A Compendium of Evidence Related to 'Social Distancing' Measure in View of the Spread of COVID-19 Pandemic

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Abstract:

With no definitive treatment in place to date for the COVID-19 pandemic, reliance on public health measures is of utmost importance. Social distancing requires maintaining a physical distance of at least one meter between people and reducing the number of times people come into close contact with each other. Modeling evidence from past influenza pandemics and current experiences with COVID-19 indicates the role of SD in delaying the spread of the virus by reducing the probability that uninfected person will come into physical contact with an infected person.

Introduction:

The world is currently reeling under the COVID-19 pandemic which began as an outbreak in Wuhan, Hubei Province, China in December 2019 and has spread across 212 countries and territories around the world.[1] With no vaccine and definitive treatment in place to date, reliance on public health measures is of utmost importance.

Social distancing (SD), is an intervention that requires maintaining a physical distance of at least onemeter between people and reducing the number of timespeople come into close contact with each other thereby reducing transmission of disease.[2] China imposed lockdown/containment measures from 27-30 January onwards on various scales.[3] Since then many countries have implemented SD measures. Though implementation of any public health intervention should be purely evidence-based, it is not the case always as evidence may be evolving and many social and political considerations need to be accounted for. Mathematical modeling and lessons from previous influenza pandemics can help in decision making.

SD is a community mobilization effort and the effectiveness solely rely on compliance by the public. Factors that affect compliance are awareness regarding the reason, provisions, penalties for defaulting, economic implications, and trust towards the authorities.[4]

The basic principle behind SD is to decrease the R_0 i.e. basic reproduction number. When the R_0 value is below one for a long time, containment can be achieved and infections will decrease. This will also reduce the burden on health care systems and health workers, explained as "flattening the curve" by experts.[5] SD is useful when linkages between cases are not clear and community transmission is occurring.[6]

SD measures at the individual level include isolation of cases, quarantine of contacts/suspects, and stay at home recommendations. This helps in separating the sick from the healthy even if they are asymptomatic. Voluntary SD, especially in high risk groups, reduces morbidity by reducing the transmission. Other measures like the closure of schools, colleges, and workplaces, cancellation of mass gatherings, and Cordon sanitaire' (mandatory quarantine of buildings or residential areas) affect at the community level.[5]

Case for social distancing

Modelling evidence from past influenza pandemics[7][8] and current experiences with COVID-19

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indicates the role of SD in delaying the spread of the virusby reducing the probability that uninfected person will come into physical contact with an infected person. However, SD along with other non-pharmaceutical measures like good respiratory hygiene, hand washing, and use of face masks can lead to a significant reduction in number of cases.[9] It has been estimated that if non-pharmaceutical measures including SD had been implemented one week, two weeks, or three weeks earlier in China, the number of COVID-19 cases could have been reduced by 66%, 86%, and 95%, respectively, also limiting the areas to which the virus had spread.[10]

A study by Glass R J et al, for Asian Flu, showed that closing schools and colleges reduced the attack rate by >than 90% as children and teenagers stayed at home. Their simulations also suggest that all young and adults must also be targeted as there is enhanced transmission by them.[6] Reluga TC reported that SD is most beneficial to individuals for diseases with R0 2.They also highlighted that in the absence of any definitive treatment/vaccination, optimal SD never recovers more than 30% of the cost of infection. The benefit is limited to creating a longer window of opportunity for vaccine development.[11] A systematic review modelling paper by Rashid et al on measures for response to an influenza pandemic that suggested that mass gatherings shortly before the peak of the epidemic could led to 10% higher peak.[12]

Several studies have reported the benefits of SD for the ongoing COVID-19 pandemic. Katie Pierce suggests that SD can reduce the chance of infection among high-risk populations, but stresses that individual behavior changes are more important.[13] A scoping review by Adhikari SP et al studied many preventive measures such as mask, hand hygiene and SD ass ways to reduce transmission.[14] Kiesha Prem et al also reported a positive effect of control strategies to reduce social mixing.[15] Chen W et al reported that SD was implemented as an early containment strategy in China and helped reduced the transmission.[3] Similar findings were also reported by a modelling study by Peng Shao et al, where they found that early case isolation and increased interpersonal distance were effective in controlling the spread of the epidemic.[16] Another study by ICMR estimated that the Covid-19 cases can be reduced by up to 62 % and the peak number of cases by 89% if social distancing and quarantines are strictly observed.[17] Koo et al reported that combined intervention (quarantine, school closure, and workplace distancing) in Singapore was the most effective and reduced the estimated median number of infections of SARS CoV-2 by 99·3%, when R_0 was 1·5, by 93·0% when R0 was 2·0, and by 78·2% when R0 was 2·5.[18] A mathematical modelling study, by Choi et al for South Korea also suggested that SD was crucial to reduce the spread of the virus, among a variety of other measures.[19] A systematic review by Fong et al found limited evidence but, suggested that mass gatherings may be beneficial, but ambiguity on the size of gathering remains. They reported that the ban on public gatherings and other preventive interventions reduced the weekly death rates and positive correlation between duration of ban and reduced death rates.[20] Goerge Milne et al found that isolation of cases, closure of schools and workplaces, and reducing contact in the community were effective in 'flattening of the curve'. These were found to be effective even after 10 weeks delay from the day of index case arrivals. Ferguson et al predicted that stopping mass gatherings have relatively little impact as contact time is relatively smaller compared to school, colleges, workplaces or bars, and restaurants. They highlighted that these measures should remain in place until a vaccine is available.[21] Additionally, all layers of SD i.e. closure of schools, colleges, and workplaces, cancellation of mass gatherings should be implemented at once rather than one by one for a better outcome.[5]

The scientific basis for SD alone is not enough. The SD policies have to be enacted without any bias against any population group. Cases of extreme forms of SD can increase the transmission in the households leading to increased clustering of household cases.[15] The potential effects of SD on mental health also need to be considered.[22] It should also be noted that in the absence of any vaccine, 'herd immunity' is the only way to decrease transmission in the community. Once 'herd immunity' is sufficient, SD measures will become obsolete.[5]

SWOT analysis of social distancing:

A strengths, weaknesses, opportunities, and threats (SWOT) analysis of SD is represented in Box 1.

Points that were directly linked to the SD were classified as strengths or weaknesses; points that were not directly linked to the SD but (potentially) affecting the SD were categorized as opportunities or threats. It can be seen that even though SD is a good strategy, lack of strict implementation and apathy of the public towards it can negate the expected results.

Scope for further research:

The epidemiological, social, psychological, and economic impact of SD measures should be closely monitored. After lifting of these measures, evaluation in each of these domains is necessary to generate evidence to inform future practices in times of resurgence or new epidemics.

Table 1: SWOT analysis of Social Distancing

STRENGTHS	WEAKNESSES
• Decreased transmission of the virus and delayed spread of illness • Decreased chance of infection among high-risk individuals • Behavioral changes (protective behavior) • Buy time for vaccine development, improved diagnostics, and treatment • Time to equip the health system at the national, state, and local level • Time to understand the epidemiology of COVID-19 and effectiveness of control measures from global experience	• Depends on compliance by the public • Depends on the credibility of public • health authorities and politicians • Depends on strict implementation • Behavioral changes - psychological changes, heightened anxiety, depression, disproportional damage to elderly, kids, and those living alone. • Parents overwhelmed due to work from home as well as taking care of kids due to the closure of schools • Co-occurrence with an outbreak • Ongoing prevention programs (e.g. routine immunization) may be affected
OPPORTUNITIES	**THREATS**
• Implementation with travel restrictions, quarantine facilities, and increased case detection and isolation • Implementation with other preventive measures like handwashing, wearing a mask, etc. • Development of candidate vaccine • Digital technology – for socializing and work • Mindfulness, physical exercises • Data from China is available • Seasonal variation (? Decline in summer)	• Religious and festival congregations • Migrant and other vulnerable population • Slums / overcrowded households • Ethical challenges/ Human rights • Socio-politico-economic disruption

Conclusion:

Even though there is only limited evidence, it supports SD measures as means of reducing the transmission and delaying the spread of COVID-19. Simultaneous implementation in multiple layers is most effective. It is critical to identify the right time for implementation and maintain it for adequate duration.

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