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## COVID-19 impact on city and region: what's next after lockdown?

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### ABSTRACT

COVID-19 is unique in that it is spread through everyday contact with other people. Therefore, social protective measures, beyond medical protective measures, such as social distancing, lockdowns, border closures, and human tracing are initiated to control the spread of COVID-19. Such responses have produced secondary issues such as drastic changes in people's way of life and work, housing instability, economic shock, and privacy issues. This paper examines the four domains of urban and regional issues related to the secondary impact of COVID-19, including (1) social distancing, urban structure, community, and density; (2) housing affordability; (3) lockdowns, border closures, reshoring, and regional economic recovery; and (4) smart city technology, contact tracing, and privacy. The following six recommendations have been proposed. First, institutional and cultural factors are more important than urban features, such as population density. To handle infectious diseases such as COVID-19, it is important to build systems, technology, infrastructure, and urban structures that can strengthen resilience instead of implementing a directionless policy of dispersion. Second, it is necessary to improve accessibility to essential services at the community level, including medical facilities and food supply. Third, continuous effort should be made to boost housing affordability, as it is directly related to people's basic life. Fourth, measures are needed to protect those people who are socioeconomically disadvantaged. There is also the need to restore global trade and economic relations. Fifth, since data technology-based COVID-19 control raises the human tracing and privacy issue, we must ensure the principles of privacy management, such as transparency and voluntary consent, are being met. Finally, since COVID-19 is spread through people, individuals may become anxious and fearful of others without grounds; this may increase prejudice and hatred, including xenophobia. Significant social effort is needed to overcome such ill-defined anxiety and fear and maintain a healthy civil society.

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## 1. What differentiates COVID-19 from previous pandemics?

The formation of a society provides humans with many benefits. Cities, where tens of thousands to tens of millions of people live, are a typical representation of humans living in a society. An individual builds one's life through interaction and cooperation with others; some exchange goods in a market, and others achieve outcomes that cannot be reached alone. It is possible to exchange knowledge and information in cities, while communing with various people in public spaces. Such urban interactions have enriched people's lives, increased happiness, and helped people feel safer. This social life, where numerous individuals live in close proximity, is only possible if built on a strong foundation of public health and hygiene.

The recent COVID-19 pandemic poses a great challenge to our current social life, as we depend on each other and often live in close proximity. In recent years, as well as in the past, various infectious diseases have emerged. Recent types of coronavirus outbreaks include the 2012 epidemic of Middle East Respiratory Syndrome (MERS-CoV) and the pandemic of Severe Acute Respiratory Syndrome (SARS-CoV) that occurred in 2003. The fatality rates of MERS-CoV and SARS-CoV were 37% and 10%, respectively. Other well-known infectious diseases include the Zika virus disease, cholera, and pest (the plague). While the fatality rate of COVID-19 is approximately 5.2%, which is lower than that of previous viruses, the numbers in Italy and England exceed 14%; thus, it is too early to conclude that the fatality rate is comparatively lower.<sup>1</sup>

A peculiarity of COVID-19 that differentiates it from past epidemics is that it spreads through everyday contact with other people. MERS-CoV infected humans through camels, while SARS-CoV infected humans through either civet cats or raccoons.<sup>2</sup> In addition, the Zika virus is spread by mosquitos, cholera is spread through contaminated water, and the pest (plague) is spread by fleas. It was possible to manage previous viruses by decreasing contact with the virus medium (MERS – limit contact with camels), purifying the medium (cholera – supply clean water), or exterminating the medium (Zika – exterminate mosquitos). While such infectious diseases were serious, their management was highly feasible. Therefore, it was unnecessary to greatly decrease people's everyday interactive activities.

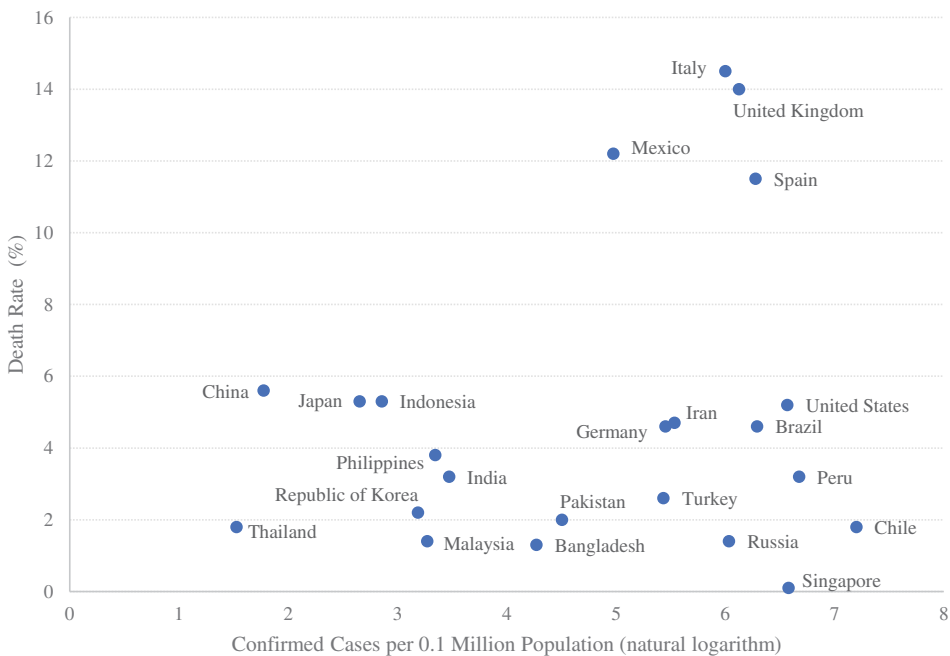
However, in the case of COVID-19, because it is spread through general contact between people, it is impossible to carry on with everyday interactions as usual. COVID-19 is fundamentally different from past viruses in that everyday interactions have become the problem. Thus, the basic response to COVID-19 is enforcing lockdowns. People have been placed on lockdown to prevent further spread of COVID-19. For a coronavirus-hit city or region, such as Wuhan in China, travel into and out of the city or region was blocked. Furthermore, many countries announced temporarily closing all borders to respond to a worst-case disease outbreak.<sup>3</sup> Lockdown and border closures affect the global value chain.

Primary responses to infectious diseases like COVID-19 are similar to disaster responses. The four aspects of disaster response are prevention, preparedness, response, and recovery (PPRR). It requires planning, securing resources and facilities, discovering and reporting, and quick and effective countermeasures. Learning from its experience with SARS and MERS, South Korea is equipped with systems and organizations that can effectively handle infectious diseases. By establishing infectious disease response

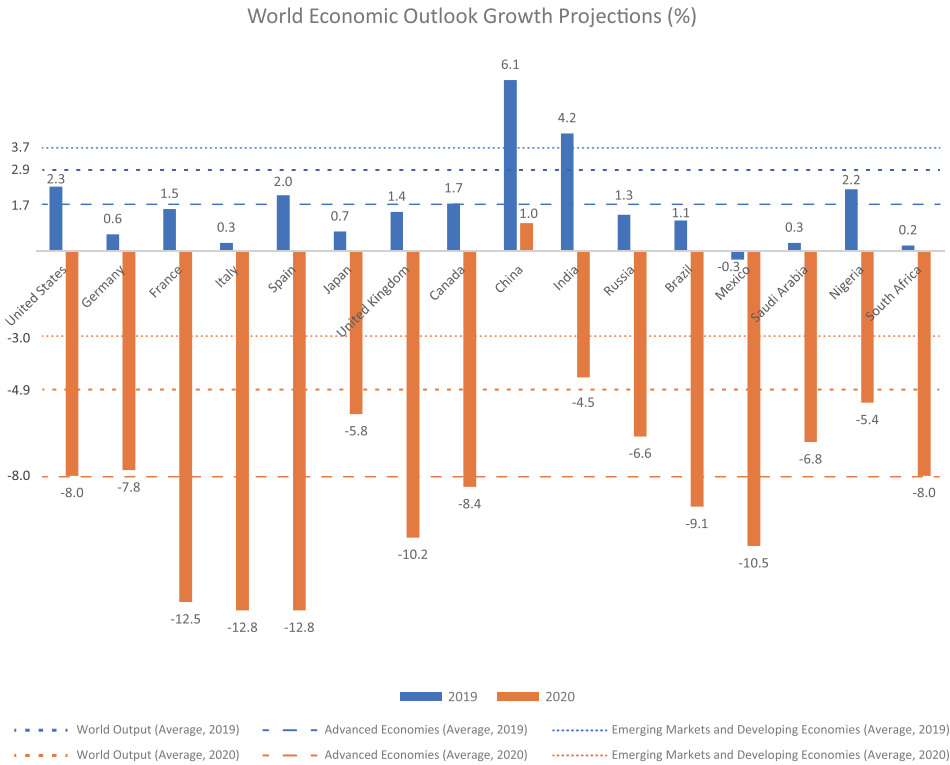
plans, and securing and managing the necessary facilities (e.g. decompression chambers) and materials (e.g. diagnostic reagents and protective gear) in advance, the country was able to respond to COVID-19 in a timely and effective manner. In addition, by utilizing information and communication technology (so called smart city technology) that has recently become widely available, the government has been able to quickly identify and respond to contact between infected people and trace the spread of the virus. Such smart city technology has amplified the effects of a society's COVID-19 response (Sonn, Kang, & Choi, 2020). Furthermore, the sharing of such information with citizens in real time heightened the ability to effectively respond to COVID-19 at the individual level (Figure 1).

Measures such as social distancing, lockdowns, border closures, and human tracing are implemented to block the spread of COVID-19, but generate various secondary urban and regional problems. Since the virus limits people's everyday social interactions, problems such as economic decline, mass unemployment, deterioration of living standards and an increase in housing vulnerability due to decreased income, a drop in service industries such as tourism, existential crises for many small and medium-sized businesses, increased risks for many firms, a decrease in face-to-face activities such as education, and worsening of public finances may occur in series, as they are all interconnected. Furthermore, the use of human tracing to identify and respond to infection routes between individuals presents the issue of privacy invasion (Figure 2).

Furthermore, COVID-19 may have a larger negative impact on socially underprivileged individuals than high-income earners; this brings forth the possibility of worsening and perpetuating inequality. The International Labor Organization (ILO) anticipates that



**Figure 1.** COVID-19 confirmed cases and death rate by country (24 June 2020). Data: KCDC (2020) (24 June 2020).



**Figure 2.** World economic outlook: growth projections (June 2020). Data: IMF (2020) <https://www.imf.org/en/Publications/WEO/Issues/2020/06/24/WEOUpdateJune2020> (Accessed on June 20, 2020.)

the number of unemployed people will reach 195 million worldwide due to the COVID-19 pandemic (ILO, 2020b). The first individuals to lose their jobs will be temporary labourers working in the face-to-face service industry, such as airlines, travel accommodations, beauty shops, restaurants, bars, sales businesses, education, entertainment, concerts, fine arts, and wholesale and retail businesses. The ILO expects the following groups of people to be particularly more vulnerable: women, informal labourers, temporary workers, youths, seniors, refugees, migrant labourers, and self-employed workers (ILO, 2020a). In the case of the US, over 20 million people became unemployed in April alone, and the figure is expected to increase as the pandemic persists (Kretchmer, 2020). Despite the considerable unemployment benefits that have been already provided to those in need, countless people are still burdened with rent.

In order to block the spread of COVID-19 and guard public health in cities and regions, measures such as social distancing, lockdowns, border closures, and human tracing have been implemented; these are at least necessary in the short-term. However, further discussions are needed to address the secondary problems faced by cities and regions that stem from such measures, such as changes in people’s lives and workplace, decrease in housing reliability, economic shock and inequality, and privacy invasion.

This paper aims to discuss the above mentioned secondary problems found in cities and regions. Specifically, this paper examines four domains of urban and regional issues related to the secondary impact of COVID-19, including (1) social distancing, urban structure,

community, and density; (2) housing affordability and inequality; (3) lockdown, border closure, reshoring, and regional economic recovery; and (4) infectious disease control, smart city technology, and privacy.

## 2. Social distancing, urban structure, community, and density

In light of the global pandemic, numerous cities around the world took the unprecedented measure of implementing a lockdown, which in turn required people to carry out every part of their daily lives at home. After lifting the lockdowns, a large number of corporations made working from home mandatory or recommended, children's educational environment was replaced with online classes instead of attending school, and leisure activities were limited to inside the home or playgrounds and parks near the home. There also were major changes in consumption patterns. E-commerce in the general retail sector more than tripled in April 2020 when compared to the same time in 2019, and demand for pick-up and delivery services related to online shopping spiked (ACI World Wide Research, 2020).

The most prominent change in housing function that post-COVID-19 society will experience is undoubtedly the centralization of work and education in residential areas and their surrounding spaces. In addition to large-scale IT and social media firms, including Google, Twitter, and Facebook, many companies are adopting flexible work systems; such a trend is expected to expand with time (Streitfeld, 2020). Government organizations are also turning to and activating work from home options (Herb, Starr, Atwood, & Holmes, 2020; UK Government, 2020b). Thus, before the pandemic, work and education occurred at workplaces and schools; however, in post-COVID-19 society, these activities are expected to increasingly occur at home or in public or quasi-public (e.g. cafes) spaces near the home.<sup>4</sup>

According to a survey conducted in England, due to the COVID-19 situation, people's interest in suburban or rural areas where population density is lower than in nearby cities, as well as in residences that are equipped with home office spaces, has spiked (Barker, 2020). If the post-COVID-19 society is based on flexible work systems and an educational environment of selective remote classes that do not require daily commuting, then the aforementioned preferences will continue and new standards for residential location will rise. In line with such changes, the majority of work and education in post-COVID-19 society will occur at home, which will amplify the significance of residences and surrounding spaces that are conducive to work and education.

The fundamental restructuring in the labour market is also likely to play a substantial role in urban structural change in the long run, but the direction is less clear. Workers may prefer working from home without a commute even after the COVID-19 pandemic fades. If remote work becomes the new normal in the post-pandemic world, many firms are likely to consider reducing office space in prime central business districts and relocating non-essential functions to areas with lower rents. Residential location choices will adapt to the new normal and the dispersal of firm locations. In addition, households may have fewer incentives to reside closer to firms, thus reducing the concentration of their housing demand within the dense city centres.

When responding to COVID-19, it is just as important to treat infected people as it is to block the spread of the virus. Through this pandemic, a lack of the following facilities in

many communities was made evident: primary medical facilities, disaster response facilities like community centres, and stores selling essential goods like neighbourhood pharmacies and grocery stores. In particular, vulnerable groups without vehicles in communities of low accessibility and walkability to essential livelihood services experienced greater damages. As such, COVID-19 also calls for a change in community planning.

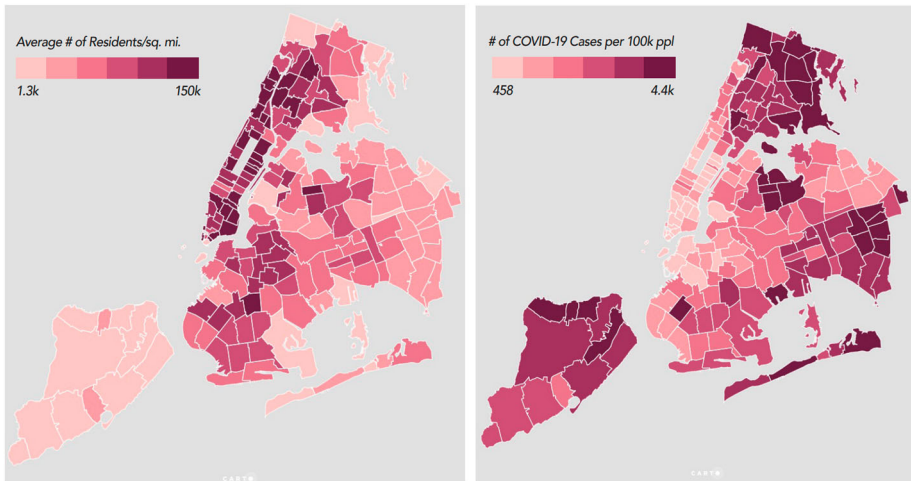
In the case of Korea, whose government is regarded as having responded appropriately to the virus, community medical centres played a major role when conducting primary screening for the infected. Local administration staff members and community centres responded rapidly in reaching out to individuals who were in contact with infected individuals, sending out emergency responses through SMS, delivering relief supplies, and quarantining suspected patients. Smartphone-based technologies, such as location tracking systems, information delivery systems, and delivery service applications, also played a crucial role (UN, 2020).

Evidently, in the face of a social crisis such as a pandemic, the community takes on the role of calculating damages to provide relief and restoration, and implementing the most effective preventative measures using modern technology. In other words, the community is the most fundamental safety net that should be reinforced in order to establish the society's resilience against the pandemic (Healey, 2014). In this respect, when it comes to community building, it is necessary to clarify the concepts of guaranteeing essential community services and accessibility to these facilities.

As an essential community service, primary medical facilities have the duty to safeguard the health of residents from infectious diseases and other disasters. In Italy, where the current pandemic has greatly affected the population, regional medical institutes were unexpectedly overcrowded with infected and suspected patients. This led to a jump in the number of infected people and deaths due to insufficient and inadequate testing, isolating, and treating of confirmed patients (Indolfi & Spaccarotella, 2020). Primary responses to pandemics, such as testing and other preventative measures, can be handled by community medical facilities; this will prevent central medical facilities from becoming suddenly overwhelmed, as was the case in Italy.

In general, while the number of confirmed cases tends to be higher in large cities, deaths from infectious diseases may be higher in suburbs and rural areas. According to Keating and Karklis (2020), the mortality rate from the flu in metropolitan areas is 4.2% per 100,000 people; the ratio increases to 6.5% and 6.9% in low-density towns and rural areas, respectively. The reason behind such a phenomenon is that there are various measures implemented to fight infectious diseases, as well as steady medical support systems, in urban areas. However, in suburban districts and rural areas, medical services and the means to cope with infectious diseases are weak.

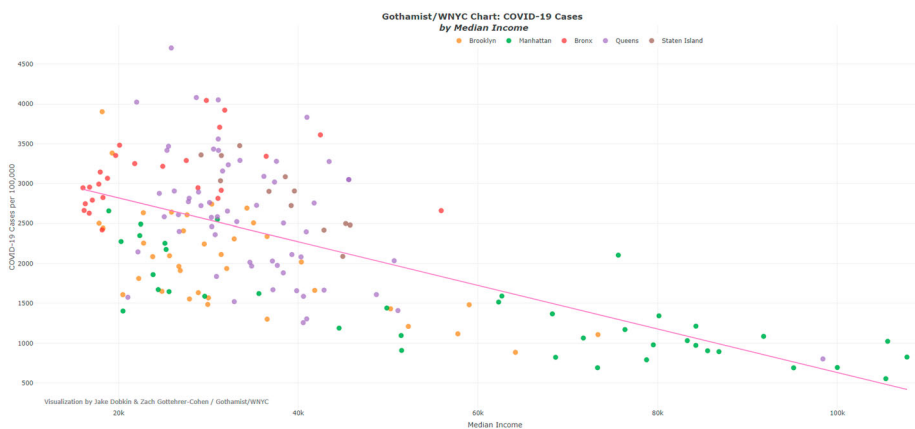
In this regard, according to a study on New York City conducted by CHPC (2020), a consistent relational pattern between population density and COVID-19 does not exist. As shown in the below figure, based on zip codes, no significant relationship was found between the occurrence of COVID-19 and densely populated areas, including Manhattan. This result indicates that densely populated areas will not always necessarily reveal high numbers of confirmed cases. Furthermore, when comparing large cities around the world, those in Asia, which are more densely populated than their European and American counterparts, display noticeably lower incidence and death rates. Such findings



**Figure 3.** Population density of NYC (left) and COVID-19 confirmed cases (right). Source: Citizens Housing Planning Council (CHPC) (2020).

suggest that population density is not a major determining factor for COVID-19 (Figure 3).<sup>5</sup>

In the case of New York City, the occurrence of COVID-19 is more closely related to income rather than population density. In downtown Manhattan, there were less than 14 confirmed cases of the virus per 1,000 residents; however, there were over 30 confirmed cases per 1,000 residents distributed around the Bronx and Queens. The median household income is low in these areas. Since low-income earners are, in general, temporary workers or tend to work in small-sized retail or service businesses, they are the first group to be significantly impacted by the COVID-19 preventative measures such as social distancing and lockdowns. Furthermore, such individuals find it difficult to continue to practice social distancing or abide by the lockdown because they must earn money and staples each day. Controlling the spread of COVID-19 through lockdowns in low-income



**Figure 4.** Median income of NYC (\$1,000) and cases of COVID-19 (per 100,000). Source: [https://covidinteractivesny.s3.us-east-2.amazonaws.com/demographics\\_dashboard.html#income](https://covidinteractivesny.s3.us-east-2.amazonaws.com/demographics_dashboard.html#income).



areas requires additional detailed measures, as it is difficult to prevent infection given their socioeconomic circumstances (Figure 4).

### 3. Housing affordability and inequality

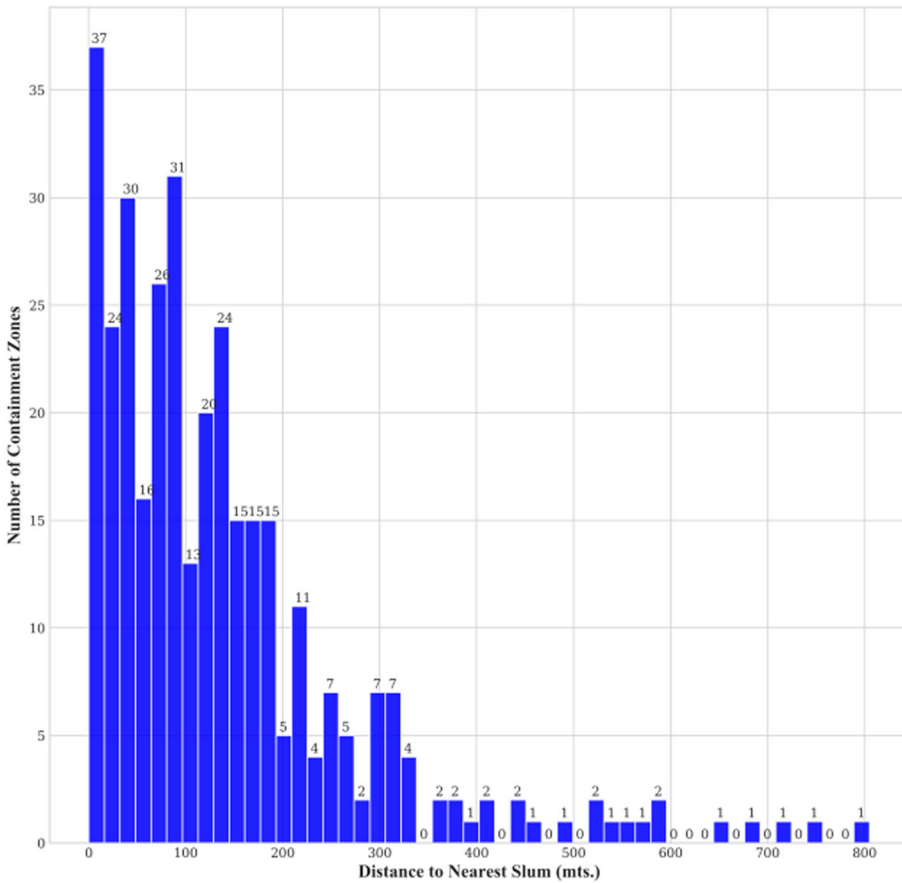
Housing affordability fundamentally depends on the relationship between the metropolitan-level distributions of household annual ability to pay (\$A) and annual occupancy costs of residential units according to their quality (\$O) (Galster & Lee, 2020). Therefore, housing affordability is not only an outcome of the housing market, but also the labour market. The COVID-19 pandemic has had a significant, direct impact on labour demand, resulting in a surge of job losses as well as significant reductions in both median household income and \$A.

However, this is not likely to translate immediately into lower housing demand due to inactive housing markets and lower residential mobility. Because of a lack of job opportunities and infection concerns, few households would consider long- and short-distance moves during the pandemic period. Furthermore, the pandemic has slowed down home construction and exacerbated housing supply chain problems. With sluggish supply, along with little short-term change in demand in the housing market, \$O is expected to remain unchanged at best.

In the short run, therefore, the households vulnerable to housing risks will be those who are affected most in the labour market. For some households, especially employees in sectors like hospitality, retail, and entertainment, their \$A has suddenly decreased to nearly zero and it will be simply impossible for them to pay their rent or mortgages. Many of these households will be forced to reduce \$O by 'doubling-up' with other family members or friends or moving into less adequate housing. In the worst case scenario, they may end up being evicted or their house could be foreclosed. Some young adults will delay the formation of new households and stay with their parents due to lower housing affordability in their own metropolitan areas; this is similar to what we experienced after the 2008 subprime crisis (Lee & Painter, 2013).

Housing inequality has manifested itself as a source of a public health crisis during the COVID-19 pandemic. First, ample evidence of the significant association between housing adequacy and protection against COVID-19 has been shown. In Mumbai, informal settlements have already faced serious health issues due to intense air pollution and inadequate access to water or sanitation, and now have become a hotspot for COVID-19. In Singapore, a larger number of foreign workers residing in overcrowded dormitories have been infected with COVID-19. Maintaining the social distance and sheltering safely against the respiratory pathogens are simply impossible in these inadequate housing conditions. Even in other better-off cities, some long-term care facilities that accommodate people with disabilities and older adults have been found to be unsafe.<sup>6</sup>

Next, housing inequality between different spatial areas and among households with different economic statuses has resulted in significant external costs with negative public health outcomes. As shown in Figure 5, the distance to the nearest slums has a significant, negative association with the frequency distribution of the number of Containment Zones in Mumbai, India. In other words, the geographically-concentrated cluster of inadequate housing has emerged as a focal point of COVID-19 and created wide-scale negative externalities for people in their surroundings. Evidence suggests that



**Figure 5.** Distribution of distance from epicentres of containment zones to the nearest slum in Mumbai, India. Source: Patranabis, Gandhi, and Tandel (2020).

Note: A ‘Containment Zone’ is described by the Ministry of Health, Government of India as a ‘defined geographic area’ where a ‘large outbreak’ of positive COVID-19 cases are found and sealed by the government.

higher household-level economic inequality and lower housing affordability are associated with a greater concentration of inadequate housing among households with lower economic statuses (Aizawa, Helble, & Lee, 2020). If income inequality widens further among resident households during and after the COVID-19 pandemic, addressing housing affordability issues will become even more critical to prevent exacerbating existing housing inequality and to mitigate a public health crisis.

Several policy responses have already been introduced. For example, the U.S. Coronavirus Aid, Relief, and Economic Security (CARES) Act temporarily allows mortgage forbearance and eviction moratorium for homeowners and renters who are financially impacted by COVID-19 (U.S. Department of the Treasury, 2020). Many countries have also provided financial support through stimulus packages and unemployment insurance benefits. These measures help prevent immediate increases in housing instability and homelessness by placing a temporary hold on \$O and increasing \$A for one or more months.

Many countries are implementing various financial support policies for housing stabilization in order to reduce the gravity of short-term housing stagnation and to prevent prolonged damages. Some countries, including the US, Canada, and Australia, are providing rent relief through regional governments. In the case of England and Germany, in addition to arranging housing support for the vulnerable class, the governments have also passed a bill to delay rent payments for three months (England) and six months (Germany) to protect tenants (Mank, 2020; UK Governmnet, 2020a). In particular, Germany's COVID emergency response is regarded as exemplary; it is unfolding multi-angle housing cost relief policies, such as providing interest-free loans to landlords, homeowner-occupiers, and members of housing cooperatives, and adjusted tax relief. In Korea, for permanent rental housings, the government permitted the delay of rent payments for six months and payments in installments for one year.

Although the above policies are a good start, stronger policy actions are required to avoid a housing affordability catastrophe in the long run. Given a potential increase in income and wealth gaps after the pandemic, it will be crucial to maintain access to affordable housing for households that have faced job losses and economic hardship, thus being left with low or unstable \$A. One-time stimulus payments or expanded employment benefits could be a bridge, but definitely not an ultimate solution, especially given expectations for a growing number of job seekers and accrued debts over unpaid rent and mortgages. Longer term financial assistance for rental and mortgage payments will help stabilize their \$A after the eviction moratoriums expire.

At the same time, continuing efforts are needed to increase the low-cost housing stock that could be covered by lower \$O. This is particularly important for areas where low-cost housing was already in short supply before the pandemic. As residential mobility dampens due to the pandemic situation and new home building dries up during the economic downturn, fewer affordable units will be available in these areas. Supply-side measures such as zoning reform and affordable housing funds should be at the top of the policy agenda.

#### **4. Lockdown, border closures, reshoring, and regional economic recovery**

The devastating impact of COVID-19 is observed not only in national and global economies, but also in urban and regional economies. Given its obvious negative impact, it is necessary to explore what actions cities and regions can take to spur economic recovery following the pandemic. More specifically, this section critically assesses optimistic views on reshoring through findings in management literature.

Such optimism is based on the view that reshoring will accelerate after COVID-19, when cities and regions can host the returned businesses in economic recovery. Behind this view is the assumption that a globally stretched value chain is more vulnerable to extra-economic shocks such as pandemic (Bals, Kirchoff, & Foerstl, 2016; De Backer, Menon, Desnoyers-James, & Moussiégt, 2016). The shambles over medical equipment including masks, personal protective suits, and ventilators in many advanced economies is often taken as evidence for the vulnerability of the global value chain. In addition, the lockdown of Wuhan, China, where the 'wiring harness' factory closures were felt downstream by the Hyundai automobile production halt this February, is often cited. If the global value chain is actually vulnerable, and the multinational corporations decided to avoid such vulnerability despite its short-term cost advantage, more firms have

increased motivation for reshoring; this would provide the economic momentum to revitalize the economics of host cities and regions (Peck, 2005; Wagner & Bode, 2006). We do not question the trend of reshoring, as it has occurred since long before the COVID-19 pandemic; however, its acceleration is doubtful.

While there is little research on the aftermath of the global pandemic, there are many studies on recovery after natural disasters such as the 2011 Japanese Tsunami, the 2011 Thailand Chao Phraya river floods, and the 2016 Taiwan earthquake (Abe & Hoontrakul, 2014; Abe & Ye, 2013; Basher et al., 2015). These studies indicated several common findings. Firstly, vulnerability to natural disasters did not cause multinational corporations to relocate their establishments away from the sites of natural hazards, and the re-establishment of the global value chain is relatively fast. Comparatively, a global pandemic such as COVID-19 is a larger external shock to the economy, but it does not physically damage the current production capacity. Once lockdowns are lifted, workers can immediately go back to their jobs and business can return to normal. Thus, the pandemic gives multinational corporations smaller incentives for relocation than natural disasters.

Secondly, if damage to global logistics is an issue, reshoring is not a solution. Reshoring can shift a longer portion of the value chain to one place, but it is not possible to cut off all international sources of raw material and essential parts. If the product is sold globally, reshoring does not assist in overcoming the breakdown of global cargo transportation.

Thirdly, even if companies return to home countries, traditional supply chains may not remain. Rather, it is likely to be transformed into supply networks, which complicates relocation. For example, an apparel-manufacturing company located in Rwanda purchases colouring material, textiles, and machinery from three tiers of domestic suppliers, who depend on hundreds of foreign chemical providers and machinery manufacturers. Because the supplier networks are interconnected across countries, the relocation does not guarantee whether the host region's supply networks work efficiently enough to avoid incurring costs and time. This year, the Japanese government has set aside \$2 billion in supporting funds to subsidize the manufacturer that relocates its production facility to Japan; however, the initial response of the market indicates this measure has not been that successful.

Finally, reshoring and the subsequent concentration of production will increase the risk of failure. Reshoring and concentration can prevent disruption only when there is a guarantee that the location is completely protected from disasters. Throughout the COVID-19 pandemic, Taiwan and South Korea have been the only two countries where production proceeded without interruption. These are not naturally protected areas, as germs have traversed borders for centuries; rather, they succeeded because they learned lessons from prior experiences (Sonn & Lee, 2020).

As such, a logical response to a pandemic is not internalization and/or reshoring of productive capacity, but diversification of supply sources (Ellram, Tate, & Petersen, 2013; Markusen, 1998). A useful illustration is Samsung's response to the temporary closure of its Korean factory. Samsung has two main locations for mobile phone production: Vietnam and South Korea. Its Korean Gumi factory was evacuated on 6 March 2020, after one employee was tested positive for the coronavirus. Then, Samsung quickly increased output from its Vietnamese factory and minimized the reduction of its total shipment. This is not a unique or unusually smart move; it is what any multinational corporation would strategically do. In fact, disruption of the value chain is a daily part of value

chain management, and its standard remedy is an increase in resilience by having multiple sources for the same product. Apple outsources production of CPU to TSMC and Samsung, and buys display panels for mobile phones from BOE, Sharp, and LG. It is rare that a multinational corporation purchases a part exclusively from one source if multiple suppliers exist in the market. This strategy will be adopted by smaller multinational corporations when the disruption of the value chain becomes apparent during this pandemic.

The latest trend of deglobalization must also be considered. While its long-term effect is still to be seen, the US–China trade war and the Korea–Japan conflict, among others, have been transpiring over the last several years. Over the past two centuries, geopolitics has been the primary cause of stopping or reversing globalization (Hirst & Thompson, 1995). The impact of the pandemic has added fuel to the shifting trend away from trade liberalization toward protectionism. The World Trade Organization’s (WTO) forecast on world trade reflects the deglobalization trend, stating that it will decline by about 30% this year (WTO, 2020). The pandemic has reinforced protectionism concerns across the countries. One may think deglobalization would strengthen reshoring, but the outcome may be the opposite. When protectionism is high, for multinational corporations to penetrate the market, they must try to localize in their major markets; this means investment in major markets and de-investment in production bases that are located in smaller markets.

All and all, a surge in reshoring is not likely to happen and therefore may not be the pivotal tool necessary for urban and regional recovery after the pandemic. In fact, reshoring may decrease, not because of the reversal of the recent reshoring trend, but because of a global recession following the current pandemic. While we do not advocate the end of reshoring policy, we do believe excessive effort would be an inefficient use of public resources. It is well known among foreign direct investment experts that locational incentives can often invite rent-seeking behaviour (Markusen, 1998; Sonn & Lee, 2012; Tewdwr-Jones & Phelps, 2000). Reshoring firms and establishment are not necessarily different, and excessive incentive packages for reshoring can fuel rent-seeking behaviour. A popular swing toward a catchy policy that gives false hope will distort public finance allocation and make the recovery process longer.

If reshoring cannot be the main mechanism of recovery for urban and regional economies, what can be? While it is premature to predict what will work and what will not, based on existing literature and evidence at hand, we can only say that the conventional strategies of urban and regional economic development should continue to be the main strategies. Earlier discussion on regional industrialization and deindustrialization taught us that there is no magic formula (Pike, 2020). Smart specialization is the latest fad, but like earlier fads such as industrial cluster and regional innovation system, smart specialization is not a magic formula. Furthermore, going beyond short-term border closures or reshoring, efforts are needed to recover the vitality of international relations and global trade. Cities and regions may struggle in the long recovery process following COVID-19.

## 5. Infectious disease control, smart city technology, and privacy

With the COVID-19 outbreak, data technology-based prevention applications to control and manage infectious diseases have been widely applied around the globe. Will it affect

the future of smart cities, in which various ICT technology-based urban services are provided to improve the citizens' quality of life? Recently, the effectiveness of the location-based service in COVID-19 prevention has attracted attention, but privacy concerns are increasing. The privacy debate in the COVID-19 prevention system is an example that applied equally to smart city services and applications, giving valuable implications for the future direction of smart cities in the post-COVID-19 era.

Amidst the COVID-19 pandemic, notable news related to the future of smart city technology was announced. The Korean government has developed and operated an epidemiological investigation support system using a smart city data platform, which was part of a smart city R&D project, to collect users' cell phone tower-based location information, credit card usage history, and GIS information; the data is then analyzed to extract information on the users' movements. It is said that the Korean epidemiological investigation that typically took one day to complete was shortened to less than 10 min (Ministry of Land, Infrastructure and Transport, 2020). This can be seen as a successful case where smart city technology is used to protect the health of citizens in a pandemic situation (Sonn et al., 2020). However, Korea's coronavirus prevention model is not free from controversy over privacy infringement due to excessive use of personal mobile location data and disclosure of private location information for the purpose of quarantine (Park, Choi, & Ko, 2020).

Indeed, various types of digital technologies meant to inhibit the spread of COVID-19, such as proximity tracing tools, symptom checkers, and quarantine compliance tools, have been widely developed and implemented (Gasser, Ienca, Scheibner, Sleight, & Vayena, 2020). Among them, the Pan-European Privacy-Preserving Proximity Tracing (PEPP-PT) project team's Decentralized Privacy-Preserving Proximity Tracing (DP3T) is considered a representative model that reflects the principles of privacy protection. Using a similar structure, Apple and Google jointly presented a Privacy-Preserving Contact Tracing (PPCT) application.

These proximity tracing applications are carefully designed to protect privacy. Bluetooth communications with other devices are recorded, and a history of proximate contact information is maintained. A randomized Bluetooth ID changes every fifteen minutes and the system utilizes pseudonyms; thus, privacy is strongly protected. The contact information remains in the device for the duration of the epidemiological investigation, which is usually several weeks. If a user tests positive, the recorded Bluetooth contact history is used to inform potentially infected individuals. This notification could be made automatically through the user's device under the decentralized system, ensuring further privacy. This entire process is only possible through the voluntary participation of users who consent to decoding the recorded data.

Another example of governmental control of smart city technologies (Sonn & Lee, 2020) is the QR code-based Visitor Lists (QR-VL) system, introduced in June 2020 in South Korea. Under Korean law, visitors to crowded facilities that are highly vulnerable to infectious diseases, such as karaoke and night clubs, must provide contact information. However, it is inconvenient to record every person's contact information manually upon entering, and the private contact information collected by business owners may be misused. To address these problems, the QR-VL application utilizes an encrypted one-time QR code for each visitor. The recorded QR code is only retained for several weeks for epidemiological purposes. When a visitor tests positive for the virus, the QR code is

processed by a government agency and potentially infected individuals are contacted. Unlike the DP3T, however, people's information is managed by the centralized system of a public agency; Koreans appreciate the convenience of this system and believe it is a superior method in protecting privacy than leaving contact information upon entrance. Furthermore, this system can be viewed as an inevitable means to achieve both the goals of infectious disease management and the economic activities of a local business. However, despite its convenience and discretion, privacy concerns regarding the Big Brother society continue in Korea.

As discussed in the preceding cases, smart technologies, which acquire and use various personal location information to tackle the spread of COVID-19, has been developed and utilized by the government for the purpose of infectious disease prevention.<sup>7</sup> Before the COVID-19 outbreak, the use of personal information such as mobile phone location had limited purposes, including crime investigation, lifesaving measures, and terrorism prevention. Recently, however, smart digitalized disease control services are increasingly common; this is occurring not only in Asian countries such as China and Singapore, where government controls and functions are relatively strong, but also in many Western countries in Europe and the United States that have traditionally prioritized privacy. From a smart city perspective, this implies that smart emergency management services can be activated in spite of privacy concerns.

In the COVID-19 situation, the privacy debate, particularly regarding human tracing, is intensifying due to the massive use of personal mobile location data by data technology-based applications. While the levels of privacy protection and the citizens' acceptance of these smart systems vary depending on each country's socioeconomic, political, and cultural backgrounds, we could expect that such smart services and applications will expand in the post-COVID-19 era, particularly in public domains. Many citizens are already encountering the use of personal location information in the public sector during the COVID-19 pandemic. They are observing and experiencing the convenience and effectiveness of smart services that utilize personal location information, which implies that the acceptance of smart city services and applications may increase. Of course, there is a growing understanding of how technology uses personal location information, including mobile location data from the public. Therefore, the smart service providers must effectively respond to increased awareness of private information use and related privacy concerns (Ienca & Vayena, 2020; Kourtiti, Elmlund, & Nijkamp, 2020). Depending on each country's situation, the government could choose an appropriate legal and technological means to address privacy concerns (i.e. decentralized system or centralized system).

## 6. Conclusion and discussion

Long before the COVID-19 pandemic, we experienced outbreaks of infectious diseases such as typhoid, cholera, smallpox, and tuberculosis in cities with poor sanitation. These outbreaks increased attention on public health and urban planning. The current COVID-19 pandemic has provoked many unprecedented questions, such as how to isolate ourselves without disrupting our everyday socio-economic life. Furthermore, COVID-19 has also questioned whether the current urban spatial structure is resilient to the pandemic. After examining four domains in urban and regional issues highlighted by the COVID-19 pandemic, six policy implications are suggested.

First, the spread of COVID-19 has been deemed to be determined by institutional and cultural factors such as social response to the virus, social distancing, individual mask-wearing, and alertness to the virus, rather than by urban form aspects such as population density. As observed in Singapore, Hong Kong, Seoul, and Tokyo, which are some of Asia's largest and most densely populated cities, it is possible to control the spread of COVID-19 to an appropriate degree even in high-density, compact urban environments where public transportation is central. Furthermore, when considering the rapid spread of the virus in the US, not only in large cities but also in low-density suburbs and small- and medium-sized cities where personal vehicles are the preferred method of transportation, it is difficult to argue that a low-density dispersed population spatial structure linked with vehicle usage has advantages against contagious diseases. In addition, medical facilities and other resources that enable rapid responses can be more readily available in cities than in non-urban regions. Therefore, it is necessary to discourage aimless dispersion policies when responding to infectious diseases like COVID-19. Cities have agglomeration benefits that many people can enjoy by living together. While taking advantage of these benefits, it is crucial to build and maintain systems, technologies, and infrastructure that can provide resilience when coping with infectious diseases.

Second, at the community level, it is crucial to improve accessibility to essential services such as medical facilities and food supply. There are prominent examples of this, including the '10-minute neighborhood' of Seoul, Korea and the '15-minute city' of Paris, France. Similar efforts should be made to include essential services within living zones, and to build self-sufficient living zones in which walking and riding bicycles is safe, to prepare for unforeseen infectious diseases and lockdowns. In particular, such efforts should prioritize communities with outdated infrastructure and insufficient living social overhead capital (SOCs), as well as pedestrian and bicycle infrastructure. In short, the government should seek to develop all communities equally so that all residents in the city have equal resources when responding to pandemics.

Third, the role of housing, which is already fundamental in people's lives, becomes even more crucial during lockdown. Housing instability poses as a greater threat to the low-income class during pandemics such as COVID-19. Therefore, effort should be made to firmly establish housing affordability in order to provide stability for residents. In the short-run, in order to secure housing stability and prevent market stagnation, providing cost or tax reliefs may help reduce the burden of housing costs. One-time stimulus payments or expanded employment benefits could serve as a bridge, but not an ultimate solution. Continuing efforts are needed to increase the low-cost housing stock; this is particularly important in citizens' everyday lives.

Fourth, socially underprivileged groups are the first to experience the financial hardships caused by COVID-19. In the short-run, swift and effective measures need to be in place to guard the socioeconomically disadvantaged groups. Special actions must be taken, particularly for informal labourers, temporary workers, women, youths, seniors, refugees, migrant labourers, and self-employed workers. In addition, in the long-run, we must restore global trade and economic relations. Policymakers should be cautious about telling the difference between protectionism by geopolitical tensions and the disruption of the global value chain network. Once some countries start restricting trade across borders, others are likely to follow suit, deteriorating the economy recovery.



Fifth, data technology-based COVID-19 management reminds us of the conflicts between smart technology and privacy. If private and public sectors' efforts to ensure the principles of privacy management, such as transparency and voluntary consent, are premised, the use of smart city technologies will help protect citizens' health and safety.

Lastly, effort should be made to firmly maintain and develop a healthy civil society. Since COVID-19 is a virus transmitted among people, individuals may become wary and distrustful of others. Once people feel anxious and fearful, prejudice and hatred, including xenophobia, against certain groups of people who are different from one's self may grow.<sup>8</sup> Such a sense of exclusiveness against others may develop into discrimination, bullying, and physical violence. Thus, a great deal of social effort should be made to build a healthy, civil society where people can overcome anxiety and fear and cultivate social inclusiveness.

## Notes

1. When observing the fatality rate of COVID-19, the measures of more rapid and stronger response to controlling spread, early detection and treatment should be taken into account.
2. For SARS-CoV, there are cases that assume the spread through air on the ninth floor of Metropole Hotel and Amoy Gardens housing complex in Hong Kong.
3. There are five categories of border closure that include (1) exports and imports; (2) travel; (3) legal immigration; (4) illegal immigration; and (5) cross-border shopping etc.
4. In the past three months, during which COVID-19 swept around the world, work from home and online classes were activated. As an effect, the number of users of Zoom, a video communication company, increased from 10 million to 200 million, a 20-fold growth. There also was a large jump in other communication applications based on social media and the Web (Mobile Index, 2020).
5. Litman (2020) argues that the crowding (number of people per interior space area) within a city, rather than its density (number of people per land area), is closely related to COVID-19. Furthermore, he states that the high number of confirmed cases in large cities, like Chicago, New York City and Seattle, is largely due to global network (major travel hubs and centres of trade, tourism and migration), rather than population density of those cities.
6. Homeless people without proper shelter have also been at a great risk of being exposed to COVID-19.
7. The use of personal information is essential in various smart city services and applications such as smart home, smart healthcare, and smart parking. Therefore, privacy-related debates have continued in smart city technologies and businesses. Researchers presented various technical approaches to minimize the privacy risk such as data minimization, data anonymization, encryption, and anonymous/pseudonymous credentials (Eckhoff & Wagner, 2018).
8. In severe cases, it may lead to racism or nationalism.

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