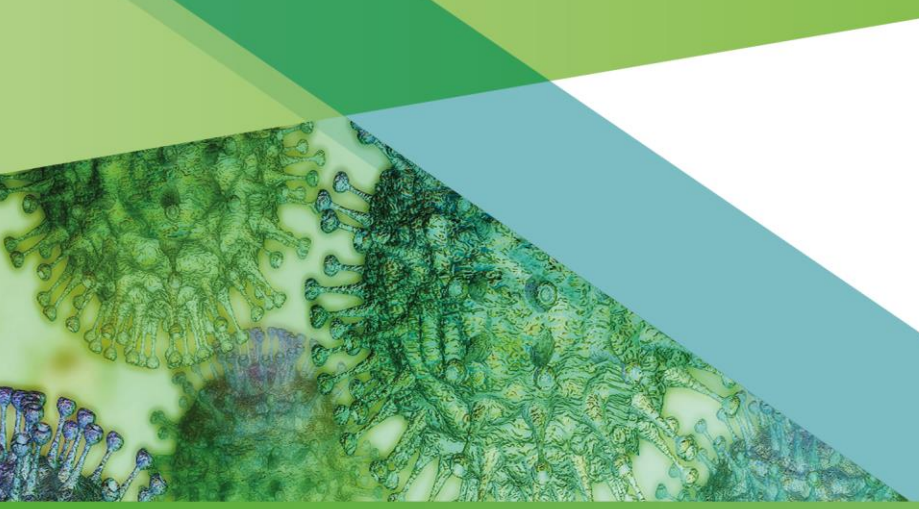

TECHNICAL REPORT

Using face masks in the community

Reducing COVID-19 transmission from potentially asymptomatic or pre-symptomatic people through the use of face masks

8 April 2020

Scope of this document

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

Target audience

Public health authorities in the EU/EEA countries and the United Kingdom.

Background

- **A medical face mask** (also known as surgical or procedure mask) is a medical device covering the mouth, nose and chin ensuring a barrier that limits the transition of an infective agent between the hospital staff and the patient. They are used by healthcare workers to prevent large respiratory droplets and splashes from reaching the mouth and the nose of the wearer and help reduce and/or control at the source the spread of large respiratory droplets from the person wearing the face mask [1]. Medical masks comply with requirements defined in European Standard EN 14683:2014.
- **Non-medical face masks** (or 'community' masks) include various forms of self-made or commercial masks or face covers made of cloth, other textiles or other materials such as paper. They are not standardised and are not intended for use in healthcare settings or by healthcare professionals.
- **A respirator** or filtering face piece (FFP), is designed to protect the wearer from exposure to airborne contaminants (e.g. from inhaling infectious agents associated with inhaling small and large particle droplets) and is classified as personal protective equipment (PPE) [1]. Respirators are mainly used by healthcare workers to protect themselves, especially during aerosol-generating procedures. Valved respirators are not appropriate for use as a means of source control since they do not prevent the release of exhaled respiratory particles from the wearer into the environment [2]. Respirators comply with requirements defined in European Standard EN 149:2001+A1:2009.

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In the EU/EEA and the UK, as of 1 April, the following countries recommend the use of face masks for persons going out in public: Austria, Bulgaria, Czechia, Slovakia and Lithuania.

Scientific evidence and rationale for the use of face masks in the community by persons without symptoms

Medical **face masks** are recommended **as a means of source control** for persons who are symptomatic in order to prevent the spread of respiratory droplets produced by coughing or sneezing. Respiratory etiquette (i.e. covering of the mouth and nose with a tissue when coughing) also aims at limiting the spread of infection from an infected individual. The application of medical masks as source control has been shown to decrease the release of respiratory droplets carrying respiratory viruses [3] and is recommended for the reduction of transmission of tuberculosis [4] and influenza [5-7].

There is increasing evidence that persons with mild or no symptoms at the pre-symptomatic and early stages of infection can contribute to the spread of COVID-19 [8-15]. The role of asymptomatic infections in transmission is unknown. The evidence comes from viral shedding studies [11,13,16], epidemiological investigations of COVID-19 clusters [14,17] and inferences through modelling [10,12] (Appendix). A face mask may help reduce the spread of infection in the community by **minimising the excretion of respiratory droplets** *from* infected individuals who may not even know they are infected and before they develop any symptoms. In this respect, mask use by asymptomatic persons can be regarded as an extension of the current practice of face mask use by symptomatic individuals.

There is conflicting evidence on the protective effect for the wearer of medical face masks for influenza-like illness (ILI) and laboratory-confirmed influenza in household settings [5,15,18,19]. Based on the lack of evidence, it has so far not been recommended that people who are not ill or who are not providing care to a patient should wear a mask to reduce influenza or COVID-19 transmission. However, **WHO**'s guidance on 'Non-pharmaceutical public health measures for mitigating the risk and impact of epidemic and pandemic influenza', conditionally **recommends face mask use in the community for asymptomatic individuals** in severe epidemics or pandemics in order to reduce transmission in the community; this is based on mechanistic plausibility for the potential effectiveness of this measure [20]. It should be noted that all relevant evidence comes from studies on influenza and other coronaviruses and may not be directly applicable to COVID-19.

There is no evidence that non-medical face masks or other face covers are an effective means of respiratory protection for the wearer of the mask. Overall, various **non-medical face masks** were shown to have **very low filter efficiency** (2–38%) [21]. In one study, cotton surgical masks were associated with a higher risk of penetration of microorganisms and ILI compared to no masks [5].

There is limited indirect evidence showing that non-medical face masks made from various materials may decrease the release to the environment of respiratory droplets produced by coughing, but available evidence suggests that **non-medical face masks are less effective** than medical masks as a means for source control [22]. There are no established standards for self-made non-medical face masks. One of the advantages of non-medical face masks made of cloth or other textiles is that they can be made easily and can be washed and reused.

Medical and non-medical face masks are used extensively by the general public in Asian countries, for example China, Singapore, South Korea and Japan. Face-mask use has been increasingly common since the 2003 SARS epidemic. In Hong Kong, 76% of the population was wearing a face mask during the SARS epidemic [23]. In one study from China, wearing a face mask was associated with a lower risk of SARS among persons without known contact with SARS patients [24]. It is not known whether the use of these masks when going out in public is linked to the lower COVID-19 rates observed in some of these countries, because mask use is only one of many response measures and practices that have been applied in these countries and their practice for respiratory etiquette and hand hygiene are considered higher than elsewhere [23].

The use of face masks in the community *may* primarily serve as a means of source control. This measure can be particularly relevant in epidemic situations when the number of asymptomatic but infectious persons in the community can be assumed to be high. Wearing a face mask could be considered, especially

- when visiting busy, closed spaces, such as grocery stores, shopping centres, etc.;
- when using public transport; and
- for certain workplaces and professions that involve physical proximity to many other people (such as members of the police force, cashiers – if not behind a glass partition, etc.) and when teleworking is not possible.

The use of **medical face masks by all healthcare workers** not providing care to COVID-19 patients may be considered as an additional measure for reducing transmission of COVID-19 within healthcare settings. Optimal strategies have not been defined, but any strategy needs to take into account the availability of medical masks, the extent of community transmission and countermeasures currently in place. A number of European healthcare facilities already require that all healthcare personnel wear a medical mask while at work.

It should be emphasised that use of face masks in the community should be considered **only as a complementary measure** and not as a replacement of the core preventive measures that are recommended to reduce community transmission including physical distancing, staying home when ill, teleworking if possible, respiratory etiquette, meticulous hand hygiene and avoiding touching the face, nose, eyes and mouth.

Appropriate use of face masks is important. The face mask should completely cover the face from the bridge of the nose down to the chin. Clean hands with soap and water or alcohol-based hand sanitiser before putting on and taking off the face mask. When taking off the face mask, remove it from behind, avoiding to touch the front side. Dispose the face mask safely if it is disposable. Wash your hands or apply alcohol-based hand sanitiser immediately after removing the face mask. Washable, reusable face should be washed as soon as possible after each use, using common detergent at 60 ˚C. Campaigns for the appropriate use of face masks may improve the effectiveness of the measure.

There are **three important caveats** related to the use of face masks in the community:

- It should be ensured that medical face masks (and respirators) are conserved and **prioritised for use by healthcare providers**, especially given the current shortages of respiratory personal protective equipment reported across EU/EEA countries.
- The use of face masks may provide a **false sense of security** leading to suboptimal physical distancing, poor respiratory etiquette and hand hygiene – and even not staying at home when ill.
- There is a risk that **improper removal** of the face mask, handling of a contaminated face mask or an increased tendency to touch the face while wearing a face mask by healthy persons **might actually increase the risk of transmission**.

For communication purposes, it is important to emphasise that the people who use face masks in the community want to protect their fellow citizens in case they are infected. They do not want to unknowingly spread the virus, and wearing a mask should not be misconstrued that they want to protect themselves from others. Wearing a mask is not an act of selfishness and should be promoted as **an act of solidarity**.

Table. Pros and cons of face mask use in the community

Arguments and evidence supporting the use of face masks	Arguments and evidence against the use of face masks
Due to increasing evidence that persons with mild or no symptoms can contribute to the spread of COVID-19, face masks and other face covers may be considered a means of source control complementary to other measures already in place to reduce the transmission of COVID-19.	Medical face masks are currently in short supply. In view of the current pressure to the health systems, their use by healthcare workers needs to be clearly prioritised and protected.
Evidence is growing that viral shedding of SARS-CoV-2 is higher just before onset of symptoms and for the initial 7–8 days after onset.	There is only limited indirect evidence that non-medical face masks are effective as a means of source control.
Face masks have been used extensively in the public in Asian countries and have been linked to a slightly lower risk of SARS among persons without known contact with SARS patients during the 2003 SARS epidemic.	Wearing a face mask may create a false feeling of security, leading to relaxing of physical distancing and increased frequency of face touching (mask adjustment, etc.)
Non-medical face masks and other face covers made of textiles have the advantage that they can be produced easily; they are washable and reusable.	Face masks need to be carefully put on and taken off in order to prevent self-contamination.
	Face masks are not well tolerated by certain population groups (e.g. children) or by persons with chronic respiratory disease.
	There are no established standards for non-medical face masks used as a means of source control or personal protection.

Conclusions

- The use of medical face masks by healthcare workers must be given priority over the use in the community.
- The use of face masks in public may serve as a means of source control to reduce the spread of the infection in the community by minimising the excretion of respiratory droplets from infected individuals who have not yet developed symptoms or who remain asymptomatic. It is not known how much the use of masks in the community can contribute to a decrease in transmission in addition to the other countermeasures.
- The use of face masks in the community could be considered, especially when visiting busy, closed spaces, such as grocery stores, shopping centres, or when using public transport, etc.
- The use of non-medical face masks made of various textiles could be considered, especially if – due to supply problems – medical face masks must be prioritised for use as personal protective equipment by healthcare workers. This is based on limited indirect evidence supporting the use of non-medical face masks as a means of source control.
- The use of face masks in the community should be considered only as a complementary measure and not as a replacement for established preventive measures, for example physical distancing, respiratory etiquette, meticulous hand hygiene and avoiding touching the face, nose, eyes and mouth.
- Appropriate use of face masks is key for the effectiveness of the measure and can be improved through education campaigns.
- Recommendations on the use of face masks in the community should carefully take into account evidence gaps, the supply situation, and potential negative side effects.

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Appendix

Viral shedding. Over the course of the infection, the virus can be identified in respiratory tract specimens 1–2 days before the onset of symptoms. It can persist up to 8 days in moderate cases and up to 2 weeks in severe cases [16]. In terms of viral load profile, SARS-CoV-2 is similar to that of influenza, which peaks at around the time of symptom onset [13], but contrasts with that of SARS-CoV, which peaks at around 10 days after symptom onset, and that of MERS-CoV which peaks at the second week after symptom onset. Older age has also been associated with higher viral loads. The high viral load close to symptom onset suggests that SARS-CoV-2 can be easily transmissible at an early stage of the infection and, potentially, in the immediate period before symptom onset [13]. Viral RNA has been detected in faeces from day 5 after symptom onset and up to 4 to 5 weeks in moderate cases, as well as in whole blood, serum, saliva and urine. Prolonged viral RNA shedding has been reported from nasopharyngeal swabs (up to 37 days among adult patients) and in faeces (more than one month after infection in paediatric patients). It should be noted that viral RNA shedding does not equate with infectivity. The viral load can be a potentially useful marker for assessing disease severity and prognosis: a recent study indicated that viral loads in severe cases were up to 60 times higher than in mild cases [25].

Transmission in pre-symptomatic phase of infection. No significant difference in viral load in asymptomatic and symptomatic patients has been reported, indicating the potential of virus transmission from asymptomatic patients [11]. Uncertainties remain with regard to the influence of pre-symptomatic transmission on the overall transmission dynamics of the pandemic because the evidence on transmission from asymptomatic cases from case reports is suboptimal.

In Singapore, seven small clusters were documented, with ten of the cases in these clusters attributable to pre-symptomatic transmission, accounting for 6.4% of the 157 locally acquired cases [14]. In addition, cases of pre-symptomatic and asymptomatic transmissions have been reported in China and have possibly occurred in a nursing facility in USA [17].

The proportion of pre-symptomatic transmission has also been inferred through modelling and was estimated to be – in the presence of control measures – at around 48% and 62% [10]. Pre-symptomatic transmission was deemed likely based on a shorter serial interval of COVID-19 (4.0 to 4.6 days) than the mean incubation period

(five days) [12]. The authors indicated that many secondary transmissions would have already occurred at the time when symptomatic cases are detected and isolated.

Modes of transmission. In most instances, coronaviruses are believed to be transmitted from person to person via large respiratory droplets, either being inhaled or deposited on mucosal surfaces. Other routes implicated in the transmission of coronaviruses include contact with contaminated fomites and inhalation of aerosols produced during aerosol-generating procedures. SARS-CoV-2 virus has been detected in respiratory and faecal specimens. Viral RNA has also been detected on rare occasions in blood specimens but there is no evidence of transmission through contact with blood [26]. The relative role of droplet, fomite and aerosol transmission for SARS-CoV-2 remains unclear, as does the level of protection provided by the different components of personal protective equipment and the transmissibility of the virus at different stages of the disease.

Face mask use in the EU. As of 1 April 2020, the countries below recommend the use of face masks for persons going out in public:

- Lithuania: http://sam.lrv.lt/uploads/sam/documents/files/KORONA/20200330_Rekomendacijos_AAP_kiti_sektoriai.pdf; residents are recommended to wear protective face masks, respirators, or other protective equipment to cover the nose and mouth in public places, except when driving motor vehicles. Parks and other open public places are requested to be visited by groups of no more than two people (excluding members of the same family), observe safe contact (greater than two meters and less than 15 minutes), and hygiene requirements.
- Austria: https://www.sozialministerium.at/Informationen-zum-Coronavirus/Coronavirus---Aktuelle-Ma%C3%9Fnahmen.html; https://www.sozialministerium.at/dam/jcr:5d5ba721-6051-4c66-b059-c554227cc11d/20200403_Fragen%20und%20Antworten%20zum%20Mund-Nasen-Schutz.pdf
- Czechia: https://www.vlada.cz/en/media-centrum/aktualne/the-government-has-decided-to-require-the-wearing-of-protective-equipment-and-reserved-time-for-senior-citizens-to-do-their-food-shopping-180465/
- Slovakia: Official document for obligatory wear of masks (or other respiratory protection equipment), effective 25 March 2020: http://www.uvzsr.sk/docs/info/covid19/Opatrenie_UVZSR_povinnost_nosit_ruska_24032020.pdf
- Bulgaria: http://www.mh.government.bg/bg/novini/aktualno/grazhdanite-koito-se-namirat-v-zakriti-ili-na-otkr/

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