COVID-19: SOCIAL DISTANCING AND CONTAINMENT

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Question: What is the best available evidence regarding social distancing and containment in the context of COVID-19?

***ALERT* Evidence regarding COVID-19 is continually evolving. This Evidence Brief will be updated regularly to reflect new emerging evidence but may not always include the very latest evidence in real-time.**

Key messages:

- COVID-19 is transmitted via moisture droplets including salvia and mucous which can enter the eyes, nose, or mouth of an uninfected person and cause illness.
- Infected droplets can land on surfaces and be passed from the surface to the eyes, nose, or mouth of an uninfected person via contact.
- Maintaining physical distance between infected and non-infected individuals can assist in preventing transmission.
- Social distancing interventions seek to encourage or enforce the physical separation of members of the community to curtail opportunities for transmission and infection between individuals.
- Social distancing interventions are among an array of approaches to infectious disease control which can generally be combined with some form of disease prophylaxis and treatment; interventions that are currently beyond the scope of possible responses to COVID-19.
- Evidence regarding social distancing appears to be largely based on theoretical and mathematical models rather than evidence from real world studies.
- Evidence appears to point to the effectiveness of swift and decisive action regarding the implementation of social distancing and containment measures across schools, workplaces, and broader society versus slower and/or less stringent measures.
- Past studies highlight the widespread impacts of containment and social distancing on economies, communities, and healthcare infrastructure. The extent and nature of these impacts are yet, not well understood in relation to COVID-19.
- Physical distancing recommendations vary between organisations and regions and appear to be between one meter and two meters however the underpinning evidence is varied and conflicting.

Summary

Droplet-borne infectious diseases are most easily spread between individuals by direct personal contact between infected and non-infected individuals involving saliva or mucous, contact with the virus on contaminated surfaces, or very close physical proximity between infected and non-infected individuals through coughing, sneezing, or talking. Maintaining physical distance between infected and non-infected individuals can assist in preventing infection by decreasing the likelihood of droplet transmission. Social distancing and containment interventions aim to encourage and enforce the maintenance of safe physical distance between individuals; both those who are infected/suspected of infection and healthy members of the community. Social distancing and containment have been utilised to varying extents during previous epidemics and pandemics, particularly for viral influenza outbreaks as well as severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS).

Background

COVID-19 pandemic

COVID-19 (from 'severe acute respiratory syndrome coronavirus 2' (or 'SARS-CoV-2') is a newly discovered (novel) corona virus first identified in Wuhan, Hubei province, China in 2019 as the cause of a cluster of pneumonia cases.[1] Coronaviruses are similar to a number of human and animal pathogens including some of those which cause the common cold as well as more serious illnesses including SARS and MERS. Since discovery, COVID-19 has spread to many countries and was declared a pandemic on 30 January 2020.1 Shortly after the emergence of the outbreak, nations began implementing measures to prevent infection spread from China and across borders, however in many instances, this was too late and did not enable effective disease control.[2]

Summary of Evidence

Evidence of the effectiveness of social distancing and other related measures in the context of pandemic influenza has been examined by previous evidence syntheses and studies as well as more recent observation and modelling based on the COVID-19 outbreak.[3] Some consider that if implemented more rapidly, containment and social distancing could have resulted in better disease control where if implemented one week, two weeks, and three weeks earlier in China, it could have reduced the number of new cases by 66%, 86%, and 95%, respectively.[3]

Theoretical and mathematical models are a key source of evidence on this topic with primary evidence being relatively weaker and less prevalent. The World Health Organisation (WHO) and United States Centers of Disease Control (CDC) issued advice early on regarding avoiding travel to high-risk areas and contact with individuals who are symptomatic and authors have noted the containment, isolation, and quarantine responses that have occurred in China that have resulted (at present) in relatively strong outbreak control in China despite widespread infection rates elsewhere around the world.[2]

In 2005 Fergusson and colleagues discussed influenza pandemic control and describe how the goal of pandemic control policies is generally to reduce an infection's basic reproduction number to below 1 where chains of disease spread inevitably die out.[4] The authors and suggested three main approaches for achieving this goal:[4]

1. **Reducing contact rates** in the population through social distancing.
2. **Reducing infectiousness of infected individuals** through treatment or isolation.
3. **Reducing the susceptibility of uninfected individuals** through vaccination or antiviral prophylaxis.

In the current context of COVID-19, treatment, vaccination, and antiviral prophylaxis are not currently feasible; social distancing and isolation being the only elements from approaches one and two that can be meaningfully implemented. Fergusson and colleagues warn that interventions involved in social distancing, while important options, can be risky. For example, closing schools and workplaces can displace infectious individuals into other settings.[4] The authors also explain how quarantine zones are another strategy for enhancing infection containment, however their focus on quarantine and containment is discussed in the context of there being an effective and available prophylactic treatment. Discussing the potential of an antiviral resistant pandemic, the authors note:

> *"A feasible strategy for containment of the next pandemic offers the potential of preventing millions of deaths. It is therefore in the interest of all countries to contribute to ensuring the resources, infrastructure and collaborative relationships are in place within the region currently most likely to be the source of a new pandemic. Even if the challenges are great, the costs of failure are potentially so catastrophic that it is imperative for the international community to prepare now to ensure containment is given the best possible chance of success."* [4 p.12]

Overall, social distancing has been found to be moderately effective for reducing influenza transmission. In 2015, one review that mainly included weaker evidence (ie. observational studies and simulated data from modelling studies) found that school closure (proactive or reactive) appears to be moderately effective and acceptable in reducing the transmission of influenza and in delaying the peak of an epidemic.[5] Voluntary home isolation and quarantine are also effective and acceptable measures but may result in an increased risk of intra-household transmission. Work closure and working from home were shown to be modestly effective and are acceptable to many individuals. Internal travel restrictions were modestly effective and may improve infection control when widely implemented. It is important to note that the situations and interventions described in this review however, appear to be on a much smaller scale than those many countries including Australia are currently implementing.

In 2012, Maharaj and Kleczkowkski studied the costs and benefits of using individual-based social distancing undertaken by healthy individuals as a form of infection control.[6] Theoretical modelling led to the conclusions that infection control via social distancing that is too weak or based upon inaccurate knowledge may lead to worse outcomes than doing nothing. Here, the worst outcomes arise when pandemic control is attempted, but not vigilantly enough to effectively curb the outbreak. We have already seen instances of this occurring around the world where social distancing measures have occurred too late or have not been implemented effectively. The authors recommended either adopting highly stringent control measures and drastically reducing contacts as soon as disease is detected to quickly suppress an epidemic; or else to forego control and allowing the epidemic to run its course.[6] In the United Kingdom, this second option was first considered as a response to COVID-19, but was followed later by social distancing measures. Findings from modelling studies that show that easing social distancing too early may result in worse pandemic outcomes appear to be supported by a recent modelling study in the context of the current COVID-19 outbreak in Wuhan.[7] Another recent modelling study using a Susceptible, Unquarantined infected, Quarantined infected, Confirmed infected (SUQC) model to characterise the dynamics of COVID-19 in China and explicitly parameterise the intervention effects of control measures including social distancing and quarantine suggests that rigorous quarantine and control measures may be effective in reducing the disease reproduction number and gaining control of an outbreak in other settings.[8]

In 2018 Leung and colleagues explained, based on theoretical and mathematical modelling, how the outbreak of an infectious disease can lead to preventive social distancing measures and result in potentially worse epidemic outcomes than without social distancing such as a greater number of cases by the end of the outbreak.[9] Such outcomes impact upon others including the size, duration, and time of the peak of the outbreak.[9] In the context of the current COVID-19 outbreak, this concept appears to have entered everyday discourse as 'flattening the curve' and is aimed at reducing overwhelming surges in health system attendance. The authors highlight that their findings, while theoretical and limited, show the importance of understanding the properties of disease-specific contact networks and modelling individual-level behavioural changes in response to an epidemic to understand infectious disease dynamics.[9]

A systematic review of 15 studies including 12 modelling studies and three epidemiology studies on social distancing in the context of influenza outbreaks supported social distancing in non-healthcare workplaces but highlighted the paucity of well-designed epidemiological studies.[10] The modelling studies showed that workplace social distancing measures alone produced a median reduction of 23% in the cumulative influenza attack rate in the general population and also delayed and reduced the peak influenza attack rate.[10]

Different countries and organisations have varying recommendations regarding the advised physical distance that should be observed between people, with the common range being between one meter (WHO) and two meters (CDC). The Australian Government Department of Health has recommended that a distance of 1.5m should be observed between people regardless of the presence or absence of respiratory symptoms. Based on inconclusive and varying evidence regarding droplet transfer and range due to the limited and emerging evidence on COVID-19 and the ongoing and complex debates regarding the biophysics of droplet movement, a strict and evidence-based physical distance recommendation is challenging to adopt.

References

1. World Health Organization. Director-General's remarks at the media briefing on 2019-nCoV on 11 February 2020 [Internet]. World Health Organization; 2020 [Accessed 2020 Mar 25]: https://www.who.int/dg/speeches/detail/who-director-general-s-remarks-at-the-media-briefing-on-2019-ncov-on-11-february-2020
2. Sohrabi C, Alsafi Z, O'Neill N, Khan M, Kerwan A, Al-Jabir A, et al. World Health Organization declares global emergency: a review of the 2019 novel coronavirus (COVID-19). *Int J Surg*. 2020; 76:71-6. doi.org/10.1016/j.ijsu.2020.02.034
3. Gudi SK, Tiwari KK. Preparedness and lessons learned from the novel coronavirus disease. *Int J Occup Environ Med.* 2020; 11(2):108-12. doi.org/10.34172/ijoem.2020.1977
4. Ferguson NM, Cummings DAT, Cauchemez S, Fraser C, Riley S, Meeyai A, et al. Strategies for containing an emerging influenza pandemic in Southeast Asia. *Nature*. 2005; 437(7056):209-14. doi.org/10.1038/nature04017
5. Rashid H, Ridda I, King C, Begun M, Tekin H, Wood JG, et al. Evidence compendium and advice on social distancing and other related measures for response to an influenza pandemic. *Paediatr Respir Rev*. 2015; 16(2):119-26. doi.org/10.1016/j.prrv.2014.01.003
6. Maharaj S, Kleczkowski A. Controlling epidemic spread by social distancing: do it well or not at all. *BMC Public Health*. 2012; 12:679. doi.org/10.1186/1471-2458-12-679
7. Prem K, Liu Y, Russell TW, Kucharski AJ, Eggo RM, Davies N, et al. The effect of control strategies to reduce social mixing on outcomes of the COVID-19 epidemic in Wuhan, China: a modelling study. *Lancet Public Health*. 2020. doi.org/10.1016/s2468-2667(20)30073-6
8. Zhao S, Chen H. Modeling the epidemic dynamics and control of COVID-19 outbreak in China. *Quant Biol*. 2020; 8:1-9. doi.org/10.1007/s40484-020-0199-0
9. Leung KY, Ball F, Sirl D, Britton T. Individual preventive social distancing during an epidemic may have negative population-level outcomes. *J R Soc Interface*. 2018; 15(145). doi.org/10.1098/rsif.2018.0296
10. Ahmed F, Zviedrite N, Uzicanin A. Effectiveness of workplace social distancing measures in reducing influenza transmission: a systematic review. *BMC Public Health*. 2018; 18(1):518. doi.org/10.1186/s12889-018-5446-1