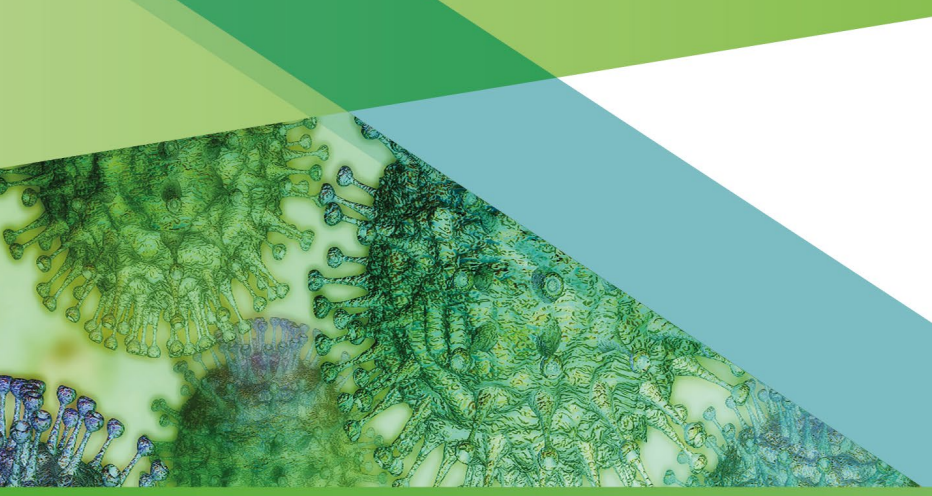

TECHNICAL REPORT

Considerations for the use of face masks in the community in the context of the SARS-CoV-2 Omicron variant of concern

7 February 2022

Key messages

- A public health policy for wearing a face mask in public spaces should be considered in areas with community transmission when the public health objective is to limit community transmission. An additional option is to focus on the use of face masks in specific settings to protect people vulnerable to severe COVID-19, such as the elderly and people with underlying medical conditions.
- The 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. The mask should be correctly adjusted on the bridge of the nose and to the face to minimise open space between the face and the mask.
- When community face coverings are used, it is advisable to choose coverings that comply with available standards for filtration efficacy and breathability, e.g. CEN CWA 17553.
- Respirators are expected to be more effective than medical masks, while community face coverings not manufactured according to the specifications in available guidelines for filtration efficacy and breathability are expected to be less effective than medical face masks. Selecting the type of face mask should take into account access, availability and tolerability, in addition to effectiveness.

Scope of this document

This document provides an update to and complements the ECDC technical report on "Using face masks in the community: first update - Effectiveness in reducing transmission of COVID-19" [1] published on 15 February 2021. The aim was to review whether the scientific evidence basis has changed since December 2020 and whether any changes are warranted given the emerging evidence on variants of concern (VOCs) and particularly the Omicron VOC. This document therefore builds on the evidence available in the literature and presents recommendations for public health measures. The use of face masks by healthcare workers for the prevention of COVID-19 is out of the scope of this document and is covered in the latest update to the technical report 'Infection prevention and control and preparedness for COVID-19 in healthcare settings' [2], published on 9 February 2021.

Target audience

Public health authorities in European Union and European Economic Area (EU/EEA) countries.

Suggested citation: European Centre for Disease Prevention and Control. Considerations for the use of face masks in the community in the context of the SARS-CoV-2 Omicron variant of concern. 7 February 2022. ECDC: Stockholm; 2022.

Background

Wearing a face mask can help reduce the spread of COVID-19 in the community by reducing the release of respiratory droplets from infected individuals who are not aware they are infected (asymptomatic), have not yet developed any symptoms (pre-symptomatic), or have mild non-specific symptoms. The use of face masks for this purpose may be adopted to reduce the societal impact associated with absence from work or healthcare pressures due to infection, or to protect vulnerable individuals in particular settings.

During the course of the pandemic, all EU/EEA countries have implemented various recommendations regarding the use of face masks as a complementary non-pharmaceutical intervention in closed places (including retail and public transportation) as well as in public places where physical distancing is not always possible. In most of these countries, the use of face masks has been or continues to be mandatory.

Scientific evidence on transmission

The Omicron VOC has a significant growth advantage, an increased household transmission risk, and an increased secondary attack rate compared to the Delta VOC [3]. According to data from the United Kingdom (UK), the adjusted odds ratio (aOR) for household transmission from an Omicron index case compared to a Delta index case, based on routine testing data, was estimated to be 3.2 (95% CI: 2.0−5.0), and the OR for a close contact becoming a secondary case was 2.09 (95% CI: 1.54−2.79). The household secondary attack rate in the UK was estimated to be 21.6% (95% CI: 16.7−27.4%) for the Omicron VOC, compared to 10.7% (95% CI: 10.5 −10.8%) for Delta.

In most instances, coronaviruses are transmitted primarily from person to person via respiratory droplets, either by being inhaled or deposited on mucosal surfaces, including aerosols produced when coughing and speaking [4]. The concentration of infectious respiratory droplets decreases with increasing distance from the source because large droplets fall on the ground or surfaces due to gravity, while small droplets that can remain suspended in the air (aerosols) are diluted. Furthermore, the droplets become less infectious with time [5]. As a result, transmission is more likely with close proximity to a source. However, there is evidence from several SARS-CoV-2 outbreak investigations that transmission also occurs in closed, poorly ventilated spaces, even without close proximity to the source [6,7], thus supporting the role of aerosols in transmission of SARS-CoV-2.

Recent non-peer-reviewed experimental data indicate that the Omicron VOC is more stable on plastic surfaces and human skin compared to the Wuhan strain and the Delta VOC, but not significantly more stable than the Alpha and Beta VOCs [8]. There are no data showing that Omicron has an increased ability to survive in aerosols or be transmitted through aerosols compared with previously circulating variants. The apparent increased transmissibility of Omicron is more likely to be primarily due to immune escape [9] or intrinsic virological characteristics of the variant (such as higher affinity to the angiotensin-converting enzyme 2 (ACE2) receptor and optimised cell entry) [6,7] rather than a change in the ability to be transmitted through aerosols or increased survival in aerosols.

Scientific evidence on face masks for the prevention of SARS-CoV-2 infection

In 2021, ECDC published a systematic review of the literature on the effectiveness of face masks in the community for the prevention of SARS-CoV-2 infection [1]. This review concluded that there was evidence of low to moderate certainty for the use of medical face masks providing a small to moderate protective effect against COVID-19 in the community, both in terms of personal protection as well as source control (protection of others).

The results of studies published after the systematic review are consistent with this conclusion. A cluster-randomised trial conducted between November 2020 and April 2021 in rural Bangladesh (600 villages; 342 183 adults) showed that increasing proper mask-wearing from 13.3% in the control group to 42.3% in the intervention group was associated with a decrease in symptomatic seroprevalence (adjusted prevalence ratio: 0.91 [0.82, 1.00]) [10].

Due to their better filtration efficiency, respirators have been considered for use in the community, particularly since the emergence of more transmissible new variants of SARS-CoV-2. Experimental studies indicate that respirators are more effective than medical face masks both in limiting the release of infectious respiratory droplets when worn by the infectious source and in limiting the exposure when worn by the exposed person [11-13]. Based on data from experimental studies on efficacy of filtration and leakage comparing respirators with medical face masks and face coverings, the ACGIH (formerly the American Conference of Governmental Industrial Hygienists) estimated that when both the source and the exposed person wear a well-fitting respirator, the time to infectious dose increases to

25 hours from 15 minutes when neither the source nor the exposed person wear any face mask [14]. However, evidence regarding the effectiveness of respirators compared to medical face masks to prevent transmission of SARS-CoV-2 in community settings remains very limited and inconclusive. Evidence from healthcare settings is also limited, and it is unclear to what extent it can be extrapolated in the community [15]. A prospective cohort study of 3 259 healthcare workers (HCWs) facing COVID-19 patients showed that FFP2 use was non-significantly associated with a decreased risk for SARS-CoV-2-positive swab (adjusted hazard ratio [aHR] 0.8, 95% CI 0.6-1.0, p 0.052). In subgroup analysis, FFP2 use was shown to be protective in the group of HCWs with exposure to more than 20 COVID-19 patients (aOR 0.7, p<0.001) [16]. A study from the UK analysing the incidence of COVID-19 among HCWs before and after the implementation of a change from surgical face masks to FFP3 respirators in COVID-19 wards found that the incidence of infection attributed to ward-based exposure decreased to levels similar to the incidence in non-COVID-19 wards (inferred risk from ward-based exposure: 0, CI 0 - 0.0804) [17].

Fit is important for the effectiveness of face masks. For respirators, an appropriate fit is necessary to ensure that the filtration level for which the respirator was designed is achieved. Fit can be affected by the size of the face and other facial characteristics, such as the presence of facial hair [18].

A review of the evidence for using masks during the COVID-19 pandemic also provides information on sociological factors such as risk compensation behaviour, stigma, and symbolism around wearing a mask. It concluded that accurate messaging is very important accompanied by the other measures that need to be followed, and that even viewing masks as a social practice could enhance their uptake [19].

There is limited evidence of harms related to the use of face masks. A systematic review identified discomfort as the most common complaint, while respirators were more commonly linked to reports of headache, difficulty breathing and pressure on the nose, compared to medical face masks [20]. The most common adverse effects associated with the use of respirators by healthcare workers have been discomfort (52%), difficulty breathing (19%), and headache (13%) [21]. In subjects with chronic obstructive pulmonary disease, the use of respirators was linked to increased breathing frequency and exhaled carbon dioxide levels, and decreased blood oxygen saturation [21].

Considerations for the use of face masks for the prevention of COVID-19 in the community

In areas where the public health objective is to reduce ongoing community transmission of COVID-19, wearing a face mask (i.e. medical face mask, respirator, or community face covering – see Annex) should be considered as one of a range of possible measures in confined public spaces, such as stores, supermarkets, transportation hubs (e.g. ports, airports, train/coach stations) and when using public transport.

Wearing a face mask should be considered in crowded outdoor settings where physical distancing is not possible when the public health objective is to limit community transmission.

A public health policy for wearing a face mask in public spaces should be considered in areas with community transmission when the public health objective is to limit community transmission. Such a policy would complement other measures that are recommended to reduce community transmission, such as physical distancing, teleworking if possible and appropriate ventilation of indoor spaces. An additional option is to focus on the use of face masks in specific settings to protect people vulnerable to severe COVID-19, such as the elderly and people with underlying medical conditions. In this case, face masks can be recommended both for vulnerable people and for people regularly interacting with them, such as in care settings. Proportionality to other measures, acceptability by the population, and environmental impacts are factors to be considered when selecting the most appropriate strategy.

Selecting the type of face mask should take into account access, availability, and tolerability, in addition to effectiveness. Based on experimental efficiency data and given the lack of high-quality evidence, respirators are in general expected to be more effective than medical masks while community face coverings not manufactured according to the specifications in available guidelines for filtration efficacy and breathability are expected to be less effective than medical face masks.

People vulnerable to severe COVID-19, such as the elderly or those with underlying medical conditions, high-risk contacts of COVID-19 cases who cannot stay in quarantine for the full recommended quarantine period, as well as COVID-19 cases who cannot isolate for the full recommended isolation period should consider wearing a respirator if available and tolerated.

In households, the use of a medical face mask or a respirator should be considered for people with symptoms of COVID-19 or confirmed COVID-19 and for the people who share their household, especially when isolation of the person with symptoms of or confirmed COVID-19 is not possible.

When community face coverings are used, it is advisable to choose coverings that comply with available standards for filtration efficacy and breathability [22].

The 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. The mask should be correctly adjusted on the bridge of the nose and to the face to minimise open space between the face and the mask. Based on experimental studies, options to maximise the fitting of medical face masks have been proposed, e.g. making knots close to the mask on each of the mask's ear loops, applying a mask fitter or wearing a community face covering over a medical face mask [23-25].

The choice of a suitable respirator for the shape of a user's face (type and size) and performing a pre-use seal check are important requirements to ensure the maximum protective effectiveness of respirators [26]. The seal check should be repeated every time a user puts on the respirator. In the community, appropriate use and fitting of respirators may be challenging, so any possible added value of respirators in preventing respiratory infections is expected to be lower in the community than in healthcare.

Contributing ECDC experts (in alphabetical order)

Agoritsa Baka, Orlando Cenciarelli, Favelle Lamb, Dominique L. Monnet, Aikaterini Mougkou, Diamantis Plachouras, Carl Suetens, Maria Tseroni, Angela Wirtz.

Annex

Figure 1. Types of face mask and shield

Medical face mask | Community face covering | Respirator | Face shield/visor

Glossary

Face mask is an overarching term used for any device (i.e. a community face covering, medical face mask or a respirator) that is worn over the mouth and nose to prevent the inhalation of harmful substances such as infectious respiratory droplets or the release of infectious respiratory droplets produced by breathing, speaking, coughing or sneezing in the environment.

Source control: When face masks are used to prevent the release of infectious respiratory particles such as droplets or aerosols by SARS-CoV-2-positive people into the environment to decrease the likelihood that these particles are inhaled by another healthy person or deposited on mucous membranes (i.e. protection of others).

Wearer protection: When face masks are intended to prevent SARS-CoV-2-containing infectious splashes and respiratory droplets, including aerosols from the environment to be inhaled or deposited on mucous membranes.

Community face coverings (or non-medical face masks, 'community' masks) include various forms of self-made and commercial masks, including re-usable face covers made of cloth, other textiles and other disposable materials such as paper. They are not standardised and are not intended to be used in healthcare settings or by healthcare workers. The minimal requirements for reusable or disposable community face coverings intended for the general public are specified in CWA 17553 (European Committee for Standardisation – CEN) [22].

A medical face mask (also known as surgical or procedure mask) is a disposable medical device used by healthcare workers to prevent large respiratory droplets and splashes reaching the mouth and nose of the wearer, and as a means of source control to stop the spread of large respiratory droplets by the person wearing them [27]. Requirements for medical face masks, including the duration of use, are defined in the European Committee for Standardization's published standards [28]. Medical face masks are not defined as personal protective equipment in Regulation (EU) 2016/425 of 9 March 2016 or Directive 89/656/EEC on personal protective equipment [29]. However, for the purpose of this document and in accordance with guidance on infection prevention and control in the context of COVID-19 by the World Health Organization (WHO) [30] and on transmission-based precautions [31], medical face masks are considered to provide protection against infections transmitted by droplets.

A respirator (also known as a filtering face piece (FFP) mask or filtering half mask) is a device designed to protect the wearer from exposure to airborne contaminants (e.g. from inhaling dust or infectious particles). Requirements for FFPs, including the intended duration of use, are specified in the European Committee for Standardization's published standards [32], and respirators are classified as personal protective equipment [27]. **An N95/N99 respirator** is the United States' equivalent of FFP2/FFP3 respirators as defined by US standard NIOSH 42 CFR, part 84 [33]. The KN95/KP95 standards (China) has similar performance requirements.

FFP2 respirators have a filtering capacity of at least 94% for 0.3 µm particles, while FFP3 respirators have a filtering capacity of at least 99% for 0.3 µm particles. Respirators are mainly used by workplace users, including healthcare professionals, to protect themselves, especially during dust- and aerosol-generating procedures, and require a fitting test to ensure proper protection.

References

1. European Centre for Disease Prevention and Control. Using face masks in the community: first update - Effectiveness in reducing transmission of COVID-19. 15 February 2021. Stockholm: ECDC; 2021. Available from: https://www.ecdc.europa.eu/en/publications-data/using-face-masks-community-reducing-covid-19-transmission
2. European Centre for Disease Prevention and Control. Infection prevention and control and preparedness for COVID-19 in healthcare settings - sixth update. 9 February 2021. Stockholm: ECDC; 2021. Available from: https://www.ecdc.europa.eu/en/publications-data/infection-prevention-and-control-and-preparedness-covid-19-healthcare-settings
3. UK Health Security Agency. SARS-CoV-2 variants of concern and variants under investigation in England: Technical briefing 31. London: UKHSA; 2021. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1042367/technical_briefing-31-10-december-2021.pdf
4. Wang CC, Prather KA, Sznitman J, Jimenez JL, Lakdawala SS, Tufekci Z, et al. Airborne transmission of respiratory viruses. Science. 2021;373(6558):eabd9149.
5. Oswin HP, Haddrell AE, Otero-Fernandez M, Mann JF, Cogan TA, Hilditch T, et al. The Dynamics of SARS-CoV-2 Infectivity with Changes in Aerosol Microenvironment. medRxiv 2022.
6. Peacock TP, Brown JC, Zhou J, Thakur N, Newman J, Kugathasan R, et al. The SARS-CoV-2 variant, Omicron, shows rapid replication in human primary nasal epithelial cultures and efficiently uses the endosomal route of entry. bioRxiv. 2022:2021.12.31.474653.
7. Willett BJ, Grove J, MacLean OA, Wilkie C, Logan N, Lorenzo GD, et al. The hyper-transmissible SARS-CoV-2 Omicron variant exhibits significant antigenic change, vaccine escape and a switch in cell entry mechanism. medRxiv. 2022:2022.01.03.21268111.
8. Hirose R, Itoh Y, Ikegaya H, Miyazaki H, Watanabe N, Yoshida T, et al. Differences in environmental stability among SARS-CoV-2 variants of concern: Omicron has higher stability. bioRxiv. 2022:2022.01.18.476607.
9. Lyngse FP, Mortensen LH, Denwood MJ, Christiansen LE, Møller CH, Skov RL, et al. SARS-CoV-2 Omicron VOC Transmission in Danish Households. medRxiv. 2021:2021.12.27.21268278.
10. Abaluck J, Kwong LH, Styczynski A, Haque A, Kabir MA, Bates-Jefferys E, et al. Impact of community masking on COVID-19: A cluster-randomized trial in Bangladesh. Science. 2021 Dec 2;0(0):eabi9069.
11. Leung NHL, Chu DKW, Shiu EYC, Chan KH, McDevitt JJ, Hau BJP, et al. Respiratory virus shedding in exhaled breath and efficacy of face masks. Nat Med. 2020 May;26(5):676-80.
12. Ueki H, Furusawa Y, Iwatsuki-Horimoto K, Imai M, Kabata H, Nishimura H, et al. Effectiveness of Face Masks in Preventing Airborne Transmission of SARS-CoV-2. mSphere. 2020 Oct 21;5(5).
13. Bagheri G, Thiede B, Hejazi B, Schlenczek O, Bodenschatz E. An upper bound on one-to-one exposure to infectious human respiratory particles. Proc Natl Acad Sci USA. 2021 Dec 7;118(49):e2110117118.
14. ACGIH. COVID-19 Fact Sheet: Workers Need Respirators. 2021. Available from: https://www.acgih.org/covid-19-fact-sheet-worker-resp
15. Chou R, Dana, T., Jungbauer, R. Update Alert 6: Masks for Prevention of Respiratory Virus Infections, Including SARS-CoV-2, in Health Care and Community Settings. Ann Intern Med. 2021;174(9):W68.
16. Haller S, Güsewell S, Egger T, Scanferla G, Thoma R, Leal-Neto OB, et al. Use of respirator vs. surgical masks in healthcare personnel and its impact on SARS-CoV-2 acquisition – a prospective multicentre cohort study. medRxiv. 2021:2021.05.30.21258080.
17. Ferris M, Ferris R, Workman C, O'Connor E, Enoch D, Goldesgeyme E, et al. FFP3 respirators protect healthcare workers against infection with SARS-CoV-2. Authorea. 30 June 2021.
18. Regli A, Sommerfield A, von Ungern-Sternberg BS. The role of fit testing N95/FFP2/FFP3 masks: a narrative review. Anaesthesia. 2021 Jan;76(1):91-100.
19. Howard J, Huang A, Li Z, Tufekci Z, Zdimal V, van der Westhuizen HM, et al. An evidence review of face masks against COVID-19. Proc Natl Acad Sci USA. 2021 Jan 26;118(4):e2014564118.
20. Bakhit M, Krzyzaniak N, Scott AM, Clark J, Glasziou P, Del Mar C. Downsides of face masks and possible mitigation strategies: a systematic review and meta-analysis. BMJ Open. 2021 Feb 22;11(2):e044364.
21. Kyung SY, Kim Y, Hwang H, Park JW, Jeong SH. Risks of N95 Face Mask Use in Subjects With COPD. Respir Care. 2020 May;65(5):658-64.
22. European Committee for Standardization (CEN). CEN Workshop Agreement CWA 17553: Community face coverings - Guide to minimum requirements, methods of testing and use. June 2020. Brussels: CEN; 2020. Available from: https://www.cencenelec.eu/media/CEN-CENELEC/CWAs/RI/cwa17553_2020.pdf

23. 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 Intern Med. 2020 Dec-10.
24. 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. MMWR Morb Mortal Wkly Rep. 2021;ePub: 10 February 2021. Available from: http://dx.doi.org/10.15585/mmwr.mm7007e1external
25. Fox-Lewis A, Williamson F, Harrower J, Ren X, Sonder GJB, McNeill A, et al. Airborne Transmission of SARS-CoV-2 Delta Variant within Tightly Monitored Isolation Facility, New Zealand (Aotearoa). Emerg Infect Dis. 29 Dec 2021;28(3).
26. Health and Safety Executive (HSE). Fit testing face masks to avoid transmission during the coronavirus pandemic. 31 December 2020. Bootle, England: HSE; 2020. Available from: https://www.hse.gov.uk/coronavirus/ppe-face-masks/face-mask-ppe-rpe.htm
27. U.S. National Institute for Occupational Safety and Health (NIOSH). Use of Respirators and Surgical Masks for Protection Against Healthcare Hazards. 19 November 2018. Washington, DC, US: NIOSH; 2018. Available from: https://www.cdc.gov/niosh/topics/healthcarehsps/respiratory.html
28. European Committee for Standardization (CEN). CEN/TC 205 - Non-active medical devices. Brussels: CEN; 2019. Available from: https://standards.cen.eu/dyn/www/f?p=204:110:0::::FSP_PROJECT,FSP_ORG_ID:69675,6186&cs=19F67DA57C81359DD409C62A083C97AD7
29. European Parliament. Regulation (EU) 2016/425 of the European Parliament and the Council of 9 March 2016 on personal protective equipment and repealing Council Directive 89/686/ ECC. Official Journal L81, 31/3/20166 P51-98; 2016. Available from: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32016R0425
30. World Health Organization (WHO). Infection prevention and control during health care when novel coronavirus (nCoV) infection is suspected. Geneva: WHO; 2020. Available from: https://www.who.int/publications/i/item/10665-331495
31. US Centers for Disease Control and Prevention (CDC). Transmission-based precautions. 7 January 2016. Atlanta, Georgia, US: CDC; 2016. Available from: https://www.cdc.gov/infectioncontrol/basics/transmission-based-precautions.html
32. European Committee for Standardization (CEN). CEN/TC 79 - Respiratory protective devices. Brussels, Belgium: CEN; 2009. Available from: https://standards.cen.eu/dyn/www/f?p=204:110:0::::FSP_PROJECT,FSP_ORG_ID:32928,6062&cs=1FC98AD34A5EE26A0CB5A6155ED4D6E5E
33. US National Institute for Occupational Safety and Health (NIOSH). 42 CFR Part 84 Respiratory Protective Devices. 4 March 1997. Washington, DC, US: NIOSH; 1997. Available from: https://www.cdc.gov/niosh/npptl/topics/respirators/pt84abs2.html