

Critical review of social distancing in the workplace during the COVID-19 pandemic

Abderrahim Lakhout

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Abderrahim Lakhout¹ PhD, MSc

¹University of Tabuk Tabuk SA

Corresponding Author:

Abderrahim Lakhout PhD, MSc

University of Tabuk

Tabuk

Tabuk

SA

Abstract

This article summarizes what we know and what we need to know about social distancing and its importance in reducing the COVID-19 virus (SARS-CoV-2). Many countries around the world have developed social distancing policies to curb COVID-19 infection rates among their population. The virus that causes COVID-19 is transmitted from human to human, so social distancing is key to mitigating the spread of the illness. According to government and non-governmental organizations reporting on COVID-19 in the literature, there is currently no general consensus regarding social distancing in the workplace. The recommended distances range from 1 to 11 meters. Moreover, neither meteorological parameters nor engineering ventilation methods are taken in account in estimating safe social distancing in the workplace. According to our investigations, 10 meters is recommended to save lives for vulnerable persons.

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Original Manuscript

Critical review of social distancing in the workplace during the COVID-19 pandemic

Abderrahim Lakhouit

University of Tabuk

Faculty of Engineering

Civil Engineering Department

E-mail: a.lakhouit@ut.edu.sa

Abstract

This article summarizes what we know and what we need to know about social distancing and its importance in reducing the COVID-19 virus (SARS-CoV-2). Many countries around the world have developed social distancing policies to curb COVID-19 infection rates among their population. The virus that causes COVID-19 is transmitted from human to human, so social distancing is key to mitigating the spread of the illness. According to government and non-governmental organizations reporting on COVID-19 in the literature, there is currently no general consensus regarding social distancing in the workplace. The recommended distances range from 1 to 11 meters. Moreover, neither meteorological parameters nor engineering ventilation methods are taken in account in estimating safe social distancing in the workplace. According to our investigations, 10 meters is recommended to save lives for vulnerable persons.

Keywords: COVID 19, Coronavirus, Social Distancing

1. Introduction

At the end of 2019, a new virus (SARS-CoV-2) appeared in the city of Wuhan [1], China. It sickened thousands of people first in China and then started sickening thousands of people in other countries, prompting the World Health Organization to declare a pandemic in March of 2020. The WHO called the disease caused by the novel coronavirus “COVID-19”, which is short for “coronavirus disease 2019”.

Over the past several months, COVID-19 has continued to spread around the world, infecting people in more than 150 countries. The rapid expansion of the disease is due to many factors, in particular its biological formation [2], the absence of human immunity, the lack of information concerning the virus, and other physical, chemical and meteorological parameters. Globally, as of July 2020, there have been 15,012,731 confirmed cases of COVID-19, including 619,150 deaths.

To stop the spread of COVID-19, many measures are suggested to be taken, such as frequent hand-washing, avoiding the touching of eyes, nose and mouth, using medical and cloth masks, staying home as much as possible, and following social distancing guidelines. These measures are being taken in order to protect human health, to reduce the impact of the virus, and to provide an environment that is safe to reopen society.

The present paper focuses on social distancing. According to the WHO, social distancing means maintaining at least a 1-meter (approx. 3-foot) distance between people when interacting in the workplace, shops, parks, etc. Social distancing is an important method for protecting human health and reducing the impact of the disease outbreak around the world [3-14]. This form of physical distancing is recommended to be applied in schools, airports, restaurants, and healthcare facilities, and in many countries, social distancing has now become mandatory. According to Prin and Bartels (2020), during the 2009 influenza A (H1N1) pandemic, social distancing contributed to a 23% median decline in the cumulative influenza attack rate in the workplace. Social distancing is important because when someone coughs, sneezes or speaks, they emit small liquid droplets from

their nose and mouth. If the person is infected with the novel coronavirus, these droplets can spread COVID-19 to people breathing them in or touching them and then touching their eyes, nose or mouth.

During the present study, the importance of social distancing is investigated. The main objective of this paper is to study the positive impact of air profiles in an enclosed building space (operation room). Air flow speed and direction can play an import role in social distancing, and this factor should be taken into account by healthcare authorities. In this study, a series of recommendations is given to protect workers and staff in enclosed buildings as well as people outside the building.

2. Social distancing according to WHO

Based on our investigations of the WHO website, social distancing as recommended by the WHO is 1 meter (3 feet) for the following reasons: “People can catch COVID-19 by touching contaminated surfaces or objects, and then touching their eyes, nose, or mouth. If they are standing within 1 meter of a person with COVID-19, they can catch it by breathing in droplets coughed out or exhaled by them. In other words, COVID-19 spreads in a similar way to the flu.”

3. Social distancing according to scientific literature

How many meters we should we leave between us and other people in schools, shops, healthcare facilities, parks, etc.? In exploring a broad range of scientific works on the topic, we could find no consensus among the information concerning measurement of social distancing [15-22]. Several articles decrive, define and give advantages of social distancing during the COVID-19 pandemic [15-22] and aleterso discuss the benefit of social distancing to reduce the impact of COVID-19 (Figure 1), but the precise measurement is not yet agreed upon by experts in the field.

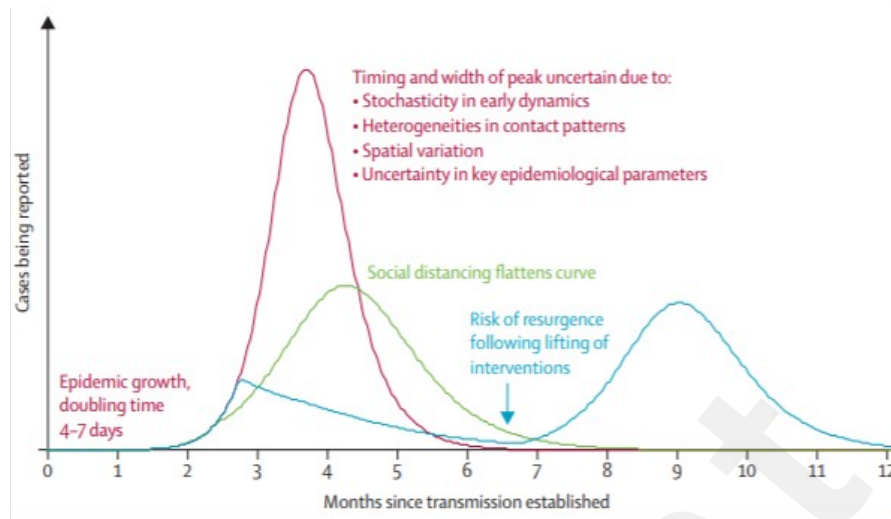


Figure 1 Effects of social distancing
Source: [23]

Unlike the WHO's recommendations, some studies suggest a social distancing measurement of 2 meters between people [24-26], while another study found that, based on simulations, the droplets (100-200 μm) can be transported between 8 to 11 meters by the action of turbulent air flow [27]. This distance can also be changed according to droplet diameter (Figure 2). In other study [28], a droplet with a 100 μm was transported up to 3 meters in less than 1 second.

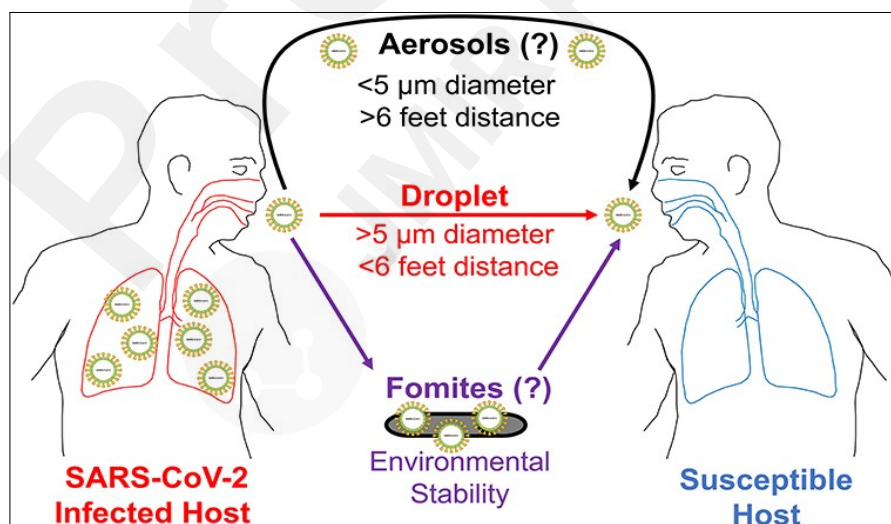


Figure 2 Transmission of COVID-19
Source: [29]

4. Social distancing according to the governments

Generally, the majority of the countries in the world are encouraging people to stay home throughout the pandemic. The slogan “Stay Home” has been used widely to limit human contact. Many countries have also imposed more restrictive measures, such as isolation and quarantine. However, social distancing is not determined explicitly by the authorities and governments. Recently, many countries and local authorities set out their plans for a phased ending of coronavirus lockdown, with many of the measures imposed including social distancing.

According to our investigation, physical distancing differs from country to country. For example, in the United States, the Centers for Disease Control and Prevention (CDC) and the Occupational Safety and Health Administration (OSHA) have recommended a spacing of 6 feet between people to decrease the spread of COVID-19 in the workplace [30]. In Singapore, non-medical people who spend a prolonged period within 2 m of a confirmed case must self-isolate for 14 days [31]. Canadian authorities are requiring a 2-meter distance in most public and commercial locations, and Middle Eastern countries also require 2-meter spacing. In Europe, Col. Rodney Coldren, chief of Preventive Medicine Services, Public Health Command Europe, is asking people to stay as far away from each other as possible. There is as yet no consensus in Europe concerning social distancing. In France, the distance is 1 meter, while in Germany the distance is 1.5 meters. Chinese authorities have stipulated 1-meter distancing in schools, but social distancing measures in Japan are quite lax.

5. Physical activities under social distancing

During the COVID-19 pandemic, the governments implemented and established rules to avoid the impact of the virus and to reduce its spread. During the period of lockdown, collective sports are stopped including league champions and other events. The social distancing is targeting between individuals [32]. During the COVID-19 pandemic, fitness and exercising physical activities can be done safely outside if the people respecting social distancing [33-35]. People can walk or jog outside but they should respect social distancing rules [10, 32, 36]. Some people cannot play sports activities by putting face masks. However, among these persons a category that find some difficulties in

breathing normally. Unfortunately, WHO and other scientific studies confirmed that the virus is transported by the air current. Under these conditions, it is recommended to put facemask and to respect social distancing. According to our investigations in the literature and the rules adopted by governments during the COVID-19 pandemic, there are no consensus concerning the social distancing outside under the real atmospheric conditions [37]. In fact, the social distancing can be affected by aerodynamic parameters [38]. These parameters are not taking in account by governments and authorities to establish the social distancing. According to the literature review, the social distancing in the case and outside under fresh air is in the range of 5 to 10 m [38] and in some cases is unknown [37].

6. Critique of social distancing measures

From the above, it is clear that there is no international consensus on social distancing [39]. To date, social distancing ranges between 1 to 2 meters but can also be as high as 11 meters in relation to droplet spread. The international rules established by authorities, healthcare, and local governments are practically the same for outside (i.e., parks) as for inside (i.e., enclosed workplaces). Numerous factors should be taken in account to determine social distancing, including meteorological parameters such as wind and air flow direction, temperature, and humidity. For example, the variations of temperature have affected the SARS outbreak [40]. Other studies in the literature state that the climate change might have contributed to various infectious diseases emergence and spread [40-42]. During the SARS epidemic, it was observed that the number of confirmed cases were gradually faded with the warming weather. The epidemic of SARS was practically ended at July 2003. The meteorological parameters, especially temperature and wind, can affect the spread of COVID-19 [42, 43]. Some previous studies state that warm weather can possibly slowdown the global pandemic [42, 43]

Unfortunately, the CDC, OSHA, and WHO have not considered these parameters when declaring their rules. Some countries require barriers between workers or staff in workplaces, and these

barriers are considered sufficient to make the workplace “safe”. However, while such barriers can reduce the spread of the virus, they cannot stop it, as the virus can float through air currents. In certain workplaces, infected air can bypass physical obstacles and be driven by air flow velocity and direction. These factors change from one workplace to another depending on the mode of ventilation used (natural, mechanical, or mixed). Wind and air flow profiles can also change according to the nature of the barriers and obstacles.

Therefore, the ventilation strategy adopted at a workplace can play an important role in determining the type of social distancing that should be used. Social distancing parameters should not be fixed (that is, the same for all places and all people at all times), but instead be able to be altered according to meteorological parameters, temperature profiles, the profile of the air flow, and the position and debit of ventilation (in the case of mechanical or mixed mode of ventilation). Thus, the positioning of workers and staff should be based on parameters that are relatively unique to each workplace (Figure 3).

As depicted in Figure 3, the direction of the air flow within a building can play a crucial role in determining the spread of the virus in the workplace. Hence, the correct positioning of workstations and care beds is essential. In hospitals or other healthcare facilities in particular, air flow profiles in the rooms should be used to reduce the transmission of the virus to staff and patients. According to Sahin Mohamet (2020), the wind speed represents a positive relationship with the number of COVID-19 cases. In fact, the higher number of confirmed cases of COVID has recorded during the higher average wind speed [43].

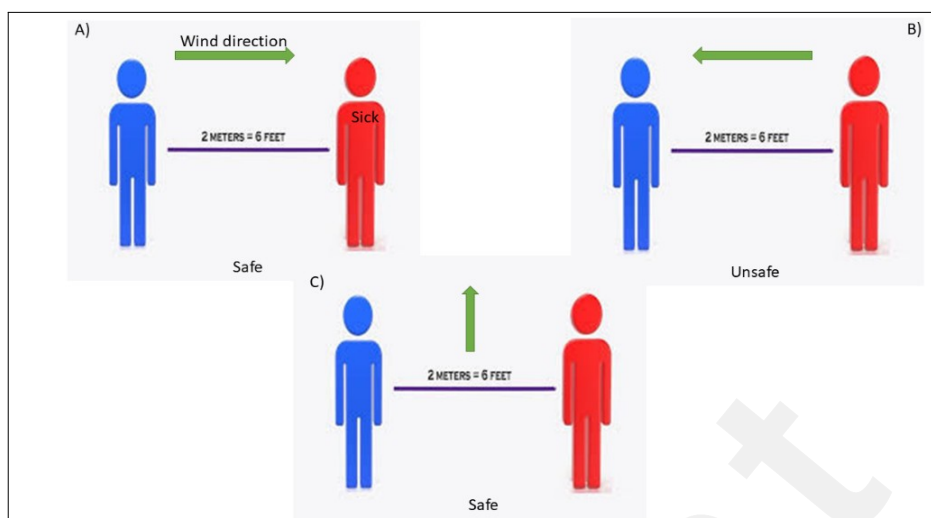


Figure 3 Impact of air flow direction

Recently WHO states that SARS-CoV-2 can be transported by the atmospheric air for a long distance. The mechanism of such transport of COVID is known now [44]. The new virus spreads through the air. The authorities and countries should acknowledge this concept. The rules of social distancing should develop and be revised according to this concept. Also, the social distancing cannot be the same for different seasons and for different regions in the world.

6. Conclusion

At the beginning of the COVID-19 pandemic, the majority of social, educational, healthcare, economic and industrial activities temporarily ceased operations in the world. As well, international boundaries were closed to avoid the spread of the novel virus among vulnerable populations. Now, with the passing of the first wave of illness, the majority of countries have decided to reopen most activities gradually throughout the summer. To prepare for the reopening, policies are being developed and imposed, with social distancing being one of the most important and ubiquitous. The concept of social distancing was defined and explored in this paper, first by reviewing the literature related to the idea and then by considering it from a technical perspective. According to the most recently published scientific papers on social distancing, the recommended distance range between people should be anywhere from 1 to 11 meters, depending on the activity being engaged in. This measure is based on numerical simulations of the propagation of 100 μm droplets. However, for

most countries, social distancing has been set at 1 to 2 meters. For social distancing measures in the workplace, positioning of workers, staff, shoppers and patients should depend on a variety of factors, including meteorological parameters, air flow profiles and velocity, and the impact of the engineering ventilation.

According to our investigations, the social distancing measures as required by most established policies are insufficient to protect human health in workplaces and reduce the spread of COVID-19. In some workplaces, barriers have been erected between workers and staff, but these physical obstacles are ineffective if air flow velocity and direction are not taken in account. Recently, WHO and scientific research confirmed that the virus is transported by the air. Hence, the social distancing policies and rules should be revised according to the aerodynamic parameters. According to our investigations, 10 meters is recommended to avoid any contamination human to human by COVID-19 especially in workplaces. The virus can travel many meters. The distance traveled by the virus depends on aerodynamic parameters (outdoor air) and mode of ventilation (indoor air). All the discussed parameters during this paper should be taken in account to reduce the impact of COVID-19 and to save lives for vulnerable persons.

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