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Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Social distancing during the COVID-19 pandemic: Staying home save lives

The severity of the COVID-19 outbreak is the greatest public health threat caused by a respiratory virus since 1918. According to the Imperial College, 2.2 million Americans could die if we do not mitigate the spread of infection [1]. With the incidence of COVID-19 increasing, it may only be time before the healthcare system becomes overwhelmed and forces physicians to triage treatment among critically ill patients. Without an intervention, it is likely that there will be more seriously ill people than we have the resources to care for [1].

The rate of COVID-19 infection is largely determined by its reproductive number (R_0)-the number of secondary infections produced by an infected person. If the R_0 is >1, infections will continue to spread. If R_0 is ≤1 the infection will eventually diminish. The R_0 of COVID-19 is estimated at 1.3–6.5, with an average of 3.3 [2]. R_0 is affected by a number of factors including the innate properties of the virus, and the amount/ duration of contact people have with each other [3]. Although we cannot influence biological properties of the virus, we can change the amount of contact we have with each other via a phenomenon known as social distancing.

Social distancing is the practice of increasing the space between people in order to decrease the chance of spreading illness. According to the CDC, spacing of 6 ft away decreases the spread of COVID-19 [4]. Individual actions include working remotely, avoiding public transportation, and staying home if you suspect you have been exposed and/or are symptomatic [5]. Community-wide measures include transition to online teaching, businesses temporarily closing, and the widespread engagement of telecommunication [6]. Multiple states including Washington state, California, and New York are resorting to statewide home orders being issued to minimize contact [7-9]. Nationwide measures taken to minimize contact with potentially infected individuals include cancelling travel from China and Europe [10]. It is likely that additional action will be taken with suspension of domestic air travel on the list.

According to a large study performed in China, younger individuals are more likely to be asymptomatic when infected and could be unaware they are putting others at risk [11]. Of noteworthy importance is the risk of transmitting infection to the elderly, particularly those over the age of 60 [12]. The severity of illness is much more dire in this population with a strong association between in-hospital death and older age [13]. For this reason, it is essential that contact is limited not only to ensure personal safety, but also to prevent the spread of disease to others who are at high risk for developing severe complications.

Social distancing also plays a role in lessening the burden imposed on the healthcare system. In the absence of any intervention, there would be a rapid rise in the number of cases that could overwhelm the healthcare system's capacity, and force physicians to treat some patients over others. If 200,000 people became critically ill in the same week, it would overwhelm the <100,000 ICU beds [14]. Moreover, it is likely that many of these patients would require a full-feature ventilator, exceeding the 62,000 available [15]. On the other hand, if this same situation occurred over the course of several weeks, it would be more manageable. Social distancing has the potential to slow the rate of infection and reduce the peak of incidence, and then fewer critically ill patients would need care on any one day. The peak incidence could be reduced to a level the healthcare system is equipped to adequately respond to and save thousands of lives that would otherwise be left without treatment.

Delaying the peak to a later time-period could be beneficial. Delaying the peak incidence to the summer holds potential for healthcare facilities to dedicate more resources to those ill with COVID-19. Many of the resources used for serious cases of influenza are also required for severe cases of COVID-19 and stalling the peak incidence of cases to the summer when the majority of influenza cases have resolved may lend more resources to these patients. In the end, this improves the healthcare system's ability to treat those in critical condition without the need to ration.

It is too late to stop COVID-19; the importance of slowing the infection cannot be understated. With the vast amount of cases identified in the US, resources are becoming scarce. Concern in public health has often been about the shortage of physicians- rarely do we consider if a ventilator will be available if you become critically ill. Social distancing is a realistic solution that all individuals can take part in to reduce the risk of infection while increasing available resources to critically ill patients, during this pandemic.

We can still practice physical distancing while remaining connected socially, emotionally, and spiritually. We can do this together to defeat the COVID19 pandemic and continue moving forward towards a brighter future for our current and future generations.

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A state overview of COVID19 spread, interventions and preparedness

This is a trying time for the world battling the COVID-19 pandemic. By April 4th, 1,192,028 cases have been confirmed worldwide, with 64,316 deaths [1]. COVID-19 is now the 3rd leading cause of daily deaths behind heart disease and cancer [1-4]. The United States (US) holds the greatest number of confirmed cases [1]. By April 4th, 305,820 cases were confirmed with 8291 deaths and a fatality rate of 2.7% [1]. The US has a lower fatality rate than Italy (12.4%) and China (4.0%) [1]. The lower fatality rate could be partially explained by interventions taken by the government.

The current doubling time in the US for the SARS-CoV-2, virus, is 3 days [5]. However, the doubling time is currently 6 days for King County in Washington state [6]. In mid-March Washington state took measures to limit the spread of infection, by closing educational facilities, closing non-essential services, and a stay at home order (SAHO) [7,8]. These efforts have been associated with the percent increase in cases and fatalities decreasing (Fig. 2). According to the Institute for Disease Modeling (IDM), the spread of infection into Seattle and Eastside decreased by about 90% and has continuously decreased since March 2nd [9]. In late February, the reproductive number was about 2.7, whereas it was approximately 1.4 on March 18th [9].

Likewise, in California, with strict physical distancing measures in effect in the Bay Area and Sacramento County, the doubling time is now 6 days [6]. On March 19th California closed non-essential services and educational facilities, and a SAHO was enacted [10] (Fig. 3). The percent increase in cases in California also decreased after this period (Fig. 2).

Additionally, a similar effect was observed after Idaho issued a SAHO and closed non-essential services on March 25th [11] (Fig. 3). After March 25th the fatality rate increased slightly, and then showed a decreasing trend and lower percent increase in new cases (Fig. 2). The lack of testing does not appear to play a role in the decrease in fatality rate because the percentage of those testing positive continues to increase (Fig. 2).

Florida issued a SAHO on April 3rd, late in comparison to many other states [12,13] (Fig. 3.). However, their percent increase in cases over the past two weeks has decreased comparably to states in which a SAHO was in effect earlier (Fig. 2). This highlights the importance of other interventions. Florida mandated isolation orders of those at most risk, including senior citizens and those with underlying medical conditions [12]. Furthermore, travel was limited to that necessary to obtain or provide essential services or to conduct essential activities, and businesses/organizations were encouraged to provide delivery, carry-out or curbside service [12].

New York holds the greatest number of cases and deaths (Fig. 1) [1]. This forced the state to consider extraordinary measures aimed at increasing hospital capacity and decreasing density of cases. To address the first issue, an executive order was issued, allowing the state to increase hospital capacity [14]. In addition, there was deployment of a 1000-bed hospital ship to New York Harbor [15]. Moreover, an executive order signed on March 19th mandated all businesses requiring in-office personnel to decrease their in-office workforce by 75% [16] (Fig. 3). Another executive order on March 20th, enforced the closure of all non-essential businesses [17] (Fig. 3). The percent increase in cases dropped after these interventions (Fig. 2).

The relative increase in cases appears to be abating, but the fatality rate is increasing (Fig. 2). These trends may suggest that there are inadequate healthcare capacity and medical supplies [18]. In response, the Centers for Medicare & Medicaid Services (CMS) granted changes to provide some flexibility for hospitals, physicians and healthcare organizations [19]. CMS allowed hospitals to provide services for patients
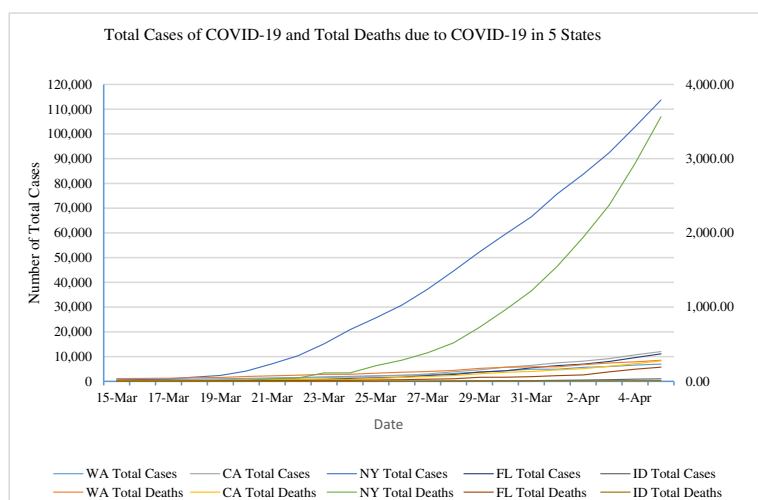

Fig. 1. Total cases of COVID-19 and total deaths due to COVID-19 in 5 states. The total cases and total deaths plotted as a function of time for Washington State (WA), California (CA), New York (NY), Florida (FL) and Idaho (ID). As of April 1, 2020, the total number of cases in descending order is NY > CA > FL > WA > ID. The total number of deaths in descending order is NY > WA > CA > FL > ID.