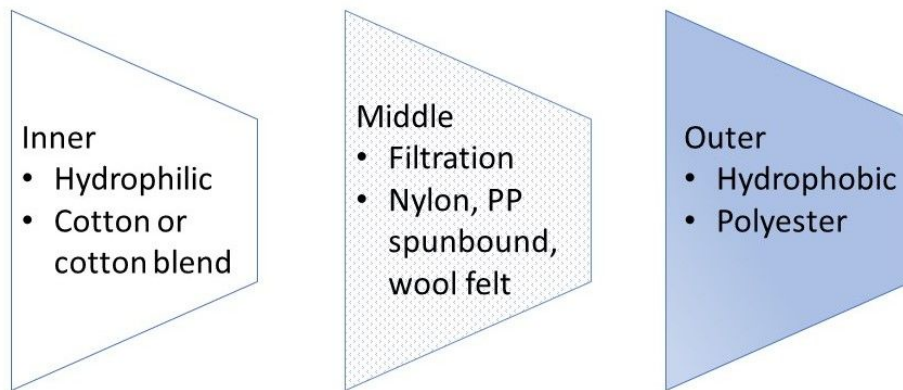
effective source control and protection. In addition, GDG members discussed the potential harms associated with limited resources and lack of personnel to test the essential parameters of masks in various low-income settings, together with expressing concerns regarding waste disposal.

### Adaptation

**Homemade non-medical masks made from household fabrics (e.g. cotton, cotton blends and polyesters) should ideally have a three-layer structure, with each layer serving a function (see Figure 1) [83].**

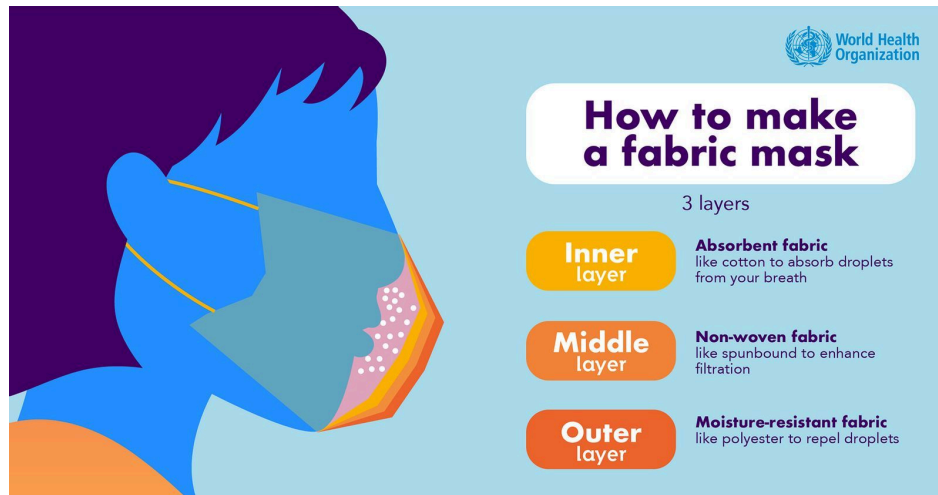
1. an innermost layer (that will be in contact with the face) of a hydrophilic material (e.g. cotton or cotton blends of terry cloth towel, quilting cotton and flannel) that is non-irritating against the skin and can contain droplets [177];
2. a middle, hydrophobic layer made of synthetic, breathable, non-woven material (spunbond polypropylene, polyester and polyaramid), which may enhance filtration, prevent permeation of droplets or retain droplets [177][84]; and
3. an outermost layer made of hydrophobic material (e.g. spunbond polypropylene, polyester or their blends), which may limit external contamination from penetrating through the layers to the wearer's nose and mouth and maintains and prevents water accumulation from blocking the pores of the fabric [177].

**Figure 8. Non-medical mask three-layer layers**



Non-medical mask construction using breathable fabrics such as cotton, cotton blends, polyesters, nylon and polypropylene spunbond that are breathable may impart adequate filtration performance when layered. Single- or double-layer combinations of advanced materials may be used if they meet performance requirements.

**Figure 9. How to make a fabric mask**



Although at least three layers are recommended for non-medical masks for the most common fabric used, single, double or other layered combinations of advanced materials may be used if they meet performance requirements.

Assumptions regarding homemade masks are that individual makers have access only to common household fabrics and do not have access to test equipment to confirm target performance (filtration and breathability). Figure 1 illustrates a multi-layer mask construction with examples of fabric options. Very porous materials, such as gauze, even with multiple layers, may provide very low filtration efficiency [152]. Fabrics with higher thread counts offer improved filtration performance [153]. Coffee filters, vacuum bags and materials not meant for clothing should be avoided, as they may contain injurious material when breathed in. Microporous films such as Gore-Tex are not recommended [154].

#### Good practice statement



When wearing a mask in community settings, individuals should use a well-fitting mask with full coverage of the nose and mouth.

- Ensure a snug fit at the nose bridge, cheeks, chin and lateral sides of the face.
- The “knot-and-tuck” and “linking-ear-loops-behind-the-head” techniques improve medical mask fit by reducing gaps on the sides of medical masks with ear loops.

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## Practical info

### Implementation considerations

#### Medical masks

Improving the fit of medical masks may not always be possible in low-resource settings, given the resource requirements. However, techniques such as the “tie-and-tuck” method may benefit low- and middle-income countries since the techniques do not require additional materials. The “knot-and-tuck” and “linking-ear-loops-behind-the-head” techniques improve medical mask fit by reducing gaps on the sides of medical masks with ear loops. Such gaps allow leakage of air (potentially containing infectious particles) to bypass the filtration layers of the medical mask when the wearer inhales or exhales.

#### Considerations on the use of linking-ear-loops-behind-the-head techniques to improve medical mask fit

- Always use a clean, unused, rectangular, pleated medical mask meeting the minimum performance standards (or equivalent) [14].
- Always clean hands thoroughly (per [WHO guidance](#)) prior to putting on, taking off and/or manipulating a mask.
- Where connectors are used to link ear loops behind the head, ensure that these connectors are clean for use upon

putting on (either new, cleaned and disinfected or laundered, depending on the connector and local implementation strategy). When connectors are removed, they should be treated as potentially contaminated. A local strategy should be in place to manage used connectors through cleaning and disinfection processes, laundering or discarding used connectors through standard waste management.

## Justification

GDG members unanimously agreed that mask fit was among the most important considerations for choosing a mask. If a medical mask does not snugly fit an individual's face, the individual can use techniques (i.e. *"knot-and-tuck"* and *"linking-ear-loops-behind-the-head"*) to improve its fit.

## Clinical question/ PICO

**Population:** Community  
**Intervention:** Methods to improve mask fitting  
**Comparator:** An ill-fitting mask (does not fit snugly, gaps)

## Summary

The research of the included studies had been conducted over a large range of countries, with the most frequent research coming from the USA

Studies aimed to evaluate:

- modifications to improve fit to reduce the number of expelled particles.
- amount of leakage associated with double masking.
- fitted filtration efficiency of consumer grade masks.
- aerosol particle leaking/leakage and standard surgical mask fitting with 3 elastomeric harness designs

Studies found that crossing ear loops or using mask brackets made no significant improvement. However, modifications such as knot-and-tuck methods and double masking did improve the fit, blocking of particles from the wearer and reducing exposure. Furthermore, increasing the tension through a brace, connector, 'ear-guards', etc. did improve fit and protection. Lastly, an elastomeric harness may improve the fit and protection of a standard surgical mask.

Outcome Timeframe	Study results and measurements	Comparator An ill-fitting mask (does not fit snugly, gaps)	Intervention Methods to improve mask fitting	Certainty of the Evidence (Quality of evidence)	Summary
SARS-CoV-2 Infection				Evidence was not GRADE' d as all studies were performed in the laboratory setting	There were too few who experienced SARS- CoV-2 infection, to determine whether methods to improve mask fitting made a difference.

## 4.2.1.2 Mask use during physical activity

Conditional recommendation against , Low certainty evidence



WHO suggests that people do not wear masks during vigorous-intensity physical activity

<sup>1</sup>Vigorous-intensity physical activity (VPA) refers to physical activity that is performed at 6.0 or more Metabolic equivalent of task (METs) (on an absolute scale). On a scale relative to an individual's personal capacity, VPA is usually a 7 or 8 on a rating scale of perceived exertion scale of 0–10 [179].

Published 21 December 2023

### Practical info

#### Implementation considerations

- People may choose to wear a mask during light to moderate physical activity, especially indoors where a physical distance cannot be maintained.
- Facilities should ensure proper ventilation.

### Evidence to decision

#### Benefits and harms

Important harms

Evidence suggests that there may be potential discomforts when wearing masks during vigorous-intensity physical activity.

#### Certainty of the Evidence

Low

The certainty of the evidence has been assessed as low.

#### Values and preferences

We expect few to want the intervention

Given the discomforts, people would likely prefer not wearing masks during vigorous-intensity physical activity.

#### Resources

Important issues, or potential issues not investigated

This intervention is unlikely to have resource implications.

#### Equity

Important issues, or potential issues not investigated

This intervention likely does not have an impact on equity.

### Acceptability

Intervention is likely poorly accepted

Given the effects on perceived exertion and performance, masks during vigorous-intensity physical activity may not be deemed acceptable.

### Feasibility

Important issues, or potential issues not investigated

This intervention is likely feasible.

### Justification

The GDG determined that benefits of wearing a mask during vigorous-intensity physical activity did not outweigh any potential harms and discomforts. This was based on the low certainty of evidence and likely lack of acceptability. The GDG also considered the lack of feasibility and impacts on equity and agreed that a recommendation was not appropriate. While this recommendation does not favour the use of a mask during intense, vigorous activity, masks are recommended in other settings as outlined in the WHO recommendations on mask use in the community.

### Clinical question/ PICO

**Population:** All people  
**Intervention:** Wearing of facemask during physical activity  
**Comparator:** Not using face mask during physical activity

Outcome Timeframe	Study results and measurements	Comparator Not using face mask during physical activity	Intervention Wearing of facemask during physical activity	Certainty of the Evidence (Quality of evidence)	Summary
SARS-CoV-2 Infection				Very low	No studies were found that looked at SARS-CoV-2 infection.
Tolerability Outcomes: (i) Exercise performance		4 RCT (Surgical Mask) MD 0.22 lower (0.47 lower to 0.03 higher) 1 RCT (Respirator) MD 14 lower (49.09 lower to 21.09 higher)		Low	Wearing a mask during intense physical activity may worsen exercise performance.
(ii) Rate of perceived exertion		7 RCT (Surgical Mask) MD 0.48 higher (0.01 higher to 0.94 higher) 3 RCT (respirators) MD 1.88 higher (0.3 lower to 4.06 higher)		Low	Wearing a mask during intense physical activity may increase the rate of perceived exertion.

Outcome Timeframe	Study results and measurements	Comparator Not using face mask during physical activity	Intervention Wearing of facemask during physical activity	Certainty of the Evidence (Quality of evidence)	Summary
(iii) oxygen saturation		7 RCT (Surgical Mask) MD 0.50 lower (1.04 lower to 0.04 higher)		Low	Wearing a mask during intense physical activity may worsen oxygen saturation.
(iv) oxygen uptake		2 RCT (respirators) MD 0.91 lower (5.07 lower to 3.25 higher)			
		3 RCT (Surgical Mask) MD 5.49 lower (12.16 lower to 1.17 higher)		Low	Wearing a mask during intense physical activity may worsen oxygen uptake.
		2 RCT (respirators) MD 8.08 lower (13.96 lower to 2.21 lower)			

## 4.2.2 Mask use by children

### Guiding Principles

Given the limited evidence on the use of masks by children in the context of COVID-19, including limited evidence on transmission of SARS-CoV-2 in children at specific ages, policy formulation by national authorities should be guided by the following overarching principles:

- Do no harm: the best interest, health and well-being of the child should be prioritized.
- The application of these guidelines should not affect development or learning outcomes, including access to education.
- The guidelines should consider the feasibility of implementing recommendations in different social, cultural and geographic contexts, including limited-resource and humanitarian settings, and among children with disabilities or specific health conditions.
- Any recommendation for mask use for children should encompass needed flexibility to enable children to maintain their rights to play and to education and their ability to engage in everyday activities [3].
- National policies on the use of masks by children should be adapted based on social, cultural and environmental considerations, including in settings with limited resources and humanitarian settings.

## 4.2.2.1 Introduction

### Introduction

WHO guidance on the use of masks by children in the community was first published in August 2020 as an annex to the document [Mask use in the context of COVID-19 \[181\]\[180\]](#). In December 2021, it was incorporated into the online version 1.0 of the WHO IPC COVID-19 living guideline published using the MAGICapp platform [182]. This updated version includes new recommendations for mask use by children of different ages, accommodations for children living with disabilities and updated implementation considerations, including for school settings.

WHO and UNICEF jointly developed this guideline. A guideline development group, the *WHO-UNICEF GDG for the use of masks by children in the context of COVID-19*, was established. Details on the composition of the GDG and the retrieval, synthesis and assessment of evidence can be found in the [methods](#) and [acknowledgements](#) sections of the document.

When aiming to reduce community transmission and mitigate the impact of COVID-19 outbreaks on health and social services, health officials should ensure that policies developed for mask use are included as one element of a comprehensive package of preventive measures to reduce transmission (ventilation, physical distance, hand hygiene and respiratory etiquette). In any decision being made related to the use of masks by children, the guiding principles for the best interests of children and a “do-no-harm” approach should prevail.

Each country is facing a different situation in the pandemic depending on a number of factors, including the intensity of SARS-CoV-2 circulation, amount of population-level immunity, capacities to respond and agility to adjust measures. As the pandemic continues and the virus evolves, changes in transmission intensity, the circulating variants of concern, and the capacities for health systems to respond based on the situation will result in a need for policy adjustments related to IPC and PHSM. National policies should be evidence-based, agile and adjusted as needed, taking into consideration these and other factors. Countries should conduct an assessment of the transmission scenario and the health system response capacity – and assign a situational level to a geographic area. The assessment should examine quantitative and qualitative information from available sources, and can refer to the situational and community transmission (CT) Levels CT1-CT4 as described in [Considerations for implementing and adjusting public health and social measures in the context of COVID-19 \[60\]](#). Additional factors, including population-level immunity, will need to be taken into account when setting national and subnational policies, as outlined above.

This section of the guideline focuses on the use of masks by children in the context of COVID-19 in community settings, such as schools and recreational areas. Children typically spend a considerable portion of their time in schools, which may have indoor and outdoor areas, and there are existing specific guidance documents available that address school-related public health measures.

Recommendations on types of masks can be found in the [mask use in community settings](#) section of the document.

There are five statements for the use of masks by children, including three recommendations by [age group \(≤ 5, 6-11, 12 and over\)](#), and [two good practice statements](#).

*Published 7 March 2022*

### **SARS-CoV-2 transmission in children**

Disease severity and mortality due to COVID-19, including infections with VoCs, increase with age, and children tend to present with milder courses of illness than do older population groups [183][135][184]. The transmission characteristics among children need to be interpreted in light of new VoCs, in particular, Omicron; vaccination strategies and age-specific vaccination coverage and changes in mixing patterns as a result of the implementation of PHSM. Evidence early in the pandemic from household, serological and infection prevalence studies suggested that young children may be at lower risk of infection than adolescents and adults and potentially transmit SARS-CoV-2 less frequently [183][184][186][187][188][189][190][191][192][193][194][195][196]. However, more recent epidemiological trends seem to indicate that children contribute to transmission similarly to adults, due to their social mixing patterns in some settings and in light of emerging VoCs such as Omicron [197][198][199][200][201][202]. This has been well documented in settings where extensive community testing has been undertaken (e.g. the REACT study in the United Kingdom) [203]. Researchers at the European Centre for Disease Prevention and Control (ECDC) reported the age distribution of COVID-19 among children, as of July 2021, in the European Union (EU), European Economic Area (EEA) and the United Kingdom. They found that children made up an increasing proportion of weekly case numbers, with the most noticeable increase among those aged 5-11 years. These findings should be interpreted in light of the proportion of vaccinated adolescents, social mixing patterns by age and adults in those countries at the time [184][198].

Also, studies from high-income countries have shown that, in some settings, children tend to have more extensive social mixing patterns than adults do and, consequently, more contacts than adults [200]. Thus, even though the propensity to transmit may be lower for children, in some settings, they may be contributors to transmission as a consequence of their social mixing patterns, especially if PHSMs have been relaxed [197][188][189][196][204][205][206].

The Omicron variant has resulted in very high levels of incidence in most countries, across all age groups, with higher incidence levels than observed earlier in the pandemic [197]. There is currently limited evidence to suggest a difference in transmission risk of Omicron according to age group, other than that modulated by vaccination, but more data are required to know for sure. In the context of the Delta and Omicron VoCs, increased transmission and growth rates have been documented [197].

*Published 7 March 2022*

Figure 8. When should children wear masks?

**World Health Organization**

# When should children wear masks?

Each country is facing a different situation, as the pandemic evolves, national policies for protective measures should be agile and adjusted as needed.

## Masks are **not required**

- Children 5 years of age and under.
- Children with cognitive or respiratory impairments, developmental disorders, disabilities or other specific health conditions that cause them to experience difficulties wearing a mask or who have health conditions that interfere with mask-wearing.
- Children who are doing physical activities, such as running, jumping or playing, since masks may impact their breathing.

## Masks are **recommended**

- In areas where there is known or suspected community transmission of SARS-CoV-2, children ages 6-11 years:
  - in indoor settings where ventilation is poor or unknown, even if physical distancing of at least 1 metre can be maintained;
  - in indoor settings that have adequate ventilation when physical distancing of at least 1 metre cannot be maintained.
- Adolescents 12 years or older should follow the same WHO recommendations for mask use as adults.

## Medical masks are **recommended**

- Children with a higher risk\* of severe complications from COVID-19 should be assessed in consultation with the child's medical provider.
- Children who have symptoms of COVID-19 should wear a medical mask at home when they are in shared spaces, as long as they can tolerate it.

\* This includes paediatric patients with underlying noncommunicable diseases (such as diabetes, cardiac disease, chronic lung disease, chronic kidney disease, immunosuppression, HIV, obesity, mental disorders and cancer).

25/03/2022

## 4.2.2.2 Age-specific recommendations

### Recommendation for children 5 years of age and under

Conditional recommendation against , Very low certainty evidence



Masks are not required for children 5 years of age and under

Published 7 March 2022

#### Practical info

##### Implementation considerations

As mask use is not recommended in this age group, IPC and public health and social measures should be prioritized to minimize the risk of SARS-CoV-2 transmission.

- Adults and staff working with children should follow national guidelines for vaccination against COVID-19.
- Adequate ventilation\* should be in place and maintained in settings where children are congregating or cared for.
- Adults and staff working with children should wear masks ([see WHO recommendations for mask use in adults](#)).
- Adequate sanitation and hygiene requirements and a regimen for environmental cleaning and disinfection should be in place in settings where children congregate or are cared for.
- Children should be taught to perform frequent hand hygiene and respect respiratory etiquette using an age-appropriate approach and materials.

In the event that policy-makers decide to adjust the age range for mask recommendations (i.e. children under the age of 5 years would utilize a mask), relevant settings should have adequate human resources to ensure safe mask use. Adoption of the mask recommendation should include appropriate and consistent supervision by an adult and the ability to ensure mask compliance and adherence, especially if mask-wearing is expected for an extended period. The guiding principles of the best interests of children and a “do-no-harm” approach should prevail.

*\*For adequate ventilation refer to regional or national institutions or heating, refrigerating and air-conditioning societies implementing ventilation requirements. If recommendations are not in place, a recommended ventilation rate of 10l/s/ person should be met (except in health-care facilities that have specific requirements). For more information, consult [Roadmap to improve and ensure good indoor ventilation in the context of COVID-19](#) [7].*

#### Evidence to decision

##### Benefits and harms

###### Uncertain benefits and harms

The wearing of a well-fitting mask is associated with a decrease in SARS-CoV-2 transmission in the community and provides protective benefits to the individual [38][32]. A systematic review of the clinical effectiveness of masks that included two RCTs and three observational studies in adult populations provided some evidence that mask-wearing in the community is associated with decreased risk of COVID-19 infection [32][?][140][147][148][137][138]. The systematic review found inconsistent effects of masks on reducing the risk of influenza-like illness (ILI) in community settings, although a cluster RCT found that hand hygiene and face masks may prevent household transmission of influenza if applied early after symptom onset in an index case [167]. A systematic review evaluating 21 ecological studies in adults reports that mask use is associated with reduced mortality, reduced incidence of disease, and reduced hospitalization in the community in the context of COVID-19 [38]. Studies from the United States, Spain, Germany and

the United Kingdom looked at the effectiveness of mask use in ages 4-18; and 11 studies reported an association between mask use and decreased COVID-19 incidence in children [207][208][209][210][211][212][213][214][215][216][217]. These studies were generally observational and ecological, with important shortcomings, including limited reporting of other infection-control measures and exposures.

The systematic review did not find evidence of serious harms with masks in adults in community settings, although bothersome harms were common. Evidence of potential harms, specifically in children aged 5 years or younger, is limited. Parents who completed an online survey conducted in France reported behavioural and mood changes (e.g. anxiety, sadness, anguish), headaches, speaking difficulties and breathing discomfort attributed to mask-wearing [218]. There is currently no evidence on the long-term impact of mask use on the physical and mental health, development and well-being of children.

Given the lack of direct evidence in this age group, evidence was extrapolated from adults. The GDG found that evidence from adults is less applicable (more indirect) to children 5 and under compared to older children due to lower COVID-19 incidence and severity. Even if masks are associated with the same relative reduction in COVID-19 incidence in children 5 and under as in adults, the absolute benefits would be smaller due to lower incidence and severity. Furthermore, benefits in children 5 and under are likely further reduced due to suboptimal adherence.

Additionally, despite the limited/lack of evidence of harms in this age group, there were concerns regarding potential greater harms with regard to childhood development. The GDG, therefore, determined that, given the above information, the benefits of mask-wearing in children aged 5 and under are trivial to none and do not outweigh potential harms.

### Certainty of the Evidence

Very low

The evidence certainty is very low due to the limited evidence in this age group and lower applicability of evidence in adults to this age group compared to older children.

### Values and preferences

Substantial variability is expected or uncertain

The GDG determined that, given the close balance of benefits and harms, different preferences (e.g. focusing on potential benefits in terms of reducing infection risk versus focusing on potential developmental harms) could change the decision. Therefore, variability in preferences/values could affect judgements about mask use in this population.

### Resources

No important issues with the recommended alternative

Given that masks are not recommended for this age group, minimal resource implications are anticipated.

### Equity

#### Effect on equity variable

Risk factors that increase the likelihood of contracting COVID-19 include race, ethnicity and community-level socioeconomic status [219][220].

The GDG assessed effects on equity as uncertain or variable. Because masks are not required in this age group, their effects on equity would depend upon how mask use is implemented. If masks are widely available, using masks could improve equity by reducing the risk of transmission overall, including among socioeconomically disadvantaged groups more affected by COVID-19. However, there is a need to ensure that lack of access to masks does not have a negative impact on children (which would decrease equity), and that certain populations (such as disabled individuals) are not

adversely affected.

### **Acceptability**

There is a significant lack of evidence as to the acceptability of mask use for children in this age group across different contexts [221][207]. Additionally, despite limited evidence on harms in this age group, there are concerns regarding potential greater harms with regard to childhood development.

The GDG felt that the acceptability of mask use in children under 5 years of age is variable.

### **Feasibility**

The GDG judged that use of masks is less feasible in this age group since it requires more supervision and children may have more difficulty wearing masks for prolonged periods and during certain activities.

### **Justification**

The GDG determined that benefits of masks in children <5 years of age did not outweigh harms. This was based on the low certainty of the evidence and the lower incidence (and severity) of SARS-CoV-2 transmission in this age group relative to older children and adults. The GDG also considered the low acceptability and preference for mask use and agreed that a recommendation for the use of masks for this age group was not appropriate.

Decisions for children under the age of 5 years to wear masks may be informed by factors such as contact with high-risk individuals; local incidence of COVID-19; ability to adhere to and tolerate mask-wearing; local vaccination rates; and parental preferences. There was agreement among the GDG members that, in settings where children of this age group are congregating – for example, childcare settings – it is important to adhere to PHSM and IPC measures, including adequate ventilation, hand hygiene and environmental hygiene measures, regardless of whether masks are used.

## Recommendation for children 6 - 11 years of age

Conditional recommendation for , Low certainty evidence



In areas where there is known or suspected community transmission<sup>1</sup> of SARS-CoV-2, masks are recommended for use in children ages 6-11 years in the following settings:

- in indoor settings where ventilation is known to be poor or cannot be assessed, or the ventilation system is not properly maintained<sup>2</sup>, regardless of whether physical distancing of at least 1 metre can be maintained<sup>3</sup>;
- in indoor settings that have adequate ventilation\*\* if physical distancing of at least 1 metre cannot be maintained.

<sup>1</sup> Details on the levels of community transmission (CT1-CT4) can be found in [Considerations for implementing and adjusting public health and social measures in the context of COVID-19](#) [60]. Countries should regularly assess the intensity of spread and health systems' capacities at the most localized levels possible.

<sup>2</sup> For adequate ventilation, refer to regional or national institutions or heating, refrigerating and air-conditioning societies implementing ventilation requirements. If regulations are not in place, a recommended ventilation rate of 10l/s/person should be met (except in health-care facilities that have specific requirements). For more information, consult [Roadmap to improve and ensure good indoor ventilation in the context of COVID-19](#) [7].

<sup>3</sup> Physical distance should be increased beyond 1 metre whenever feasible.

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### Practical info

#### Implementation considerations

Countries should regularly assess the intensity of spread and health systems' capacities at the most localized levels possible. The assessment should examine the quantitative and qualitative information from available sources and can refer to the situational level (S0-S4) and community transmission (CT) Levels CT1-CT4 as described in [Considerations for implementing and adjusting public health and social measures in the context of COVID-19](#) [60] Additional factors, including population-level immunity, will need to be taken into account when setting national and sub-national policies.

Policy-makers and decision-makers are encouraged to ensure the following considerations are addressed when implementing the use of masks in this age group:

- Factors that can influence the decision on implementing the use of masks include the age range in this group, the impact on education and development, the impact on routine activities, equity and the general health and well-being of the children.
- Masks should be made accessible (free of charge) to children in schools, health-care settings and any other setting where they congregate (e.g. recreational areas), to ensure all children – including those living in households or geographic areas with social vulnerabilities and limited resources – have equitable access. No child should be denied access to these activities for not wearing a mask.
- Efforts should be made to accommodate children who do not have access to masks or are unable to tolerate a mask so they can participate in activities involving face-to-face gatherings. No child should be denied access to these activities for not wearing a mask.
- In cases where children are expected to wear masks for a longer duration, routine mask breaks should be implemented.

- The child's capacity to adhere to correct mask use and availability of appropriate supervision should be addressed, especially in younger children within this age group.
- Age-appropriate communication should aim to help the child understand the purpose and proper use of mask-wearing.
- The design of masks for children should take into consideration the safety and overall quality of the material(s) and ensure a proper fit without compromising breathability, comfort and child-friendliness (appropriate size, colours, patterns).
- Key stakeholders should develop and implement strategies for ensuring that each reusable mask is worn by no more than one child and stored safely; for disposing of soiled masks (e.g. in dedicated bags or containers); and for addressing the need for masks to be changed when they become soiled or wet.
- The use of masks is part of a comprehensive package of preventive measures to reduce transmission that includes ventilation, physical distance, hand hygiene and respiratory etiquette.

## Evidence to decision

### Benefits and harms

Substantial net benefits of the recommended alternative

The wearing of a well-fitting mask is associated with a decrease in SARS-CoV-2 transmission in the community and the provision of protective benefits to the individual [38][32]. A systematic review of the clinical effectiveness of masks included two RCTs and three observational studies in adult populations that provided some evidence that mask-wearing in the community is associated with decreased risk of COVID-19 infection [32]. The systematic review found inconsistent effects of masks on reducing the risk of ILI in community settings, though a cluster RCT found that hand hygiene and face masks may prevent household transmission of influenza if applied early after symptom onset in an index case [167]. A systematic review evaluating 21 ecological studies in adults found that mask use is associated with reduced mortality, reduced incidence of disease, and reduced hospitalization in the community [38]. Studies from the United States, Spain, Germany and the United Kingdom looked at the effectiveness of mask use in children ages 4-18. Ten studies reported an association between mask use and decreased COVID-19 incidence in children. However, these studies were generally observational and ecological with several limitations, including limited reporting of other control measures [208][209][210][211][212][213][214][215][216][217]. Furthermore, two studies of influenza (one RCT and one observational study) found a reduced incidence of COVID-19 with mask-wearing in households and school settings [167][170].

The systematic review did not find evidence of serious harms with masks in adults in community settings, although bothersome harms were common. Evidence of potential harms, specifically in children aged 6-11, is limited. Parents who completed an online survey conducted in France -- among whom only 9% had children over the age of 11 -- reported behavioural and mood changes (e.g. anxiety, sadness, anguish), headaches, speaking difficulties and breathing discomfort that they attributed to mask-wearing [218]. There is currently no evidence on the long-term impact of mask use on the physical and mental health, development and well-being of children.

The GDG previously determined that, in adults, mask use in community settings is likely associated with a decreased risk of SARS-CoV-2 infections compared with no mask-wearing. The evidence is indirect since it is from adults. Emerging variants such as SARS-CoV-2 B.1.617.2 (Delta) and SARS-CoV-2 B.1.1.529 (Omicron) have been reported to have increased transmissibility [32]. The GDG judged that the benefits in this group are smaller than in adolescents 12 years of age and older, given lower incidence/severity and reduced adherence (at least in the younger children in this age range).

Evidence on the harms in this age group is also limited. An online survey conducted in France among parents of children in a wide age range (>6 years to >11 years) found that parents attributed behavioural changes and mood changes (e.g. anxiety, sadness, anguish), headaches, speaking difficulties and breathing discomfort to mask-wearing [218]. However, a study in the United States of America found no apparent adverse biological effects (e.g. impacts on memory, heart rate, oxygen saturation, and emotional state) after mask wearing for at least 30 minutes in elementary school children [222]. There is currently no evidence on the long-term impact of mask use on the physical and mental health, development and well-being of children.

The evidence is indirect since it is from adults; the GDG judged that the benefits in this age group are smaller than in adolescents aged 10-12, given lower incidence/severity and reduced adherence (at least in younger children in this age range). Therefore, the GDG judged that the benefits of mask-wearing slightly outweigh the harms. Benefits are likely to

be larger in situations in which the risks of infection are higher, e.g. areas with poor ventilation and/or where people are unable to physically distance from one another.

### Certainty of the Evidence

Low

There is limited evidence on the benefits and harms of mask-wearing in this age group. Although ecological studies that include children aged 4-18 years have reported an association between mask mandates and a reduced incidence of infection, these studies were judged to be of low quality, with few studies available from low- and middle-income countries [208][209][210][211][212][213][215][216][217][225][226]. Even though this evidence is largely indirect, it was judged by the GDG to have applicability, especially to older children in this group.

### Values and preferences

Substantial variability is expected or uncertain

Substantial variability in preferences, ideas and values is expected regarding the potential outcomes of mask use (prevention of SARS-CoV-2 infection, side effects). Such differences could have an impact on the decision about whether to use masks in this age group.

The GDG determined that, given the close balance of benefits and harms, different preferences (e.g. focusing on potential benefits in terms of reducing infection risk versus focusing on potential harms) could change the decision. Consequently, variability in preferences/values could affect judgements about mask use in this population.

### Resources

No important issues with the recommended alternative

There are no formal data available on costs. Given the widespread availability and relatively low costs of non-medical and medical masks, the GDG judged costs and resources / availability of masks to be low.

### Equity

#### Effect on equity variable

Risk factors that increase the likelihood of contracting COVID-19 include race, ethnicity and community-level socioeconomic status [219][220].

The GDG assessed effects on equity as uncertain or variable as they would depend on how mask use is implemented. If masks are widely available, their use could reduce the overall risk of transmission and thereby improve equity, including among socioeconomically disadvantaged groups, which are typically more affected by COVID-19. However, there is a need to ensure that a lack of access to masks does not negatively affect children (which would decrease equity) and that certain populations (disabled individuals) are not adversely affected.

### Acceptability

The limited evidence available indicates variability in the acceptance of masks in children aged 6 to 11. One online study found that parents were generally opposed to children between the ages of 6-10 wearing masks, especially in school settings. Other studies reported that children in this age group demonstrated good adherence to mask-wearing, in particular in school settings [207][215][223].

The GDG decided to make a conditional recommendation despite the low certainty of the evidence because the benefits of mask-wearing – reduction of SARS-CoV-2 transmission – outweigh potential harms, and preferences,

values and acceptability generally all favour mask-wearing.

### Feasibility

Adherence is generally feasible in this age group, though there may be some issues in younger children within this range [207][224].

### Justification

Although there may be a net benefit in mask wearing, this was judged to be small. After reviewing the limited evidence available on the effectiveness of mask use in this age group, a survey was completed by GDG members, 80% of whom voted in favour of a conditional recommendation for mask use. Other factors informing the conditional recommendation were low certainty of evidence, variability in preferences and values that could affect decisions and variability in acceptability and feasibility.

Settings in which the recommendation applies were also discussed, and members voted 70% in favour of applying the recommendation to indoor settings where ventilation is known to be poor or cannot be assessed or the ventilation system is not adequate and where a distance of at least 1 metre cannot be maintained. The GDG acknowledged the importance of the guiding principles noted earlier, including the right to play and the importance of children continuing to attend school in the context of the COVID-19 pandemic.

## Recommendation for adolescents 12 years of age or older

Strong recommendation for , Low certainty evidence



Adolescents 12 years or older should follow the same WHO [recommendations for mask use as adults](#).

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### Practical info

#### Implementation considerations

Policy-makers and decision-makers are encouraged to ensure the following considerations are addressed when implementing the use of masks in this age group, irrespective of vaccination status:

- Even where national guidelines apply, additional considerations and adaptations will need to be specified for special settings, such as schools, during sports or for children with disabilities or underlying medical conditions.
- Masks should be made accessible free of charge to children in schools, health-care settings and any other settings where they congregate (such as recreational areas) to ensure that all children – including those living in households or geographic areas with social vulnerabilities and limited resources – have equitable access. No child should be denied access to these activities for not wearing a mask.
- Efforts should be made to accommodate children who do not have access to masks or are unable to tolerate a mask so they can participate in activities involving face-to-face gatherings. No child should be denied access to these activities for not wearing a mask.
- Routine mask breaks should be implemented when children are expected to wear masks for a longer duration.
- Age-appropriate communication should aim to help the child understand the purpose and proper use of mask-wearing.
- Key stakeholders should develop and implement strategies for ensuring each reusable mask is worn by no more than

one child and stored safely; for disposing of soiled masks (e.g. in dedicated bags or containers); and for addressing the need for masks to be changed when they become soiled or wet.

- The use of masks is part of a comprehensive package of preventive measures to reduce transmission that includes , ventilation, physical distance, hand hygiene and respiratory etiquette.

## Evidence to decision

### Benefits and harms

Small net benefit, or little difference between alternatives

The wearing of a well-fitting mask is associated with a decrease in SARS-CoV-2 transmission in the community and provides protective benefits to the individual [38][32]. A systematic review of the clinical effectiveness of masks included two RCTs and three observational studies in adult populations that provided some evidence that mask-wearing in the community is associated with decreased risk of COVID-19 infection [32]. The systematic review found inconsistent effects of masks on reducing the risk of ILI in community settings, though a cluster RCT found that hand hygiene and face masks may prevent household transmission of influenza if applied early after symptom onset in an index case [167].

A systematic review evaluating 21 ecological studies reports that mask use is associated with reduced mortality and reduced incidence of disease and hospitalization in the community [38]. Studies from the United States, Spain, Germany and the United Kingdom looked at the effectiveness of mask use in people ages 4-18; 12 studies reported an association between mask use and decreased COVID-19 incidence [208][209][210][211][212][213][214][215][216][217][225][226]. However, these studies were generally observational and ecological with important shortcomings, including limited reporting of other infection-control measures and exposures.

The systematic review did not find evidence of serious harms with masks in adults in community settings, although bothersome harms were common. Evidence of potential harms specifically in adolescents 12-18 years of age is limited. In France, an online survey of parents – only 9% of whom had children over the age of 11 – reported that their children experienced behavioural and mood changes (e.g. anxiety, sadness, anguish), headaches, speaking difficulties and breathing discomfort attributed to mask-wearing [218].

The GDG previously determined that in adults, mask-wearing in community settings is likely associated with a decreased risk of SARS-CoV-2 infections compared with no mask-wearing. The GDG found that evidence on the use of masks in community settings in adults is likely applicable to adolescents 12 years of age and older due to the similarity in the incidence of SARS-CoV-2 infection (compared with young adults) and ability to adhere to mask-wearing recommendations. Emerging variants such as SARS-CoV-2 B.1.617.2 (Delta) and SARS-CoV-2 B.1.1.529 (Omicron) have been reported to have increased transmissibility [32].

The GDG judged the benefits, such as reduced transmission and facilitating increased access to schools/in-person learning, in adolescents to be small but agreed that, in the context of the Delta and Omicron variants, the benefits of mask-wearing in the community setting outweigh potential harms.

### Certainty of the Evidence

Low

There is limited evidence on the benefits and harms of mask-wearing in this age group. Although ecological studies that include children aged 4-18 years have reported an association between mask mandates and a reduced incidence of infection, these studies were judged to be of low quality, with few studies available from low- and middle-income countries [208][209][210][211][212][213][214][215][216][217][225][226]. Evidence on the effectiveness of masks in adolescents can also be extrapolated from adults. Even though this evidence is indirect, it was judged by the GDG to be more applicable to this age group due to the similarity in incidence and severity of SARS-CoV-2 infection in young adults and adolescents.

### Values and preferences

No substantial variability expected

There is limited data available on adolescents' perception of the value and benefits or harms of wearing masks. Some studies conducted in European settings looking at parental perceptions, showing mixed results but generally favouring mask use in children over the age of 12 [223][227][228]. Given the potential benefits of masks for preventing infections and considering the presence of bothersome but non-serious harms, the GDG determined that differences in values/preference regarding outcomes would not impact the decision to wear masks. This supports a strong recommendation, despite the low certainty of evidence.

### Resources

No important issues with the recommended alternative

There are no formal data available on costs. Given the widespread availability and relatively low costs of non-medical and medical masks, the GDG judged the impact of costs and resource availability to be low.

### Equity

Important issues, or potential issues not investigated

Risk factors that increase the likelihood of contracting COVID-19 include race, ethnicity and community-level low socioeconomic status [219][220].

The GDG assessed the effects of mask use on equity as uncertain or variable as it depends on how mask use is implemented. If masks are widely available, their use could improve equity by reducing the risk of transmission overall, including among socioeconomically disadvantaged groups, who tend to be more affected by COVID-19. However, there is a need to ensure that lack of access to masks does not negatively affect children (which would decrease equity) and that certain populations (such as disabled individuals) are not adversely affected.

### Acceptability

No important issues with the recommended alternative

This recommendation was assessed by the GDG as likely acceptable in this age group. Studies on the perception of the effectiveness of mask use are limited and generally focused on European countries for children over the age of 10. The GDG considered the limited evidence and discussed knowledge of practice in their respective countries, including the evolution of acceptance of mask use as the pandemic has continued and the emergence of VoCs. The GDG agreed that, for children over the age of 10, mask-wearing was generally regarded as useful [223][227][228].

### Feasibility

No important issues with the recommended alternative

GDG members noted that masks are widely recommended and used in many contexts throughout the world in this age group. The feasibility of implementing this recommendation was judged to be acceptable given low concerns about tolerance and likely higher adherence to mask-wearing in older age groups [207].

### Justification

The GDG considered the low certainty of evidence and, although the majority of the evidence was in the adult population, felt it was reasonable to extrapolate from what had been observed in (young) adults. The GDG noted that the benefits of mask use, such as a potential reduction in transmission and a greater ability to keep schools functioning, outweighed any potential bothersome harms and considered other factors (not preference-sensitive, low costs, acceptability, feasibility) and concluded that a strong recommendation was justified.

### 4.2.2.3 Special populations

#### Good practice statement



Children with cognitive or respiratory impairments, developmental disorders, disabilities<sup>1</sup> or other specific health conditions who experience difficulties wearing a mask or have health conditions that interfere with mask-wearing should not be required to wear a mask.

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<sup>1</sup>According to the Convention on the Rights of persons with disabilities, children with disabilities “include those who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis” [229].

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#### Practical info

##### Implementation considerations

- The individual decision for a child to wear a mask should be discussed in consultation with the child's medical provider when possible.
- A safe environment should be created for children who are not able to tolerate a mask, including requirements for caregivers, teachers or other adults to wear a mask when interacting with the child and to be vaccinated against COVID-19 according to national vaccination policies.
- The use of masks with a transparent component may be considered, where available, for children with hearing impairment and people who interact with them. These masks should meet approved regulatory standards, if available.

#### Justification

The GDG acknowledged that children with several health conditions may experience difficulties or harm while wearing a mask. Despite little direct evidence but considering equity and ethical issues, the GDG determined that a good practice statement was justified.

#### Good practice statement



The use of a medical mask is recommended for children with a higher risk<sup>1</sup> of severe complication from COVID-19 but should be assessed in consultation with the child's medical provider.

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<sup>1</sup>This includes paediatric patients with underlying non-communicable diseases (for example, diabetes, cardiac disease, chronic lung disease, chronic kidney disease, immunosuppression, obesity, mental disorders and cancer) and those living with HIV [52].

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#### Justification

The GDG noted that, in some low-resource settings, there may be challenges for families to access medical masks or health-care providers. It was proposed that it may be more appropriate in some circumstances for caregivers to wear

mask when interacting with the child. In conclusion, the GDG agreed that, while there is no direct evidence, a good practice statement was justified due to this population's higher risk of COVID-19 complications.

#### 4.2.2.4 Implementation considerations for use of masks in schools

##### Implementation considerations

Policy-makers and decision-makers are encouraged to consider the following when implementing mask-wearing by children in school settings:

- Policies should be evidence-based, agile and adjusted as needed, taking into consideration factors such as changes in transmission intensity, the circulating variant(s) of concern and the capacities for health systems to respond based on the situation.
- No child should be denied access to education because of mask-wearing or the lack of a mask due to low resources or unavailability.
- The views of teachers and other educators on risks and time burden required to ensure mask adherence by children should be considered.
- Situations where wearing a mask can significantly interfere with the learning process or have a negative impact on critical school activities such as physical education or sports and recreation (during which the mask may reduce the child's ability to breathe comfortably) and meal programmes require special consideration.
- Specific instructions and supplies should be provided for the availability, safe handling and storage of masks.
- A sufficient supply of appropriate masks should be ensured.
- Masks should not increase social inequalities in access to schools, especially for marginalized communities. No child should be denied access to these activities for not wearing a mask.
- Basic water, sanitation, hygiene, ventilation and space requirements should be met in the school building so that IPC and PHSMs can be implemented.
- If disposable masks are used, a system for waste management of used masks needs to be established to reduce the risk of contaminated masks being disposed of in the classroom and recreational or sports settings.

The recommendations for wearing masks in the different age groups of children in this document supersede those existing in other WHO documents published prior to this update. The following guidance documents can be used to inform policy-making and programming for a comprehensive school safety strategy when re-opening or during normal operations in the context of COVID-19:

- [WHO considerations for school-related public health measures in the context of COVID-19](#)
- [WB/WFP/UNESCO/UNICEF framework for school reopening](#)
- [WHO/UNICEF/IFRC Interim Guidance for COVID-19 Prevention and Control in Schools](#)

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*Published 7 March 2022*

#### Justification

GDG members agreed that the recommendations on mask-wearing in this document should be implemented in the context of school settings. They also noted the importance of applying existing public health and social measures and infection prevention and control measures in schools, in addition to mask-wearing.

## 4.3 Glove use

### Background

In the health-care facility, medical gloves are recommended to be worn for two main reasons:

- 1) To reduce the risk of contamination of health and care workers' hands with blood and other body fluids [102].
- 2) To reduce the risk of germ dissemination to the environment and of transmission from the health-care worker to the patient and vice versa, as well as from one patient to another [102].

Wearing gloves as a form of PPE in the community setting became popularized in the early days of the COVID-19 pandemic. However, the use of gloves when not indicated represents a waste of resources; does not contribute to a reduction of cross-transmission in the community; and has a negative impact on the environment due to increased waste [74][102]. Wearing gloves may result in missed opportunities for hand hygiene as gloves do not provide complete protection against hand contamination [102]. If worn for extended periods, after contact with contaminated surfaces, and when not removed properly, gloves may contribute to cross-contamination.

**Gloves are not a substitute for hand hygiene.** In situations where glove use is indicated, gloves should be changed when damaged or soiled.

Conditional recommendation against , Very low certainty evidence



WHO suggests that the general public not wear gloves for routine activities in community settings in the context of COVID-19.

Remarks: Hand hygiene should be performed frequently.

*Published 21 December 2023*

## Practical info

### Implementation consideration

- Gloves may be indicated in the community when a community member comes in contact with blood or another body fluid, including contact with non-intact skin and mucous membranes.
- Gloves may also be indicated for preparation or application of disinfectant products to avoid contact with chemicals or ingredients that can be irritating when in direct contact with hands (skin).
- As medical gloves are single-use items, glove decontamination and reprocessing are not recommended and should be avoided.
- Because intact skin is the first line of defence against microorganisms, it is important to maintain good skin care.

### Clean hands regularly

- after any type of contact with a person with COVID-19, or the immediate environment;
- before and after preparing food, before eating, after using the toilet, and whenever hands look dirty;
- before and after the use of PPE (masks or gloves), follow recommended steps on how to clean hands (hand washing or using hand rubs);
- If hands are not visibly soiled, an alcohol-based hand rub can be used;
- for visibly soiled hands, always use soap and water.

### Handwashing with soap

- Remove any hand or arm jewelry and wet your hands with warm (not hot) running water.
- Add soap, and then rub your hands together, making a soapy lather. Do this for at least 15 seconds, being careful not to wash away the lather. Wash the front and back of your hands, as well as between your fingers and under your nails.
- Rinse your hands well under warm, running water, using a rubbing motion.
- Wipe and dry hands gently with a paper towel. Rubbing vigorously with paper towels can damage the skin.
- Turn off tap using a paper towel so that you do not re-contaminate your hands.

### Alcohol-based hand rubs (ABHRs)

- ABHRs are widely used in health-care settings and in situations where running water is not available.
- Alcohol-based hand rubs should be used only if no visible dirt is present on the hands.
- Remove any hand or arm jewelry.
- Apply to your hand enough alcohol-based hand rub (1-2 pumps) to have enough so that, when you rub your hands together, you cover all areas of your hands, including under your nails.
- Use a rubbing motion to evenly distribute the alcohol-based hand rub over all surfaces of the hands, particularly between fingers, fingertips, back of hands and base of thumbs.
- Rub your hands until they feel dry (15-30 seconds).

For further information on hand hygiene, see:

- [WHO IPC - Hand Hygiene \[230\]](#)
- [Hygiene for all \(UNICEF\) \[231\]](#)

### Evidence to decision

#### Benefits and harms

Important harms

No studies investigated glove use in the community, although it is well known that inappropriate glove use in the health-care setting can lead to potential harms [102].

#### Certainty of the Evidence

Very low

The quality of the evidence is indirect and *very low*.

#### Values and preferences

Substantial variability is expected or uncertain

It was not possible to assess the values and preferences as there is a lack of evidence on the effects of glove use in the community and on the impact it may have on SARS-CoV-2 infection.

#### Resources

Important negative issues

##### Research evidence

The use of gloves is likely to have a negative impact on resources and an increase in waste [74].

##### Summary

The use of gloves is likely to have a negative impact on resources and to result in an increase in waste [74].

#### Equity

Important issues, or potential issues not investigated

This intervention likely does not have an impact on equity.

#### Acceptability

No important issues with the recommended alternative

This intervention is likely acceptable.

**Feasibility**

No important issues with the recommended alternative

This intervention is likely feasible.

**Justification**

No studies compared glove use to no glove use and risk of SARS-CoV-2 infection in the community; however, inappropriate glove use in the health-care setting has been linked to potential harms such as missed opportunities for hand hygiene and excess waste [102]. Furthermore, the use of gloves at the improper moment with the wrong technique of putting on and taking off gloves may result in unintentional cross-contamination and pathogen transmission. Therefore, the GDG elected a conditional recommendation against glove use in the community as a preventive measure for SARS-CoV-2 transmission.

Hand hygiene (hand washing or use of hand rub) is the preferred practice [15], unless there are additional considerations based on a risk assessment, where glove use protects workers from potential hazards (chemicals) or contact with spills or body fluids.

**Clinical question/ PICO**

**Population:** Community/households  
**Intervention:** Glove use  
**Comparator:** No glove use

**Summary**

No studies compared glove use to no glove use and the risk of SARS-CoV-2 infection.

Outcome Timeframe	Study results and measurements	Comparator No glove use	Intervention Glove use	Certainty of the Evidence (Quality of evidence)	Summary
SARS-CoV-2 Infection				Very low	There were no studies looking at impact on SARS-CoV-2 infection.

## 4.4 Caring for persons with COVID-19 in the home

**Background**

In many contexts, health services are delivered at the community level and in the home by community health workers, traditional medicine practitioners, social care workers, or a variety of formal and informal community-based providers, including caregivers. A caregiver refers to anyone – parents, spouses, other family members or friends – who provides informal care as opposed to the care provided by formal health-care providers [10]. This section outlines practices that caregivers should take to reduce the risk of spreading COVID-19 in a household.

Caregivers should try to minimize the risk of infection and be attentive to signs that the COVID-19 patient's condition is worsening and when to send that patient to a health facility. Household members and individuals who are caring for a person with probable or confirmed COVID-19 are to follow instructions from local public health officials.

General public health practices and IPC principles apply to situations involving care for persons with COVID-19 in home and community settings.

### Implementation consideration

It is important that community-based providers and caregivers have instruction on important hygiene measures to care for persons with COVID-19, including hand hygiene and the use of personal protective equipment (PPE) for the tasks that they are expected to perform.

- The risk of getting COVID-19 is higher in crowded and inadequately ventilated spaces where infected people spend periods of time near uninfected people. Understanding and controlling building ventilation can improve the quality of the air we breathe and reduce the risk of indoor health concerns, including preventing the virus that causes COVID-19 from spreading indoors [7].
  - It is therefore important to keep the space well-ventilated; to maintain a distance of at least 1 metre when possible; and to limit in-person interactions and time spent in shared spaces.
  - Isolation of persons with COVID-19 can help break the chain of transmission of the virus.
  - Household members should avoid entering the room where the patient is located or, if that is not possible, wear a mask and keep a distance of at least 1 metre from the patient.
- See WHO recommendations for mask use in the community and home .
  - When providing care within 1 metre of a person infected with SARS-CoV-2, ask that that person wear a well-fitted medical mask.
    - Individuals who cannot tolerate a medical mask should practice respiratory hygiene by coughing or sneezing into a bent elbow or tissue and then disposing of the tissue, followed by hand hygiene.
- One of the most effective means of preventing infections from spreading to others is by practicing proper hand hygiene.
  - Clean hands regularly: after any type of contact with the person or the person's immediate environment; before and after preparing food; before eating; after using the toilet; and whenever hands look dirty.
  - if hands are not visibly soiled, an alcohol-based hand rub can be used.
  - For visibly soiled hands, always use soap and water.
  - When washing hands with soap and water, use disposable paper towels to dry hands. If paper towels are not available, use clean cloth towels and replace them frequently.
- Maintaining a clean environment in the home setting requires regular cleaning of the person's room and other essential areas of the home that are shared living spaces.
  - This requires frequent cleaning and disinfecting of high-touch surfaces and objects in the home.
  - For proper handling of linens, laundry and waste, follow routine processes according to local guidance.

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## 4.5 Water, sanitation, hygiene, and waste management

### Background

The provision of safe water, sanitation and waste management and hygienic conditions is essential for protecting human health during all infectious disease outbreaks, including COVID-19. Ensuring evidenced-based and consistently applied WASH and waste management practices in communities, homes, schools, marketplaces and health-care facilities will help prevent human-to-human transmission of pathogens, including SARS-CoV-2, the virus that causes COVID-19.

The most important information concerning WASH and SARS-CoV-2 is summarized as follows:

- Frequent and correct hand hygiene is one of the most important measures to prevent infection with SARS-CoV-2.
- Existing WHO guidance on the safe management of drinking water and sanitation services also applies to the COVID-19

pandemic.

- Many other infectious diseases can be prevented by safely managing water and sanitation services and by applying good hygiene practices and waste management.

## 4.5.1 Environmental Cleaning

### Background

For suspect or confirmed COVID-19 cases in community and home settings, maintaining a clean environment includes regular cleaning, changing of linens and clothing when they become soiled and routine laundering. Existing WHO guidance on the WASH also applies to COVID-19.

Cleaning and disinfection practices are important to reduce the potential for COVID-19 virus contamination in non-health-care settings, such as in the home, office, schools, gyms, publicly accessible buildings, faith-based community centres, markets, transportation and business settings or restaurants. High-touch surfaces -- such as door and window handles, kitchen and food-preparation areas, countertops, bathroom surfaces, toilets and taps, touch-screen personal devices, personal computer keyboards, and work surfaces -- in these non-health-care settings should be identified for priority disinfection [232].

#### Good practice statement



In the context of COVID-19, households and community settings should follow routine environmental cleaning and disinfection practices.

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### Practical info

#### Implementation consideration

No additional measures are required for SARS-CoV-2; households should follow routine cleaning and disinfection practices.

- Cleaning should occur before disinfection; this will allow the disinfectant to work more effectively as dirt and grime may make it harder for the chemicals to kill the germs.
- Clean surfaces with soap and water or a regular household detergent to remove many germs, dirt, and other substances.
- Ensure that surfaces are frequently cleaned and disinfected.
- Pay special attention to high-touch surfaces, especially if anyone in your household is sick.
  - High touch surfaces include: door and window handles, kitchen and food preparation areas, counter tops, bathroom surfaces, toilets and taps, touchscreen personal devices, personal computer keyboards, and work surfaces.
- Follow product instructions on preparation, use, disposal and storage.
- Pay particular attention to how long the product should remain on the surface, and ensure the surfaces stays wet during the duration of the required contact time.
- Perform hand hygiene often, and after contact with contaminated surfaces or items, handling soiled linen or waste [15].

### Justification

Rapid reviews of cleaning and disinfection methods found no evidence that any one cleaning modality was better than another in terms of its impact on SARS-CoV-2 infection. Therefore, the GDG determined that there was insufficient evidence to suggest added precautions are needed for environmental cleaning in the context of COVID-19.

While there was no evidence to support spraying versus wiping when cleaning, GDG members noted that, for safety, products need to be applied according to manufacturer's instructions for dilution, application and contact time. Harms may be associated

with application of higher-than-recommended concentrations and the use of spraying as a method of application, or that differ from those recommended by the manufacturer. Wiping is the preferred method for application. GDG members noted that it is not appropriate to spray disinfectant on individuals nor is it appropriate to spray large areas (i.e. sidewalks), as doing so would be unlikely to prevent the spread of SARS-CoV-2.

### Clinical question/ PICO

**Population:** Community/households  
**Intervention:** Soap and water (cleaning alone)  
**Comparator:** Bleach-based cleaner (disinfectants)

#### Summary

No studies compared cleaning practices to cleaning and disinfection and the risk of SARS-CoV-2 infection.

Outcome Timeframe	Study results and measurements	Comparator Bleach-based cleaner (disinfectants)	Intervention Soap and water (cleaning alone)	Certainty of the Evidence (Quality of evidence)	Summary
SARS-CoV-2 infection				Very low	There were no studies looking at the impact on SARS-CoV-2 infection, evidence was insufficient to determine impacts on the risk of infection

### Clinical question/ PICO

**Population:** Communities  
**Intervention:** Spraying  
**Comparator:** Mechanical cleaning (wiping, brushing, scrubbing)

#### Summary

No studies evaluated the effects of SARS-CoV-2 infection. Three studies were found and included in the narrative syntheses that compared spraying versus wiping. The evidence was inconclusive as surface contamination varied greatly by the health-care facility, the disinfectant used and the cleaning regime. A qualitative synthesis was also performed on this topic ( for full details see Annex 3).

Outcome Timeframe	Study results and measurements	Comparator Mechanical cleaning (wiping, brushing, scrubbing)	Intervention Spraying	Certainty of the Evidence (Quality of evidence)	Summary
SARS-CoV-2 infection				Very low	Few studies looked at the outcome of SARS-

Outcome Timeframe	Study results and measurements	Comparator Mechanical cleaning (wiping, brushing, scrubbing)	Intervention Spraying	Certainty of the Evidence (Quality of evidence)	Summary
					CoV-2 infection. Evidence was inconclusive.

## 4.5.2 Waste Management

### Background

In the context of COVID-19, there is no need to take special WASH precautions; however, it is imperative that communities strengthen, monitor and assess their existing WASH programmes. Existing WHO guidance on the safe management of water and sanitation services also applies to the COVID-19 pandemic [232].

The COVID-19 pandemic had numerous environmental consequences, including impacts on municipal waste management systems, changes in consumption and waste disposal patterns [233].

Proper waste management protects community members, sanitation workers and the environment. It is imperative to follow national/subnational and local regulations for the disposal of household waste. Where feasible, minimizing garbage is a good waste management practice.

#### Good practice statement



Waste generated in the community from persons with suspected or confirmed COVID-19 should be handled and disposed of according to national/subnational/local regulations for waste management.

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### Practical info

#### Implementation consideration

If someone in a household has tested positive for COVID-19, carefully handle and dispose of waste, and follow national/subnational and local regulations for waste management.

- Place all materials into garbage bags and tie them securely closed before putting them in waste receptacles;
- put all cleaning wipes and disposable paper towels with cleaning products in the garbage;
- if there is a household member with COVID-19, dispose of any tissues (respiratory hygiene) and empty waste frequently;
- frequently clean hands;
- separate items and materials that are considered hazardous waste; ensure that sharps and other hazardous materials are properly disposed of as per local processes, to not risk harm to sanitation workers;
- minimize waste (i.e. avoid unnecessary packaging, recycle, consider reusable items).

### Justification

A systematic review found no study comparing the handling of COVID-19-related waste as infectious versus non-infectious and

the GDG found no evidence to support handling COVID-19-related waste differently from other waste. Upon review of the evidence, the GDG determined that waste produced from SARS-CoV-2 was not infectious and did not require special handling beyond what was currently the standard advised through national, subnational or local policies for waste.

### Clinical question/ PICO

**Population:** Personnel handling waste  
**Intervention:** Infectious waste  
**Comparator:** Noninfectious waste

#### Summary

No studies evaluated impacts on risk of SARS-CoV-2 infection.

Outcome Timeframe	Study results and measurements	Comparator Noninfectious waste	Intervention Infectious waste	Certainty of the Evidence (Quality of evidence)	Summary
SARS-CoV-2 infection				Very low	No studies were found that looked at SARS-CoV-2 infection.

## 4.5.3 Handling of linens and laundry

### Background

Maintaining a clean environment includes changing of linens and clothing when they become soiled and routine laundering. In health-care settings, no added measures beyond following standard precautions are required for handling of linens and laundry. These same IPC principles apply to persons with COVID-19 in home and community settings.

#### Good practice statement



Regular household processes should be used for laundering<sup>1</sup> items for persons with suspected or confirmed COVID-19.

<sup>1</sup> Laundering includes the handling, sorting and washing/drying

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### Practical info

Implementation consideration

- Bed linen and clothing should be changed regularly and when soiled.
- Soiled linen and waste should be handled carefully (with minimal manipulation or agitation) to prevent personal contamination. It can be rolled or folded to contain the heaviest soil in the centre of the bundle.
- Contaminated and soiled laundry can be washed with other laundry, with soap or laundry detergent in warm water, preferably at a temperature of 60-90 C.
- If a washing machine is not available, wash by hand with soap and water.
- Perform hand hygiene often, and after handling soiled linen [15].

### Justification

The GDG found insufficient evidence to support added measures and precautions in the context of COVID-19 regarding handling, transporting, sorting and laundering of linens. The evidence on the effects of SARS-CoV-2 infection was limited to one observational study [97].

### Clinical question/ PICO

**Population:** Personnel handling linens  
**Intervention:** Above standard  
**Comparator:** Standard precautions for routine handling of linens and laundry

### Summary

One study addressed the PICO question, reporting that SARS-CoV-2 RNA was not detected in rinse water after washing with tap water, disinfecting with sodium hypochlorite, or disinfecting with 80 °C water. However, SARS-CoV-2 was detected in one of five samples after washing with laundry detergent and in one of six samples after washing with fabric softener.

Outcome Timeframe	Study results and measurements	Comparator Standard precautions for routine handling of linens and laundry	Intervention Above standard	Certainty of the Evidence (Quality of evidence)	Summary
SARS-CoV-2 Transmission				Very low	There were too few who experienced the SARS-CoV-2 infection to determine a difference between standard versus above-standard cleaning.

## 4.6 Safe dead body management

### Background

Deaths from COVID-19 may occur in health-care facilities, at home or in other locations. The safe management of dead bodies protects those who have died of COVID-19, their families, health and care and funeral home workers. For safe handling of bodies in the community, practices would follow the same measures for death due to other respiratory illnesses (e.g. influenza). The dignity of the dead, their cultural and religious traditions and their families should be respected and protected throughout, balancing the rights of the family, the need to investigate the cause of death, and the risks of exposure to infection.

Measures for managing the bodies of deceased persons infected with SARS-CoV-2 should be consistent with those applied to persons

who have died of an infectious disease and following national, subnational and local public health guidance.

### Implementation consideration

#### **Burial by family members for deaths at home**

No added precautions are needed for SARS-CoV-2, besides those already routine for those who die of a respiratory illness, following local, national and public health guidance and regulations.

In contexts where mortuary services are not standard or not available, or where traditional funeral rituals are required, families and traditional burial attendants can be instructed in the preparation of bodies for burial or cremation.

For handling bodies at the community level, handling practices would follow those followed after death due to other respiratory illnesses (e.g. influenza). Cover the body with a sheet before handling, turning, or rolling it, if culturally appropriate; plastic or cloth sheeting can be used. Alternatively, a body bag can be used, if culturally appropriate and available. The dignity of the dead, their cultural and religious traditions, and their families should be respected and protected throughout.

As a general practice, before attending to a dead body, people should ensure that necessary hand hygiene supplies and facilities, PPE, and cleaning and disinfection supplies are readily available. Any person (e.g. family member, religious leader) preparing the deceased (e.g. washing, cleaning or dressing body, tidying/shaving hair or trimming nails) in a community setting should wear gloves during any physical contact with the body. For any activity that may involve the splashing of body fluids, eye and mouth protection, i.e. face shield/goggles and medical mask, are recommended.

Apply principles of cultural sensitivity and ensure that family members reduce their exposure as much as possible. Family members, traditional and religious leaders and others may typically be involved in burials at the community level.

- Those preparing the body should instruct family and friends not to kiss or touch the deceased. Anyone who assists in preparing the body should wash their hands thoroughly with soap and water when finished (6,7).
  - Identify local alternatives to kissing and touching the dead body in settings where such contact is traditionally part of funeral procedures.
- Family and friends may view the body after it has been prepared for burial, per customs, where possible.
  - If family members wish to view the body, allow them to do so, but instruct them not to touch or kiss the body; to maintain at least a 1-metre distance from one another and any staff during the viewing; and to perform hand hygiene after the viewing.
- The belongings of the deceased person do not need to be burned or otherwise disposed of.
- All those involved in such burials should follow WHO guidelines for mask use in the community.
- People who have died from COVID-19 can be buried or cremated according to local standards and family preferences.

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## 5. Acknowledgements

WHO would like to thank the following groups and individuals for their support and contribution to this guideline. This includes Part 1: Health-care and Part 2: Mitigation measures in the community.

### 5.1 Part 1: Health care setting authorship, acknowledgements and contributions

#### Authorship, contributions, and acknowledgements

WHO would like to thank the collaborative efforts of all those involved to make this process rapid, efficient, trustworthy and transparent.

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#### Declaration of conflicts of interest

Researchers may be eligible to sit on GDGs. However, the participation of researchers who have been involved in any “major academic programme of work that concerns the intervention, approach, or exposure under consideration in the guideline, including conducting trials or systematic reviews and publishing conclusions or opinion on the benefits and/or harms” should be carefully considered and managed by the Responsible Technical Officer and director of the relevant technical unit. In most cases, such involvement would constitute a conflict of interest, and should be appropriately managed by limiting their participation in the process

(i.e. provide specific information but be excluded from the formulation of recommendations and/or discussion), or if significant interests are identified, full recusal. As an observer, a member can follow the discussions and may be permitted by the Chair to speak and/or to respond to technical questions the other GDG members may have.

Disclosures of interests and any required actions were reviewed by the WHO Secretariat in consultation with the WHO Ethics Office, prior to deliberations. The following conflicts of interest were reviewed and managed accordingly:

Dr J. Conly is an author of a randomized controlled trial used as one piece of evidence to determine the type of mask to use while caring for a suspected or confirmed COVID-19 patient. Given his role as a researcher, he has recused himself from discussions and development of the recommendation for health and care workers on masks and respirator use.

Dr Y. Li is an author involved in various research studies and in particular opinion papers concerning the use of N95 and medical masks. His participation was restricted to observing the GDG meeting on this topic without being involved in the discussion and/or formulation of recommendations.

Dr T. Okwor partook as a member of the rapid review team for the reviews on cleaning and disinfection in the community. Dr. Okwor recused themselves from the decision-making process.

### **Methodologist**

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### **Declaration of conflicts of interest**

Dr R. Chou is an author on some of the evidence used to inform some recommendations. However, as a methodologist, he provided guidance to the GDG on methodologic issues and is not a voting member of the GDG. In some meetings, he presented evidence and provided clarification on methods to guide discussions regarding the EtD tables; however, all decisions were made by voting members of the GDG.

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Declarations of interest of external reviewers were collected and assessed, and no conflict of interest was identified for these thematic areas.

### **Editor**

Many thanks to Tom Watkins for editing this document.

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## **5.2 Part 2: Mitigation measures in the community authorship, acknowledgements and contributions**

### **5.2.1 Mitigation measures in the community authorship, acknowledgements and contributors**

#### **Authorship, contributions and acknowledgements**

WHO would like to thank the collaborative efforts of all those involved to make this process rapid, efficient, trustworthy and transparent.

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**Declaration of conflicts of interest**

*Dr R. Chou* is an author on some of the evidence used to inform some recommendations. However, as a methodologist, he provided guidance to the GDG on methodologic issues and is not a voting member of the GDG. In some meetings, he presented evidence and provided clarification on methods to guide discussions regarding the EtD tables; however, all decisions were made by voting members of the GDG.

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**Declarations of interest of external reviewers were collected and assessed, and no conflict of interest was identified.**

**Editor**

Many thanks to Tom Watkins for editing this document.

## 5.2.2 Mask use by children authorship, acknowledgements and contributors

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### **Methodologist**

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### **Declaration of conflicts of interest**

R. Chou is an author on some of the evidence used to inform some recommendations. However, as a methodologist, he provided guidance to the GDG on methodologic issues and is not a voting member of the GDG. In some meetings, he presented evidence and provided clarification on methods to guide discussions regarding the EtD tables; however, all decisions were made by voting members of the GDG.

### **Temporary Advisor**

**Dr Fernanda C. Lessa** (US Centers for Disease Control and Prevention, United States of America).

### **Declaration of conflicts of interest**

Dr F. Lessa reported she is an employee of the United States CDC who provided funding towards the development of this guideline. After consulting with the WHO Ethics Committee, it was determined Dr Lessa could contribute to discussions as she brings significant technical and field expertise to the discussions but would be recused from voting on recommendations.

### **External reviewers (for the update on mask use by children, in alphabetical order)**

**Zulfiqar A. Bhutta**, Centre for Global Child Health, The Hospital for Sick Children, Toronto, Canada and Center of Excellence In Women and Child Health, The Aga Khan University Karachi, Pakistan, **Jon Klein**, University of Illinois, United States of America, **Shamez Ladhani**, St. George's University of London, United Kingdom, **Erin Maughan**, College of Health and Human Services, George Mason University, United States of America, **Nina Schwalbe**, Columbia University, United States of America

### **Declarations of conflicts of interest**

- *J. Klein* reported receipt of a grant from the International Pediatric Association and UNICEF for contribution of child health and COVID-19 information to pediatric societies. No actions were required.
- *E. Maughan* reported she is also a member of the WHO Technical Advisory Group of Experts on Educational Institutions and COVID-19. No actions were required.
- *Professor F. Russell* declared receipt of funds for research to study school outbreak data and develop mitigation strategies for return to school from the Department of Health, Victoria. No actions were required.

### **WHO and UNICEF reviewers (for the update on mask use by children, in alphabetical order)**

Ida Marie Ameda (UNICEF), Astrid Chojnacki (WHO-WPR), Landry Cihambanya (WHO-AFR), Delphine Sauvageot (UNICEF), Aparna Singh Shah (WHO-SEAR), Howard Sobel (WHO-WPR), Valeska Stempluk (WHO-AMR), Maha Talaat (WHO-EMR), Bassim Zayed, (WHO-EMR).

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## 5.3 Systematic review teams

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### Rapid Research Evaluation and Appraisal Lab (RREAL) at University College London

Megan Bowers, Sigrun Clark, Ailey McLeod, Lucy Mitchinson, Sophie Moniz, Thomas Moniz, Norha Vera San Juan, Gianna Cadorna, Monica Gonzalez, Amelia Karia, Federico Redin, Roberto Wright, Matthew Bain, Cecilia Vindrola-Padros.

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## 6. Annexes

### 6.1 Annex 1: Research Gaps

The recommendations in this guideline are based on the scientific evidence available at the time of publication; however, limitations in the quality of studies and persistent research gaps were recognized by the GDG when formulating the recommendations. These limitations included the cost and resource implications of interventions to reduce transmission of SARS-CoV-2, and the social and cultural factors that influence compliance with the application of interventions.

The GDG noted that a number of research gaps for COVID-19 are ongoing and relevant to IPC practices in general. For example, the lack of high-quality research on several facets of the transmission of acute respiratory infections (ARIs) and the effectiveness of interventions to reduce transmission were described in the 2014 WHO guideline *Infection prevention and control of epidemic-and pandemic prone acute respiratory infections in health care* [8].

Specific research gaps identified in 2014 include:

- Transmission in health-care and community settings, and effectiveness of interventions to reduce transmission
- Aerosol-generating procedures (AGPs) and transmission from patients to health-care workers during procedures
- Epidemiology of transmission of specific ARIs from patients to health-care workers, and to other patients, during care delivery in health-care settings
- The use of specific precautions, triage and early identification, spatial separation with the use of other selected precautions
- The duration of additional IPC precautions for patients with ARIs in health-care settings to reduce the risk of transmission to other patients and to health-care workers, including use of laboratory tests as a guide
- Placement of patients, cohorting and other measures to separate potentially infectious patients, for the reduction of transmission of ARI pathogens
- Cost and resource implications in different settings around the world
- Other interventions, innovative technologies and cost-effective measures
- Need for high-quality studies

While COVID-19 will remain a critical area for future research, the need for high-quality studies and broadening recommendations to other respiratory pathogens was discussed. Furthermore, GDG members noted that many of the gaps highlighted in the 2014 guideline still persist. Research is needed to further investigate IPC interventions in the context of public health emergencies, readiness, outbreak management and pandemic response. There is a need for high-quality studies utilizing various methodologies (e.g. modeling or laboratory-based) and study types (e.g. RCTs). IPC practices are often implemented as a bundled approach and, therefore, it is difficult to separate and define the impact of individual measures.

The following themes were identified as areas for future study by the COVID-19 GDG:

- Management of health and care workers in the context of COVID-19 and other respiratory infections (i.e. period of isolation, impact of syndromic surveillance and testing protocols for detection and management of occupational infections);
- PPE innovation, interventions to improve fit and effectiveness;
- Ventilation standards in health-care settings to effectively reduce the risk of SARS-CoV-2 transmission; effectiveness of air cleaning and purifier technologies;
- Aerosol-generating procedures (AGPs);
- Environmental cleaning and disinfection practices, products and technologies that require further study (i.e. UVGI, environmental sampling, application of products, effectiveness, adverse effects, harms and benefits);
- Use of physical barriers in health-care and community settings (i.e. Impact, design, ventilation, potential harms);
- Physical distancing and other interventions to reduce and mitigate transmission;
- Implementation science, behavioural factors and social science (e.g. human) factors to improve understanding of factors that influence application of IPC practices;
- Context of IPC practices in low-resource settings, and considerations across all settings where health care is delivered.

The COVID-19 pandemic has been at the centre of WHO's research endeavours. **The Global Research and Innovation Forum (GRIF) - COVID-19 and beyond** builds on lessons learned from COVID-19 to identify and support research priorities [234]. The

COVID-19 pandemic saw an augmented and integrated research response, which helped accelerate the testing of vaccines, treatments and diagnostics, but also underpinned public policy, regulatory and communications initiatives to tackle the spread of disease and reduce its health and social harms.

For IPC, research areas identified include:

- Understanding risk factors in exposures to SARS-CoV-2 and other pathogens in the health-care work environment;
- Rethinking existing IPC medical devices and equipment based on key enabling technologies;
- Defining pragmatic protocols for guiding local implementers in executing safe and effective IPC practices;
- Working with laboratory experts to bridge knowledge gaps on how to deactivate novel pathogens;
- Establishing research and innovation (RI) priorities that should be brought to the attention of the international community.

The COVID-19 pandemic highlighted the critical role of IPC for protection and control in the context of public health emergencies due to novel high-threat pathogens of epidemiologic concern. The identification of research gaps is useful in planning and conducting future studies in areas relevant to COVID-19 and other ARIs; in the evaluation of IPC interventions and outcomes to reduce the transmission of infections in health-care settings; and in the implementation of mitigation measures in the community.

## 6.2 Annex 2. Evidence tables for mask use in the community

This section contains a table highlighting the application of GRADE to the available literature reviewed for mask use in community settings.

**Table 2.1** GRADE table for assessment of mask use versus no mask use in the community setting

Outcome	SARS-CoV-2 infection
Number and type of studies	2 RCTs [137][138] and 10 observational studies [139][140][141][142][143][144][145][146][147][148].
Study limitations	Serious
Consistency	No serious inconsistency
Precision	No serious imprecisions*
Directness	Direct
Strength of evidence	Low-to-moderate
Main findings	<p>2 RCTs: adjusted prevalence ratio 0.90 (95% CI 0.82 to 0.995) for symptomatic SARS-CoV-2 seroprevalence and OR 0.82 (95% CI 0.52 to 1.23) for SARS-CoV-2 infection;</p> <p>10 observational studies: OR/HR/RR estimates ranged from 0.04 to 0.86 in 8 studies [139][140][141][142][143][144][145][146][147][148];</p> <p>One additional study of health workers reported an imprecise estimate for mask use outside work (yes vs no; OR 2.35; 95% CI 0.67 to 8.25) [147] and one study found mask use in a household with an index case of SARS-CoV-2 infection associated with a decreased risk of secondary infection of family members (all family members using masks all the time vs no family members [OR 0.20; 95% CI 0.07 to 0.60])[148].</p>

RCT, randomized controlled trial; OR, odds ratio; HR, hazard ratio; RR, relative risk; CI, confidence interval.

\*The RCTs had methodological limitations, including open-label design, attrition, incomplete outcome assessment, variable adherence and differential recruitment. The RCTs were consistent and were not downgraded for imprecision (due to the very large total sample size [greatly exceeding any optimum information size threshold] with a precise estimate from one of the trials). One trial evaluated a

mask recommendation directly; although the other evaluated a mask promotion intervention and did not evaluate mask use or a mask recommendation directly, this resulted in suboptimal uptake of mask use and would underestimate the effects of mask use. Therefore, the RCTs were not downgraded for indirectness.

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### 6.3 Annex 3. Evidence tables for mask use by children

This section contains two tables highlighting the application of GRADE to available literature reviewed for mask use by children.

**Table 3.1.** GRADE table for assessment of masks versus no mask use in community settings

<b>Outcome</b>	SARS-CoV-2 infection
<b>Number and type of studies</b>	2 RCT and 3 observational studies [140][147][148][137][138]
<b>Consistently</b>	Moderate
<b>Precision</b>	Some imprecision*
<b>Directness</b>	Some indirectness*
<b>Strength of evidence</b>	Low-to-moderate
<b>Main findings</b>	<p>RCT1 (cluster): Mask promotion intervention associated with increased mask use and decreased risk of symptomatic SARS-CoV-2 seroprevalence; adjusted prevalence ratio of 0.91, 95% CI 0.82 to 1.00 [137].</p> <p>RCT 2: OR 0.82, 95% CI 0.52 to 1.23 [138]</p> <p>Two observational studies reported inconsistent and imprecise estimates for mask use vs no mask use in community settings outside the home [147][148]. One observational study found mask use by all members of a household or prior to index case illness onset associated with decreased risk of secondary infection vs no mask use [140].</p>

*Note: All studies were conducted in settings without widespread Delta variant. Also, ecological studies were not included in this table but they consistently found that policies requiring masks were associated with decreased risk of SARS-CoV-2 infection.*

\*Of two RCTs, one reported an imprecise estimate while the other evaluated an indirect intervention (mask promotion).

**Table 3.2** GRADE assessment of observational and ecological studies on mask effectiveness

	<b>Adult Studies</b>	<b>Ecological Studies</b>	<b>Influenza Studies</b>
<b>Outcome</b>	SAR-CoV-2 infection	SARS-CoV-2 infection	SARS-CoV-2 infection
<b>Number of studies</b>	2 RCTs and 3 observational studies [140][147][148][137][138]	13 [208][209][210][211][212][213][214][215][216][217][223][225][226].	1 RCT [167] and 1 observational study [170].
<b>Risk of bias</b>	Moderate	High <sup>2</sup>	Moderate

<b>Consistency</b>	Consistent	Consistent	Consistent
<b>Precision</b>	Some imprecision	Some imprecision	Some imprecision <sup>4</sup>
<b>Directness</b>	Serious indirectness <sup>1</sup>	Serious indirectness <sup>3</sup>	Serious indirectness <sup>5</sup>
<b>Strength of evidence</b>	Low	Very low	Very Low

1 Different population, adult evidence strength rated as moderate. Rated down 1 for children.

2 Studies did not control for the effect of concurrent interventions.

3 Different interventions. Studies did not assess actual mask-wearing or adherence to the intervention.

4 RCT outcomes had wide confidence intervals (0.31 - 0.087).

5 Different outcomes were measured. Different population. RCT was a cluster household trial including adults and children. Differences in the intervention: RCT randomized households to face masks plus "enhanced hand hygiene" (educational materials provided).

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## 6.4 Annex 4. Systematic review for prevention, identification, management of COVID-19 in health and care workers

### PICO Questions

The PICO questions included in this systematic review were:

1. *Should health and care workers be tested following a high-risk exposure to SARS-CoV-2?*
2. *Should routine testing of asymptomatic health and care workers for COVID-19 surveillance be conducted?*
3. *Should health and care workers who have had a positive test or have indication of active SARS-CoV-2 infection be excluded from work (isolate in designated setting) versus continue to work?*
4. *What should be the duration of exclusion from work/isolation for health and care workers (infectious period)?*

<b>Q1. Should health workers be tested following a high-risk exposure to SARS-CoV-2?</b>	
<b>Setting</b>	Health-care facilities
<b>Background interventions</b>	Defining high-risk exposures (breaches in PPE, inappropriate PPE) Review evidence to determine if testing is still needed
<b>Population</b>	Health workers
<b>Intervention</b>	Continue with normal duties (no testing) or proceed to quarantine
<b>Comparator(s)</b>	Not being tested and continuing to provide care <ul style="list-style-type: none"> <li>• NB To compare groups, there would need to be some metric reported of positive testing, either detected by the testing intervention protocol, or health workers calling in sick, or reporting a positive home test.</li> </ul>

<b>Outcome</b>	<p>Infection with SARS-CoV-2 following an exposure</p> <ul style="list-style-type: none"> <li>Suggest reporting findings in the manner of Blazeby et al. 2021 <a href="https://www.comet-initiative.org/Studies/Details/1594">https://www.comet-initiative.org/Studies/Details/1594</a>) and possibly also including (if available) severity of disease, missed days from work/ loss of income/ staffing shortages).</li> </ul>
<b>Potential effect modifiers</b>	As above

<b>Q2. Should routine testing of asymptomatic health workers for COVID-19 surveillance be conducted?</b>	
<b>Setting</b>	Health-care facilities
<b>Background interventions</b>	Standard of care
<b>Population</b>	Health workers
<b>Intervention</b>	Periodic testing of health workers (at what intervals, and in what type of transmission scenario (community, or sporadic, low case risk?)
<b>Comparator(s)</b>	Testing according to need when a known exposure occurs, or when symptomatic
<b>Outcome</b>	Percentage of study population testing positive by PCR compared to the percentage with self-reported infection
<b>Potential effect modifiers</b>	As above

<b>Q3. Should health workers who have had a positive test or have indication of SARS-CoV-2 infection be excluded from work (isolate in designated setting) versus continue to work?</b>	
<b>Sub-question: what should be the duration of exclusion from work/isolation for health workers (infectious period)?</b>	
<b>Setting</b>	Health-care facilities
<b>Background interventions</b>	Current standard of care
<b>Population</b>	Health workers
<b>Intervention</b>	Excused from work (for X days)
<b>Comparator(s)</b>	Continue with normal duties (no work exclusion)
<b>Outcome</b>	Reduction in secondary transmission from infected health workers in specific facilities
<b>Potential effect modifiers</b>	As above

<b>Q4. What should be the duration of exclusion from work/isolation for health workers (infectious period)?</b>	
<b>Sub question: symptomatic versus asymptomatic (different types of symptoms reporting and testing to be considered)?</b>	

<b>Sub question: test versus no test?</b>	
<b>Setting</b>	Health-care facilities
<b>Background interventions</b>	Standards of care
<b>Population</b>	Health workers
<b>Intervention</b>	Returning to work after SARS-CoV-2 infection recovery
<b>Comparator(s)</b>	10+3 days is current guidance
<b>Outcome</b>	Infectious period of SARS-CoV-2 (we can draw from literature, which was included in the evidence for the contact-tracing guidance update)
<b>Potential effect modifiers</b>	As above

## Search terms

"health personnel"~3 OR "healthcare personnel"~3 OR "health provider"~3 OR "health providers"~3 OR "healthcare provider"~3 OR "healthcare providers"~3 OR "health worker"~3 OR "health workers"~3 OR "healthcare worker"~3 OR "healthcare workers"~3 OR "health professional"~3 OR "health professionals"~3 OR "healthcare professional"~3 OR "healthcare professionals"~3 OR "healthcare staff" OR "health care staff" OR "healthcare staffs" OR "health care staffs" OR "health workforce"~3 OR "healthcare assistant" OR "healthcare assistants" OR "health assistant"~3 OR "health assistants"~3 OR "Community Health Aides" OR "Community Health Aide" OR "Family Planning Personnel" OR "Village Health Workers" OR "Village Health Worker" OR "Barefoot Doctors" OR "Barefoot Doctor" OR "Family Planning Personnel" OR "Dental Auxiliary" OR "Dental Receptionist" OR "Dental Receptionists" OR "Dental hygienist" OR "Dental hygienists" OR "Emergency Medicine Technicians" OR "Emergency Medicine Technician" OR Paramedic\* OR "Emergency Medical Technician" OR "Emergency Medical Technicians" OR "Home Health Aide" OR "Home Health Aides" OR "Home Care Aides" OR "Home Care Aide" OR "care home staff"~3 OR nurse\* OR "advanced practice provider" OR "advanced practice providers" OR "Nursing Assistant" OR "Nurses' Aides" OR "Nurse's Aides" OR "Nurses Aides" OR "Nurses' Aide" OR "Nursing Auxiliaries" OR "Nursing Auxiliary" OR "Nurse Aide" OR "Nurse Aides" OR "Operating Room Technician" OR "Operating Room Technicians" OR "surgical technician" OR "Surgical technicians" OR "Scrub technicians" OR "Scrub Technician" OR "Surgical staff" OR "Surgical staffs" OR "Pharmacy Technician" OR "Pharmacists' Aides" OR "Pharmacist Aides" OR "Pharmacist's Aides" OR "Pharmacists Aides" OR "Pharmacists' Aide" OR "Physical Therapist Assistant" OR "Physical Therapy Assistants" OR "Physical Therapy Assistant" OR "Doctor's Assistant" OR "Doctor Assistant" OR "Doctors Assistant" OR "Physicians' Extender" OR "Physician Extender" OR "Physician's Extender" OR "Physicians Extender" OR "Physicians' Extenders" OR "Physician Extenders" OR "Physician's Extenders" OR "Doctor's Assistants" OR "Doctor Assistants" OR "Physicians' Assistants" OR "Physician's Assistants" OR "Physicians Assistants" OR "Physicians' Assistant" OR "Physician Assistant" OR Feldsher\* OR Anesthesiologist\* OR anesthetist\* OR "Anaesthesiology assistant" OR perfusionist\* OR Caregiver\* OR Carer\* OR "Care Givers" OR "Care Giver" OR "Case Manager" OR "Case Managers" OR "Care Manager" OR "Care Managers" OR Coroner\* OR "Medical Examiner" OR "Medical Examiners" OR "mortuary staff" OR mortition\* OR "autopsy technician" OR "autopsy technicians" OR "Dental Staff" OR "Dental staffs" OR "dental practitioner" OR "dental practitioners" OR Dentist\* OR \*dontist\* OR "Dentofacial Orthopedists" OR "Dentofacial Orthopedist" OR Doula\* OR "Labor Coaches" OR "Labor Coach" OR "Labour Coach" OR "Labour Coaches" OR Midwife OR Midwives OR "Maternity staff" OR "Maternity Staffs" OR "Emergency Medical Dispatchers" OR "911 Dispatcher" OR "911 Dispatchers" OR "9-1-1 Dispatcher" OR "9 1 1 Dispatcher" OR "9-1-1 Dispatchers" OR "Emergency dispatcher" OR "Emergency dispatchers" OR Epidemiologist\* OR "Dental Faculty" OR "Dental Faculties" OR "Medical Faculties" OR "Medical Faculty" OR "Nursing Faculties" OR "Nursing Faculty" OR "Health Educator" OR "Health Educators" OR "Health Facility Administrator" OR "Health Facility Administrators" OR "Hospital Administrator" OR "Hospital Administrators" OR "Infection Control Practitioner"~3 OR "Infection Control Practitioners"~3 OR "infection prevention staff"~3 OR "infection prevention staffs"~3 OR "Laboratory Personnels" OR "Laboratory Personnel" OR "Laboratory Scientists" OR "Laboratory Scientist" OR "Medical Technologists" OR "Medical Technologist" OR "Laboratory Technicians" OR "Laboratory Technician" OR "Laboratory Assistants" OR "Laboratory Assistant" OR microbiologist\* OR "Medical Staff" OR "Medical Staffs" OR "medical personnel" OR "medical practitioner" OR "Medical practitioners" OR Physician\* OR "Hospital Registrar" OR "Hospital Registrars" OR "hospital staff" OR "hospital staffs" OR "hospital Personnel" OR nurse\* OR "nursing personnel" OR "Patient tehnician"~3 OR "Emergency room Technician" OR "Emergency department technician" OR "Health Visitors" OR "Health Visitor" OR "nursing staff" OR "nursing staffs" OR "Occupational Therapist" OR "Occupational Therapists" OR Pathologist\* OR Optometrist\* OR "Hospital Administrator" OR "Hospital Administrators" OR "Hospital Volunteer" OR "Hospital Volunteers" OR pharmacist\* OR "Physical Therapist" OR "Physical Therapists" OR Physiotherapist\* OR physician\* OR doctor\* OR Allergist\* OR immunologist\* OR

Anesthesiologist\* OR Cardiologist\* OR Dermatologist\* OR Endocrinologist\* OR "Medical Graduate" OR "Medical Graduates" OR "Medical resident" OR "Medical residents" "Medical students" OR "medical student" OR "Gastroenterologist" OR "Hepatologists" OR "Hepatologist" OR "General Practitioner" OR "General Practitioners" OR "Medical Practioner"~2 OR "Medical Practioners"~2 OR "Geriatrician" OR "Gerontologists" OR "Gerontologist" OR \*Gynecologist\* OR Obstetrician\* OR \*Gynaecologist\* OR Hospitalist\* OR internisit OR internist OR internists OR Intensivist\* OR Nephrologist\* OR Neurologist\* OR Haematologist\* OR hematologist\* OR Oncologist\* OR Ophthalmologist\* OR Optometrist\* OR Osteopath\* OR Otolaryngologist\* OR Otologist\* Or rhinologist\* "ENT specialist" OR Pathologist\* OR "Pathology assistant" OR "Pathology Assistant" OR Pediatrician\* OR Neonatologist\* OR Physiatrist\* OR Podiatrist\* OR Toxicologist\* OR Pulmonologist\* OR Radiologist\* OR Rheumatologist\* OR \*Surgeon\* OR Orthopedist\* OR exodontist\* OR Urologist\* OR Psychotherapist\* OR psychologist\* OR \*Therapist\* OR "Social workers" OR "Social Workers" OR healer\* OR "practitioners medicine"~3 OR "Respiratory technician" OR Radiographer\* OR "radiology technician" OR "MRI technician" OR sonographer\*

## Search output using health worker terms

#	Search	Results (review filter)	MESH	results(all)
1	"health personnel"~3 OR "healthcare personnel"~3 OR "health provider"~3 OR "health providers"~3 OR "healthcare provider"~3 OR "healthcare providers"~3 OR "health worker"~3 OR "health workers"~3 OR "healthcare worker"~3 OR "healthcare workers"~3 OR "health professional"~3 OR "health professionals"~3 OR "healthcare professional"~3 OR "healthcare professionals"~3 OR "healthcare staff" OR "health care staff" OR "healthcare staffs" OR "health care staffs" OR "health workforce"~3	2107	<b>Health Personnel</b>	<b>30 865</b>
2	"healthcare assistant" OR "healthcare assistants" OR "health assistant"~3 OR "health assistants"~3 OR paramedic*	55	<b>Allied health professional</b>	1751
4	"Community Health Aides" OR "Community Health Aide" OR "Family Planning Personnel" OR "Village Health Workers" OR "Village Health Worker" OR "Barefoot Doctors" OR "Barefoot Doctor" OR "Family Planning Personnel"	7	Community Health Workers	
5	"Dental Auxiliary" OR "Dental Receptionist" OR "Dental Receptionists" OR "Dental hygienist" OR "Dental hygienists"	0	Dental Auxiliaries	11

6	"Emergency Medicine Technicians" OR "Emergency Medicine Technician" OR Paramedic* OR "Emergency Medical Technician" OR "Emergency Medical Technicians"	1	Emergency Medical Technicians	29
7	"Home Health Aide" OR "Home Health Aides" OR "Home Care Aides" OR "Home Care Aide" OR "care home staff"~3	0	Home Health Aides	25
8	nurse* OR "advanced practice provider" OR "advanced practice providers"	513	Licensed Practical Nurses	11 176
9	"Nursing Assistant" OR "Nurses' Aides" OR "Nurse's Aides" OR "Nurses Aides" OR "Nurses' Aide" OR "Nursing Auxiliaries" OR "Nursing Auxiliary" OR "Nurse Aide" OR "Nurse Aides"	2	Nursing Assistants	
10	"Operating Room Technician" OR "Operating Room Technicians" OR "surgical technician" OR "Surgical technicians" OR "Scrub technicians" OR "Scrub Technician" OR "Surgical staff" OR "Surgical staffs"	0	Operating Room Technicians	
11	"Pharmacy Technician" OR "Pharmacists' Aides" OR "Pharmacist Aides" OR "Pharmacist's Aides" OR "Pharmacists Aides" OR "Pharmacists' Aide"	1	Pharmacy Technicians	
12	"Physical Therapist Assistant" OR "Physical Therapy Assistants" OR "Physical Therapy Assistant"	0	Physical Therapist Assistants	
13	"Doctor's Assistant" OR "Doctor Assistant" OR "Doctors Assistant" OR "Physicians' Extender" OR "Physician Extender" OR "Physician's Extender" OR "Physicians Extender" OR "Physicians' Extenders" OR "Physician Extenders" OR "Physician's Extenders" OR "Doctor's Assistants" OR "Doctor Assistants" OR "Physicians' Assistants" OR "Physician's Assistants" OR "Physicians Assistants" OR "Physicians' Assistant" OR "Physician Assistant" OR Feldsher*	3	Physician Assistants	
14	Anesthesiologist* OR anesthetist* OR "Anaesthesiology assistant" OR perfusionist*	41	<b>Anaesthetists</b>	

17	Caregiver* OR Carer* OR "Care Givers" OR "Care Giver"	306	<b>Caregivers</b>	5204
18	"Case Manager" OR "Case Managers" OR "Care Manager" OR "Care Managers"	1	<b>Case Managers</b>	
19	Coroner* OR "Medical Examiner" OR "Medical Examiners" OR "mortuary staff" OR mortition* OR "autopsy technician" OR "autopsy technicians"	0	<b>Coroners and Medical Examiners</b>	
20	"Dental Staff" OR "Dental staffs" OR "dental practitioner" OR "dental practitioners"	16	<b>Dental Staff</b>	
21	Dentist* OR *dontist*	225	<b>Dentists</b>	
23	"Dentofacial Orthopedists" OR "Dentofacial Orthopedist"	1	Orthodontists	
24	Doula* OR "Labor Coaches" OR "Labor Coach" OR "Labour Coach" OR "Labour Coaches" OR Midwife OR Midwives OR "Maternity staff" OR "Maternity Staffs"	0	<b>Doulas</b>	
25	"Emergency Medical Dispatchers" OR "911 Dispatcher" OR "911 Dispatchers" OR "9-1-1 Dispatcher" OR "9 1 1 Dispatcher" OR "9-1-1 Dispatchers" OR "Emergency dispatcher" OR "Emergency dispatchers"	0	<b>Emergency Medical Dispatcher</b>	
26	Epidemiologist*	31	<b>Epidemiologists</b>	
27	"Dental Faculty" OR "Dental Faculties"	0	<b>Faculty, Dental</b>	
28	"Medical Faculties" OR "Medical Faculty"	5	<b>Faculty, Medical</b>	
29	"Nursing Faculties" OR "Nursing Faculty"		<b>Faculty, Nursing</b>	
30	"Health Educator" OR "Health Educators"		<b>Health Educators</b>	
31	"Health Facility Administrator" OR "Health Facility Administrators"	1	<b>Health Facility Administrators</b>	
32	"Hospital Administrator" OR "Hospital Administrators"	2	Hospital Administrators +	
33	"Infection Control Practitioner"~3 OR "Infection Control Practitioners"~3 OR "infection prevention staff"~3 OR "infection prevention staffs"~3	3	<b>Infection Control Practitioners</b>	45
35	"Laboratory Personnels" OR "Laboratory Personnel" OR "Laboratory Scientists" OR "Laboratory Scientist" OR "Medical Technologists" OR "Medical Technologist" OR "Laboratory Technicians" OR "Laboratory		<b>Medical Laboratory Personnel</b>	

	Technician" OR "Laboratory Assistants" OR "Laboratory Assistant" OR microbiologist*			
36	"Medical Staff" OR "Medical Staffs" OR "medical personnel" OR "medical practitioner" OR "Medical practitioners"	210	<b>Medical Staff</b>	<b>3828</b>
37	Physician* OR "Hospital Registrar" OR "Hospital Registrars" OR "hospital staff" OR "hospital staffs" OR "hospital Personnel"	691	Medical Staff, Hospital +; Personnel, Hospital	<b>14 555</b>
38	nurse* OR "nursing personnel" OR "Patient technician"~3 OR "Emergency room Technician" OR "Emergency department technician"	486	<b>Nurses</b>	
42	"Health Visitors" OR "Health Visitor"	0	Nurses, Community Health	
46	"nursing staff" OR "nursing staffs"	43	Nursing Staff	
49	"Occupational Therapist" OR "Occupational Therapists" OR Pathologist*	7	<b>Occupational Therapists</b>	
50	Optometrist*	0	<b>Optometrists</b>	
53	"Hospital Administrator" OR "Hospital Administrators"	2	Hospital Administrators +	
54	"Hospital Volunteer" OR "Hospital Volunteers"	0	Hospital Volunteers	
56	pharmacist*	73	Nursing Staff, Hospital	
58	"Physical Therapist" OR "Physical Therapists" OR Physiotherapist*	34	<b>Physical Therapists</b>	
60	physician* OR doctor*	903	<b>Physicians</b>	20 354
61	Allergist* OR immunologist*	11	Allergists	
62	Anesthesiologist*	33	Anesthesiologists	
63	Cardiologist*	12	Cardiologists	
64	Dermatologist*	35	Dermatologists	
65	Endocrinologist*	4	Endocrinologists	
66	"Medical Graduate" OR "Medical Graduates" OR "Medical students" OR "medical student"	9	Foreign Medical Graduates	
67	"Gastroenterologist" OR "Hepatologists" OR "Hepatologist"	3	Gastroenterologists	
68	"General Practitioner" OR "General Practitioners" OR "Medical Practioner"~2 OR "Medical Practioners"~2	46	General Practitioners	1132
69	"Geriatrician" OR "Gerontologists" OR "Gerontologist"	3	Geriatricians	
	*Gynecologist* OR Obstetrician* OR *Gynaecologist*			
70	Hospitalist* OR internisit OR internist OR internists OR Intensivist*	4	Hospitalists	

71	Nephrologist*	13	Nephrologists	
72	Neurologist*	32	Neurologists	
	Haematologist* OR hematologist*			
74	Oncologist*	33	Oncologists +	
75	Ophthalmologist* OR Optometrist*	42	Ophthalmologists	
76	Osteopath*	5	Osteopathic Physicians	
77	Otolaryngologist* OR Otologist* Or rhinologist* "ENT specialist"	40	Otolaryngologists	
78	Pathologist* OR "Pathology assistant" OR "Pathology Assistant"	22	Pathologists	
79	Pediatrician* OR Neonatologist*	31	Pediatricians +	
80	Physiatrist* OR Podiatrist*	1	Physiatrists	
	toxicologist*			
84	Pulmonologist*	9	Pulmonologists	
85	Radiologist*	40	Radiologists +	
86	Rheumatologist*	27	Rheumatologists	
87	*Surgeon* OR Orthopedist* OR exodontist*	205	Surgeons +	
88	Urologist*	34	Urologists	
89	Psychotherapist* OR psychologist* OR *Therapist* OR "Social workers" OR "Social Workers"	5	Psychotherapists	
90	healer* OR "practitioners medicine"~3		Practitioners of Traditional Medicine	
91	"Respiratory technician"			
92	Radiographer* OR "radiology technician" OR "MRI technician" OR sonographer*		Imaging	

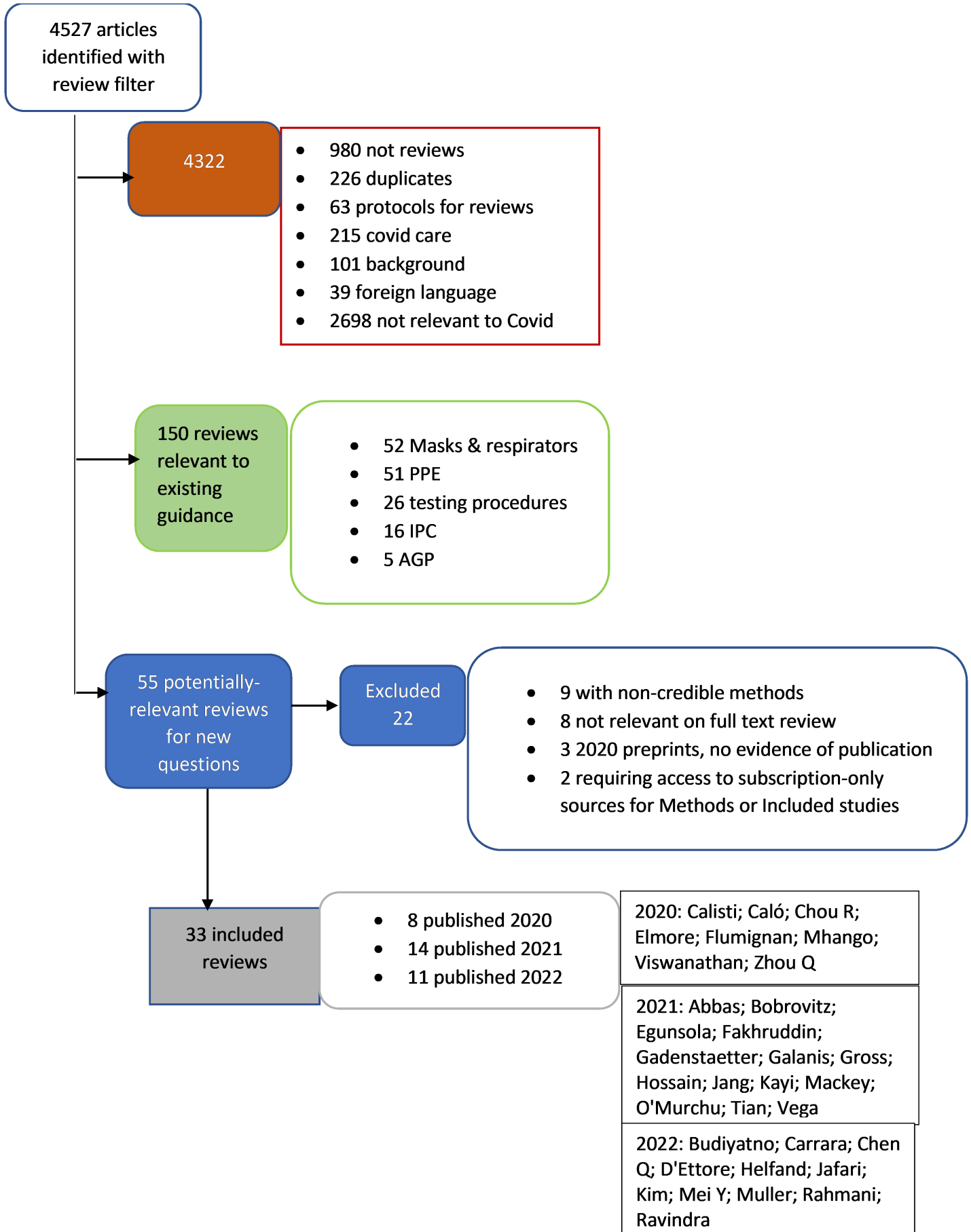
## Stratification issues relevant to synthesizing and reporting the literature for each question

Element	Stratification issues
Setting	<p>Definition/description of health-care facilities (e.g. acute care hospitals – various units such as ER, ICU, community care, primary care).</p> <p>Risk stratification of infection potential in settings.</p>
Population	<p>Health workers - suggest reporting findings in a manner similar to Nguyen et al (34).</p> <p>Include all health workers in an overview, and then report by sub-groups to account for risks within the facility.</p> <p>Health worker demographics (age, gender, health status, etc.).</p> <p>Stratification of health worker risk of infection by role, tasks and settings.</p>
Potential effect modifiers	<p>Vaccination status, health worker's health status, health worker settings and duties, health worker knowledge about risk minimization, contact "dose" (amount of time spent in close contact with potential source), dose-response risk of infection, circulation of variants of concern, availability of PPE, correct use of PPE.</p>

Implementation considerations	<ul style="list-style-type: none"><li>• COVID-19 infection risk stratification according to settings.</li><li>• COVID-19 infection risk stratification according to health worker roles/responsibilities.</li><li>• vaccination status of health workers and risk of reinfection in those who have been vaccinated versus those who have not (35).</li><li>• type of testing (PCR, rapid antigen, self-testing), sensitivity/specificity, how it is administered (by professional or self-collected), costs.</li><li>• behaviours, perspectives, availability and use of PPE.</li><li>• PPE cost, acceptability, waste disposal.</li></ul>
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## PRISMA Flowchart for included studies



## Studies characteristics

**Table 1.** Author, year, preliminary critical appraisal score, study aim

Author	Year	Aim
Abbas	2021	explore current literature in hospital-onset COVID-19 infections surveillance
Bobrovitz	2021	synthesize seroprevalence data to better estimate the level and distribution of SARS-CoV-2 infection among health workers? identify high-risk groups, and inform public health decision making
Caló	2020	critically analyse the evidence on surveillance and risk to support public health strategies that protect health workers in hospital settings
Carrara	2022	test asymptomatic individuals, including health and care workers? OR test asymptomatic health and care workers?
Chen	2022	describe COVID-19 reinfection in health and care workers?
Chou	2020	examine the burden of SARS-CoV-2 on health and care workers and risk factors for infection
D'Ettore	2022	evaluate the literature and discover what are the latest developments about the management of the occupational health surveillance of health and care workers during COVID-19 pandemic.
Egunsola	PP 2021	identify comparative observational studies and randomized controlled trials (RCTs) evaluating the efficacy and effectiveness of COVID-19 vaccination in reducing forward transmission from vaccinated people (health and care workers and the general population), and studies examining the biological plausibility of vaccination-induced transmission reduction.
Elmore	2020	generate a rapid evidence map of risk and protective factors to comprehensively inform areas that affect COVID-19 outcomes for different sub-populations to better protect the public.
Fakhruddin	2021	is SARS-CoV-2 detectable in the saliva of asymptomatic individuals?
Flumignan	2020	identify and summarize the evidence from Cochrane systematic reviews regarding measures for controlling the dissemination of COVID-19 infection.
Gadenstaedter	2021	provide an overview of nasal specimen collection methods for SARS-CoV-2 detection in various populational groups, including health workers.
Galanis	2021	determine the seroprevalence of SARS-CoV-2 antibodies among health workers and identify the factors associated with this seroprevalence.
Gross	2021	examine health risks at workplaces regarding COVID-19, and effectiveness of preventative recommendations.
Helfand	2022	synthesize evidence on protection against reinfection after SARS-CoV-2 infection in various population groups, including health workers.
Hossain	2021	determine seroprevalence of SARS-CoV-2 IgG antibodies over geographic regions among health workers.
Jafari	2021	identify evidence on IPC practices/measures adopted by hospitals.
Jang	2021	review whether national and international guidelines provide recommendations for infection prevention and control to prevent the spread of COVID-19 in hospitals.
Kayi	2021	investigate the seroprevalence of SARS-CoV-2 among health and care workers and related risk factors by including studies published in 2020, which were conducted before the unpredictable effects of highly spreading new variants appeared and vaccination programmes put in place in 2021.
Kim	2022	evaluate the diagnostic utility of self-collected saliva in coronavirus disease-19 (COVID-19) screening procedures
Mackey	2021	synthesize evidence on the prevalence, levels, and durability of the antibody response to SARS-CoV-2 infection among adults and how antibodies correlate with protective immunity.

Mei	2022	identify optimal health and care workers' monitoring mechanisms and provide practical recommendations for administrators, leaders, policy- makers.
Mhango	2020	identify risk factors for COVID-19 in health and care workers.
Muller	2022	review and appraise the evidence of SARS-CoV-2 seroprevalence and its risk factors in health and care workers in Africa to inform response and preparedness strategies during the SARS-CoV-2 pandemic.
O'Murchu	2021	evaluate the risk and relative risk of SARS-CoV-2 reinfection over time, comparing previously infected individuals to those without evidence of prior infection.
Rahmani	2022	synthesize the available evidence for the duration of SARS-CoV-2 infectivity of working-age populations
Ravindra	2022	investigate the role of asymptomatic infection and transmission reported in family clusters, adults, children and health and care workers.
Tian	2021	investigate risk factors for health and care worker infection in viral respiratory pandemics.
Vegas	2021	analyse evidence concerning the risks of occupational illnesses to which health and care workers providing care to patients infected with COVID-19 are exposed.
Viswanathan	2020	assess (1) the effectiveness of universal screening for SARS-CoV-2 infection compared with no screening and (2) the accuracy of universal screening in people who have not presented to clinical care for symptoms of COVID-19.
Zhou	2021	compares the incidence of nosocomial infections during the COVID-19, SARS and MERS epidemics and analyses the characteristics of the nosocomial infections.

**Table 2.** Description of included reviews

Author	Year	Type of paper	Category	Setting
Chen	2022	SR & MA	Antibody protection against reinfection	any health-care setting
Chou	2020	Living Rapid Review	Burden of disease	any health-care setting
Budiyatno	2022	SR	Comparative testing procedures	any health-care setting
Gadenstaetter	2021	SR	Comparative testing procedures	hospital
Kim	2022	SR & MA	Comparative testing procedures	any health-care setting
Flumignan	2020	Narrative review	Controlling disease transmission (including quarantine, PPE)	hospital
Jafari	2021	SR	Infection control procedures	any health-care setting
Jang	2021	SR & analysis of guidelines	Infection control procedures	any health-care setting
Zhou	2020	Rapid review & MA	Nosocomial infection	hospital
Elmore	2020	Rapid Evidence Map	Risk factors for disease	any health-care setting
Calisti	2020	SR	Risk factors for infection	hospital
Gross	2020	Rapid SR	Risk factors for infection	any health-care setting
Mhango	2020	rapid review	Risk factors for infection	any health-care setting
Tian	2021	SR & MA	Risk factors for infection	hospital
Vega	2021	integrative review	Risk factors for infection	any COVID-19 care setting
Helfand	2022	Living Rapid Review	Risk of reinfection	any health-care setting
O'Murchu	2021	SR	Risk of reinfection	hospitals and LTCF

Fakhruddin	2022	SR & MA	Saliva as SARS-CoV-2 source	dentists
Bobrovitz	2021	SR & MA	Seroprevalence / sero-surveillance	any health-care setting
Galanis	2021	SR & MA	Seroprevalence / sero-surveillance	hospital, primary health-care facilities
Kayi	2021	SR & MA	Seroprevalence / sero-surveillance	any health-care setting
Mackey	2021	Rapid Living Review	Seroprevalence / sero-surveillance	any health-care setting
Muller	2022	Scoping review, appraisal of existing evidence	Seroprevalence / sero-surveillance	any health-care setting (African countries)
Hossain	2021	SR & MA	Seroprevalence prior to vaccination	any health-care setting
Abbas	2021	SR	Surveillance	hospital
Calo	2020	scoping review	Surveillance	hospital
D'Ettore	2022	Narrative review	Surveillance	any health-care setting
Mei	2022	SR & MA	Surveillance	hospital
Viswanathan	2020	Rapid review	Surveillance	ED
Ravindra	2022	SR & MA	Surveillance of asymptomatic Transmission in clusters	any health-care setting
Carrara	2022	guidelines	Testing asymptomatic individuals	any health-care setting
Egunsola	2021 PP	Rapid Literature Review update #1	Vaccination in reducing risk	hospital
Rahmani	2022	SR & MA	Viral shedding and infectivity in workers	any health-care setting

Published 10 August 2023

## 6.5 Annex 5: Results of rapid qualitative evidence synthesis

### Summary of qualitative evidence synthesis (QES) findings - PPE/Masks (Health and care workers)

Analytical themes	Descriptive themes (review findings)
Health and care workers valued the use of masks and PPE in patient care	PPE gave peace of mind
	Masks create a safety climate to deliver optimal care
Masks and PPE cause physical discomfort to health and care workers	Health and care workers experience physical discomfort wearing masks and PPE
Masks and PPE challenge effective communication	Masks and PPE compromise communication with colleagues
	Masks and PPE affect communication and relationship with patients
	Learning to communicate effectively with patients while wearing a mask
Familiarity with masks and PPE helped health and care workers adapt for COVID-19	Already familiar with PPE pre-pandemic (varies)
	Progressive adaptation over time occurs with masks (varies)
Health and care workers in care homes experienced unequal access to PPE	Inequality in access to PPE
Individual health and care worker factors affecting PPE use	Putting on PPE takes time and affects ability to carry out clinical procedures
	PPE design and fit influence risk of contamination

	Questions about the effectiveness of PPE
Health-system factors that prevented PPE use	Availability and supply of PPE (varies)
	Gap between guidelines and protocols and implementation of PPE
Facility-level factors that affected PPE use	Institutional support and role modelling helped PPE use (varies)
	Layout of health facility affected PPE use
Health and care workers were anxious about being put at risk	Anxiety and insecurity about the level of protection
	Perception of susceptibility and risk
Health and care workers responded creatively to the lack of masks/PPE	Re-using, rationing, and improvising with PPE/masks
	Procurement and quality control of masks

### Summary of QES findings – Cleaning and Disinfection

Analytical themes	Descriptive themes (review findings)
Cleaning is a cornerstone of patient care	Importance of cleaning recognized
Organizational culture affects cleaning practices	Cleaning practices are undervalued (by management)
Individual judgement influences uptake	Differential disinfection practices in risk areas of facility
Historic standards, norms and practices influence uptake	COVID exposed/ poor cleaning practices and standards
Pivoting practice quickly as guidance changed	Lack of clear guidance/changing guidance
Resource considerations for cleaning uptake	Resources required for disinfecting and cleaning
No studies reported on equity and cleaning/disinfecting	

### Summary of QES findings – Physical distance (Health and care workers)

Analytical themes	Descriptive themes (review findings)
Beliefs and cultural norms compete with the logic of physical distancing	Changing perception of susceptibility and risk
	Community distrust of health professionals and disbelief in COVID-19
	People value cultural norms and beliefs that preclude physical distancing
	Security is a greater priority than physical distancing
Solidarity in not physically distancing	Peer and social pressure to comply (or not) with physical distancing (varies)
	Difficulty complying with physical distancing among friends and family
Physical distancing is a barrier to relational patient care	Physical distancing affects relationships with patients
Difficult to challenge those higher up in the hierarchy	Workplace hierarchy influences social distancing
Physical infrastructure prevents physical distancing	Health-facility infrastructure prevents physical distancing
	Infrastructure in IDP camps/informal settlements influences physical distancing
Service delivery presents barriers to distancing	Clinical workflows require health and care workers to gather in proximity
Social and political factors and physical distancing	Social space supports or discourages physical distancing
	Confusing and contradictory messaging from government/regulatory agencies
No studies reported on costs or resource requirements for physical distancing	

Published 09 October 2023

## 6.6 Annex 6: Search Strategies

### 6.6.1 Airborne Precautions

#### Outcome terms

Exp Virus Diseases/ Exp Respiratory Tract Infections/ "respiratory infection\*".ti,ab. "respiratory virus\*".ti,ab. "respiratory tract infections".ti,ab. Exp Pneumonia/ Exp COVID-19/ Exp SARS-CoV-2/ Exp Coronavirus/ Coronavirus\*.ti,ab. "Coronavirus infection".ti,ab. 2019-nCoV.ti,ab. 2019 nCoV.ti,ab. nCov.ti,ab. Covid19.ti,ab. SARSCoV-2.ti,ab. "novel coronavirus".ti,ab. "novel corona virus".ti,ab. covid\*.ti,ab. "severe acute respiratory syndrome".ti,ab. "coronavirus 2".ti,ab. "coronavirus disease".ti,ab. "corona virus disease".ti,ab. "new coronavirus".ti,ab. "new corona virus".ti,ab. "new coronaviruses".ti,ab. "novel coronaviruses".ti,ab. Sars.ti,ab. "sars corona virus".ti,ab. "respiratory infectious disease\*".ti,ab. "acute respiratory disease\*".ti,ab. "influenza like illness".ti,ab. Exp Pandemics/ Pandemic\*.ti,ab. "respiratory disease".ti,ab.

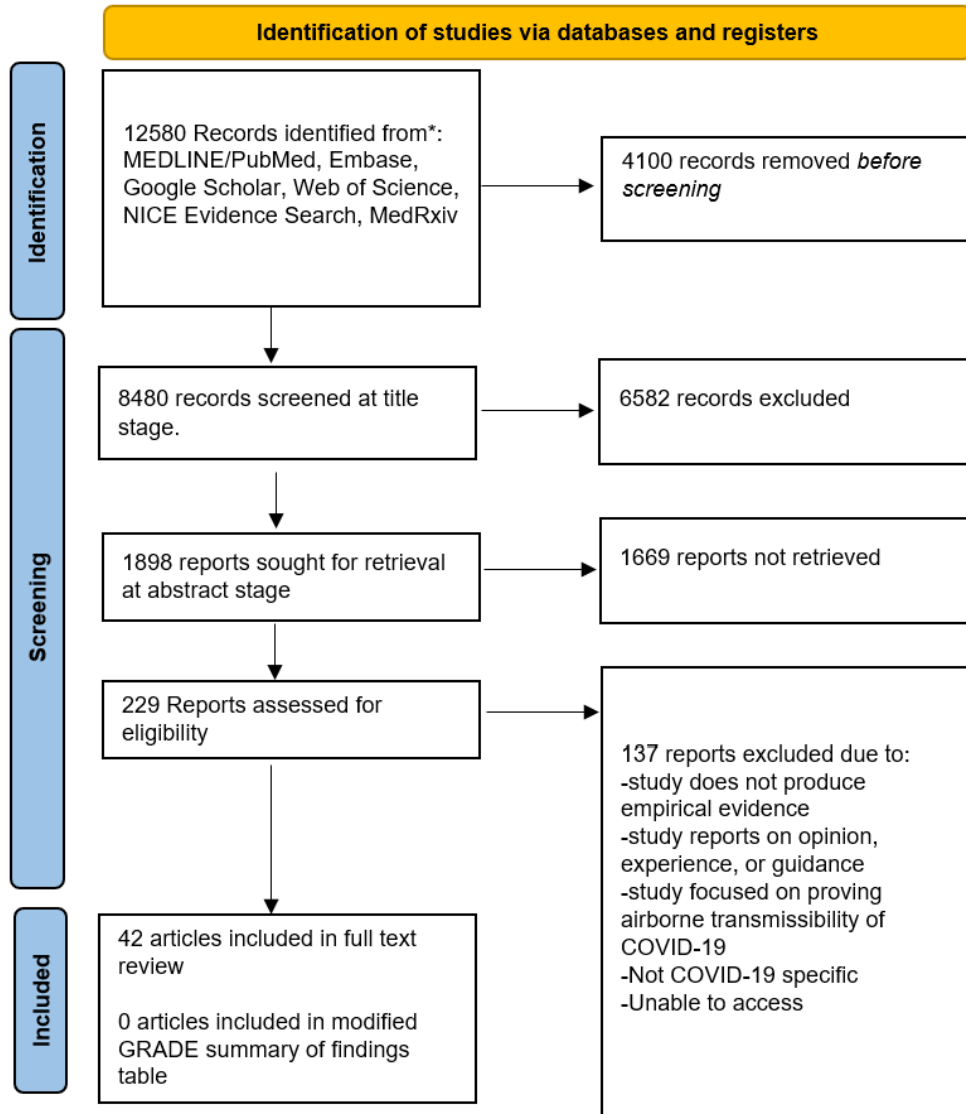
#### Intervention terms

("aerosols"[All Fields] OR "aerosolic"[All Fields] OR "aerosolization"[All Fields] OR "aerosolizations"[All Fields] OR "aerosolize"[All Fields] OR "aerosolized"[All Fields] OR "aerosolizer"[All Fields] OR "aerosolizes"[All Fields] OR "aerosolizing"[All Fields] OR "aerosols"[MeSH Terms] OR "aerosols"[All Fields] OR "aerosol"[All Fields]) OR (("airborn"[All Fields] OR "airborne"[All Fields]) AND ("precaution"[All Fields] OR "precautions"[All Fields])) AND (y\_1[Filter])

### 6.6.2 Cleaning in the community

#### Search terms

1.	exp Health facilities/ or exp hospitals/ or exp Nursing Homes/ or Homes for the Aged/ or assisted living facilities/
2.	exp Health Personnel/ or exp Health Occupations/
3.	((medical or health or healthcare) adj3 (facility or facilities or centre* or center* or office* or setting*)).ti,ab,kf.
4.	((medical or health care or healthcare) adj (worker* or staff or employee* or personnel or occupation*)).ti,ab,kf.
5.	(hospital* or ward* or physician* or doctor* or surgeon* or surgical or surger* or dentist* or dental or nurs* or infirmar* or hospice* or Clinic or Clinics or "Old Age Homes" or "Old Age Home").ti,ab,kf.
6.	((longterm care or long term care) adj3 (home* or facility or facilities or residence* or housing* or setting*)).ti,ab,kf.
7.	Pharmacies/ not Health facilities/
8.	(Caregivers/ or Pharmacists/) not (Health Personnel/ or Health Occupations/)
9.	or/1-6
10.	or/7-8
11.	9 not 10
12.	Disinfection/ or exp Disinfectants/ or exp Detergents/ or Fumigation/ or Decontamination/
13.	exp chlorine compounds/ or hypochlorous acid/ or sodium hypochlorite/
14.	Quaternary Ammonium Compounds/ or Bleaching Agents/ or Hydrogen Peroxide/
15.	exp ethanol/ or exp ethanolamines/ or 2-Propanol/
16.	methylene blue/
17.	((sanitation or sanitary or housekeep* or janitor*) adj3 (worker* or staff or employee* or personnel or occupation* or team* or department*)).ti,ab,kf.
18.	(brush or brushing or clean* or disinfect* or decontaminat* or fogging or fog or fogger* or fumigat* or mist or misting or sanitis* or sanitiz* or scrub or scrubbing or spray* or wipe or wiping).ti,ab,kf.
19.	(detergent* or soap* or methylene blue or ethanol or bleach* or chlorin* or hypochlorit* or hydrogen peroxide or



	glutaraldehyde or formaldehyde or aldehyde or dihydrogen dioxide or hydrogen dioxide or hydroperoxide or quaternary ammonium or quaternary bisammonium or quaternized amine or hypochlorous acid).ti,ab,kf.
20.	(antiseptic* or iodine or ethanolamin* or isopropanol or isopropyl or propanol or 2propanol).ti,ab,kf.
21.	or/12-20
22.	(cisplatin/ or exp Hydrochloric acid/) not (chlorine compounds/ or hypochlorous acid/ or sodium hypochlorite/)
23.	21 not 22
24.	(hand wash* or hand hygiene or hand sanitisation or hand sanitization or hand disinfection or hand decontamination or skin disinfection or skin decontamination or skin wash* or skin hygiene or skin sanitisation or skin sanitization or hands or eczema* or mouth or oral* or nose or handwash* or skinwash* or mouthwash* or nosewash* or nasal* or topical* or ultraviolet or ultra violet or UV or UVC or UVGI or actinic).ti.
25.	((PPE or "personal protective equipment" or mask* or facemask* or respirator or respirators or N95 or N99 or KN95 or FFP2 or FFP3 or "Filtering face piece" or "Filtering face pieces" or "Filtering facepiece" or "Filtering facepieces" or "respiratory protective device" or "respiratory protective devices") adj2 (disinfect* or decontaminat* or sanitiz* or sanitis* or clean* or wash*)).ti.
26.	((PPE or "personal protective equipment" or mask* or facemask* or respirator or respirators or N95 or N99 or KN95 or FFP2 or FFP3 or "Filtering face piece" or "Filtering face pieces" or "Filtering facepiece" or "Filtering facepieces" or "respiratory protective device" or "respiratory protective devices") not (surface* or touch* or high touch or high traffic or

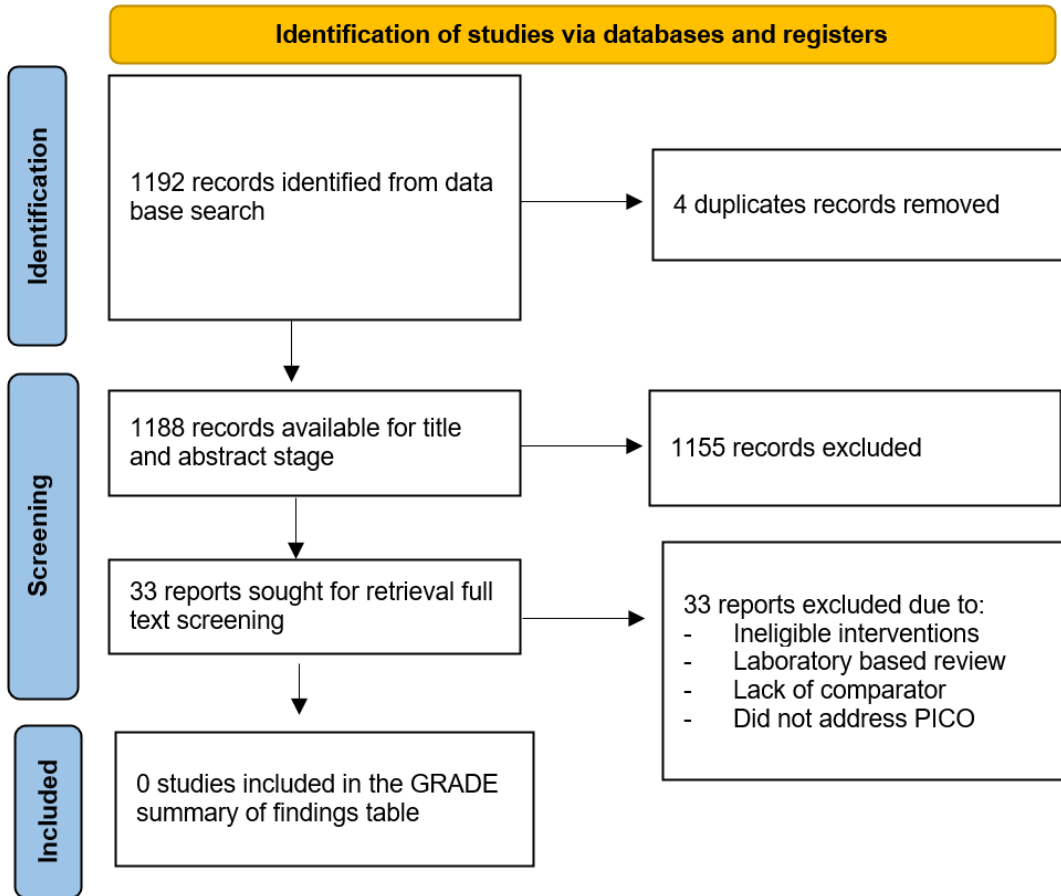
	environment* or material* or object or objects or building* or floor* or counter* or bed or beds or equipment* or room or rooms or space* or door* or chair* or wheelchair* or washroom* or bathroom* or elevator* or toilet* or contact time* or wood* or plastic* or metal* or fog* or fumigat* or mist or misting or spray*)).ti.
27.	24 or 25 or 26
28.	23 not 27
29.	limit 28 to covid-19
30.	11 and 29
31.	limit 30 to (meta analysis or "systematic review")
32.	randomized controlled trial.pt.
33.	controlled clinical trial.pt.
34.	randomized.ab.
35.	placebo.ab.
36.	randomly.ab.
37.	trial.ab.
38.	groups.ab.
39.	or/32-38
40.	exp animals/ not humans.sh.
41.	39 not 40 [adapted from the Cochrane HSSS RCT filter]
42.	30 and 41
43.	exp cohort studies/ or exp epidemiologic studies/ or exp clinical trial/ or exp evaluation studies as topic/ or exp statistics as topic/
44.	((time and factors) or program or survey* or ci or cohort or comparative stud* or evaluation studies or follow-up*).mp.
45.	(control and (group* or study)).mp.
46.	or/43-45
47.	(animals/ not humans/) or comment/ or editorial/ or exp review/ or meta analysis/ or consensus/ or exp guideline/
48.	hi.fs. or case report.mp.
49.	or/47-48
50.	46 not 49 [NRS filter by Waffenschmidt et al. 2020]
51.	30 and 50
52.	31 or 42 or 51
53.	exp Animals/ not Humans/
54.	52 not 53
55.	(comment or editorial or newspaper article).pt.
56.	54 not 55
57.	((sanitation or sanitary or housekeep* or janitor*) adj (worker* or staff or employee* or personnel or occupation* or team* or department*)).ti,ab,kw.
58.	(clean* or disinfect* or decontaminat* or sanitis* or sanitiz*).ti,ab,kw.
59.	(mist or misting or scrub or scrubbing or spray* or wipe or wiping).ti,ab. not scrub typhus.mp.
60.	(brush or brushing or fogging or fogger* or fumigat*).ti,ab.
61.	(detergent* or soap* or methylene blue or ethanol or bleach* or chlorin* or hypochlorit* or hydrogen peroxide or glutaraldehyde or formaldehyde or aldehyde or dihydrogen dioxide or hydrogen dioxide or hydroperoxide or quaternary ammonium or quaternary bisammonium or quaternized amine or hypochlorous acid).ti,ab,kw.
62.	(antiseptic* or iodine or ethanolamin* or isopropanol or isopropyl or propanol or 2propanol).ti,ab,kw.
63.	(hand* or skin* or eczema* or mouth* or oral* or nose* or nasal* or intranasal* or inhal* or nebuli* or throat* or gargl* or topical* or ultraviolet or ultra violet or UV or UVC or UVGI or actinic).ti,kw.
64.	(PPE or "personal protective equipment" or mask* or facemask* or respirator or respirators or N95 or N99 or KN95 or FFP2 or FFP3 or "Filtering face piece" or "Filtering face pieces" or "Filtering facepiece" or "Filtering facepieces" or "respiratory protective device" or "respiratory protective devices").ti,kw. or exp mask/ or exp respiratory protection/ or

	protective equipment/
65.	drinking/ or exp alcoholism/ or exp drug dependence/ or exp addiction/
66.	63 or 64 or 65
67.	disinfection/
68.	decontamination/
69.	fumigation/
70.	exp disinfectant agent/ or 2 propanol/ or alcohol/ or formaldehyde/ or glutaraldehyde/ or hypochlorite sodium/ or iodine/
71.	detergent/
72.	chlorine/ or chlorine derivative/
73.	hypochlorous acid/
74.	quaternary ammonium derivative/ or benzalkonium/ or benzalkonium chloride/ or tetrylammonium/
75.	bleaching agent/ or hydrogen peroxide/
76.	ethanolamine derivative/ or ethanolamine/
77.	methylene blue/
78.	or/57-62,67-77
79.	78 not 66
80.	limit 79 to covid-19
81.	exp health care facility/ or assisted living facility/ or exp hospital/ or nursing home/
82.	home for the aged/
83.	exp health care personnel/
84.	medical profession/
85.	((medical or health or healthcare) adj3 (facility or facilities or centre* or center* or office* or setting*)).ti,ab,kw.
86.	((medical or health care or healthcare) adj (worker* or staff or employee* or personnel or occupation*)).ti,ab,kw.
87.	(hospital* or physician* or doctor* or surgeon* or surgical or surger* or dentist* or dental or nurs* or infirmar* or hospice* or Clinic or Clinics or "Old Age Homes" or "Old Age Home").ti,ab,kw.
88.	((longterm care or long term care) adj3 (home* or facility or facilities or residence* or housing* or setting*)).ti,ab,kw.
89.	exp "pharmacy (shop)"/ not health care facility/
90.	(exp pharmacist/ or exp health educator/) not (paramedical personnel/ or health care personnel/ or health practitioner/ or paramedical profession/ or medical profession/)
91.	or/81-88
92.	89 or 90
93.	91 not 92
94.	80 and 93
95.	limit 94 to "systematic review"
96.	randomized controlled trial/ or controlled clinical trial/ or randomization/ or exp intermethod comparison/ or double-blind procedure/
97.	human experiment/
98.	(random\$ or crossover or cross over or volunteer or volunteers or placebo or allocated or assigned or (open adj label)).ti,ab.
99.	(compare or compared or comparison).ti.
100.	((evaluated or evaluate or evaluating or assessed or assess) and (compare or compared or comparing or comparison)).ab.
101.	((double or single or doubly or singly) adj (blind or blinded or blindly)).ti,ab.
102.	parallel group\$1.ti,ab.
103.	((assign\$ or match or matched or allocation) adj5 (alternate or group\$1 or intervention\$1 or patient\$1 or subject\$1 or participant\$1)).ti,ab.
104.	(controlled adj7 (study or design or trial)).ti,ab.
105.	trial.ti.

106.	or/96-105
107.	(Systematic review not (trial or study)).ti.
108.	(random cluster adj3 sampl\$.ti,ab.
109.	(review.ab. and review.pt.) not trial.ti.
110.	(databases adj4 searched).ab.
111.	"we searched".ab. and (review.ti. or review.pt.)
112.	"update review".ab.
113.	Random field\$.ti,ab.
114.	(nonrandom\$ not random\$.ti,ab.
115.	(random\$ adj sampl\$ adj7 (cross section\$ or questionnaire\$1 or survey\$ or database\$1)).ti,ab. not (comparative study/ or controlled study/ or randomi?ed controlled.ti,ab. or randomly assigned.ti,ab.)
116.	Cross-sectional study/ not (randomized controlled trial/ or controlled clinical trial/ or controlled study/ or randomi?ed controlled.ti,ab. or control group\$1.ti,ab.)
117.	((((case adj control\$) and random\$) not randomi?ed controlled).ti,ab.
118.	(rat or rats or mouse or mice or swine or porcine or murine or sheep or lambs or pigs or piglets or rabbit or rabbits or cat or cats or dog or dogs or cattle or bovine or monkey or monkeys or trout or marmoset\$1).ti. and animal experiment/
119.	Animal experiment/ not (human experiment/ or human/)
120.	("cochrane database of systematic reviews" or "cochrane database of systematic reviews online").jn.
121.	or/107-120
122.	106 not 121 [Cochrane Embase RCT filter 2022 revision (Glanville et al. 2019)]
123.	94 and 122
124.	Clinical article/ or controlled study/ or major clinical study/ or prospective study/ or cohort.mp. or compared.mp. or groups.mp. or multivariate.mp. [NRS filter by Furlan et al. 2006 for Embase]
125.	94 and 124
126.	95 or 123 or 125
127.	exp animal/ not exp human/
128.	126 not 127
129.	editorial.pt.
130.	128 not 129
131.	1 or 2 or 85 or 86 or 87 or 88
132.	131 not 10
133.	12 or 13 or 14 or 15 or 16 or 57 or 58 or 59 or 60 or 61 or 62
134.	133 not 27
135.	(nCoV* or 2019nCoV or 19nCoV or COVID19* or COVID or SARS-COV-2 or SARSCOV-2 or SARS-COV2 or SARSCOV2 or coronavirus* or corona virus* or betacoronavirus* or CoV or HCoV).mp.
136.	limit 135 to yr="2019 -Current" [COVID-19 filter adapted from CADTH Search Strings]
137.	132 and 134 and 136
138.	56 use medall
139.	130 use emczd
140.	137 use cctr
141.	137 use coch
142.	138 or 139 or 140 or 141
143.	remove duplicates from 142

### 6.6.3 Cleaning in the health-care facility

#### Search terms



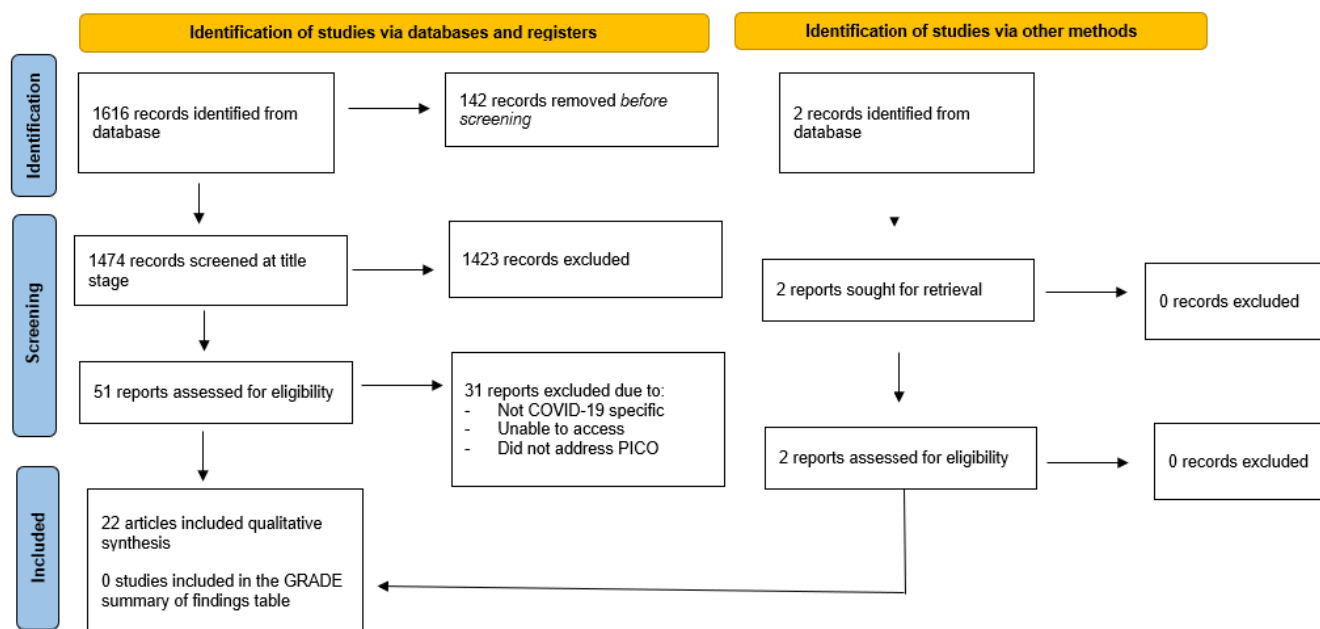
1.	exp Health facilities/ or exp hospitals/ or exp Nursing Homes/ or Homes for the Aged/ or assisted living facilities/
2.	exp Health Personnel/ or exp Health Occupations/
3.	((medical or health or healthcare) adj3 (facility or facilities or centre* or center* or office* or setting*)).ti,ab,kf.
4.	((medical or health care or healthcare) adj (worker* or staff or employee* or personnel or occupation*)).ti,ab,kf.
5.	(hospital* or ward* or physician* or doctor* or surgeon* or surgical or surger* or dentist* or dental or nurs* or infirmar* or hospice* or Clinic or Clinics or "Old Age Homes" or "Old Age Home").ti,ab,kf.
6.	((longterm care or long term care) adj3 (home* or facility or facilities or residence* or housing* or setting*)).ti,ab,kf.
7.	Pharmacies/ not Health facilities/
8.	(Caregivers/ or Pharmacists/) not (Health Personnel/ or Health Occupations/)
9.	or/1-6
10.	or/7-8
11.	9 not 10
12.	Disinfection/ or exp Disinfectants/ or exp Detergents/ or Fumigation/ or Decontamination/
13.	exp chlorine compounds/ or hypochlorous acid/ or sodium hypochlorite/
14.	Quaternary Ammonium Compounds/ or Bleaching Agents/ or Hydrogen Peroxide/
15.	exp ethanol/ or exp ethanolamines/ or 2-Propanol/
16.	methylene blue/

17.	((sanitation or sanitary or housekeep* or janitor*) adj3 (worker* or staff or employee* or personnel or occupation* or team* or department*)).ti,ab,kf.
18.	(brush or brushing or clean* or disinfect* or decontaminat* or fogging or fog or fogger* or fumigat* or mist or misting or sanitis* or sanitiz* or scrub or scrubbing or spray* or wipe or wiping).ti,ab,kf.
19.	(detergent* or soap* or methylene blue or ethanol or bleach* or chlorin* or hypochlorit* or hydrogen peroxide or glutaraldehyde or formaldehyde or aldehyde or dihydrogen dioxide or hydrogen dioxide or hydroperoxide or quaternary ammonium or quaternary bisammonium or quaternized amine or hypochlorous acid).ti,ab,kf.
20.	(antiseptic* or iodine or ethanolamin* or isopropanol or isopropyl or propanol or 2propanol).ti,ab,kf.
21.	or/12-20
22.	(cisplatin/ or exp Hydrochloric acid/) not (chlorine compounds/ or hypochlorous acid/ or sodium hypochlorite/)
23.	21 not 22
24.	(hand wash* or hand hygiene or hand sanitisation or hand sanitization or hand disinfection or hand decontamination or skin disinfection or skin decontamination or skin wash* or skin hygiene or skin sanitisation or skin sanitization or hands or eczema* or mouth or oral* or nose or handwash* or skinwash* or mouthwash* or nosewash* or nasal* or topical* or ultraviolet or ultra violet or UV or UVC or UVGI or actinic).ti.
25.	((PPE or "personal protective equipment" or mask* or facemask* or respirator or respirators or N95 or N99 or KN95 or FFP2 or FFP3 or "Filtering face piece" or "Filtering face pieces" or "Filtering facepiece" or "Filtering facepieces" or "respiratory protective device" or "respiratory protective devices") adj2 (disinfect* or decontaminat* or sanitiz* or sanitis* or clean* or wash*)).ti.
26.	((PPE or "personal protective equipment" or mask* or facemask* or respirator or respirators or N95 or N99 or KN95 or FFP2 or FFP3 or "Filtering face piece" or "Filtering face pieces" or "Filtering facepiece" or "Filtering facepieces" or "respiratory protective device" or "respiratory protective devices") not (surface* or touch* or high touch or high traffic or environment* or material* or object or objects or building* or floor* or counter* or bed or beds or equipment* or room or rooms or space* or door* or chair* or wheelchair* or washroom* or bathroom* or elevator* or toilet* or contact time* or wood* or plastic* or metal* or fog* or fumigat* or mist or misting or spray*)).ti.
27.	24 or 25 or 26
28.	23 not 27
29.	limit 28 to covid-19
30.	11 and 29
31.	limit 30 to (meta analysis or "systematic review")
32.	randomized controlled trial.pt.
33.	controlled clinical trial.pt.
34.	randomized.ab.
35.	placebo.ab.
36.	randomly.ab.
37.	trial.ab.
38.	groups.ab.
39.	or/32-38
40.	exp animals/ not humans.sh.
41.	39 not 40 [adapted from the Cochrane HSSS RCT filter]
42.	30 and 41
43.	exp cohort studies/ or exp epidemiologic studies/ or exp clinical trial/ or exp evaluation studies as topic/ or exp statistics as topic/
44.	((time and factors) or program or survey* or ci or cohort or comparative stud* or evaluation studies or follow-up*).mp.
45.	(control and (group* or study)).mp.

46.	or/43-45
47.	(animals/ not humans/) or comment/ or editorial/ or exp review/ or meta analysis/ or consensus/ or exp guideline/
48.	hi.fs. or case report.mp.
49.	or/47-48
50.	46 not 49 [NRS filter by Waffenschmidt et al. 2020]
51.	30 and 50
52.	31 or 42 or 51
53.	exp Animals/ not Humans/
54.	52 not 53
55.	(comment or editorial or newspaper article).pt.
56.	54 not 55
57.	((sanitation or sanitary or housekeep* or janitor*) adj (worker* or staff or employee* or personnel or occupation* or team* or department*)).ti,ab,kw.
58.	(clean* or disinfect* or decontaminat* or sanitis* or sanitiz*).ti,ab,kw.
59.	(mist or misting or scrub or scrubbing or spray* or wipe or wiping).ti,ab. not scrub typhus.mp.
60.	(brush or brushing or fogging or fogger* or fumigat*).ti,ab.
61.	(detergent* or soap* or methylene blue or ethanol or bleach* or chlorin* or hypochlorit* or hydrogen peroxide or glutaraldehyde or formaldehyde or aldehyde or dihydrogen dioxide or hydrogen dioxide or hydroperoxide or quaternary ammonium or quaternary bisammonium or quaternized amine or hypochlorous acid).ti,ab,kw.
62.	(antiseptic* or iodine or ethanolamin* or isopropanol or isopropyl or propanol or 2propanol).ti,ab,kw.
63.	(hand* or skin* or eczema* or mouth* or oral* or nose* or nasal* or intranasal* or inhal* or nebuli* or throat* or gargl* or topical* or ultraviolet or ultra violet or UV or UVC or UVGI or actinic).ti,kw.
64.	(PPE or "personal protective equipment" or mask* or facemask* or respirator or respirators or N95 or N99 or KN95 or FFP2 or FFP3 or "Filtering face piece" or "Filtering face pieces" or "Filtering facepiece" or "Filtering facepieces" or "respiratory protective device" or "respiratory protective devices").ti,kw. or exp mask/ or exp respiratory protection/ or protective equipment/
65.	drinking/ or exp alcoholism/ or exp drug dependence/ or exp addiction/
66.	63 or 64 or 65
67.	disinfection/
68.	decontamination/
69.	fumigation/
70.	exp disinfectant agent/ or 2 propanol/ or alcohol/ or formaldehyde/ or glutaraldehyde/ or hypochlorite sodium/ or iodine/
71.	detergent/
72.	chlorine/ or chlorine derivative/
73.	hypochlorous acid/
74.	quaternary ammonium derivative/ or benzalkonium/ or benzalkonium chloride/ or tetrylammonium/
75.	bleaching agent/ or hydrogen peroxide/
76.	ethanolamine derivative/ or ethanolamine/
77.	methylene blue/
78.	or/57-62,67-77
79.	78 not 66
80.	limit 79 to covid-19
81.	exp health care facility/ or assisted living facility/ or exp hospital/ or nursing home/
82.	home for the aged/
83.	exp health care personnel/

84.	medical profession/
85.	((medical or health or healthcare) adj3 (facility or facilities or centre* or center* or office* or setting*)).ti,ab,kw.
86.	((medical or health care or healthcare) adj (worker* or staff or employee* or personnel or occupation*)).ti,ab,kw.
87.	(hospital* or physician* or doctor* or surgeon* or surgical or surger* or dentist* or dental or nurs* or infirmar* or hospice* or Clinic or Clinics or "Old Age Homes" or "Old Age Home").ti,ab,kw.
88.	((longterm care or long term care) adj3 (home* or facility or facilities or residence* or housing* or setting*)).ti,ab,kw.
89.	exp "pharmacy (shop)"/ not health care facility/
90.	(exp pharmacist/ or exp health educator/) not (paramedical personnel/ or health care personnel/ or health practitioner/ or paramedical profession/ or medical profession/)
91.	or/81-88
92.	89 or 90
93.	91 not 92
94.	80 and 93
95.	limit 94 to "systematic review"
96.	randomized controlled trial/ or controlled clinical trial/ or randomization/ or exp intermethod comparison/ or double-blind procedure/
97.	human experiment/
98.	(random\$ or crossover or cross over or volunteer or volunteers or placebo or allocated or assigned or (open adj label)).ti,ab.
99.	(compare or compared or comparison).ti.
100.	((evaluated or evaluate or evaluating or assessed or assess) and (compare or compared or comparing or comparison)).ab.
101.	((double or single or doubly or singly) adj (blind or blinded or blindly)).ti,ab.
102.	parallel group\$1.ti,ab.
103.	((assign\$ or match or matched or allocation) adj5 (alternate or group\$1 or intervention\$1 or patient\$1 or subject\$1 or participant\$1)).ti,ab.
104.	(controlled adj7 (study or design or trial)).ti,ab.
105.	trial.ti.
106.	or/96-105
107.	(Systematic review not (trial or study)).ti.
108.	(random cluster adj3 sampl\$).ti,ab.
109.	(review.ab. and review.pt.) not trial.ti.
110.	(databases adj4 searched).ab.
111.	"we searched".ab. and (review.ti. or review.pt.)
112.	"update review".ab.
113.	Random field\$.ti,ab.
114.	(nonrandom\$ not random\$).ti,ab.
115.	(random\$ adj sampl\$ adj7 (cross section\$ or questionnaire\$1 or survey\$ or database\$1)).ti,ab. not (comparative study/ or controlled study/ or randomi?ed controlled.ti,ab. or randomly assigned.ti,ab.)
116.	Cross-sectional study/ not (randomized controlled trial/ or controlled clinical trial/ or controlled study/ or randomi?ed controlled.ti,ab. or control group\$1.ti,ab.)
117.	((case adj control\$) and random\$) not randomi?ed controlled).ti,ab.
118.	(rat or rats or mouse or mice or swine or porcine or murine or sheep or lambs or pigs or piglets or rabbit or rabbits or cat or cats or dog or dogs or cattle or bovine or monkey or monkeys or trout or marmoset\$1).ti. and animal experiment/
119.	Animal experiment/ not (human experiment/ or human/)

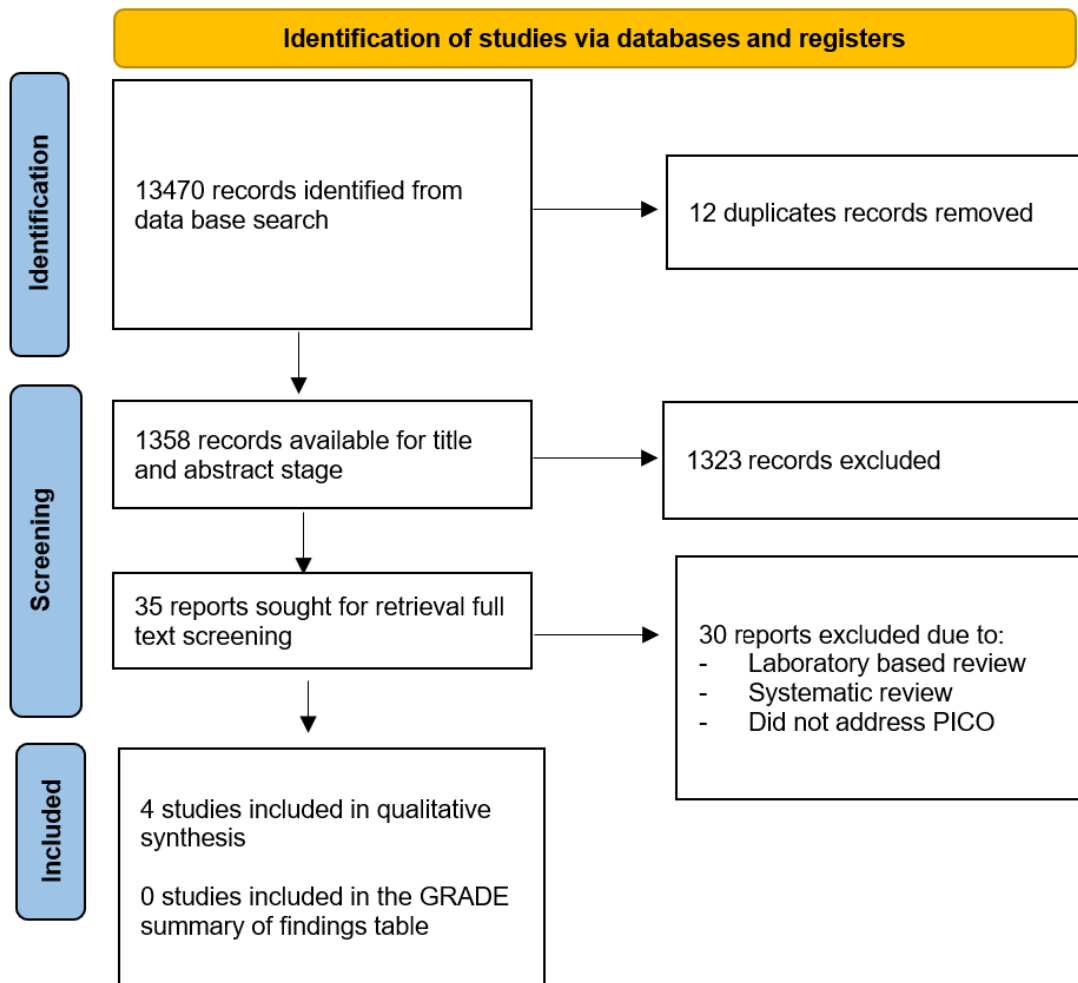
120.	("cochrane database of systematic reviews" or "cochrane database of systematic reviews online").jn.
121.	or/107-120
122.	106 not 121 [Cochrane Embase RCT filter 2022 revision (Glanville et al. 2019)]
123.	94 and 122
124.	Clinical article/ or controlled study/ or major clinical study/ or prospective study/ or cohort.mp. or compared.mp. or groups.mp. or multivariate.mp. [NRS filter by Furlan et al. 2006 for Embase]
125.	94 and 124
126.	95 or 123 or 125
127.	exp animal/ not exp human/
128.	126 not 127
129.	editorial.pt.
130.	128 not 129
131.	1 or 2 or 85 or 86 or 87 or 88
132.	131 not 10
133.	12 or 13 or 14 or 15 or 16 or 57 or 58 or 59 or 60 or 61 or 62
134.	133 not 27
135.	(nCoV* or 2019nCoV or 19nCoV or COVID19* or COVID or SARS-COV-2 or SARSCOV-2 or SARS-COV2 or SARSCOV2 or coronavirus* or corona virus* or betacoronavirus* or CoV or HCoV).mp.
136.	limit 135 to yr="2019 -Current" [COVID-19 filter adapted from CADTH Search Strings]
137.	132 and 134 and 136
138.	56 use medall
139.	130 use emczd
140.	137 use cctr
141.	137 use coch
142.	138 or 139 or 140 or 141
143.	remove duplicates from 142



## 6.6.4 UV

### Search terms

1.	Ultraviolet Rays/ or Ultraviolet Therapy/
2.	(ultraviolet or ultra violet or UV or UVGI or UVC).ti,ab,kf.
3.	(actinic adj3 (ray* or radiat* or irradiat*)).ti,ab,kf.
4.	(germicid* adj3 lamp*).ti,ab,kf.
5.	or/1-4
6.	limit 5 to covid-19
7.	exp Animals/ not Humans/
8.	6 not 7
9.	(comment or editorial or newspaper article).pt.
10.	8 not 9
11.	exp ultraviolet radiation/
12.	ultraviolet germicidal irradiation/
13.	ultraviolet irradiation/
14.	ultraviolet phototherapy/
15.	(ultraviolet or ultra violet or UV or UVGI or UVC).ti,ab,kw.
16.	(actinic adj3 (ray* or radiat* or irradiat*)).ti,ab,kw.
17.	(germicid* adj3 lamp*).ti,ab,kw.
18.	or/11-17
19.	limit 18 to covid-19
20.	exp animal/ not exp human/
21.	19 not 20
22.	editorial.pt.
23.	21 not 22
24.	(ultraviolet or ultra violet or UV or UVGI or UVC).mp.
25.	(actinic adj3 (ray* or radiat* or irradiat*)).mp.
26.	(germicid* adj3 lamp*).mp.
27.	or/24-26
28.	(nCoV* or 2019nCoV or 19nCoV or COVID19* or COVID or SARS-COV-2 or SARSCOV-2 or SARS-COV2 or SARSCOV2 or SARS coronavirus 2 or Severe Acute Respiratory Syndrome Coronavirus 2 or Severe Acute Respiratory Syndrome Corona Virus 2).mp.
29.	(longCOVID* or postCOVID* or postcoronavirus* or postSARS*).mp.
30.	((Wuhan or Hubei) adj5 pneumonia).mp.
31.	(coronavirus* or corona virus* or betacoronavirus* or CoV or HCoV).mp.
32.	28 or 29 or 30 or 31
33.	limit 32 to yr="2019 -Current" <i>[COVID-19 filter adapted from CADTH Search Strings]</i>
34.	27 and 33
35.	10 use medall
36.	23 use emczd
37.	34 use cctr
38.	34 use coch
39.	35 or 36 or 37 or 38
40.	remove duplicates from 39



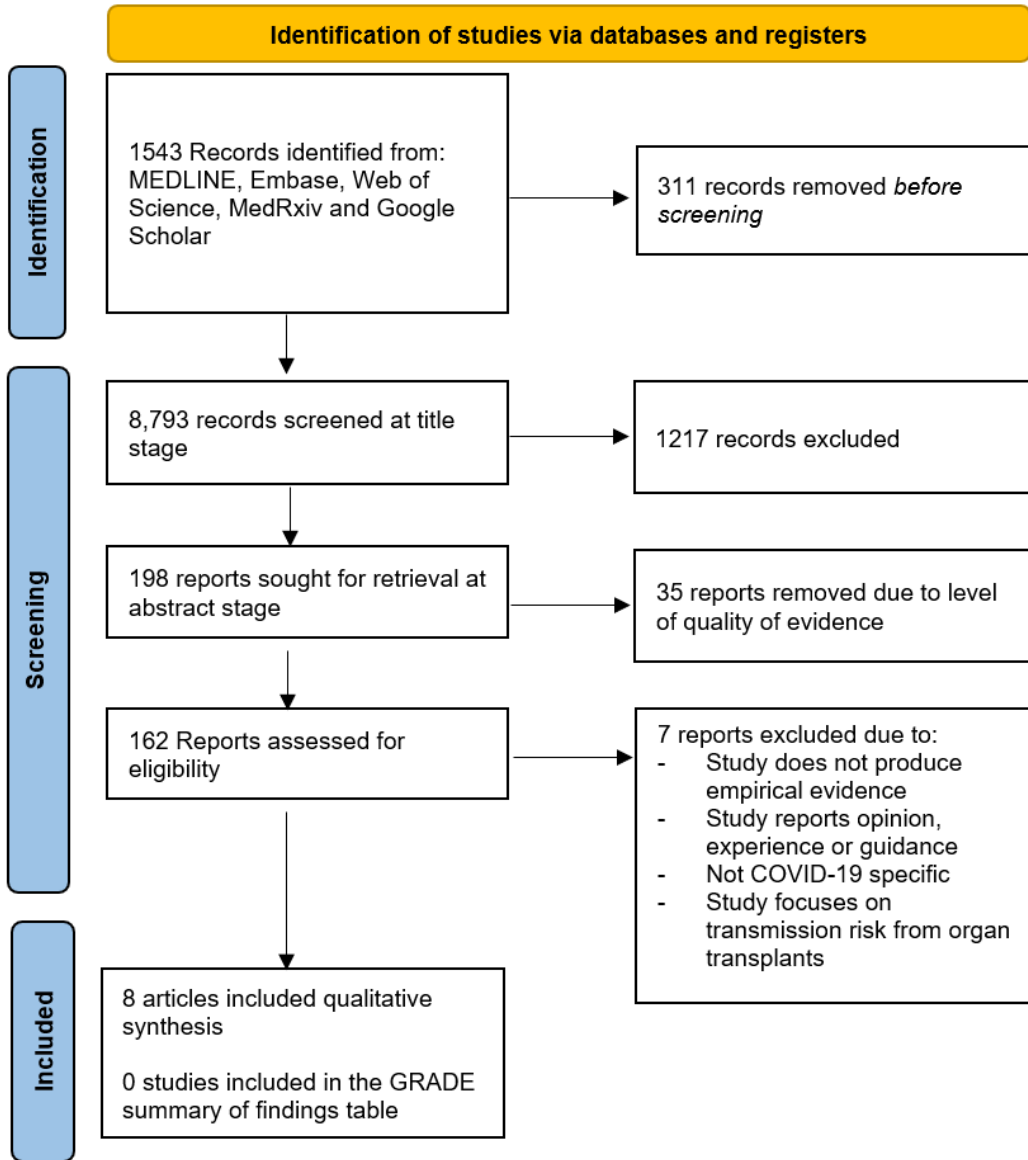
## 6.6.5 Dead body management

### Outcome terms

Exp Virus Diseases/ Exp Respiratory Tract Infections/ "respiratory infection".ti,ab. "respiratory virus".ti,ab. "respiratory tract infections".ti,ab. Exp Pneumonia/ Exp COVID-19/ Exp SARS-CoV-2/ Exp Coronavirus/ Coronavirus\*.ti,ab. "Coronavirus infection".ti,ab. 2019-nCoV.ti,ab. 2019 ncov.ti,ab. nCov.ti,ab. Covid19.ti,ab. SARSCoV-2.ti,ab. "novel coronavirus".ti,ab. "novel corona virus".ti,ab. covid\*.ti,ab. "severe acute respiratory syndrome".ti,ab. "coronavirus 2".ti,ab. "coronavirus disease".ti,ab. "corona virus disease".ti,ab. "new coronavirus".ti,ab. "new corona virus".ti,ab. "new coronaviruses".ti,ab. "novel coronaviruses".ti,ab. Sars.ti,ab. "sars corona virus".ti,ab. "respiratory infectious disease".ti,ab. "acute respiratory disease".ti,ab. "influenza like illness".ti,ab. Exp Pandemics/ Pandemic\*.ti,ab. "respiratory disease".ti,ab.

### Intervention terms

"cadaver"[Title/Abstract] OR "corpse"[Title/Abstract] OR "dead"[Title/Abstract] OR "death"[Title/Abstract] OR "remains"[Title/Abstract] OR "mortem"[Title/Abstract] OR "postmortem"[Title/Abstract] OR "post-mortem"[Title/Abstract] OR "deceased"[Title/Abstract] OR "passed away"[Title/Abstract] OR "cremation"[Title/Abstract] OR "cremated"[Title/Abstract] OR "buried"[Title/Abstract] OR "embalming"[Title/Abstract] OR "burial"[Title/Abstract] OR "grave"[Title/Abstract]



## 6.6.6 Glove use in community

### Outcome terms

Exp Virus Diseases/ Exp Respiratory Tract Infections/ "respiratory infection\*".ti,ab. "respiratory virus\*".ti,ab. "respiratory tract infections".ti,ab. Exp Pneumonia/ Exp COVID-19/ Exp SARS-CoV-2/ Exp Coronavirus/ Coronavirus\*.ti,ab. "Coronavirus infection\*".ti,ab. 2019-nCoV.ti,ab. 2019 ncov.ti,ab. nCov.ti,ab. Covid19.ti,ab. SARSCoV-2.ti,ab. "novel coronavirus".ti,ab. "novel corona virus".ti,ab. covid\*.ti,ab. "severe acute respiratory syndrome".ti,ab. "coronavirus 2".ti,ab. "coronavirus disease".ti,ab. "corona virus disease".ti,ab. "new coronavirus".ti,ab. "new corona virus".ti,ab. "new coronaviruses".ti,ab. "novel coronaviruses".ti,ab. Sars.ti,ab. "sars corona virus".ti,ab. "respiratory infectious disease\*".ti,ab. "acute respiratory disease\*".ti,ab. "influenza like illness".ti,ab. Exp Pandemics/ Pandemic\*.ti,ab. "respiratory disease".ti,ab.

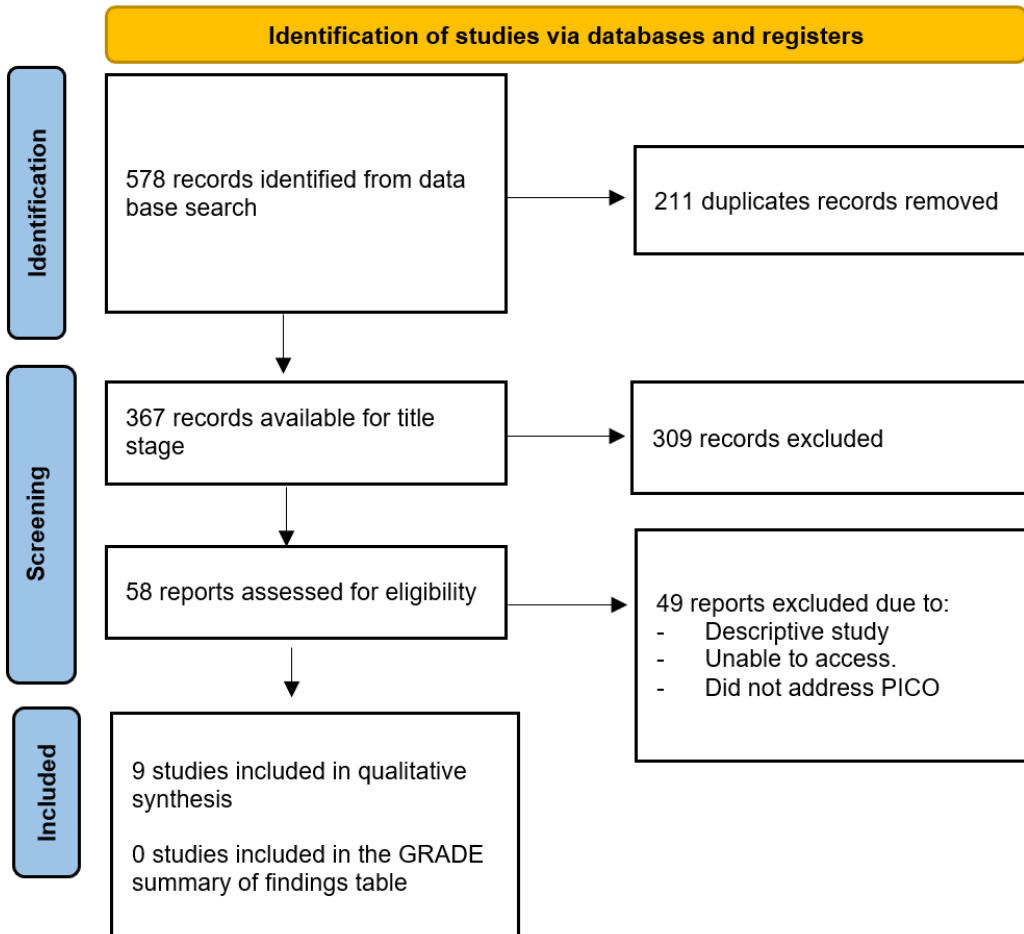
### Intervention terms

glove\* OR surgical glove\* OR protective glove\*

### Setting terms

"Community Health Worker\*\*"[Mesh] OR "Community Health Center\*\*"[Mesh] OR "Community Health Centre\*\*"[Mesh] OR "Community Health Nurs\*\*"[Mesh] OR "Community Health Service\*\*"[Mesh] OR "Community Pharmacy Service\*\*"[Mesh] OR

"Hospital\*, Community"[Mesh] OR "Nurses, Community Health"[Mesh] OR "community setting\*" OR "Community health program\*" OR "community health programme\*" OR "community" OR "community outreach" OR "community level" OR "outpatient" OR "community-based\*" OR "community based\*" OR "visiting nurse\*" OR "health visitor\*" OR "mobile clinic\*" OR "ambulatory care" OR "community medicine" OR "community care" OR "community" OR "village health worker\*" OR "health post\*"



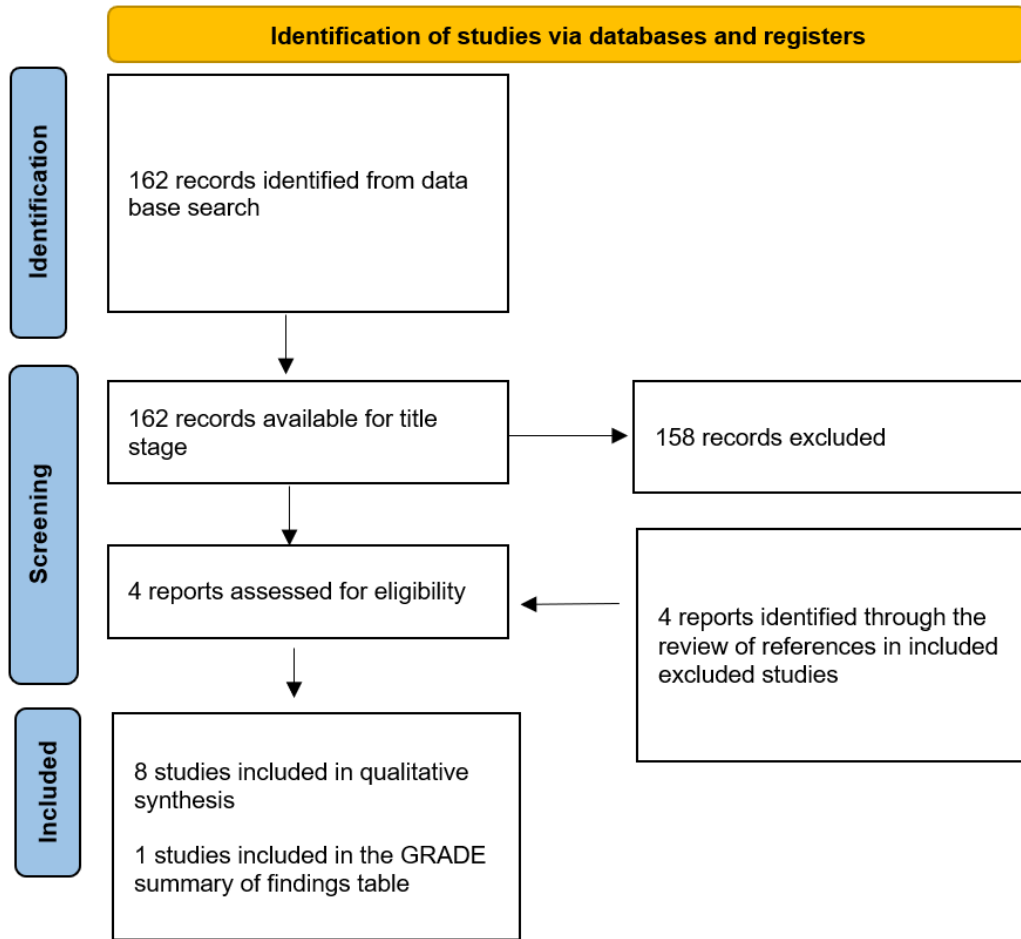
## 6.6.7 Laundry

### Outcome terms

Exp Virus Diseases/ Exp Respiratory Tract Infections/ "respiratory infection\*".ti,ab. "respiratory virus\*".ti,ab. "respiratory tract infections".ti,ab. Exp Pneumonia/ Exp COVID-19/ Exp SARS-CoV-2/ Exp Coronavirus/ Coronavirus\*.ti,ab. "Coronavirus infection".ti,ab. 2019-nCoV.ti,ab. 2019 ncov.ti,ab. nCov.ti,ab. Covid19.ti,ab. SARSCoV-2.ti,ab. "novel coronavirus".ti,ab. "novel corona virus".ti,ab. covid\*.ti,ab. "severe acute respiratory syndrome".ti,ab. "coronavirus 2".ti,ab. "coronavirus disease".ti,ab. "corona virus disease".ti,ab. "new coronavirus".ti,ab. "new corona virus".ti,ab. "new coronaviruses".ti,ab. "novel coronaviruses".ti,ab. Sars.ti,ab. "sars corona virus".ti,ab. "respiratory infectious disease\*".ti,ab. "acute respiratory disease\*".ti,ab. "influenza like illness".ti,ab. Exp Pandemics/ Pandemic\*.ti,ab. "respiratory disease".ti,ab.

### Intervention terms

"Laundry"[Title/Abstract] OR "Laundering"[Title/Abstract] OR ("bedded"[All Fields] OR "bedding and linens"[MeSH Terms] OR ("bedding"[All Fields] AND "linens"[All Fields]) OR "bedding and linens"[All Fields] OR "bedding"[All Fields] OR "beddings"[All Fields]) OR "Hospital laundry"[Title/Abstract] OR "laundry management"[Title/Abstract] OR "linen handling"[Title/Abstract] OR "linen"[Title/Abstract]



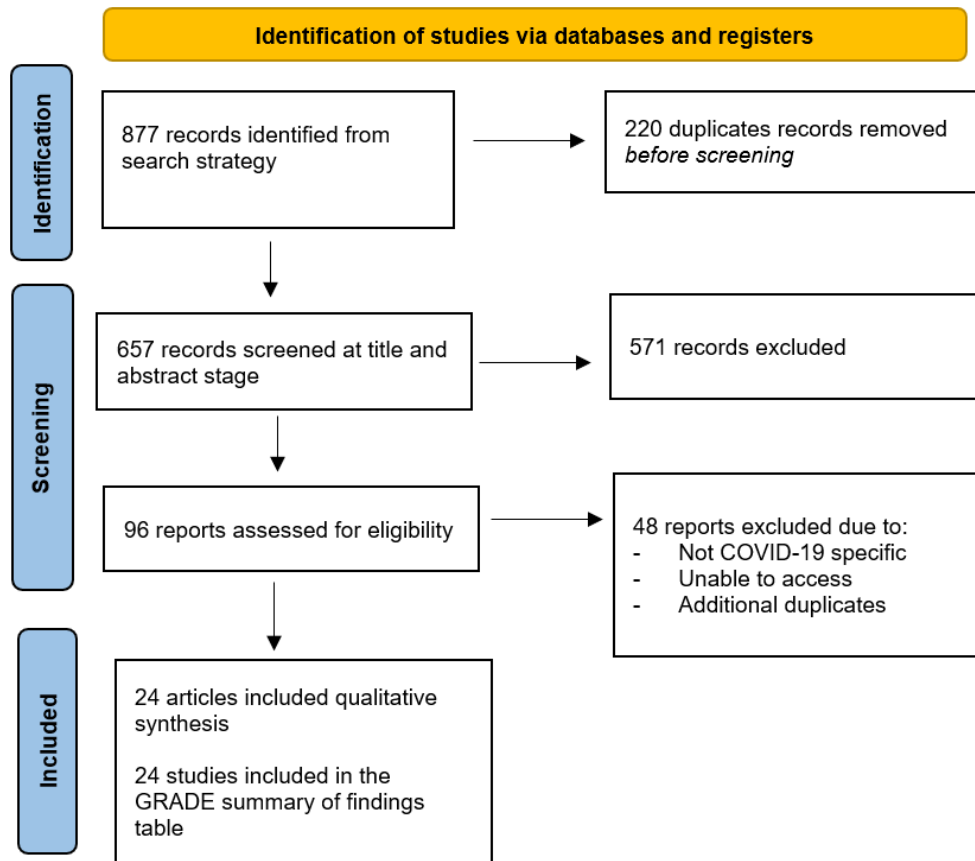
### 6.6.8 Mask use during physical activity

#### Search terms

1.	masks/ or n95 respirators/
2.	Respiratory Protective Devices/
3.	(mask or masks or masking or masked or facemask* or respirator or respirators or N95 or N99 or KN95 or FFP2 or FFP3 or "Filtering face piece" or "Filtering face pieces" or "Filtering facepiece" or "Filtering facepieces" or "respiratory protective device" or "respiratory protective devices").ti,ab,kf.
4.	or/1-3
5.	exp Exercise/
6.	(exercis* or physical activit* or workout or running or walking or weight lifting or body building or weightlifting or bodybuilding or jogging or stretching or yoga or pilates or aerobics or sport or sports or boxing or wrestling or volleyball or badminton or tennis or squash or racquetball or martial art* or athlete* or athletic* or basketball or cycling or bicycling or football or soccer or hockey or baseball or softball or rugby or cricket or skating or dancing or golf or rowing or bowling).ti,ab,kf.
7.	exp Sports/ or exp Athletes/
8.	(gym* or arena* or ((fitness or recreation*) adj5 (club* or center* or centre* or facility or facilities or class or classes))).ti,ab,kf.
9.	(track adj5 field).ti,ab,kf.
10.	or/5-9
11.	4 and 10
12.	limit 11 to covid-19
13.	exp Animals/ not Humans/
14.	12 not 13

15.	(comment or editorial or newspaper article).pt.
16.	14 not 15
17.	exp mask/
18.	exp respiratory protection/
19.	(mask or masks or masking or masked or facemask* or respirator or respirators or N95 or N99 or KN95 or FFP2 or FFP3 or "Filtering face piece" or "Filtering face pieces" or "Filtering facepiece" or "Filtering facepieces" or "respiratory protective device" or "respiratory protective devices").ti,ab,kw.
20.	or/17-19
21.	exp physical activity/
22.	exp exercise/
23.	(exercis* or physical activit* or workout or running or walking or weight lifting or body building or weightlifting or bodybuilding or jogging or stretching or yoga or pilates or aerobics or sport or sports or boxing or wrestling or volleyball or badminton or tennis or squash or racquetball or martial art* or athlete* or athletic* or basketball or cycling or bicycling or football or soccer or hockey or baseball or softball or rugby or cricket or skating or dancing or golf or rowing or bowling).ti,ab,kw.
24.	exp "sports and sport related phenomena"/ or exp sport facility/ or exp sports medicine/
25.	exp athlete/
26.	(gym* or arena* or ((fitness or recreation*) adj5 (club* or center* or centre* or facility or facilities or class or classes))).ti,ab,kw.
27.	(track adj5 field).ti,ab,kw.
28.	or/21-27
29.	20 and 28
30.	limit 29 to covid-19
31.	exp animal/ not exp human/
32.	30 not 31
33.	editorial.pt.
34.	32 not 33
35.	1 or 2 or 19
36.	5 or 7 or 23 or 26 or 27
37.	35 and 36
38.	(nCoV* or 2019nCoV or 19nCoV or COVID19* or COVID or SARS-COV-2 or SARSCOV-2 or SARS-COV2 or SARSCOV2 or SARS coronavirus 2 or Severe Acute Respiratory Syndrome Coronavirus 2 or Severe Acute Respiratory Syndrome Corona Virus 2).mp.
39.	(longCOVID* or postCOVID* or postcoronavirus* or postSARS*).mp.
40.	((Wuhan or Hubei) adj5 pneumonia).mp.
41.	(coronavirus* or corona virus* or betacoronavirus* or CoV or HCoV).mp.
42.	38 or 39 or 40 or 41
43.	limit 42 to yr="2019 -Current" <span style="float: right;">[COVID-19 filter adapted from CADTH Search Strings]</span>
44.	37 and 43
45.	16 use medall
46.	34 use emczd
47.	44 use cctr
48.	44 use coch
49.	45 or 46 or 47 or 48
50.	remove duplicates from 49

## 6.6.9 Mask fit



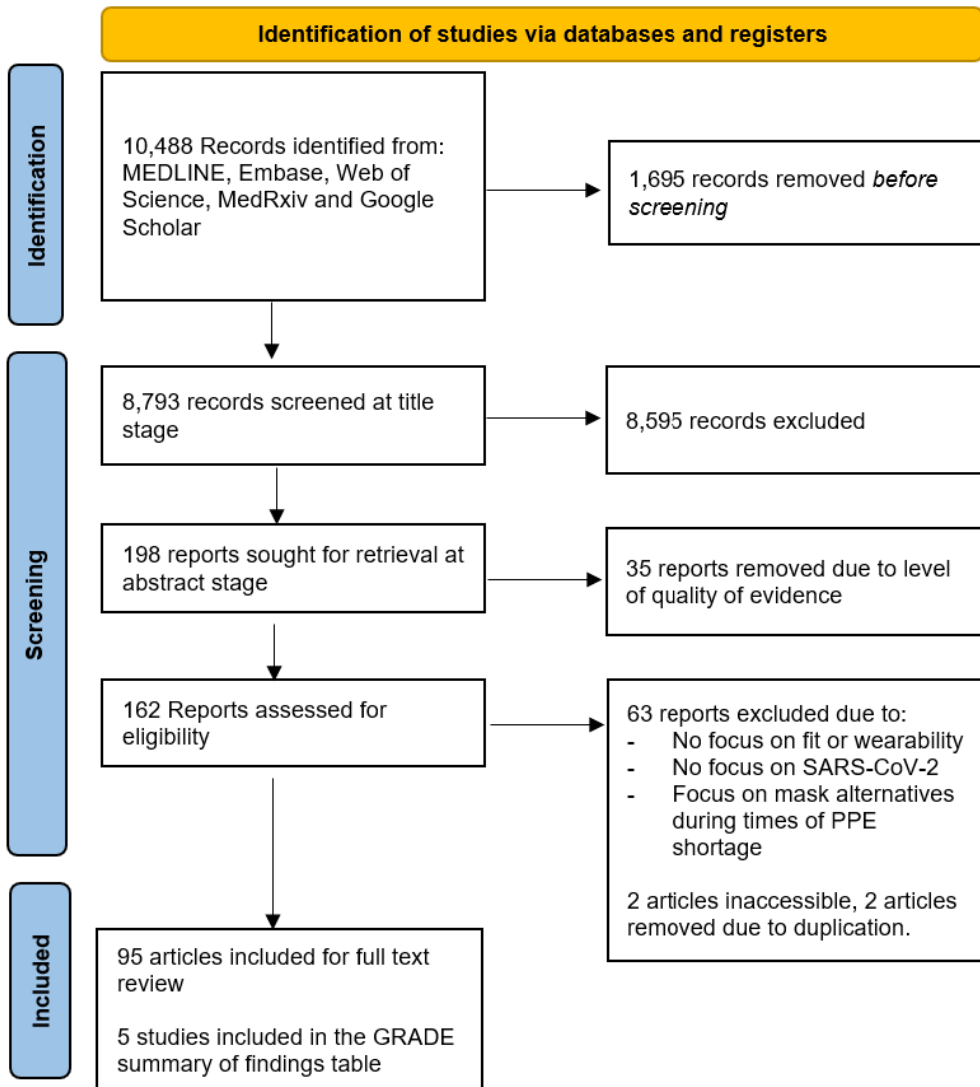
### Search Terms

exp Masks /exp Protective Device /exp Respiratory Protective Devices /Mask.ti,ab. /Facemask\*.ti,ab. /Respirator.ti,ab. /FFP2.ti,ab. /exp N95 Respirators /N95.ti,ab. /N99.ti,ab. /N100.ti,ab. /R95.ti,ab. /P2.ti,ab. /P95.ti,ab. /P99.ti,ab. /P100.ti,ab. /PARP.ti,ab. /FFR.ti,ab. /'medical mask\*.ti,ab. /'surgical mask\*.ti,ab. /'cloth mask\*.ti,ab. /PPE.ti,ab. /'personal protection equipment'.ti,ab. /exp Personal Protective Equipment /Fit.ti,ab. /Fitting.ti,ab. /Fit-tested.ti,ab. /Fit-testing.ti,ab. /Size.ti,ab. /Sized.ti,ab. /Sizing.ti,ab. /Loose.ti,ab. /Ill-fitting.ti,ab. /Leak.ti,ab. /Leakage.ti,ab. /Secure.ti,ab. /Secured.ti,ab. /Fasten.ti,ab. /Fastened.ti,ab. /Attached.ti,ab. /Insecure.ti,ab. /Unsecure.ti,ab. /Unattached.ti,ab. /Detached.ti,ab. /Unfastened.ti,ab. /Slack.ti,ab. /Oversized.ti,ab. /exp Virus Diseases/ /exp Respiratory Tract Infections/ /'respiratory infection\*.ti,ab. /'respiratory virus\*.ti,ab. /'respiratory tract infections'.ti,ab. /exp Pneumonia/ /exp COVID-19/ /exp SARS-CoV-2/ /exp Coronavirus/ /Coronavirus\*.ti,ab. /'Coronavirus infection\*.ti,ab. /2019-nCoV.ti,ab. /2019 ncov.ti,ab. /nCov.ti,ab. /Covid19.ti,ab. /SARSCoV-2.ti,ab. /'novel coronavirus'.ti,ab. /'novel corona virus'.ti,ab. /covid\*.ti,ab. /'severe acute respiratory syndrome'.ti,ab. /'coronavirus 2'.ti,ab. /'coronavirus disease'.ti,ab. /'corona virus disease'.ti,ab. /'new coronavirus'.ti,ab. /'new corona virus'.ti,ab. /'new coronaviruses'.ti,ab. /'novel coronaviruses'.ti,ab. /Sars.ti,ab. /'sars corona virus'.ti,ab. /'respiratory infectious disease\*.ti,ab. /'acute respiratory disease\*.ti,ab. /'influenza like illness'.ti,ab. /exp Pandemics/ /Pandemic\*.ti,ab. /'respiratory disease'.ti,ab. /bracers.ti,ab. /'double masking'.ti,ab. /'respiratory protection program'.ti,ab.

## 6.6.10 Physical distancing

### Search terms

1 physical distancing/ 9392

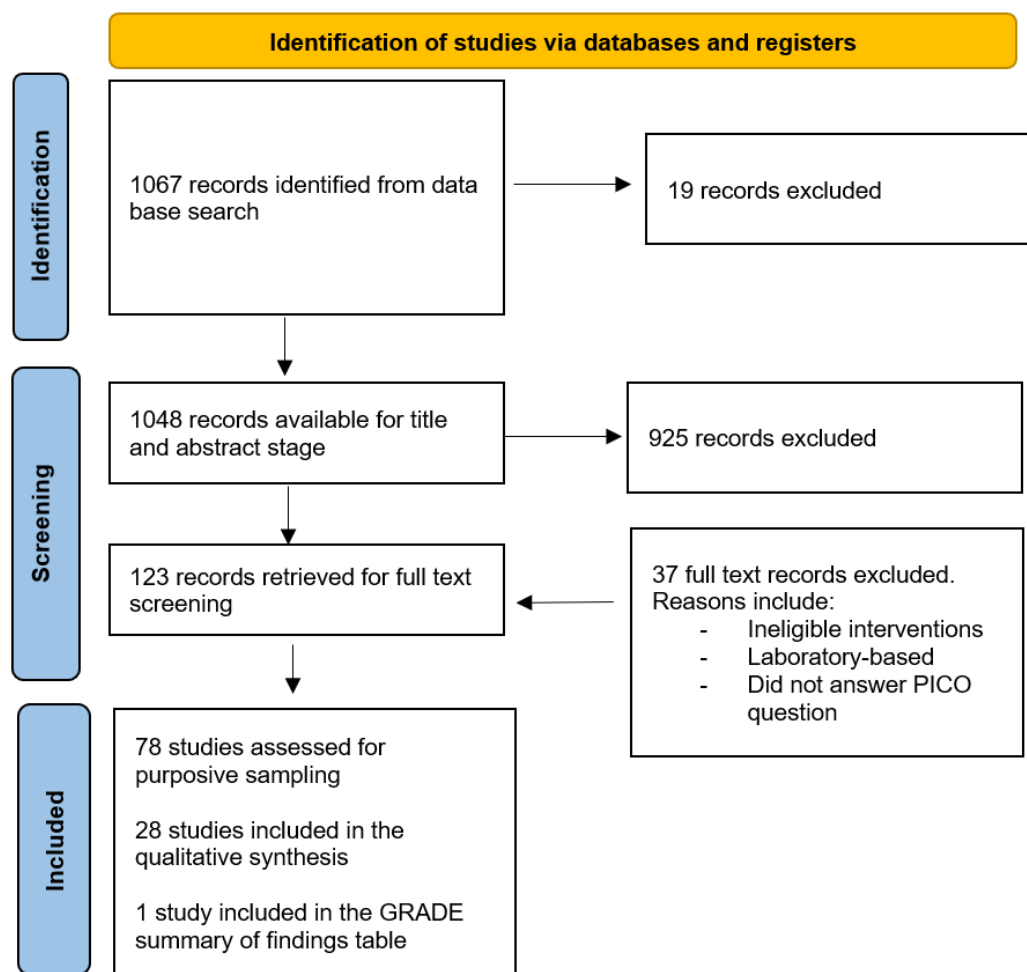


2	(distancing or ((physical* or social* or intervention* or measure* or strategies or strategy or policy or policies or contact) adj5 distance*)).mp.	98182
3	1 or 2	98182
4	((distance* or distant*) adj (learning or education)).mp.	7710
5	3 not 4	97480
6	(metre or metres or meter or meters or feet or foot or ft or yard* or centimeter* or centimetre* or cm or cms or 1m or 2m or "1 m" or "2 m" or "≥1m" or "≥2m" or "≤1m" or "≤2m" or ">1m" or ">2m" or "<1m" or "<2m" or "	
7	((compare or compared or comparison or comparing or versus or vs or "vs." or assess or assessed or assessing or evaluate or evaluated or evaluating or measuring or ascertain* or optimum or optimal or ideal or best or minimum or short or shorter or shorten* or shortest or long or longer or longest or length* or close or closer or closest or far or farther or farthest or further or furthest or small or smaller or smallest or large or larger or largest or differ* or increasing or decreasing or exposure) adj5 (distance or distances)).ti,ab,kf.	208318
8	6 or 7	5694865
9	5 and 8	33250
10	(predicter* or predictor* or predictive or ((risk or protective or multiple) adj3 factor*) or (risk adj3 (analysis or analyses or assessment or evaluation or model*))).ti,ab,kf. or Risk Factors/	4907279
11	5 and 10	7907
12	exp Disease Transmission, Infectious/ or transmission/ or communicable disease control/ or infection control/	456188

13	(tm or pc).fs.	2937579
14	(transmission or transmissibility or transmit* or prevent* or spread* or containment).ti,ab,kf.	5727049
15	or/12-14	7766059
16	11 and 15	2729
17	9 or 16	35446
18	limit 17 to covid-19	5762
19	limit 18 to (meta analysis or "systematic review")	157
20	randomized controlled trial.pt.	1138501
21	controlled clinical trial.pt.	188275
22	randomized.ab.	2059666
23	placebo.ab.	896240
24	randomly.ab.	1204675
25	trial.ab.	2068182
26	groups.ab.	6397283
27	or/20-26	9555987
28	exp animals/ not humans.sh.	36234151
29	27 not 28	4923557
30	18 and 29	1490
31	exp cohort studies/ or exp epidemiologic studies/ or exp clinical trial/ or exp evaluation studies as topic/ or exp statistics as topic/	13109232
32	((time and factors) or program or survey* or ci or cohort or comparative stud* or evaluation studies or follow-up*).mp.	15180580
33	(control and (group* or study)).mp.	6317732
34	or/31-33	25111022
35	(animals/ not humans/) or comment/ or editorial/ or exp review/ or meta analysis/ or consensus/ or exp guideline/	14617907
36	hi.fs. or case report.mp.	3620143
37	or/35-36	18035109
38	34 not 37	20747473
39	18 and 38	3611
40	19 or 30 or 39	4111
41	exp animals/ not humans/	17316537
42	40 not 41	4109
43	(comment or editorial or newspaper article).pt.	2160773
44	42 not 43	4101
45	social distancing/	12183
46	(distancing or ((physical* or social* or intervention* or measure* or strategies or strategy or policy or policies or contact) adj5 distance*).ti,ab.	87355
47	45 or 46	93398
48	((distance* or distant*) adj (learning or education)).mp.	7710
49	47 not 48	92712
50	(metre or metres or meter or meters or feet or foot or ft or yard* or centimeter* or centimetre* or cm or cms or 1m or 2m or "1 m" or "2 m" or "≥1m" or "≥2m" or "≤1m" or "≤2m" or ">1m" or ">2m" or "<1m" or "<2m" or "	
51	((compare or compared or comparison or comparing or versus or vs or "vs." or assess or assessed or assessing or evaluate or evaluated or evaluating or measuring or ascertain* or optimum or optimal or ideal or best or minimum or short or shorter or shorten* or shortest or long or longer or longest or length* or close or closer or closest or far or farther or farthest or further or furthest or small or smaller or smallest or large or larger or largest or differ* or increasing or decreasing or exposure) adj5 (distance or distances)).ti,ab.	207648
52	50 or 51	5666290
53	49 and 52	32733
54	(predicter* or predictor* or predictive or ((risk or protective or multiple) adj3 factor*) or (risk adj3 (analysis or analyses or assessment or evaluation or model*))).ti,ab. or risk factor/	4976315

55	49 and 54	7508
56	exp disease transmission/ or exp nosocomial transmission/ or exp pathogen transmission/ or communicable disease control/ or infection control/	450246
57	(transmission or transmissibility or transmit* or spread* or containment).ti,ab,kw.	1852448
58	56 or 57	2112218
59	55 and 58	1557
60	53 or 59	34025
61	limit 60 to covid-19	4961
62	limit 61 to "systematic review"	1529
63	randomized controlled trial/ or controlled clinical trial/ or randomization/ or exp intermethod comparison/ or double-blind procedure/	2035290
64	human experiment/	593123
65	(random\$ or crossover or cross over or volunteer or volunteers or placebo or allocated or assigned or (open adj label)).ti,ab.	5570375
66	(compare or compared or comparison).ti.	1194113
67	((evaluated or evaluate or evaluating or assessed or assess) and (compare or compared or comparing or comparison)).ab.	4614752
68	((double or single or doubly or singly) adj (blind or blinded or blindly)).ti,ab.	749260
69	parallel group\$1.ti,ab.	90999
70	((assign\$ or match or matched or allocation) adj5 (alternate or group\$1 or intervention\$1 or patient\$1 or subject\$1 or participant\$1)).ti,ab.	812120
71	(controlled adj7 (study or design or trial)).ti,ab.	1173263
72	trial.ti.	1029826
73	or/63-72	11241401
74	(Systematic review not (trial or study)).ti.	414473
75	(random cluster adj3 sampl\$).ti,ab.	2728
76	(review.ab. and review.pt.) not trial.ti.	2116515
77	(databases adj4 searched).ab.	101404
78	"we searched".ab. and (review.ti. or review.pt.)	82456
79	"update review".ab.	229
80	Random field\$.ti,ab.	5958
81	(nonrandom\$ not random\$).ti,ab.	35836
82	(random\$ adj sampl\$ adj7 (cross section\$ or questionnaire\$1 or survey\$ or database\$1)).ti,ab. not (comparative study/ or controlled study/ or randomi?ed controlled.ti,ab. or randomly assigned.ti,ab.)	18817
83	Cross-sectional study/ not (randomized controlled trial/ or controlled clinical trial/ or controlled study/ or randomi?ed controlled.ti,ab. or control group\$1.ti,ab.)	745980
84	((case adj control\$) and random\$) not randomi?ed controlled).ti,ab.	38693
85	(rat or rats or mouse or mice or swine or porcine or murine or sheep or lambs or pigs or piglets or rabbit or rabbits or cat or cats or dog or dogs or cattle or bovine or monkey or monkeys or trout or marmoset\$1).ti. and animal experiment/	1165072
86	Animal experiment/ not (human experiment/ or human/)	2450145
87	("cochrane database of systematic reviews" or "cochrane database of systematic reviews online").jn.	55180
88	or/74-87	5770138
89	73 not 88	10231673
90	61 and 89	1632
91	Clinical article/ or controlled study/ or major clinical study/ or prospective study/ or cohort.mp. or compared.mp. or groups.mp. or multivariate.mp.	24730657
92	case control study/	521560
93	91 or 92	24878612
94	61 and 93	2375
95	62 or 90 or 94	3110
96	exp animal/ not exp human/	10823124
97	95 not 96	3107

98	editorial.pt.	1357916
99	97 not 98	3099
100	1 or 46	91600
101	100 not 4	90919
102	52 and 101	32697
103	54 and 101	7311
104	12 or 13 or 57	4754501
105	103 and 104	1873
106	102 or 105	34205
107	(nCoV* or 2019nCoV or 19nCoV or COVID19* or COVID or SARS-COV-2 or SARSCOV-2 or SARS-COV2 or SARSCOV2 or coronavirus* or corona virus* or betacoronavirus* or CoV or HCoV).mp.	677814
108	limit 107 to yr="2019 -Current"	645253
109	106 and 108	3674
110	44 use medall	1146
111	99 use emczd	1114
112	109 use cctr	81
113	109 use coch	0
114	110 or 111 or 112 or 113	2341
115	remove duplicates from 114	1879



## 6.6.11 Operating Rooms

### Outcome terms

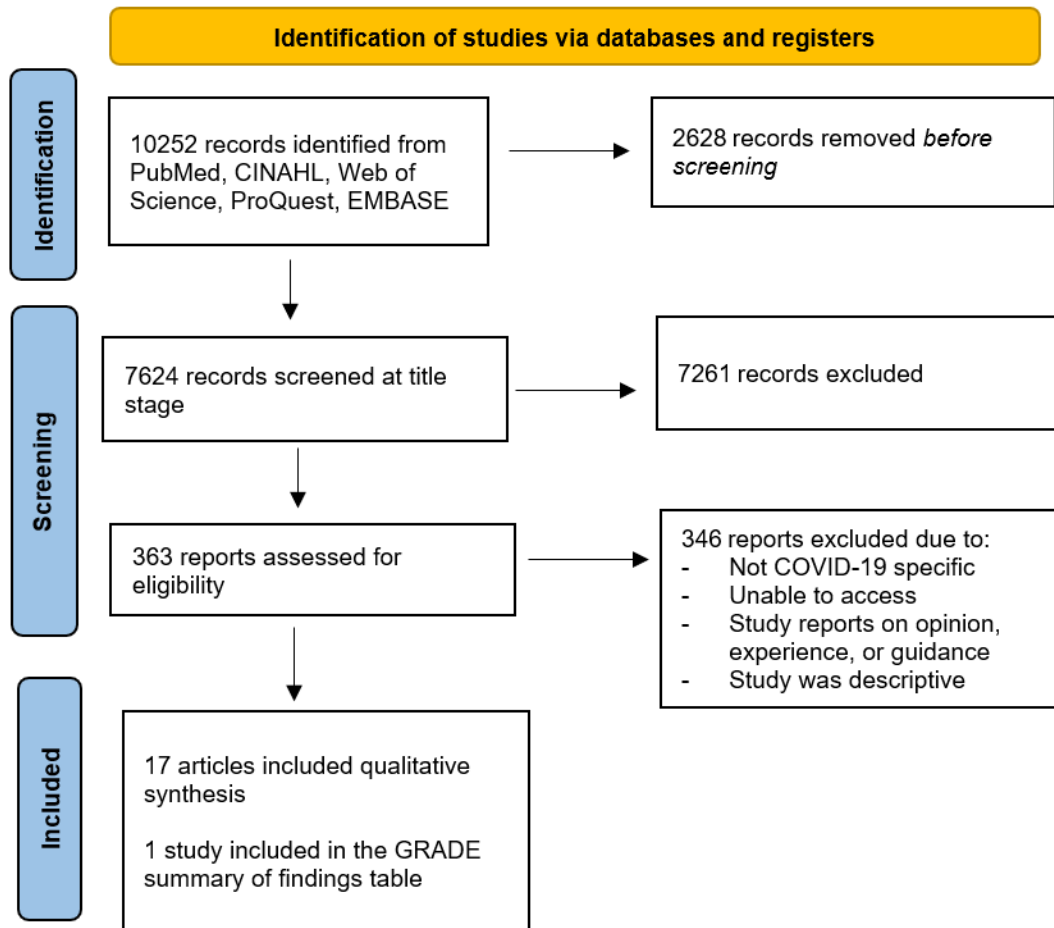
Exp Virus Diseases/ Exp Respiratory Tract Infections/ "respiratory infection".ti,ab. "respiratory virus".ti,ab. "respiratory tract infections".ti,ab. Exp Pneumonia/ Exp COVID-19/ Exp SARS-CoV-2/ Exp Coronavirus/ Coronavirus\*.ti,ab. "Coronavirus infection".ti,ab. 2019-nCoV.ti,ab. 2019 nCoV.ti,ab. nCov.ti,ab. Covid19.ti,ab. SARSCoV-2.ti,ab. "novel coronavirus".ti,ab. "novel corona virus".ti,ab. covid\*.ti,ab. "severe acute respiratory syndrome".ti,ab. "coronavirus 2".ti,ab. "coronavirus disease".ti,ab. "corona virus disease".ti,ab. "new coronavirus".ti,ab. "new corona virus".ti,ab. "new coronaviruses".ti,ab. "novel coronaviruses".ti,ab. Sars.ti,ab. "sars corona virus".ti,ab. "respiratory infectious disease".ti,ab. "acute respiratory disease".ti,ab. "influenza like illness".ti,ab. Exp Pandemics/ Pandemic\*.ti,ab. "respiratory disease".ti,ab.

### Setting terms

("operating rooms"[MeSH Terms] OR ("operating"[All Fields] AND "rooms"[All Fields]) OR "operating rooms"[All Fields] OR ("operating"[All Fields] AND "room"[All Fields]) OR "operating room"[All Fields] OR "operating theatre"[All Fields] OR "operating suite"[All Fields] OR ("theater"[All Fields] OR "theaters"[All Fields] OR "theatre"[All Fields] OR "theatres"[All Fields]) OR ("surgery"[MeSH Subheading] OR "surgery"[All Fields] OR "surgical procedures, operative"[MeSH Terms] OR ("surgical"[All Fields] AND "procedures"[All Fields] AND "operative"[All Fields]) OR "operative surgical procedures"[All Fields] OR "general surgery"[MeSH Terms] OR ("general"[All Fields] AND "surgery"[All Fields]) OR "general surgery"[All Fields] OR "surgery s"[All Fields] OR "surgerys"[All Fields] OR "surgeries"[All Fields]) OR ("operability"[All Fields] OR "operable"[All Fields] OR "operate"[All Fields] OR "operated"[All Fields] OR "operates"[All Fields] OR "operating"[All Fields] OR "operation s"[All Fields] OR "operational"[All Fields] OR "operative"[All Fields] OR "operatively"[All Fields] OR "operatives"[All Fields] OR "operator"[All Fields] OR "operator s"[All Fields] OR "operators"[All Fields] OR "surgery"[MeSH Subheading] OR "surgery"[All Fields] OR "operations"[All Fields] OR "surgical procedures, operative"[MeSH Terms] OR ("surgical"[All Fields] AND "procedures"[All Fields] AND "operative"[All Fields]) OR "operative surgical procedures"[All Fields] OR "operation"[All Fields]) OR ("surgical procedures, operative"[MeSH Terms] OR ("surgical"[All Fields] AND "procedures"[All Fields] AND "operative"[All Fields]) OR "operative surgical procedures"[All Fields] OR "surgical"[All Fields] OR "surgically"[All Fields] OR "surgicals"[All Fields])) AND (y\_1[Filter])

### Intervention terms-cleaning

"clean"[All Fields] OR "cleaned"[All Fields] OR "cleaning"[All Fields] OR "cleanings"[All Fields] OR "cleanness"[All Fields] OR "cleans"[All Fields] OR ("clean"[All Fields] OR "cleaned"[All Fields] OR "cleaning"[All Fields] OR "cleanings"[All Fields] OR "cleanness"[All Fields] OR "cleans"[All Fields]) OR "sterile"[All Fields] OR "sterility"[All Fields] OR "sterilant"[All Fields] OR "sterilants"[All Fields] OR "sterilely"[All Fields] OR "steriles"[All Fields] OR "sterilisation"[All Fields] OR "sterilization"[MeSH Terms] OR ("sterilization"[All Fields] OR "sterilization"[All Fields] OR "sterilization"[MeSH Terms] OR "sterilisations"[All Fields] OR "sterilised"[All Fields] OR "steriliser"[All Fields] OR "sterilisers"[All Fields] OR "sterilising"[All Fields] OR "sterilities"[All Fields] OR "sterilise"[All Fields] OR "sterilize"[All Fields] OR "sterilizations"[All Fields] OR "sterilized"[All Fields] OR "sterilizer"[All Fields] OR "sterilizers"[All Fields] OR "sterilizes"[All Fields] OR "sterilizing"[All Fields]) OR "decontaminant"[All Fields] OR "decontaminants"[All Fields] OR "decontaminated"[All Fields] OR "decontaminates"[All Fields] OR "decontamination"[MeSH Terms] OR "decontamination"[All Fields] OR "decontaminate"[All Fields] OR "decontaminating"[All Fields] OR "decontaminations"[All Fields] OR "decontaminative"[All Fields] OR "disinfect"[All Fields] OR "disinfectable"[All Fields] OR "disinfectants"[Pharmacological Action] OR "disinfectants"[MeSH Terms] OR "disinfectants"[All Fields] OR "disinfectant"[All Fields] OR "disinfected"[All Fields] OR "disinfecting"[All Fields] OR "disinfection"[MeSH Terms] OR "disinfection"[All Fields] OR "disinfections"[All Fields] OR "disinfective"[All Fields] OR "disinfects"[All Fields] OR "terminal cleaning"[All Fields] OR "terminal disinfection"[All Fields] AND (y\_1[Filter])



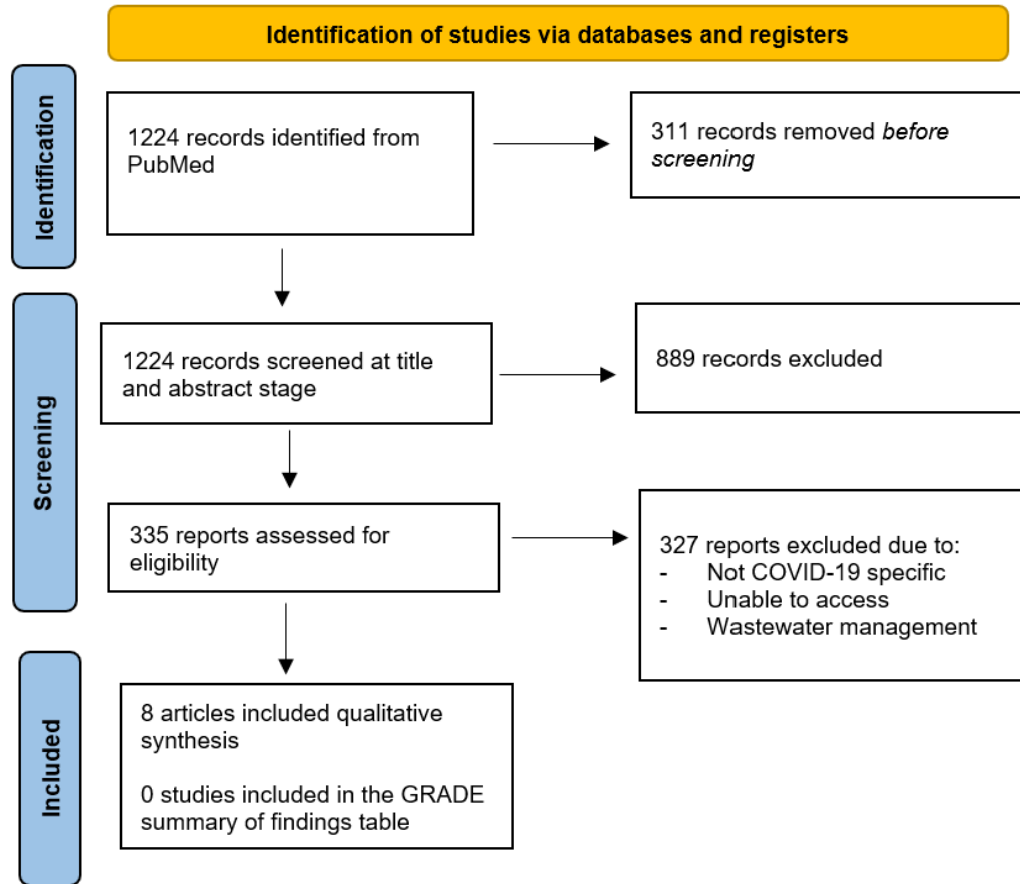
## 6.6.12 Waste Management

### Outcome terms

Exp Virus Diseases/ Exp Respiratory Tract Infections/ "respiratory infection\*".ti,ab. "respiratory virus\*".ti,ab. "respiratory tract infections".ti,ab. Exp Pneumonia/ Exp COVID-19/ Exp SARS-CoV-2/ Exp Coronavirus/ Coronavirus\*.ti,ab. "Coronavirus infection\*".ti,ab. 2019-nCoV.ti,ab. 2019 ncov.ti,ab. nCov.ti,ab. Covid19.ti,ab. SARSCoV-2.ti,ab. "novel coronavirus".ti,ab. "novel corona virus".ti,ab. covid\*.ti,ab. "severe acute respiratory syndrome".ti,ab. "coronavirus 2".ti,ab. "coronavirus disease".ti,ab. "corona virus disease".ti,ab. "new coronavirus".ti,ab. "new corona virus".ti,ab. "new coronaviruses".ti,ab. "novel coronaviruses".ti,ab. Sars.ti,ab. "sars corona virus".ti,ab. "respiratory infectious disease\*".ti,ab. "acute respiratory disease\*".ti,ab. "influenza like illness".ti,ab. Exp Pandemics/ Pandemic\*.ti,ab. "respiratory disease".ti,ab.

### Intervention terms

("waste"[All Fields] OR "waste s"[All Fields] OR "wastes"[All Fields] OR "medical waste"[All Fields] OR "biomedical waste"[All Fields] OR "infectious waste"[All Fields] OR "healthcare waste"[All Fields] OR "hazardous waste"[All Fields] OR "contaminated waste"[All Fields] OR "disposal"[All Fields] OR "disposals"[All Fields] OR "dispose"[All Fields] OR "disposed"[All Fields] OR "disposer"[All Fields] OR "disposers"[All Fields] OR "disposes"[All Fields] OR "disposing"[All Fields]) AND (2020:2023[pdat])



## 6.6.13 Ventilation

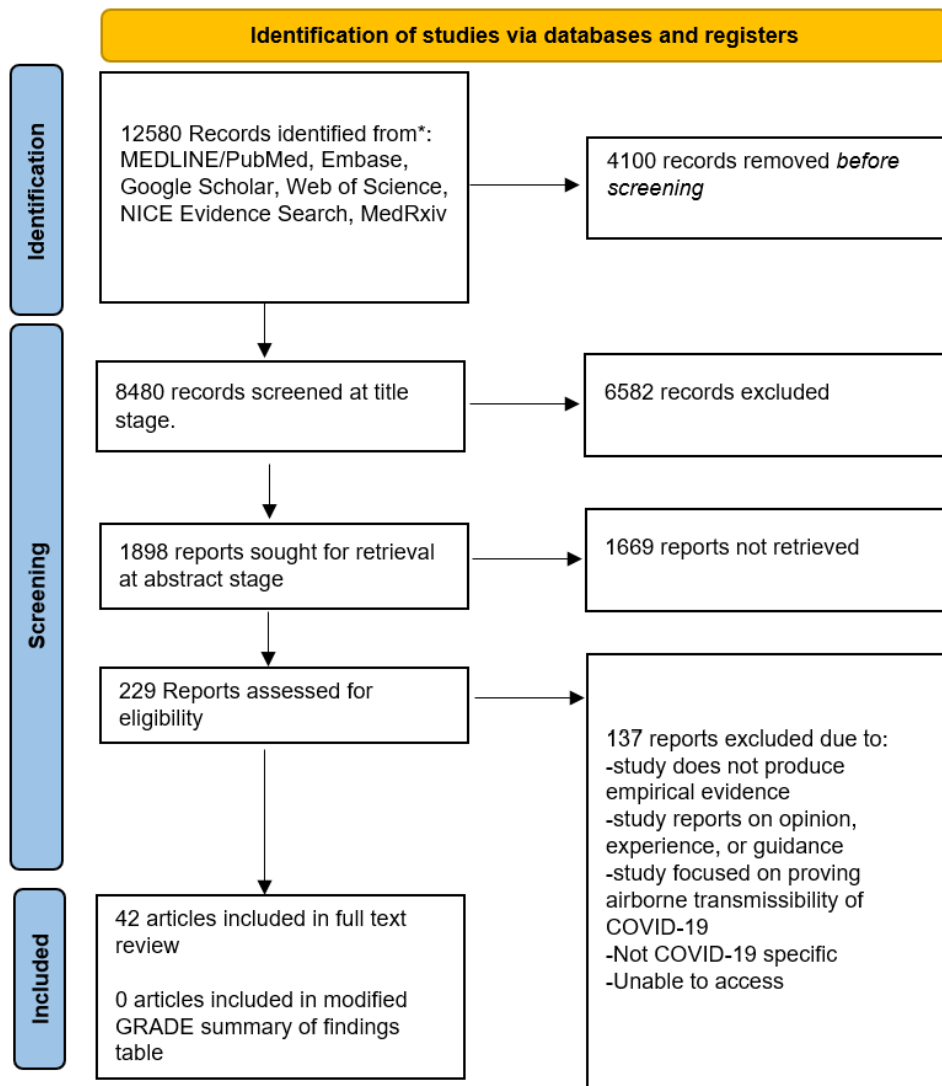
### Outcome terms

Exp Virus Diseases/ Exp Respiratory Tract Infections/ "respiratory infection".ti,ab. "respiratory virus".ti,ab. "respiratory tract infections".ti,ab. Exp Pneumonia/ Exp COVID-19/ Exp SARS-CoV-2/ Exp Coronavirus/ Coronavirus\*.ti,ab. "Coronavirus infection".ti,ab. 2019-nCoV.ti,ab. 2019 nCoV.ti,ab. nCov.ti,ab. Covid19.ti,ab. SARSCoV-2.ti,ab. "novel coronavirus".ti,ab. "novel corona virus".ti,ab. covid\*.ti,ab. "severe acute respiratory syndrome".ti,ab. "coronavirus 2".ti,ab. "coronavirus disease".ti,ab. "corona virus disease".ti,ab. "new coronavirus".ti,ab. "new corona virus".ti,ab. "new coronaviruses".ti,ab. "novel coronaviruses".ti,ab. Sars.ti,ab. "sars corona virus".ti,ab. "respiratory infectious disease".ti,ab. "acute respiratory disease".ti,ab. "influenza like illness".ti,ab. Exp Pandemics/ Pandemic\*.ti,ab. "respiratory disease".ti,ab.

### Intervention terms

("filtrate"[All Fields] OR "filtrated"[All Fields] OR "filtrates"[All Fields] OR "filtrating"[All Fields] OR "filtration"[MeSH Terms] OR "filtration"[All Fields] OR "filtrations"[All Fields] OR ("recirculate"[All Fields] OR "recirculated"[All Fields] OR "recirculates"[All Fields] OR "recirculating"[All Fields] OR "recirculation"[All Fields] OR "recirculations"[All Fields]) OR ("ventilated"[All Fields] OR "ventilates"[All Fields] OR "ventilating"[All Fields] OR "ventilation"[MeSH Terms] OR "ventilation"[All Fields] OR "ventilate"[All Fields] OR "ventilations"[All Fields] OR "ventilator s"[All Fields] OR "ventilators, mechanical"[MeSH Terms] OR ("ventilators"[All Fields] AND "mechanical"[All Fields]) OR "mechanical ventilators"[All Fields] OR "ventilator"[All Fields] OR "ventilators"[All Fields] OR "ventilation"[All Fields]) OR "HVAC"[All Fields] OR (("mechanical"[All Fields] OR "mechanically"[All Fields] OR "mechanicals"[All Fields] OR "mechanics"[MeSH Terms] OR "mechanics"[All Fields] OR "mechanic"[All Fields]) AND ("drug delivery systems"[MeSH Terms] OR ("drug"[All Fields] AND "delivery"[All Fields] AND "systems"[All Fields]) OR "drug delivery systems"[All Fields] OR "system"[All Fields] OR "system s"[All Fields] OR "systems"[All Fields])) OR "Airconditioning"[All Fields] OR ("ventilated"[All Fields] OR "ventilates"[All Fields] OR "ventilating"[All Fields] OR "ventilation"[MeSH Terms] OR "ventilation"[All

Fields] OR "ventilate"[All Fields] OR "ventilations"[All Fields] OR "ventilator s"[All Fields] OR "ventilators, mechanical"[MeSH Terms] OR ("ventilators"[All Fields] AND "mechanical"[All Fields]) OR "mechanical ventilators"[All Fields] OR "ventilator"[All Fields] OR "ventilators"[All Fields] OR "ventillation"[All Fields]) AND ("setting"[All Fields] OR "setting s"[All Fields] OR "settings"[All Fields])) OR (("respiration, artificial"[MeSH Terms] OR ("respiration"[All Fields] AND "artificial"[All Fields]) OR "artificial respiration"[All Fields] OR ("mechanical"[All Fields] AND "ventilation"[All Fields]) OR "mechanical ventilation"[All Fields]) AND ("drug delivery systems"[MeSH Terms] OR ("drug"[All Fields] AND "delivery"[All Fields] AND "systems"[All Fields]) OR "system"[All Fields] OR "system s"[All Fields] OR "systems"[All Fields])) OR (("indoor"[All Fields] OR "indoors"[All Fields]) ("airflow"[All Fields] OR "airflows"[All Fields]))



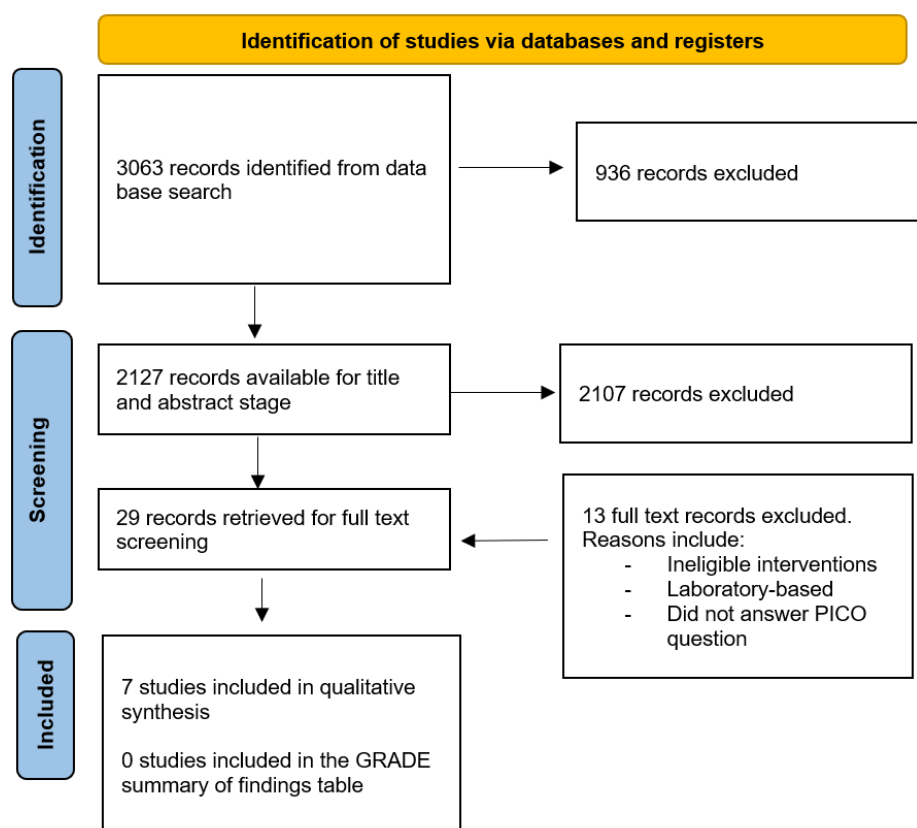
### 6.6.14 HEPA Filter

#### Search terms

1.	air filters/
2.	Air Ionization/
3.	Ventilation/
4.	(HVAC or HEPA or MERV or CADR or HRV or ERV or "Heating ventilation and air conditioning" or "High Efficiency Particulate Air" or "High Efficiency Particulate Arrestance" or "Minimum Efficiency Reporting Value" or "Clean Air Delivery Rate" or "Heat Recovery Ventilator" or "Energy Recovery Ventilator").ti,ab,kf.
5.	(ventilation adj3 (unit* or system* or technolog* or vents or equipment or device*)).ti,ab,kf.

6.	(air adj3 (cleaner* or cleaning or filter* or filtering or filtration or purifier* or purifying or purification or ultraviolet or ultra violet or UV or UVGI or UVC or actinic or ioni?er* or ioni?ing or ioni?ation or ozone or ozoni?er* or ozoni?ation)).ti,ab,kf.
7.	(ion generator* or electrostatic precipitator*).mp.
8.	or/1-7
9.	air pollutants/ or air pollutants, occupational/
10.	air pollution/ or air pollution, indoor/
11.	Air/ or Air Microbiology/
12.	Aerosols/ or Inhalation Exposure/
13.	or/9-12
14.	filtration/
15.	Ultraviolet Rays/ or Ultraviolet Therapy/
16.	or/14-15
17.	13 and 16
18.	8 or 17
19.	limit 18 to covid-19
20.	exp Animals/ not Humans/
21.	19 not 20
22.	(comment or editorial or newspaper article).pt.
23.	21 not 22
24.	exp air filter/ or hepa filter/ or air cleaning system/
25.	room ventilation/
26.	(HVAC or HEPA or MERV or CADR or HRV or ERV or "Heating ventilation and air conditioning" or "High Efficiency Particulate Air" or "High Efficiency Particulate Arrestance" or "Minimum Efficiency Reporting Value" or "Clean Air Delivery Rate" or "Heat Recovery Ventilator" or "Energy Recovery Ventilator").ti,ab,kw.
27.	(ventilation adj3 (unit* or system* or technolog* or vents or equipment or device*)).ti,ab,kw.
28.	(air adj3 (cleaner* or cleaning or filter* or filtering or filtration or purifier* or purifying or purification or ultraviolet or ultra violet or UV or UVGI or UVC or actinic or ioni?er* or ioni?ing or ioni?ation or ozone or ozoni?er* or ozoni?ation)).ti,ab,kw.
29.	(ion generator* or electrostatic precipitator*).mp.
30.	or/24-29
31.	air pollution/ or air pollutant/ or air pollution control/ or indoor air pollution/
32.	exp air/ or ambient air/ or workroom air/
33.	aerosol/
34.	31 or 32 or 33
35.	filtration/
36.	exp ultraviolet radiation/ or ultraviolet germicidal irradiation/ or ultraviolet irradiation/
37.	35 or 36
38.	34 and 37
39.	30 or 38
40.	limit 39 to covid-19
41.	exp animal/ not exp human/
42.	40 not 41
43.	editorial.pt.
44.	42 not 43
45.	1 or 2 or 3 or 7 or 26 or 27 or 28
46.	17 or 45
47.	(nCoV* or 2019nCoV or 19nCoV or COVID19* or COVID or SARS-COV-2 or SARSCOV-2 or SARS-COV2 or SARSCOV2 or SARS coronavirus 2 or Severe Acute Respiratory Syndrome Coronavirus 2 or Severe Acute Respiratory Syndrome Corona Virus 2).mp.

48.	(longCOVID* or postCOVID* or postcoronavirus* or postSARS*).mp.
49.	((Wuhan or Hubei) adj5 pneumonia).mp.
50.	(coronavirus* or corona virus* or betacoronavirus* or CoV or HCoV).mp.
51.	47 or 48 or 49 or 50
52.	limit 51 to yr="2019 -Current" [COVID-19 filter adapted from CADTH Search Strings]
53.	46 and 52
54.	23 use medall
55.	44 use emczd
56.	53 use cctr
57.	53 use coch
58.	54 or 55 or 56 or 57
59.	remove duplicates from 58



## References

1. From emergency response to long-term COVID-19 disease management: sustaining gains made during the COVID-19 pandemic. Geneva: World Health Organization; 2023. [Website](#)
2. Ending the COVID-19 emergency and transitioning from emergency phase to longer-term disease management: guidance on calibrating the response, 4 September 2023. Geneva: World Health Organization; 2023. [Website](#)
3. Convention on the Rights of the Child: the children's version. New York: UNICEF; 1990. [Website](#)
4. Use of SARS-CoV-2 antigen-detection rapid diagnostic tests for COVID-19 self-testing: interim guidance, 9 March 2022. Geneva: World Health Organization; 2022. [Website](#)
5. WHO COVID-19 Case definition. Geneva: World Health Organization; 2022. [Website](#)
6. Natural Ventilation for Infection Control in Health-Care Settings. Geneva: World Health Organization; 2009. [Website](#)
7. Roadmap to improve and ensure good indoor ventilation in the context of COVID-19. Geneva: World Health Organization; 2021. [Website](#)
8. Infection prevention and control of epidemic-and pandemic prone acute respiratory infections in health care. Geneva: World Health Organization; 2014. [Website](#)
9. Transmission-based precautions for the prevention and control of infections: aide-memoire. Geneva: World Health Organization; 2022. [Website](#)
10. A GLOSSARY OF TERMS FOR COMMUNITY HEALTH CARE AND SERVICES FOR OLDER PERSONS. Geneva: World Health Organization; 2004. [Website](#)
11. Standard precautions for the prevention and control of infections: aide-memoire. Geneva: World Health Organization; 2022. [Website](#)
12. Standard precautions: Environmental cleaning and disinfection. Geneva: World Health Organization; OpenWHO; 2020. [Website](#)
13. Isolation Precautions. Centers for Disease Control and Prevention; Atlanta 2007. [Website](#)
14. Technical specifications of personal protective equipment for COVID-19. Geneva: World Health Organization; 2020. [Website](#)
15. WHO guidelines on hand hygiene in health care : a summary. Geneva: World Health Organization; 2009. [Website](#)
16. Standard precautions: Waste management. Geneva: World Health Organization; OpenWHO; [Website](#)
17. The world health report: 2006: working together for health. Geneva: World Health Organization; 2006. [Website](#)
18. COVID-19: occupational health and safety for health workers: interim guidance, 2 February 2021. Geneva: World Health Organization; 2021. [Website](#)
19. Hierarchy of Controls. National Institute for Occupational Safety and Health National Institute for Occupational Safety and Health; 2023. [Website](#)

20. COVID-19: occupational health and safety for health workers: interim guidance, 2 February 2021. Geneva: World Health Organization; 2021. [Website](#)
21. Infection prevention and control: Website. Geneva: World Health Organization; [Website](#)
22. ASTM standards & COVID-19. West Conshohocken (PA): ASTM International; 2021. [Website](#)
23. Directorate General of Drug Administration (DGDA). Dhaka: Ministry of Health & Family Welfare, Government of the People's Republic of Bangladesh; 2021. [Website](#)
24. European Committee for Standardization. Brussels: Cen; 2021. [Website](#)
25. WHO guidance on research methods for health emergency and disaster risk management. Geneva: World Health Organization; 2021. [Website](#)
26. Screening: when is it appropriate and how can we get it right?. World Health Organization: Regional Office for Europe 2020. [Website](#)
27. World Health Organization. "Crafting the mosaic": A framework for resilient surveillance for respiratory viruses of epidemic and pandemic potential. Geneva: World Health Organization; 2022. [Website](#)
28. Statement on the fifteenth meeting of the IHR (2005) Emergency Committee on the COVID-19 pandemic. Geneva: World Health Organization; 2023. [Website](#)
29. WHO handbook for guideline development, 2nd edition. Geneva: World Health Organization; 2014. [Website](#)
30. Schumemann H, Brożek J, Guyatt G, Oxman A. GRADE Handbook. Grading of Recommendations Assessment, Development and Evaluation, Grade Working Group. GRADEPro [Website](#)
31. Guidelines for declaration of interests (WHO experts). Geneva: World Health Organization; 2021. [Website](#)
32. Chou R, Dana T, Jungbauer R, Weeks C, McDonagh MS. Masks for prevention of respiratory virus infections, including SARS-CoV-2, in health care and community settings: a living rapid review. *Ann Intern Med.* 2020;173(7):542-55. [PubMed Journal](#)
33. Chou R, Dana T, Jungbauer R. Update Alert 8: Masks for Prevention of Respiratory Virus Infections, Including SARS-CoV-2, in Health Care and Community Settings. *Annals of internal medicine* 2022;175(9):W108-W109 [PubMed Journal](#)
34. Tricco A, Langlois E, Straus S. Rapid reviews to strengthen health policy and systems: a practical guide. World Health Organization; Geneva 2017. [Website](#)
35. Gale NK, Heath G, Cameron E, Rashid S, Redwood S. Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC medical research methodology* 2013;13:117 [PubMed Journal](#)
36. Chou R, Dana T, Buckley DI, Selph S, Fu R, Totten AM. Epidemiology of and risk factors for coronavirus infection in health care workers: a living rapid review. *Ann Intern Med.* 2020;173(2):120-36. [PubMed Journal](#)
37. Chou R, Dana T, Buckley DI, Selph S, Fu R, Totten AM. Update alert 10: epidemiology of and risk factors for coronavirus infection in health care workers. *Ann Intern Med.* 2022;175(1):W8-W9. [PubMed Journal](#)
38. Ford N, Holmer HK, Chou R, Villeneuve PJ, Baller A, et al. Mask use in community settings in the context of COVID-19: a systematic review of ecological data. *EClinicalMedicine.* 2021;38::101024 [PubMed Journal](#)

39. Dewidar O, Lotfi T, Langendam M, Parmelli E, Saz Parkinson Z, Solo K, et al. Which actionable statements qualify as good practice statements In Covid-19 guidelines? A systematic appraisal. *BMJ evidence-based medicine* 2022;27(6):361-369 [Pubmed Journal](#)
40. Andrews JC, Schünemann HJ, Oxman AD, Oxman Ad, Pottie K, Pottie K, Meerpohl JJ, Meerpohl Jj, Coello PA, Coello Pa, Rind D, et al. GRADE guidelines: 15. Going from evidence to recommendation-determinants of a recommendation's direction and strength. *J Clin Epidemiol* 2013;66(7):726-35 [Pubmed Journal](#)
41. Guyatt GH, Alonso-Coello P, Schünemann HJ, Djulbegovic B, Nothacker M, et al. Guideline panels should seldom make good practice statements: guidance from the GRADE Working Group. *J Clin Epidemiol*. 2016;80::3-7. [Pubmed Journal](#)
42. Lotfi T, Hajizadeh A, Moja L, Akl EA, Piggott T, et al. A taxonomy and framework for identifying and developing actionable statements in guidelines suggests avoiding informal recommendations. *J Clin Epidemiol*. 2021;141::161-71. [Pubmed Journal](#)
43. Guidelines on core components of infection prevention and control programmes at the national and acute health care facility level. Geneva: World Health Organization; 2016. [Website](#)
44. Allegranzi B, Bagheri Nejad S, Combescure C, Graafmans W, Attar H, et al. Burden of endemic health-care-associated infection in developing countries: systematic review and meta-analysis. *Lancet*. 2011;377(9761):228-41. [Pubmed Journal](#)
45. Interim practical manual: supporting national implementation of the WHO guidelines on core components of infection prevention and control programmes. Geneva: World Health Organization; 2017. [Website](#)
46. Improving infection prevention and control at the health facility: interim practical manual supporting implementation of the WHO guidelines on core components of infection prevention and control programmes. Geneva: World Health Organization; 2018. [Website](#)
47. Core competencies for infection prevention and control professionals. World Health Organization; Geneva 2020. [Website](#)
48. Chain of Infection Components. National Institute for Occupational Safety and Health; 2022. [Website](#)
49. Casadevall A, Pirofski LA. Host-pathogen interactions: basic concepts of microbial commensalism, colonization, infection, and disease. *Infection and immunity* 2000;68(12):6511-8 [Pubmed](#)
50. Occupational safety and health in public health emergencies: a manual for protecting health workers and responders. World Health Organization; Geneva 2018. [Website](#)
51. The COVID-19 Clinical CARE Pathway. World Health Organization; Geneva 2022. [Website](#)
52. Living guidance for clinical management of COVID-19: living guidance, 13 January 2023. Geneva: World Health Organization; [Website](#)
53. CONTACT AND DROPLET PRECAUTIONS - COVID-19 PERSONAL PROTECTIVE EQUIPMENT (PPE). Geneva: World Health Organization; 2021. [Website](#)
54. Antigen-detection in the diagnosis of SARS-CoV-2 infection: interim guidance, 6 October 2021. Geneva: World Health Organization; 2021. [Website](#)
55. Diagnostic testing for SARS-CoV-2. Geneva: World Health Organization; 2020. [Website](#)
56. Herstein JJ, Degarege A, Stover D, Austin C, Schwedhelm MM, Lawler JV, et al. Characteristics of SARS-CoV-2 Transmission among Meat Processing Workers in Nebraska, USA, and Effectiveness of Risk Mitigation Measures. *Emerging infectious diseases* 2021;27(4):1032-1038 [Pubmed Journal](#)

57. Eykelbosh A. Physical barriers for COVID-19 infection prevention and control in commercial settings. National Collaborating Centre for Environmental Health; Vancouver 2020. [Website](#)
58. van den Berg P, Schechter-Perkins EM, Jack RS, Epshtein I, Nelson R, Oster E, et al. Effectiveness of 3 Versus 6 ft of Physical Distancing for Controlling Spread of Coronavirus Disease 2019 Among Primary and Secondary Students and Staff: A Retrospective, Statewide Cohort Study. *Clinical infectious diseases : an official publication of the Infectious Diseases Society of America* 2021;73(10):1871-1878 [Pubmed Journal](#)
59. Source Control: CDC. Center for Disease Control and Prevention; Atlanta [Website](#)
60. Considerations for implementing and adjusting public health and social measures in the context of COVID-19. Geneva: World Health Organization; 2023. [Website](#)
61. Lan F-Y, Christophi CA, Buley J., Iliaki E, Bruno-Murtha LA, et al. Effects of universal masking on Massachusetts healthcare workers' COVID-19 incidence. *Occup Med (Lond)*. 2020;70(8):606-9. [Pubmed Journal](#)
62. Seidelman JL, Lewis SS, Advani SD,, Akinboyo IC, Epling C, et al. Universal masking is an effective strategy to flatten the severe acute respiratory coronavirus virus 2 (SARS-CoV-2) healthcare worker epidemiologic curve. *Infect Control Hosp Epidemiol*. 2020;41(12):1466-7. [Pubmed Journal](#)
63. Wang DD, O'Neill WW, Zervos MJ,, McKinnon JE, Allard D, et al. Association between implementation of a universal face mask policy for healthcare workers in a health care system and SARS-CoV-2 positivity testing rate in healthcare workers. *J Occup Environ Med*. 2021;63(6):476-81. [Pubmed Journal](#)
64. Temkin E, Schwaber MJ, Vaturi A., Nadir E, Zilber R, et al. Effect of a national policy of universal masking and uniform criteria for severe acute respiratory coronavirus virus 2 (SARS-CoV-2) exposure on hospital staff infection and quarantine. *Infect Control Hosp Epidemiol*. 2021;3 May 2021::1-7. [Pubmed Journal](#)
65. Wang X, Ferro EG, Zhou G., Hashimoto D, Bhatt DL. Association between universal masking in a health care system and SARS-CoV-2 positivity among health care workers. *JAMA*. 2020;324(7):703-4. [Pubmed Journal](#)
66. Ribeiro AI, Triguero-Mas M, Jardim Santos C, Gómez-Nieto A, Cole H, Anguelovski I, et al. Exposure to nature and mental health outcomes during COVID-19 lockdown. A comparison between Portugal and Spain. *Environment international* 2021;154:106664 [Pubmed Journal](#)
67. Setiawan HW, Pratiwi IN, Nimah L, Pawanis Z, Bakhtiar A, Fauziniqtyas R, et al. Challenges for Healthcare Workers Caring for COVID-19 Patients in Indonesia: A Qualitative Study. *Inquiry : a journal of medical care organization, provision and financing* 2021;58:469580211060291 [Pubmed Journal](#)
68. Broom J, Broom A, Williams Veazey L, Burns P, Degeling C, Hor S, et al. "One minute it's an airborne virus, then it's a droplet virus, and then it's like nobody really knows...": Experiences of pandemic PPE amongst Australian healthcare workers. *Infection, disease & health* 2022;27(2):71-80 [Pubmed Journal](#)
69. Candido G, Tortù C, Seghieri C, Tartaglia R, Baglioni C, Citti P, et al. Physical and stressful psychological impacts of prolonged personal protective equipment use during the COVID-19 pandemic: A cross-sectional survey study. *Journal of infection and public health* 2023;16(8):1281-1289 [Pubmed Journal](#)
70. Hoernke K, Djellouli N, Andrews L, Lewis-Jackson S, Manby L, Martin S, et al. Frontline healthcare workers' experiences with personal protective equipment during the COVID-19 pandemic in the UK: a rapid qualitative appraisal. *BMJ open* 2021;11(1):e046199 [Pubmed Journal](#)
71. Markkanen P, Brouillette N, Quinn M, Galligan C, Sama S, Lindberg J, et al. "It changed everything": The safe Home care qualitative study of the COVID-19 pandemic's impact on home care aides, clients, and managers. *BMC health services research* 2021;21(1):1055 [Pubmed Journal](#)

72. Romeu-Labayen M, Tort-Nasarre G, Alvarez B, Subias-Miquel M, Vázquez-Segura E, Marre D, et al. Spanish nurses' experiences with personal protective equipment and perceptions of risk of contagion from COVID-19: A qualitative rapid appraisal. *Journal of clinical nursing* 2022;31(15-16):2154-2166 [Pubmed Journal](#)
73. Venesoja A, Grönman K, Tella S, Hiltunen S, Koljonen K, Butylina S, et al. Healthcare Workers' Experiences and Views of Using Surgical Masks and Respirators, and Their Attitudes on the Sustainability: A Semi-Structured Survey Study during COVID-19. *Nursing reports (Pavia, Italy)* 2021;11(3):615-628 [Pubmed Journal](#)
74. Global analysis of health care waste in the context of COVID-19. Geneva: World Health Organization 2022. [Website](#)
75. Hospital Respiratory Protection Program Toolkit. The National Institute for Occupational Safety and Health (NIOSH) [Website](#)
76. Appendix A to §1910.134—fit testing procedures (mandatory) Part I. OSHA-accepted fit test protocols. Washington (DC): United States Department of Labor; 2004. [Website](#)
77. Blachere FM, Lemons AR, Coyle JP, Derk RC, Lindsley WG, Beezhold DH, et al. Face mask fit modifications that improve source control performance. *American journal of infection control* 2022;50(2):133-140 [Pubmed Journal](#)
78. Brooks JT, Beezhold DH, Noti JD, Coyle JP, Derk RC, Blachere FM, et al. Maximizing Fit for Cloth and Medical Procedure Masks to Improve Performance and Reduce SARS-CoV-2 Transmission and Exposure, 2021. *MMWR. Morbidity and mortality weekly report* 2021;70(7):254-257 [Pubmed Journal](#)
79. Clapp PW, Sickbert-Bennett EE, Samet JM, Berntsen J, Zeman KL, Anderson DJ, et al. Evaluation of Cloth Masks and Modified Procedure Masks as Personal Protective Equipment for the Public During the COVID-19 Pandemic. *JAMA internal medicine* 2021;181(4):463-469 [Pubmed Journal](#)
80. Ingabire J, McKenney H, Sebesta C, Badhiwala K, Kemere C, Kapur S, et al. Evaluation of Aerosol Particle Leak and Standard Surgical Mask Fit With 3 Elastomeric Harness Designs. *JAMA network open* 2022;5(1):e2145811 [Pubmed Journal](#)
81. Fletcher JJ, Feucht EC, Hahn PY, McGoff TN, Dehart DJ, et al. Healthcare-acquired coronavirus disease 2019 (COVID-19) is less symptomatic than community-acquired disease among healthcare workers. *Infect Control Hosp Epidemiol.* 2021;1-7. [Pubmed Journal](#)
82. Haller S, Güsewell S, Egger T, Scanferla G, Thoma R. Impact of respirator versus surgical masks on SARS-CoV-2 acquisition in healthcare workers: a prospective multicentre cohort. *Antimicrob Resist Infect Control.* 2022;11(1):27 [Pubmed Journal](#)
83. Sims MD, Maine GN, Childers KL, Podolsky RH, Voss DR, et al. Coronavirus disease 2019 (COVID-19) seropositivity and asymptomatic rates in healthcare workers are associated with job function and masking. *Clin Infect Dis.* 2021;73(Suppl 2):S154-62. [Pubmed Journal](#)
84. Piapan L, De Michieli P, Ronchese F, Rui F, Mauro M, et al. COVID-19 outbreak in healthcare workers in hospitals in Trieste, north-east Italy. *J Hosp Infect.* 2020;106(3):626-8. [Pubmed Journal](#)
85. Venugopal U, Jilani N, Rabah S, Shariff MA, Jawed M, et al. SARS-CoV-2 seroprevalence among health care workers in a New York City hospital: a cross-sectional analysis during the COVID-19 pandemic. *Int J Infect Dis.* 2021;102::63-9. [Pubmed Journal](#)
86. Loeb M, Bartholomew A, Hashmi M, Tarhuni W, Hassany M, Youngster I, et al. Medical Masks Versus N95 Respirators for Preventing COVID-19 Among Health Care Workers : A Randomized Trial. *Annals of internal medicine* 2022;175(12):1629-1638 [Pubmed Journal](#)
87. Priority medical devices list for the COVID-19 response and associated technical specifications. Geneva: World Health Organization; 2020. [Website](#)
88. Tran K, Cimon K, Severn M, Pessoa-Silva CL, Conly J. Aerosol generating procedures and risk of transmission of acute respiratory infections to healthcare workers: a systematic review. *PLoS one* 2012;7(4):e35797 [Pubmed Journal](#)

89. WASH FIT: A practical guide for improving quality of care through water, sanitation and hygiene in health care facilities. Second edition. Geneva: World Health Organization; 2022. [Website](#)
90. Kwok CS, Dashti M, Tafuro J, Nasiri M, Muntean E-A, Wong N, et al. Methods to disinfect and decontaminate SARS-CoV-2: a systematic review of in vitro studies. *Therapeutic advances in infectious disease* 2021;8:2049936121998548 [Pubmed Journal](#)
91. Tyan K, Levin A, Avalos-Pacheco A, Plana D, Rand EA, Yang H, et al. Considerations for the Selection and Use of Disinfectants Against SARS-CoV-2 in a Health Care Setting. *Open forum infectious diseases* 2020;7(9):ofaa396 [Pubmed Journal](#)
92. Essential environmental health standards in health care. Geneva: World Health Organization; 2008. [Website](#)
93. Aide-memoire: environmental cleaning, waste and linen management. In: *Infection prevention and control: guidance to action tools*. Geneva: World Health Organization; 2021. [Website](#)
94. Disinfectant Use and Coronavirus (COVID-19) | United States Environmental Protection Agency. United States Environmental Protection Agency [Website](#)
95. Safe management of wastes from health-care activities, 2nd edition. World Health Organization; Geneva 2014. [Website](#)
96. Environmental cleaning and infection prevention and control in health care facilities in low- and middle-income countries. World Health Organization; Geneva 2023. [Website](#)
97. Fujita R, Kurosu H, Norizuki M, Ohishi T, Zamoto-Niikura A, Iwaki M, et al. Potential risk of SARS-CoV-2 infection among people handling linens used by COVID-19 patients before and after washing. *Scientific reports* 2022;12(1):14994 [Pubmed Journal](#)
98. Rani S. A review of the management and safe handling of bodies in cases involving COVID-19. *Medicine, science, and the law* 2020;60(4):287-293 [Pubmed Journal](#)
99. WHO guideline on the use of safety-engineered syringes for intramuscular, intradermal and subcutaneous injections in health care settings. Geneva: World Health Organization; 2016. [Website](#)
100. Immunization in practice: a practical guide for health staff, 2015 update. Geneva: World Health Organization; 2015. [Website](#)
101. Aide-mémoire for a national strategy for the safe and appropriate use of injections. Geneva: World Health Organization; 2000. [Website](#)
102. Glove use information leaflet. Geneva: World Health Organization; 2009. [Website](#)
103. Interim recommendations for the use of mRNA COVID-19 vaccines. Geneva: World Health Organization; 2023. [Website](#)
104. Pittet D, Duce G. Infectious risk factors related to operating rooms. *Infection control and hospital epidemiology* 1994;15(7):456-62 [Pubmed](#)
105. Mayworm D. Keeping Your OR Clean: Five guidelines for controlling the environment to help prevent contamination and infections. Association of periOperative Registered Nurses: Denver; 2007. [Website](#)
106. Infection Prevention and Control (IPC) Protocol for Adult Surgical Procedures During the COVID-19 Pandemic. 2022. [Journal Website](#)
107. Glasbey JC, Nepogodiev D, Simoes JFF, Omar O, Li E, Venn ML, et al. Elective Cancer Surgery in COVID-19-Free Surgical Pathways During the SARS-CoV-2 Pandemic: An International, Multicenter, Comparative Cohort Study. *Journal of clinical oncology* :

official journal of the American Society of Clinical Oncology 2021;39(1):66-78 [Pubmed Journal](#)

108. Decontamination and reprocessing of medical devices for health care facilities: aide-memoire. Geneva: World Health Organization; 2022. [Website](#)

109. Kitazawa A. Infection Prevention and Control at Home. Japan Medical Association journal : JMAJ 2015;58(1-2):27-30 [Pubmed](#)

110. Dyer AH, Fallon A, Noonan C, Dolphin H, O'Farrelly C, Bourke NM, et al. Managing the Impact of COVID-19 in Nursing Homes and Long-Term Care Facilities: An Update. Journal of the American Medical Directors Association 2022;23(9):1590-1602 [Pubmed Journal](#)

111. Stratil JM, Biallas RL, Burns J, Arnold L, Geffert K, Kunzler AM, et al. Non-pharmacological measures implemented in the setting of long-term care facilities to prevent SARS-CoV-2 infections and their consequences: a rapid review. The Cochrane database of systematic reviews 2021;9(9):CD015085 [Pubmed Journal](#)

112. Estabrooks CA, Ewa V, Keefe J, Straus SE. The predictable crisis of covid-19 in Canada's long term care homes. BMJ (Clinical research ed.) 2023;382:e075148 [Pubmed Journal](#)

113. How to implement seasonal influenza vaccination of health workers: an introduction manual for national immunization programme managers and policy makers. Geneva: World Health Organization; 2019. [Website](#)

114. Abbas M, Robalo Nunes T, Martischang R, Zingg W, Iten A, Pittet D, et al. Nosocomial transmission and outbreaks of coronavirus disease 2019: the need to protect both patients and healthcare workers. Antimicrobial Resistance & Infection Control 2021;10(1):7 [Journal Website](#)

115. Mutambudzi M, Niedzwiedz C, Macdonald EB, Leyland A, Mair F, Anderson J, et al. Occupation and risk of severe COVID-19: prospective cohort study of 120 075 UK Biobank participants. Occupational and Environmental Medicine 2021;78(5):307-314 [Journal Website](#)

116. Shbaklo NA-O, Lupia TA-O, De Rosa FA-O, Corcione S.. Infection Control in the Era of COVID-19: A Narrative Review. Antibiotics 2021;10(10) [Pubmed Journal](#)

117. Brown CS, Clare K, Chand M, Andrews J, Auckland C, Beshir S, et al. Snapshot PCR surveillance for SARS-CoV-2 in hospital staff in England. The Journal of infection 2020;81(3):427-434 [Pubmed Journal](#)

118. Arons MM, Hatfield KM, Reddy SC, Kimball A., James A., Jacobs JR, et al. Presymptomatic SARS-CoV-2 Infections and Transmission in a Skilled Nursing Facility. N Engl J Med 2020;382(22):2081-2090

119. Moghadas SM, Fitzpatrick MC, Sah P, Pandey A, Shoukat A, Singer BH, et al. The implications of silent transmission for the control of COVID-19 outbreaks. Proceedings of the National Academy of Sciences of the United States of America 2020;117(30):17513-17515 [Pubmed Journal](#)

120. Kalish HA-O, Klumpp-Thomas CA-O, Hunsberger S., Baus HA, Fay MA-O, Siripong NA-O, et al. Undiagnosed SARS-CoV-2 seropositivity during the first 6 months of the COVID-19 pandemic in the United States. Sci Transl Med 2021;13(601):22 [Pubmed Journal](#)

121. Jones TA-O, Biele GA-O, Mühlemann BA-O, Veith TA-O, Schneider JA-O, Beheim-Schwarzbach J., et al. Estimating infectiousness throughout SARS-CoV-2 infection course. Science 2021;373(6551):25 [Pubmed Journal](#)

122. Hakki S, Zhou J, Jonnerby J, Singanayagam A, Barnett JL, Madon KJ, et al. Onset and window of SARS-CoV-2 infectiousness and temporal correlation with symptom onset: a prospective, longitudinal, community cohort study. The Lancet. Respiratory medicine 2022;10(11):1061-1073 [Pubmed Journal](#)

123. Blann AD, Heitmar R. SARS-CoV-2 and COVID-19: A Narrative Review. British journal of biomedical science 2022;79:10426 [Pubmed Journal](#)

124. Jamison DA, Anand Narayanan S., Trovão NS, Guarneri JW, Topper MJ, Moraes-Vieira PM, et al. A comprehensive SARS-CoV-2 and COVID-19 review, Part 1: Intracellular overdrive for SARS-CoV-2 infection. [Journal Website](#)
125. World Health Organization. Recommendations for national SARS-CoV-2 testing strategies and diagnostic capacities. Geneva, World Health Organization; 2021. [Website](#)
126. Public health surveillance for COVID-19: interim guidance. World Health Organization; Geneva 2022. [Website](#)
127. Contact tracing and quarantine in the context of COVID-19: interim guidance, 6 July 2022. Geneva: World Health Organization 2022. [Website](#)
128. World Health Organization. WHO policy brief: COVID-19 testing, 14 September 2022. Geneva: World Health Organization; 2022. [Website](#)
129. Framework and toolkit for infection prevention and control in outbreak preparedness, readiness and response at the national level. Geneva: World Health Organization; 2021. [Website](#)
130. Framework and toolkit for infection prevention and control in outbreak preparedness, readiness and response at the health care facility level. World Health Organization; Geneva 2022. [Website](#)
131. Defining collaborative surveillance: a core concept for strengthening the global architecture for health emergency preparedness, response, and resilience (HEPR). World Health Organization; Geneva 2023. [Website](#)
132. WHO policy brief: Maintaining infection prevention and control measures for COVID-19 in health care facilities, 14 September 2022. Geneva: World Health Organization; 2021. [Website](#)
133. WHO policy brief: COVID-19 surveillance, 11 April 2023. Geneva: World Health Organization; 2023. [Website](#)
134. Strategic preparedness, readiness and response plan to end the global COVID-19 emergency in 2022. Geneva: World Health Organization; 2022. [Website](#)
135. Coronavirus disease (COVID-19) weekly epidemiological update and weekly operational update. Geneva: World Health Organization; 2023. [Website](#)
136. Roberge RJ. Face shields for infection control: a review. *J Occup Environ Hyg.* 2016;13(4):235-42. [PubMed Journal](#)
137. Abaluck J, Kwong LH, Styczynski A., Haque A, Kabir MD, et al. The impact of community masking on COVID-19: a cluster randomized trial in Bangladesh. *Science.* 2022;375(6577) [PubMed Journal](#)
138. Bundgaard H, Bundgaard JS, Raaschou-Pedersen DET., von Buchwald C, Todsén T, et al. Effectiveness of adding a mask recommendation to other public health measures to prevent SARS-CoV-2 infection in Danish mask wearers: a randomized controlled trial. *Ann Intern Med.* 2021;174(3):335-43. [PubMed Journal](#)
139. Andrejko KL, Pry JM, Myers JF, Fukui N, DeGuzman JL, Openshaw J, et al. Effectiveness of Face Mask or Respirator Use in Indoor Public Settings for Prevention of SARS-CoV-2 Infection - California, February-December 2021. *MMWR. Morbidity and mortality weekly report* 2022;71(6):212-216 [PubMed Journal](#)
140. Doung-Ngern P, Suphanchaimat R, Panjangampatthana A., Janekrongtham C, Ruampoom D, et al. Case-control study of use of personal protective measures and risk for SARS-CoV-2 infection, Thailand. *Emerg Infect Dis.* 2020;26(11):2607-16. [PubMed Journal](#)
141. Gonçalves MR, Dos Reis RCP, Tólio RP, Pellanda LC, Schmidt MI, Katz N, et al. Social Distancing, Mask Use, and Transmission of Severe Acute Respiratory Syndrome Coronavirus 2, Brazil, April-June 2020. *Emerging infectious diseases* 2021;27(8):2135-2143 [PubMed](#)

## Journal

142. Lio CF, Cheong HH, Lei CI, Lo IL, Yao L, Lam C, et al. Effectiveness of personal protective health behaviour against COVID-19. *BMC public health* 2021;21(1):827 [Pubmed Journal](#)
143. Rebmann T, Loux TM, Arnold LD, Charney R, Horton D, Gomel A. SARS-CoV-2 Transmission to Masked and Unmasked Close Contacts of University Students with COVID-19 - St. Louis, Missouri, January-May 2021. *MMWR. Morbidity and mortality weekly report* 2021;70(36):1245-1248 [Pubmed Journal](#)
144. Sharif N, Alzahrani KJ, Ahmed SN, Opu RR, Ahmed N, Talukder A, et al. Protective measures are associated with the reduction of transmission of COVID-19 in Bangladesh: A nationwide cross-sectional study. *PLoS one* 2021;16(11):e0260287 [Pubmed Journal](#)
145. Sugimura M, Chimed-Ochir O, Yumiya Y, Ohge H, Shime N, Sakaguchi T, et al. The Association between Wearing a Mask and COVID-19. *International journal of environmental research and public health* 2021;18(17) [Pubmed Journal](#)
146. Tjaden AH, Gibbs M, Runyon M, Weintraub WS, Taylor YJ, Edelstein SL, et al. Association between Self-reported Masking Behavior and SARS-CoV-2 Infection Wanes from Pre-Delta to Omicron-Predominant Periods - North Carolina COVID-19 Community Research Partnership (NC-CCRP). *American journal of infection control* 2022. [Pubmed Journal](#)
147. van den Broek-Altenburg EM, Atherly AJ, Diehl SA, Gleason KM, Hart VC, et al. Jobs, housing, and mask wearing: cross-sectional study of risk factors for COVID-19. *JMIR Public Health Surveill.* 2021;7(1) [Pubmed Journal](#)
148. Wang YU, Tian H, Zhang L, Zhang M, Guo D, et al. Reduction of secondary transmission of SARS-CoV-2 in households by face mask use, disinfection and social distancing: a cohort study in Beijing, China. *BMJ Glob Health.* 2020;5(5) [Pubmed Journal](#)
149. Hale T, Angrist N, Goldszmidt R, Kira B, Petherick A, Phillips T, et al. A global panel database of pandemic policies (Oxford COVID-19 Government Response Tracker). *Nature human behaviour* 2021;5(4):529-538 [Pubmed Journal](#)
150. Face masks and coverings for the general public: Behavioural knowledge, effectiveness of cloth coverings and public messaging. *The Royal Society* 2020. [Website](#)
151. Tsang PM, Prost A. Boundaries of solidarity: a meta-ethnography of mask use during past epidemics to inform SARS-CoV-2 suppression. *BMJ global health* 2021;6(1) [Pubmed Journal](#)
152. Machida M, Nakamura I, Saito R, Nakaya T, Hanibuchi T, et al. Incorrect use of face masks during the current COVID-19 pandemic among the general public in Japan. *Int J Environ Res Public Health.* 2020;17(18):6484 [Pubmed Journal](#)
153. Milton DK, Fabian MP, Cowling B, Grantham ML, McDevitt JJ. Influenza virus aerosols in human exhaled breath: particle size, culturability, and effect of surgical masks. *PLoS Pathog.* 2013;9(3) [Pubmed Journal](#)
154. Chen Y-J, Qin G, Chen J, Xu J-L, Feng D-Y, et al. Comparison of face-touching behaviors before and during the coronavirus disease 2019 pandemic. *JAMA Netw Open.* 2020;3(7):e2016924 [Pubmed Journal](#)
155. Shiraly R, Shayan Z, McLaws M-L. Face touching in the time of COVID-19 in Shiraz, Iran. *Am J Infect Control.* 2020;48(12):1559-61. [Pubmed Journal](#)
156. Betsch C, Korn L, Sprengholz P, Felgendreff L, Eitze S, Schmid P. Social and behavioral consequences of mask policies during the COVID-19 pandemic. *Proc Natl Acad Sci U S A.* 2020;117(36):21851-3. [Pubmed Journal](#)
157. Cowling BJ, Ali ST, Ng T, Tsang TK, Li JCM, Fong MW. Impact assessment of non-pharmaceutical interventions against coronavirus disease 2019 and influenza in Hong Kong: an observational study. *Lancet Public Health.* 2020;5(5):e279-88. [Pubmed Journal](#)

158. Bakhit M, Krzyzaniak N, Scott A., Clark J, Glasziou P, Del Mar C. Downsides of face masks and possible mitigation strategies: a systematic review and meta-analysis. *BMJ Open*. 2021;11(2):e044364 [Pubmed Journal](#)
159. Kunstler B, Newton S, Hill H, Ferguson J, Hore P, Mitchell BG, et al. P2/N95 respirators & surgical masks to prevent SARS-CoV-2 infection: Effectiveness & adverse effects. *Infection, disease & health* 2022;27(2):81-95 [Pubmed Journal](#)
160. Kisielinski K, Giboni P, Prescher A, Klosterhalfen B, Graessel D, Funken S, et al. Is a Mask That Covers the Mouth and Nose Free from Undesirable Side Effects in Everyday Use and Free of Potential Hazards?. *International journal of environmental research and public health* 2021;18(8) [Pubmed Journal](#)
161. Balestracci B, La Regina M, Di Sessa D, Mucci N, Angelone FD, D'Ecclesia A, et al. Patient safety implications of wearing a face mask for prevention in the era of COVID-19 pandemic: a systematic review and consensus recommendations. *Internal and emergency medicine* 2022. [Pubmed Journal](#)
162. Thatiparthi A, Liu J, Martin A, Wu JJ. Adverse Effects of COVID-19 and Face Masks: A Systematic Review. *The Journal of clinical and aesthetic dermatology* 2021;14(9 Suppl 1):S39-S45 [Pubmed](#)
163. Giacalone S, Minuti A, Spigariolo C., Passoni E, Nazzaro G. Facial dermatoses in the general population due to wearing of personal protective masks during the COVID-19 pandemic: first observations after lockdown. *Clin Exp Dermatol*. 2021;46(2):368-9. [Pubmed Journal](#)
164. Matusiak Ł, Szepietowska M, Krajewski P., Białynicki-Birula R, Szepietowski JC. Inconveniences due to the use of face masks during the COVID-19 pandemic: a survey study of 876 young people. *Dermatol Ther*. 2020;33(4):e13567 [Pubmed Journal](#)
165. Hübner K, Hofer A, Sperner-Unterweger B. On the difficulties of building therapeutic relationships when wearing face masks. *J Psychosom Res*. 2020;138(110226):110226 [Pubmed Journal](#)
166. Crume B. The silence behind the mask: my journey as a deaf pediatric resident amid a pandemic. *Acad Pediatr*. 2020;21(1):1-2. [Pubmed Journal](#)
167. Cowling BJ, Chan K-H, Fang V., Cheng CKY, Fung ROP, et al. Facemasks and hand hygiene to prevent influenza transmission in households: a cluster randomized trial. *Ann Intern Med*. 2009;151(7):437-46. [Pubmed Journal](#)
168. Allison MA, Guest-Warnick G, Nelson D., Pavia AT, Srivastava R, et al. Feasibility of elementary school children's use of hand gel and facemasks during influenza season. *Influenza Other Respir Viruses*. 2010;4(4):223-9. [Pubmed Journal](#)
169. Canini L, Andréoletti L, Ferrari P., D'Angelo R, Blanchon T, et al. Surgical mask to prevent influenza transmission in households: a cluster randomized trial. *PLoS One*. 2010;5(11) [Pubmed Journal](#)
170. Uchida M, Kaneko M, Hidaka Y., Yamamoto H, Honda T, et al. Effectiveness of vaccination and wearing masks on seasonal influenza in Matsumoto City, Japan, in the 2014/2015 season: An observational study among all elementary schoolchildren. *Prev Med Rep*. 2017;5::86-91. [Pubmed Journal](#)
171. Zand AD, Heir AV. Environmental impacts of new coronavirus outbreak in Iran with an emphasis on waste management sector. *J Mater Cycles Waste Manag*. 2021;23(1):240-7. [Pubmed Journal](#)
172. Coronavirus disease (COVID-19) advice for the public: when and how to use masks. Geneva: World Health Organization; 2020. [Website](#)
173. Scott N, Saul A, Spelman T., Stooze M, Pedrana A, et al. The introduction of a mandatory mask policy was associated with significantly reduced COVID-19 cases in a major metropolitan city. *PLoS One*. 2021;16(7) [Pubmed Journal](#)
174. Aydin O, Emon B, Cheng S., Hong L, Chamorro LP, Saif MTA. Performance of fabrics for home-made masks against the spread of COVID-19 through droplets: a quantitative mechanistic study. *Extreme Mech Lett*. 2020;40. [Pubmed Journal](#)

175. Fischer EP, Fischer MC, Grass D., Henrion I, Warren WS, Westman E. Low-cost measurement of face mask efficacy for filtering expelled droplets during speech. *Sci Adv.* 2020;6(36) [Pubmed Journal](#)
176. Infection prevention and control (IPC) in health-care facilities in the event of a surge or resurgence in cases of COVID-19. Geneva: World Health Organization; 2021. [Website](#)
177. Lustig SR, Biswakarma JJH, Rana D, Tilford SH, Hu W, Su M, et al. Effectiveness of Common Fabrics to Block Aqueous Aerosols of Virus-like Nanoparticles. *ACS nano* 2020;14(6):7651-7658 [Pubmed Journal](#)
178. Lee S-A, Hwang D-C, Li H-Y, Tsai C-F, Chen C-W, Chen J-K. Particle Size-Selective Assessment of Protection of European Standard FFP Respirators and Surgical Masks against Particles-Tested with Human Subjects. *Journal of healthcare engineering* 2016;2016 [Pubmed Journal](#)
179. Bull FC, Al-Ansari SS, Biddle S., Borodulin K, Buman MP, Cardon G. World Health Organization 2020 guidelines on physical activity and sedentary behaviour. *Br J Sports Med.* 2020;54(24):1451-62. [Pubmed Journal](#)
180. Advice on the use of masks for children in the community in the context of COVID-19. Geneva: World Health Organization; 2020. [Website](#)
181. Mask use in the context of COVID-19: interim guidance, 1 December 2020. Geneva: World Health Organization; 2020. [Website](#)
182. Version 1.0 of the COVID-19 infection prevention and control living guideline: mask use in community settings. Geneva: World Health Organization; 2021. [Website](#)
183. Bialek S, Gierke R, Hughes M., McNamara LA, Pilishvili T, Skoff T. Coronavirus disease 2019 in children - United States, February 12-April 2, 2020. *MMWR Morb Mortal Wkly Rep.* 2020;69(14):422-6. [Pubmed Journal](#)
184. COVID-19 in children and the role of school settings in transmission – second update. Stockholm: European Centre for Disease Prevention and Control; 2021. [Website](#)
185. Divala T, Sakala M, Chirombo J, Baggaley R, Sacks JA, Johnson C. Use of SARS-CoV-2 antigen-detection rapid diagnostic tests for COVID-19 self-testing: interim guidance, 9 March 2022: web annex D: global survey on COVID-19 self-testing using SARS-CoV-2 Ag-RDTs. Geneva: World Health Organization; 2022. [Website](#)
186. Fontanet A, Tondeur L, Grant R., Temmam S, Madec Y, et al. SARS-CoV-2 infection in schools in a northern French city: a retrospective serological cohort study in an area of high transmission, France, January to April 2020. *Euro Surveill.* 2021;26(15):2001695 [Pubmed Journal](#)
187. Goldstein E, Lipsitch M, Cevik M. On the effect of age on the transmission of SARS-CoV-2 in households, schools, and the community. *J Infect Dis.* 2020;223(3):362-9. [Pubmed Journal](#)
188. Ladhani SN, Amin-Chowdhury Z., Davies H., Aiano F, Hayden I, et al. COVID-19 in children: analysis of the first pandemic peak in England. *Arch Dis Child.* 2020;105(12):1180-5. [Pubmed Journal](#)
189. Ladhani SN, Ireland G, Baawuah F., Beckmann J, Okike IO, et al. SARS-CoV-2 infection, antibody positivity and seroconversion rates in staff and students following full reopening of secondary schools in England: a prospective cohort study, September–December 2020. *EClinicalMedicine.* 2021;37::100948 [Pubmed Journal](#)
190. Li X, Xu W, Dozier M., He Y, Kirolos A, et al. The role of children in the transmission of SARS-CoV2: updated rapid review. *J Glob Health.* 2020;10(2):021101 [Pubmed Journal](#)
191. Ludvigsson JF. Children are unlikely to be the main drivers of the COVID-19 pandemic: a systematic review. *Acta Paediatr.* 2020;109(8):1525-30. [Pubmed Journal](#)

192. Lu Y, Li Y, Deng W., Liu M, He Y, et al. Symptomatic infection is associated with prolonged duration of viral shedding in mild coronavirus disease 2019: a retrospective study of 110 children in Wuhan. *Pediatr Infect Dis J.* 2020;39(7):e95-9. [Pubmed Journal](#)
193. National COVID-19 surveillance reports, including weekly summary of findings monitored through various COVID-19 surveillance systems. London: Public Health England; 2020. [Website](#)
194. Stringhini S, Wisniak A, Piumatti G., Azman AS, Lauer SA, et al. Seroprevalence of anti-SARS-CoV-2 IgG antibodies in Geneva, Switzerland (SEROCoV-POP): a population-based study. *Lancet.* 2020;396(10247):313-9. [Pubmed Journal](#)
195. Torres JP, Piñera C, De La Maza V., Lagomarcino AJ, Simian D, et al. Severe acute respiratory syndrome coronavirus 2 antibody prevalence in blood in a large school community subject to a coronavirus disease 2019 outbreak: a cross-sectional study. *Clin Infect Dis.* 2020;73(2):e458-65. [Pubmed Journal](#)
196. Viner RM, Mytton OT, Bonell C., Melendez-Torres GJ, Ward J, et al. Susceptibility to SARS-CoV-2 infection among children and adolescents compared with adults: a systematic review and meta-analysis. *JAMA Pediatr.* 2021;175(2):143-56. [Pubmed Journal](#)
197. Enhancing response to Omicron SARS-CoV-2 variant. World Health Organization; Geneva 2022. [Website](#)
198. Chadeau-Hyam M, Wang H, Eales O., Haw D, Bodinier B, et al. REACT-1 study round 14: High and increasing prevalence of SARS-CoV-2 infection among school-aged children during September 2021 and vaccine effectiveness against infection in England. *medRxiv [preprint].* 2021. [Journal](#)
199. Elliot P, Bodineier B, Ealse O., Wang H, Haw D. Rapid increase in Omicron infections in England during December 2021: REACT-1 study. London: Imperial College London; 2021. [Website](#)
200. Munday J, Jarvis C, Gimma A., Wong K, Van Zandvoort K, et al. Contact matrices estimated from the CoMix social contact survey. London: London School of Hygiene and tropical Medicine; 2021. [Website](#)
201. Kleynhans J, Tempia S, Wolter N., von Gottberg A, Bhiman J, et al. SARS-CoV-2 seroprevalence in a rural and urban household cohort during first and second waves of infections, South Africa, July 2020–March 2021. *Emerg Infect Dis.* 2021;27(12):3020-9. [Pubmed Journal](#)
202. Weekly epidemiological update on COVID-19; 19-October-2021. Geneva: World Health Organization; 2021. [Website](#)
203. Real-time assessment of community transmission findings. London: Imperial College London; 2021. [Website](#)
204. COVID-19 SeroHub. Washington (DC): National Institutes of Health; 2021. [Website](#)
205. Thompson HA, Mousa A, Dighe A., Fu H, Arnedo-Pena A, et al. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) setting-specific transmission rates: a systematic review and meta-analysis. *Clin Infect Dis.* 2021;73(3):e754-64. [Pubmed Journal](#)
206. Zhu Y, Bloxham CJ, Hulme KD., Sinclair JE, Tong ZWM, et al. A meta-analysis on the role of children in severe acute respiratory syndrome coronavirus 2 in household transmission clusters. *Clin Infect Dis.* 2021;72(12):e1146-53. [Pubmed Journal](#)
207. Mickells GE, Figueroa J, West K., Wood A, McElhanon BO. Adherence to masking requirement during the COVID-19 pandemic by early elementary school children. *J Sch Health.* 2021;91(7):555-61. [Pubmed Journal](#)
208. Budzyn SE, Panaggio MJ, Parks S., Papazian M, Magid J, Barrios LC. Pediatric COVID-19 cases in counties with and without school mask requirements—United States, July 1-September 4, 2021. *MMWR Morb Mortal Wkly Rep.* 2021;70:1377-8. [Pubmed Journal](#)
209. Chernozhukov V, Kasahara H, Schrimpf P. The association of opening K–12 schools with the spread of COVID-19 in the United States: county-level panel data analysis. *Proc Natl Acad Sci U S A.* 2021;118(42):e2103420118 [Pubmed Journal](#)

210. Doyle T, Kendrick K, Troelstrup T, Gumke M, Edwards J, et al. COVID-19 in primary and secondary school settings during the first semester of school reopening—Florida, August-December 2020. *MMWR Morb Mortal Wkly Rep.* 2021;70(12):437-41. [Pubmed Journal](#)
211. Falk A, Benda A, Falk P, Steffen S, Wallace Z, Hoeg TB. COVID-19 cases and transmission in 17 K-12 schools—Wood County, Wisconsin, August 31-November 29, 2020. *MMWR Morb Mortal Wkly Rep.* 2021;70(4):136-40. [Pubmed Journal](#)
212. Gettings J, Czarnik M, Morris E, Haller E, Thompson AM, et al. Mask use and ventilation improvements to reduce COVID-19 incidence in elementary schools—Georgia, November 16–December 11, 2020. *MMWR Morb Mortal Wkly Rep.* 2021;70:779-84. [Pubmed Journal](#)
213. Jordan I, de Sevilla MF, Fumado V, Bassat Q, Bonet-Carne E, et al. Transmission of SARS-CoV-2 infection among children in summer schools applying stringent control measures in Barcelona, Spain. *Clin Infect Dis.* 2021;74(1):66-73. [Pubmed Journal](#)
214. McCullough JM, Dale AP, Gue M, Eller B, Cullen T, Scott SE. Association between K–12 school mask policies and school-associated COVID-19 outbreaks— Maricopa and Pima Counties, Arizona, July–August 2021. *MMWR Morb Mortal Wkly Rep.* 2021;70(39):1372-3. [Pubmed Journal](#)
215. Nelson SB, Dugdale CM, Bilinski A, Cosar D, Pollock NR, Ciaranello A. Prevalence and risk factors for in-school transmission of SARS-CoV-2 in Massachusetts K-12 public schools, 2020-2021. *medRxiv [preprint].* 2021. [Journal](#)
216. Yuan H, Reynolds C, Ng S, Yang W. Factors affecting the transmission of SARS-CoV-2 in school settings. *Influenza Other Respir Viruses.* 2022. [Pubmed Journal](#)
217. Zimmerman KO, Akinboyo IC, Brookhart M, Boutzoukas AE, McGann KA, et al. Incidence and secondary transmission of SARS-CoV-2 infections in schools. *Pediatrics.* 2021;147(4):e2020048090 [Pubmed Journal](#)
218. Assathiany R, Salinier C, Béchet S, Dolard C, Kochert F, et al. Face masks in young children during the COVID-19 pandemic: parents' and pediatricians' point of view. *Front Pediatr.* 2021 2021;9(579):676718 [Journal](#)
219. Lo C-H, Nguyen LH, Drew DA, Warner ET, Joshi AD, et al. Race, ethnicity, community-level socioeconomic factors, and risk of COVID-19 in the United States and the United Kingdom. *EclinicalMedicine.* 2021;38:101029 [Pubmed Journal](#)
220. Sze S, Pan D, Nevill CR, Gray LJ, Martin CA, et al. Ethnicity and clinical outcomes in COVID-19: a systematic review and meta-analysis. *EclinicalMedicine.* 2020;29:100630 [Pubmed Journal](#)
221. Aronu AE, Chinawa JM, Nduagubam OC, Ossai EN, Chinawa AT, Igwe WC. Maternal perception of masking in children as a preventive strategy for COVID-19 in Nigeria: A multicentre study. *PLoS One.* 2020;15(11) [Pubmed Journal](#)
222. Smith J, Culler A, Scanlon K. Impacts of blood gas concentration, heart rate, emotional state, and memory in school-age children with and without the use of facial coverings in school during the COVID-19 pandemic. *FASEB J.* 2021;35(S1) [Journal](#)
223. Betsch C, Korn L, Felgendreiff L, Eitze S, Thaïss H. School opening during the SARS-CoV-2 pandemic: Public acceptance of wearing fabric masks in class. *Public Health Pract (Oxf)* 2021;2:100115 [Pubmed Journal](#)
224. Chen X, Ran LI, Liu Q, Hu Q, Du X, Tan X. Hand hygiene, mask-wearing behaviors and its associated factors during the COVID-19 epidemic: a cross-sectional study among primary school students in Wuhan, China. *Int J Environ Res Public Health.* 2020;17(8):2893 [Pubmed Journal](#)
225. Theuring S, Thielecke M, van Loon W, Hommes F, Hülso C, et al. SARS-CoV-2 infection and transmission in school settings during the second COVID-19 wave: a cross-sectional study, Berlin, Germany, November 2020. *Euro Surveill.* 2021;26(34):2100184 [Pubmed Journal](#)
226. Volpp KG, Kraut BH, Ghosh S, Neatherlin J. Minimal SARS-CoV-2 transmission after implementation of a comprehensive mitigation

strategy at a school—New Jersey, August 20–November 27, 2020. *MMWR Morb Mortal Wkly Rep.* 2021;70(11):377-81. [Pubmed Journal](#)

227. Ammann P, Ulyte A, Haile SR,, Puhan MA, Kriemler S, Radtke T. Perceptions towards mask use in school children during the SARS-CoV-2 pandemic: the Ciao Corona study. *medRxiv [preprint]*. 2021. [Journal](#)

228. Ayran G, Köse S, Sarıalioğlu A,, Çelebioğlu A. Hand hygiene and mask-wearing behaviors and the related factors during the COVID-19 pandemic: a cross-sectional study with secondary school students in Turkey. *J Pediatr Nurs.* 2022;62::98-105. [Pubmed Journal](#)

229. Convention on the Rights of Persons with Disabilities. Article 2. New York (NY): United Nations; 2008. [Website](#)

230. Infection prevention and control - Hand Hygiene. [Website] Geneva: World Health Organization; [Website](#)

231. Hand hygiene for all. United Nations Children's Fund: New York; 2020. [Website](#)

232. Coronavirus disease (COVID-19): Cleaning and disinfecting surfaces in non-health care settings. [Website] Geneva: World Health Organization; 2022. [Website](#)

233. Ikiz E, Maclaren VW, Alfred E, Sivanesan S. Impact of COVID-19 on household waste flows, diversion and reuse: The case of multi-residential buildings in Toronto, Canada. *Resources, conservation, and recycling* 2021;164:105111 [Pubmed Journal](#)

234. Global Research and Innovations Forum: Building the world's resilience against future outbreaks and pandemics. Geneva: World Health Organization; 2023. [Website](#)