A study of the Effectiveness of Social Distancing on COVID-19

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Abstract. The Novel Coronavirus pandemic, which has killed at least 50 million people and infected a third of the world's population, is considered the greatest threat to public health. National governments implemented movement restrictions in response to the worldwide crisis to stop the virus's spread. The main purpose of this social isolation is to lock individuals in their homes to reduce exposure rates. This isolation manifests itself in a variety of ways. To prevent and manage future outbreaks, this study used literature analysis techniques to investigate the impact of implementing social distancing policies on COVID-19 transmission.

Keywords: COVID-19; Social distancing; Lockdowns; Human mobility

1 Introduction

The discovery of the novel Coronavirus pandemic (COVID-19) is considered the greatest public health threat since the 1918 influenza pandemic. There is great uncertainty about the ultimate global impact and the consequences for human health, which terrifies societies. At first, the public didn't understand what the virus was or how it was transmitted. Due to the lack of vaccines and effective medicines to respond to the COVID-19 pandemic, countries affected by the epidemic have implemented a social distancing policy. The government reduced peak infection rates to levels that local health facilities could handle and allowed the development of vaccines and effective drugs, The reason is that there is no guarantee that long-term medical solutions such as vaccines will address the short-term capacity limitations of hospitals. Hospitals are facing a sharp rise in demand for medical services to treat coronavirus patients, including shortages of ventilators, beds in intensive care units and personal protective equipment. Social contact rates declined due to a combination of voluntary actions by people and businesses driven by social awareness and non-pharmaceutical interventions (NPIs) carried out at the national, state, and local levels during the COVID-19 pandemic. Using social distancing to reduce contact between uninfected individuals and infected individuals should result in a reduction in the rate of transmission of the virus, as expected by public health officials and epidemiologists. Social isolation can take many forms, and its core purpose is to eliminate the rate of contact between people by isolating them from each

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other and confining them to their homes. While human movement contributes to the spread of the COVID-19 virus and poses a serious threat to global health, policies to limit human movement remain controversial. Because such a policy would have a negative impact on the economy, especially with uncertainty about its effectiveness in controlling the epidemic. The impact of many of these costs is plainly visible. The impact of these costs is obvious. For example, restrictions on business have led to increased unemployment and school closures have adversely affected educators. Therefore, it is not surprising that some people hesitate to implement these policies, especially when the costs are evident whereas health benefits are not, such as infections and deaths prevented or delayed. The ability to quantify the impact of human movements on the spread of infectious diseases and to understand detailed spatial patterns of their spread has been empirically challenging, although limiting human mobility can improve disease control and reduce health risks.

2 Literature review

Researchers are attempting to ascertain if social distance rules are helpful in lowering social connections, which in turn reduces illnesses and fatalities. On this basis, this paper puts forward a unique point of view. Next, this paper reviews empirical studies done by international academics.

Fang et al. [5] offered insightful causal evidence on the impact of human movement limitations on the containment and postponement of the spread of 2019-nCoV viruses. The nature and mode of transmission of the virus were initially unknown to the general population. On 11 January 2020, the Chinese state media announced the first death from the Novel Coronavirus. However, the news did not arouse much public interest. On 20 January 2020, the team's lead epidemiologist, Dr Zhong Nanshan, officially acknowledged on national television that novel Coronavirus is likely to transmit from person to person. To control the spread of the disease, the Chinese government ordered a lockdown in Wuhan on January 23, 2020, and other cities in Hubei province a day later. At the time, wuhan had 11 million people under lockdown. It was the largest public health quarantine ever, and unprecedented measures were taken during the lockdown. Fang et al. believed that the impact of population flow on the spread of the epidemic should be considered as follows. First, the outbreak occurred just before the Spring Festival, when a large number of Chinese were leaving the country. The second is the virus itself, as people avoid public places for fear of catching the disease. The third was panic, as residents of Wuhan, the epicenter of the outbreak, decided to leave for other cities. Fang used DID model to solve this problem and removed these three elements from the analysis. Fang used data from the Chinese Centre for Disease Control and Prevention's urban daily infection counts, city-to-city and intra-city population movement datasets, and matched data from the same lunar period in 2019 to analyse population movements from January 1 to February 29, 2020 (including the 22 days before and 38 days after the city closure on January 23, 2020). Fang also found that the virus had a significant deterrent effect on population movement. The closure of Wuhan has significantly reduced population movements, and the improved social distancing policies in destination cities have effectively mitigated the impact of population inflows on novel coronavirus transmission in the epicenter cities of the epidemic in Hubei.

Abouk [6] evaluated the efficacy of social distancing policies based on public awareness and volunteerism. To do so, he assessed the effect of six of the most popular U.S. policies for social distancing in the early days of the pandemic, specifically state-wide home orders, limited home orders, unnecessary business closures, bans on large gatherings, school closure orders, and restrictions on restaurants and bars. The impact of six social distancing rules was assessed using DID and event study techniques. The impact of movement trends over time for all 50 states and the District of Columbia in six geographic categories (retail and entertainment, grocery and pharmacy, parks, downtown stations, workplaces, and residential) by using anonymously aggregated daily location data published by Google. In the early phases of the COVID-19 pandemic, about discovered that state-wide house orders and prohibitions on bars and restaurants were most substantially related with decreased mobility, while other possible advantages of similar regulations may have been acquired via voluntary social separation.

Greenstone et al. [3] developed and implemented a method to monetize the impact of moderate social distancing on COVID-19 mortality. He found that the mortality advantage of social distancing was almost $8 trillion, or $60,000 per American household. Almost 90% of the monetization proceeds will be concentrated in individuals 50 years of age or older, and the approach has two main steps. First, they compared two scenarios in Ferguson et al. 'sfamous meditation on COVID-19 infections in 2019. One is the mitigation scenario, which is characterized by "a social distancing approach being implemented" and will last for 3-4 months. The other is the "no policy" scenario. They labeled ferguson et al. 's mortality projections as "direct deaths" and developed projections of "excess deaths" due to hospital intensive care units reaching capacity and failing to serve some COVID-19 patients in 2019. This allows for potential deficiencies in the availability of intensive care services in hospitals, improving the estimated mortality projections of Ferguson et al. Second, the lessening in passings beneath the mitigation situation is separated into nine age categories and after that monetized utilizing our age-adjusted U.S. government VSL. The distinction in monetary benefits over age groups reflects the truth that 2019 coronavirus infection mortality increments with age, though VSL diminishes with age. VSL is an economic theory tool that is now a standard part of cost-benefit analysis and supports decision-making by the U.S. government as well as dozens of foreign, state, and local governments. Utilizing VSL is beneficial for two reasons. First, it captures the whole spectrum of advantages that people anticipate from their life, such as relaxation, time spent with friends and family, and consumption of products and services. Second, the methodology is well-established, as U.S. government agencies have been using VSLs for years to assess a substantial number of policies in several fields. In addition, they found that it is reasonable to assume that social distancing can relieve pressure on health care facilities, facilities, supplies, and thus improve the treatment of medical problems other than COVID-19.

Galeazzi et al. [1] then conducted a comprehensive comparative study of location data from 13 million Facebook users in France, Italy, and the United Kingdom to determine the impact of social distancing on human migration. At the same time, they provided a model to simulate the effects of movement constraints and found that various network deconstruction strategies can reasonably well simulate the shock responses seen in real mobile networks to assess the significant effects of locking. In fact, mobile limits cause regional dispersion, a major decline in remote connection, and a general deterioration in the overall efficiency of mobile networks. However, a number of countries have experienced adjustment because of their fundamentally interconnected structures. They found that congestion generally has an impact on small world and national mobility efficiency. In other words, it greatly reduces remote connections in favor of local paths. Population movement is more concentrated in France and the UK than it is in Italy, and the impact differs among nations with varying transportation facilities. The resiliency of flow networks can be used both to predict the severity of impending systemic crises and to guide and improve the economic and social impact of policies. Thus, the correlation between population movements, disease transmission rates and economic variables is critical both in emergency situations and in peacetime. It is essential to comprehend the peculiarities of various elasticities in national mobility networks in order to create policies for reducing social distance and minimizing the economic effects of NPI.

Hsiang et al. [2] quantified how these social distancing policies directly improved people's health and, specifically, the extent to which the adoption of social distancing rules slowed the spread of disease. They used sophisticated simplified econometric methods to compare infection rates in hundreds of subcountries and regions before and after each strategy was adopted locally. Large-scale anti-infection measures were later discovered to have halted the COVID-19 epidemic. The findings suggest that anti-infection policies significantly and substantively slowed this increase, as infection rates in the study countries (China, South Korea, Italy, Iran, France, and the United States) would initially have increased exponentially if these policies had not been in place. Although some policies had different effects on different populations, they were able to gather evidence that the set of measures taken to lower transmission rates had a significant positive impact on health. It is estimated that these interventions averted or delayed about 61 million confirmed cases of illness in the six countries, equivalent to about 495 million infections averted.

The first analysis of the effects of shelter-in-place orders (SIPO) adoption on health is provided by [4] Friedson et al. In the United States, unlike in many other countries, state and local governments, not the federal government, have most of the power to deal with hazards to public health. Quarantine in place orders, sometimes known as "stay-at-home" orders, are the main state and municipal policy measure used to stop the spread of the coronavirus. In addition to slowing the spread of the epidemic in California, a key goal of the policy is to delay the peak of the epidemic so that the state has more time to secure ventilators, hospital beds and medical staff and respond to increased demand for services from people who test positive. Although California was commended by the White House Coronavirus Task Force for acting quickly to stop a COVID-19 spread across the state, no research looked at its effects. The study used 40 days of state-level data on confirmed COVID-19 cases and related deaths to examine the short-term public health impact of statewide mandates. This study also provided evidence on the public health impact of SIPO in California during the crucial first few weeks of policy implementation. Estimates from our preferred integrated control model revealed that, in the first month following passage, California SIPO reduced COVID-19 cases by 125.5 to 219.7 instances per 100,000 people and COVID-19-related fatalities by 1.9 to 4.2 per 100,000 persons. In the second and third weeks after the SPIOs intervention, we saw a significant increase in the number of cases averted and the number of deaths saved, consistent with increasing public health benefits during periods of exponential increase in the outbreak. Rough estimates indicate that between 8 and 14 jobs were lost for every coronavirus case that was prevented, and between 421 and 917 jobs were lost for every life that was saved during this brief period following the conclusion of the California sipo.

In addition to identifying high-risk areas for COVID-19 in Brazil, [7] Coelho et al. also identified socially vulnerable areas and the risk of case arrival and continued transmission. In order to identify areas of similar social vulnerability, a multivariate cluster analyses of socioeconomic indices was conducted using pre-pandemic flow data to calculate the probability of COVID-19 transmission from S*o Paulo and Rio de Janeiro. Based on the results, maps were produced depicting effective distances, outbreak probabilities, hospital capacities, and social vulnerability areas. These maps can be used by health authorities to prioritize actions, such as resource allocation, to mitigate the impact of a pandemic.

Hartl et al. [8] investigated the impact of the public shutdown beginning March 13, 2020 on Covid-19 transmission in Germany. Using a simple linear trend model, they looked for trend breakpoints in cumulative confirmed COVID-19 cases reported by Johns Hopkins University. As expected, the growth rate of confirmed COVID-19 cases in Germany slowed significantly on March 20, falling by 48.2% as a result of the public shutdown. While the rate of increase has almost halved, the number of cases continues to double every 5.35 days. Because of the large delay between new infections and statistical measurements, it will take several days to see the results of Germany's public closure policy.

3 Conclusion

The conclusion of this paper mainly includes the following aspects. First, social distancing policies can influence population mobility. For example, reducing exposure rates through the use of simple non-pharmaceutical interventions can play an important role in controlling and delaying the peak of COVID-19 outbreaks. As a point of interest, in other countries, social distance policies are enacted and implemented by the government, except in the United States, where they are implemented between individual states. Meanwhile, when the impact of social distancing policies on the epidemic was monetized using VSL, the results were more intuitive. Furthermore, it provides a theoretical basis for measuring people's voluntary self-isolation behavior in this epidemic on a monetary scale.

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