Let us not forget the mask in our attempts to stall the spread of COVID-19

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**Running head:** Mask use to stop COVID-19 transmission

On 28 February 2020, the World Health Organization (WHO) upgraded the global risk of the spread of COVID-19 to very high. Here, we make the case for mass use of masks as an effective and sustainable way to complement other measures to stall the pandemic.

In Mainland China, extreme forms of social distancing and compulsory mask wearing in public places appear to have been effective in successfully reducing the incidence after the initial explosive outbreak in Hubei Province.[1,2] This approach has also contained secondary community transmission in other provinces after five million people left Wuhan before the Chinese New Year.[1,2] Most cases subsequently detected appeared clustered, especially in households, which thus greatly facilitated early case finding and contact quarantine. In Macau, mass mask use in public places and tightened border surveillance were adopted early to cope with the tens of thousands of people who cross the border to and from Mainland China each day. Together with voluntary social distancing, hand hygiene practices and closure of government offices and casinos, there were no further new cases for almost four weeks.[1]

In Hong Kong, although the government only advised people to stay home as far as possible and for symptomatic persons to wear a mask, almost all healthy people have been voluntarily wearing masks in public places since late January. This is despite a severe shortage of masks. Interestingly, there have been precipitous drops in the laboratory detection of influenza and all other respiratory viruses from respiratory specimens since early February.[3] Despite the early wave of imported cases, there were few secondary local transmissions (see Figure). As in Mainland China, family clustering was a key feature. Three clusters involved dining parties, where naturally masks were not worn. The largest cluster included as many as 11 out of 19 persons attending a dinner party. Free dining was also provided in a Buddhist temple with another cluster of 11 cases. These "dining", family and religious clusters ($n = 57$) far outnumbered the 16 local cases with unclear transmission links. This suggests that mass mask wearing in public places is having a significant impact in limiting transmission.

Figure Clustering pattern of reported COVID-19 cases in Hong Kong, China, up to 1 March 2020.
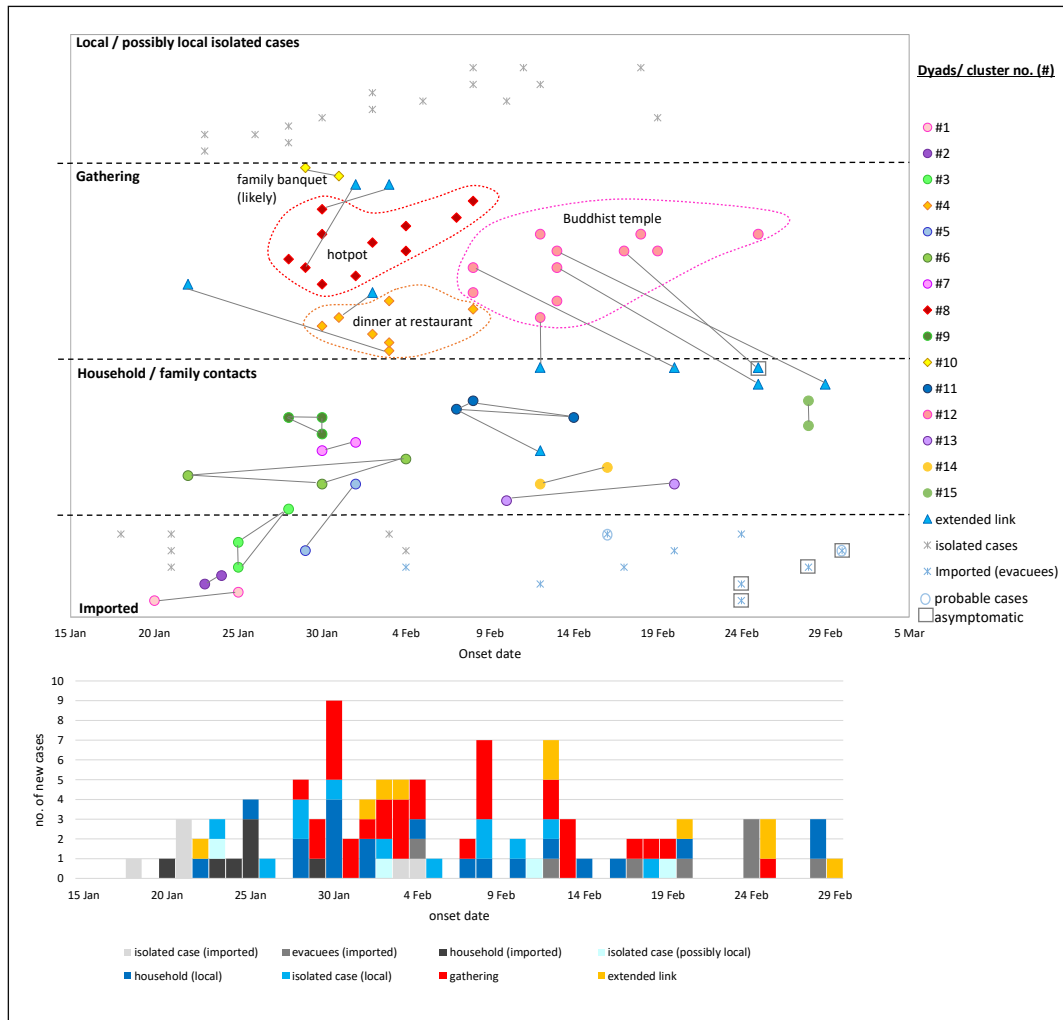
Note: For asymptomatic cases, the date of reporting is taken as the date of onset

In the absence of similar containment measures, the situation outside China is worsening rapidly with new cases outnumbering those inside China. In Korea, large church assemblies (where masks were not worn) have fuelled a major outbreak (accumulated rate: over 10/100,000 population, exceeding that in China).[1] COVID-19 is now reported in over 20 European countries, with a particularly serious outbreak in Italy.[2]

The experience in China clearly shows that with effective control measures, including mass mask use, the COVID-19 epidemic is containable.[2] Implementation of suitable containment measures at an early stage has greatly shortened the time needed for initial containment, as shown by the rapid drop in new cases outside Hubei. Whether the extreme forms of social distancing implemented in China are sustainable in other countries is unclear, but community mobilisation and other control measures are likely to be feasible in different socio-economic situations.

Similar to influenza and other respiratory infections, droplets and fomites are key routes of transmission.[2] Human coronaviruses can maintain their viability outside the host for as long as 9 days,[4] which greatly increases transmission risk through fomites. Wearing a mask can intercept respiratory droplets at source, thus greatly reducing the risk of both direct droplet spread and fomites. The WHO recommends that masks be worn by symptomatic persons but discourages healthy people from wearing masks in general community.[5] However, the SARS-CoV-2 has been detected in respiratory specimens and saliva of COVID-19 patients one to two days before they developed symptoms,[2] and asymptomatic patients have been incriminated in the transmission.[6] People may not pay attention to non-specific symptoms at early stages of the disease, but the viral load may already be high.[7] Voluntary mass mask wearing, at least in crowded places, will help to reduce transmission risk from these silent sources, as illustrated by the rapid drop in common respiratory infections in Hong Kong.

The global shortage of disposable surgical masks might have deterred the WHO and national governments from recommending mask use. The recent WHO-China Joint Mission Report has not commented specifically on the role of healthy people wearing masks.[2] Without extreme social distancing, local transmission outside household and health care settings cannot be easily contained, as the outbreaks in Korea and Italy have shown. Case detection by screening all patients with non-specific upper respiratory symptoms with no travel or contact history is not feasible. Experiences in Hong Kong and Macau suggest that mass mask wearing, which does not compromise hygiene measures (as shown by the hoarding of sanitisers) and social distancing (closure of many restaurants), has minimised not only COVID-19 cases without clear transmission links, but also reduced the "noise" from other respiratory infections.

Panic buying of masks is likely to occur irrespective of advice from authorities, as witnessed worldwide recently. The mounting public panic has also forced many governments to try to secure supply (mostly unsuccessfully) to ease the tension, indirectly confirming the impression that the mask is useful to protect oneself, in spite of WHO guidance.

As the WHO urgently assesses which aspects of China's control measures would help to stall the spread elsewhere, we propose that mask wearing should be a serious candidate to be considered when major community outbreaks threaten, especially in places where extreme social distancing cannot be easily achieved.[8] If mask use is recommended, information to the public should cover two aspects. First, the primary function of wearing a mask is to control the infection at source. Second, because asymptomatic individuals may be contagious, mass wearing in crowded places is advised. If everyone wears a mask, all will be protected.

Disposable surgical masks are designed for protecting health care workers rather than for infection source control. Before disposable masks were available, surgeons used washable cloth masks successfully during operations. Cloth masks, if endorsed by authorities, can provide a sustainable alternative for the public, conserving the disposable versions for use where they are most needed.

The good news is that on 2 March, the Hong Kong SAR government resumed most public services to normal working hours. Businesses in Mainland China are also starting to resume normality. How the epidemic evolves will provide an indication of the effectiveness of mass mask use, coupled with hand hygiene and avoidance of non-essential social contacts.

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