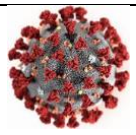
National COVID-19 Science Task Force (NCS-TF)	

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Benefits of wearing masks in community settings where social distancing cannot be reliably achieved

Executive Summary

We review the evidence for the benefits of wearing face masks in community settings for diminishing the spread of SARS-CoV-2, particularly where social distancing and traceability cannot reliably be achieved. Compared to the early phases of the pandemic in Switzerland (early March), the situation has evolved in three key aspects: (1) Additional scientific evidence has emerged supporting public use of face masks, both as an effective source control measure and for personal protection; (2) There is now broad scientific consensus that public use of face masks reduces the spread of SARS-CoV-2; and (3) Based on new evidence and the current scientific consensus, prominent health institutions including the WHO and the CDC have changed their recommendations with regard to face masks. In line with our earlier recommendation from April, **we reiterate our recommendation in favor of generalized mask wearing in settings where physical distance cannot reliably and consistently be achieved, especially where traceability is not warranted, such as for example and with highest priority in public transport. In this policy brief we make the additional point that making mask-wearing mandatory in certain settings might be the right decision at this time.**

Type of masks

FFP Masks, particle Filtering FacePiece, or personal protection face masks are masks that are chiefly designed to protect their wearer and are extensively used to protect medical personnel. FFP masks are classified into FFP1, FFP2 and FFP3 depending on their filtration capacity. FFP masks are personal protective equipment that must meet the criteria of norm EN 149 and have to comply with EU directive EU/2016/425 (SR 930.115 – Verordnung über die Sicherheit von persönlichen Schutzausrüstungen (PSA-Verordnung)). They have to be tested according to norm EN 149 and must be certified by an independent certification body.

Surgical Masks (preferred name in Switzerland), OP-masks, or medical masks, are masks that cover their wearer's mouth and nose and are designed to primarily protect others from contamination by the wearer. They additionally afford some level of protection for the wearer. These masks must meet the criteria of norm EN 14683 (e.g., Type I, Type II, Type IIR, or equivalent). With their loose fit on the face, surgical masks do not protect their wearer as extensively as FFP masks, and do not have to (generally do not, in fact) satisfy the criteria of

norm EN 149. Surgical masks have to comply with the regulation on medical products (EU/2017/745, SR 812.213 Medical Devices Ordinance- MedDO). They have to be tested according to EN 14683 and certified. **Surgical masks are hereinafter referred to as "face masks" or simply "masks".**

Community masks, barrier masks, hygienic masks, cloth masks, and textile masks are masks that are not certified under either of norms EN 14683 or EN 149. The use of non-certified barrier masks, often implemented for lack of supply of surgical masks, is aimed at use by the general population for source control – thus for protecting, in community settings, others from contamination by their wearer - hence the name. In Switzerland, community masks are a new type of mask developed for the general population to face the COVID-19 crisis. A new specification has been developed as described in the Task Force's policy brief on "Community mask spec and recommendations" from April 25, 2020 [1]. Community masks produced according to that specification are designed and tested to offer a similar level of protection or source control against COVID-19 as surgical masks.

Recent scientific evidence

In its policy brief from April 20, 2020, the Task Force concluded that the scientific literature available at the time - while in part containing conflicting evidence - overall pointed clearly to a risk-benefit ratio in favor of generalized mask-wearing when conducted in association with hand hygiene, whenever social distancing cannot be maintained [2]. In that policy brief, we concluded that "The generalized wearing of masks must therefore be implemented together with equally generalized hand hygiene and social distancing, and must be communicated as part of a broader, coherent, package of preventive measures for the entire community." That earlier policy brief was based on a review of meta-analyses published in the literature on the effects of wearing masks by the general public or by healthcare professionals during epidemics and pandemics. Over the past three months, important additional evidence has accrued, which more strongly supports the benefits of public use of face masks, and which has resulted in prominent institutions changing their recommendation on face mask use in public settings.

A systematic review and meta-analysis of data for SARS-CoV-2 and the betacoronaviruses published in June in *The Lancet* [3] showed that **wearing a face mask was associated with a significantly lower risk of infection. Indeed, people wearing a face mask were only 33% as likely to get infected compared to those that did not wear one (aOR 0·33; 95% CI 0·17 to 0·61).** The authors of that article clarify that, although "the precise quantitative effect is [of] low certainty", "the qualitative effect is qualitatively highly certain". This means that **it is highly reliable that the wearing of face masks protected against transmission of SARS-CoV-2** and related viruses, **in both healthcare settings and non-healthcare settings.** This study thus demonstrates that face masks act not only as **source control** to protect others**,** by reducing the shedding of viruses in respiratory droplets and aerosols from infected individuals [4,5], but importantly **they also protect the wearer**. Mask wearing is thus not only an act of responsible behavior, but also a self-preserving action.

Recent studies published in *Nature Medicine* and *Science* demonstrate the large role of transmission by asymptomatic and presymptomatic individuals in spreading SARS-CoV-2 [6,7]. Based on 77 transmission pairs obtained from publicly available sources within and outside mainland China (including Malaysia, Vietnam and Japan), He and coworkers inferred that **infectiousness started more than 2 days before symptom onset** and estimated that **44% of transmissions - almost half - occurred from presymptomatic individuals** [6]. Also consistent with the hypothesis of significant transmission by asymptomatic individuals is the analysis of reported infections and mobility data in China

before the travel restrictions of January 23, 2020, which showed that 86% of all infections were undocumented [7], likely occurring in asymptomatic or pauci-symptomatic individuals. **The large fraction of transmissions due to asymptomatic individuals underscores the importance of widespread or universal public mask wearing for effective source control.**

The effectiveness of community masks in source control is underscored by a recent study published in the *New England Journal of Medicine* [5], in which the cloud of droplets emitted during speech was directly visualized with a video camera and compared in scenarios with and without mask. The number of droplets emitted and the size of the cloud dropped to nearly zero when a mask was worn. The video makes a compelling demonstration of the effectiveness of community masks and can be found here (https://www.nejm.org/doi/full/10.1056/NEJMc2007800). This result is in accordance with a study published in *Nature Medicine* reporting that surgical face masks could prevent transmission of human coronaviruses and influenza viruses from symptomatic individuals [4].

New evidence for the role of face masks also emerges from a modeling study published in *Nature Human Behavior,* where the authors used a stochastic modified SEIR (susceptible–exposed–infectious–recovered) model to explore post-lockdown development of virus spreading in Spain. Based on their results, the authors suggested that the combination of (i) awareness of the continuing risk presented by COVID-19 and (ii) non-pharmaceutical interventions including face masks, has 99% significant impact on virus transmissibility and will considerably reduce the spread of the virus, potentially removing the need for further lockdowns [8]. Importantly, while the model predicts that high awareness of risk together with high compliance with measures including the use of face masks can completely prevent the occurrence of a second wave, it also predicts that even a moderate reduction in virus transmission would have a major impact on a second wave (e.g., 30% reduced transmissibility results in a 60% reduction in the peak number of cases in a second wave). In this context, the **widespread use of face masks could also serve as a tool to raise or maintain public awareness**: this stands in contrast to the often-made assumption that face masks might lead to a false sense of security and reduce compliance with hygiene measures (such risk compensation behaviors have often not materialized, for example when compulsory seat belt or helmet wearing were introduced) [8; 11].

Scientific consensus

"… *in the face of a pandemic the search for perfect evidence may be the enemy of good policy*" [9]

Over the last two months, a **broad scientific consensus has confirmed** – following the availability of new evidence [10] and extensive scientific and medical discussion – that face masks worn by the large majority of people in public settings including notably crowded places would significantly reduce the spread of SARS-CoV-2.

Even early on in the epidemic, available scientific evidence [2; 9] and current knowledge of contamination mechanisms, together with the precautionary principle, supported the use of face masks to combat the spread of SARS-CoV-2. The debate surrounding the generalized use of face masks centered on the *quality* of available evidence, specifically on the lack of "randomised controlled trials" (RCTs). RCTs are the gold standard of trials for therapeutic interventions, as they minimize the likelihood of outcomes being affected by hidden confounding factors. RCTs investigating face mask use in COVID-19 are currently not available [11] and the growing evidence in favour of face masks would probably make **conducting an RCT very difficult on ethical grounds,** as the trial would have to include a

control group instructed not to wear masks (which for example in a past trial on healthcare workers in the context of influenza was deemed unethical [11]) [12; 13]. Furthermore, all existing RCTs on face masks have investigated the protective effects for the wearer but never for others in the community [14]: the level of evidence required for the evaluation of the source control effect of face masks in the population will probably never be achieved, since the realisation of an RCT would be very difficult if not impracticable. Indeed, one would have to test the infection status not of the study participants (wearing/not wearing a face mask), but of a significant number of random members of the population interacting with the study participants.

One often-cited concern regarding the generalized public use of masks has been the potential of misuse leading to an increase in virus spreading. To the best of our knowledge, no meta-analysis about respiratory viruses has reported that wearing a face mask increased the risk of infection [2]. Furthermore, no recent study about SARS-CoV-2 has published results supporting this concern despite widespread use of face masks in many countries.

Sociologists and public health researchers have linked the debate about face masks to the debate about condoms early on in the AIDS epidemic [15]: in the early years of the epidemic - following the discovery that HIV was spread by asymptomatic individuals, just like SARS-CoV-2 - the use of condoms was recommended by the medical community and by public health officials despite a lack of scientific evidence for the benefit of condoms at the time and despite the imperfect protection they provide. This recommendation contributed significantly to slowing the spread of HIV until pharmacological interventions could be developed years later. Just like condoms, face masks are not 100% effective and do not need to prevent the transmission of every droplet and every particle to tangibly reduce transmission. The aim of wearing a mask is more modest, namely to achieve a substantial reduction in the transmission rate of the virus (R0) [14]. Mathematical models show that the use of surgical masks (with estimated efficacy of at least 70%) would lead to a dramatic reduction of COVID-19 burden if the adoption is high enough (at least 70%). Furthermore, even face masks of low efficacy (e.g., home-made cloth masks) would lead to an important reduction of disease burden [16]. The reduction of viral load that face masks mediate may result in lower chances of infection and in a milder disease when infection occurs [17]. At the same time, epidemiological and economic modelling has identified effective source control through masks as one of four key strategies to “mitigate a second wave while leaving room for an economic recovery” [18].

Recognizing that the acute and urgent nature of the COVID-19 pandemic allows for few certainties, the scientific community has widely accepted that face masks are “*a pragmatic response to a situation where evidence of situated effect can only come after (and potentially too late)”* [19]*.* This consensus is perhaps best signified by an open letter to all US state governors signed by more than 100 high-profile international academics - including Nobel Prize-winning virologists and economists - asking that “*officials require cloth masks to be worn in all public places, such as stores, transportation systems, and public buildings”* [20].

Policy changes by public health institutions in regards to mask wearing

Based on the recent scientific evidence and the emerging scientific consensus, prominent public health institutions including the WHO and the CDC have changed their policy regarding the use of face masks and now recommend population-wide use of masks. We emphasize that the policy brief we published this past April [2] already made a clear recommendation, which reads as follows: “The generalized wearing of masks must therefore be implemented together with equally generalized hand hygiene and social distancing”.

Specifically, WHO's guidance on masks (June 5, 2020) now states that [21] "[...] *At the present time, the widespread use of masks by healthy people in the community setting is not yet supported by high quality or direct scientific evidence and there are potential benefits and harms to consider [...]. However, taking into account the available studies evaluating pre- and asymptomatic transmission, a growing compendium of observational evidence on the use of masks by the general public in several countries, individual values and preferences, as well as the difficulty of physical distancing in many contexts, WHO has updated its guidance to advise that* ***to prevent COVID-19 transmission effectively in areas of community transmission, governments should encourage the general public to wear masks in specific situations and settings as part of a comprehensive approach to suppress SARS-CoV-2 transmission*** *[...].*"

Similarly, based on emerging evidence, the US Center for Disease Control and Prevention (CDC) now "*recommends that people wear cloth face coverings in public settings when around people outside of their household, especially when other social distancing measures are difficult to maintain."* [22]

Many countries have mandated face mask use in most public settings, including among others Austria, France, Germany and Italy [23].

Conclusions

In light of the currently very low levels of compliance with official recommendations regarding face mask wearing in Switzerland coupled with the new scientific evidence and the shift in the scientific consensus, and based on our earlier recommendation from last April, **the Task Force continues to recommend that action be taken that will strongly increase the extent to which the general public wears masks, both for source control and personal protection. Not achieving this is, we believe, likely to contribute to the emergence of a second intense wave of COVID-19 in Switzerland.**

Defining and implementing action that is appropriate to this end in the Swiss setting goes beyond the remit of this Task Force. We venture, however, to **propose a strategy whereby mask wearing is made mandatory in settings where (i) distancing cannot be ensured and (ii) the presence of individuals is not entirely a matter of choice for them; examples are public transport, medical institutions and food stores.**

Making the wearing of face masks mandatory in such settings, where physical distance cannot reliably and consistently be achieved, especially if traceability of contacts is not warranted - such as public transport, shops, or poorly ventilated indoor spaces - is, we believe, an appropriate strategy. We concur with the assessment that "***Public mask wearing is most effective at reducing spread of the virus when compliance is high****"* [12]**.** In light of the currently very low levels of compliance with official recommendations regarding face mask wearing in Switzerland, we conclude that universal face mask wearing should be made mandatory in selected public settings in order to lower transmission of the disease and achieve the widespread adoption of face masks needed to curb transmission and minimize the chances that more restrictive measures be needed later on.

Making face mask wearing mandatory should be accompanied by an extensive communication campaign aimed at informing the population about

(i) the individual and collective benefit of universal face mask wearing,
(ii) correct practices in face mask wearing, and

(iii) the importance of nonetheless maintaining hygiene measures and social distancing rules at all times.

Making face mask wearing mandatory in certain settings further resolves the collective action problem that voluntary face mask wearing implies. For an individual wearing a face mask thought to primarily protect others, face mask wearing is an effort that is less likely to be sustained when reciprocity is not forthcoming. Knowledge that others must wear face masks too reduces the cost of face mask wearing for the individual. **On an ethical level, universal face mask wearing is a measure that enables the participation in the public sphere and the exercise of rights for persons particularly vulnerable to COVID-19,** among these the elderly [24]. As societies are adapting to living with COVID-19, the associated re-organization of many activities to re-enable life and the exercise of individual rights - for example safely taking public transport - needs to happen for everyone and not only for those who are not particularly vulnerable to COVID-19 [24].

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