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Reflection on Early Lessons for Urban Resilience and Public Health Enhancement during the COVID-19

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Abstract

With growing impacts on public health systems and economies across the world, as a result of the COVID-19 pandemic outbreak, we need to reflect on some of the early lessons for urban resilience enhancement. In this paper, a brief discussion is made through several recommendations that could make our cities more prepared specially in the probable future waves of this current outbreak or potential spikes in infections or clustered cases. The experiences from global examples highlighted in this study address what has worked in the past few months at the spatial levels of communities and cities. The COVID-19 outbreak highlighted the deficiencies and shortfall across multiple sectors of the urban systems and enabled us to identify risks, challenges, and pathways to better city management. With regard to urban resilience enhancement, the negative impacts of the COVID-19 outbreak are assessed to suggest a checklist of what could be done through early preparedness. The findings are novel in ongoing research related to urban resilience and public health during the COVID-19 pandemic. The early lessons here reflect on the ongoing situation of this pandemic outbreak, but could effectually help to enhance the resilience of our cities and communities, and especially addressing the protection of public health and societal well-being. The findings contribute to major sectors of urban resilience, city management, and public health. The recommendations from this study could be utilised and adapted in any context, allowing for the consideration of all-inclusive decision-making and much-enhanced planning processes.

Keywords

Urban Resilience, Resilience Enhancement, Pandemic Outbreak, Public Health, COVID-19

1. Introduction

During the ongoing COVID-19 pandemic outbreak, many measures or practices helped to make cities and communities more resilient. These are defined as early lessons that we could reflect on and recommend them as methods of making cities and communities more resilient. These lessons are aimed to reduce the impacts on public health and economies through better preparedness and response plans. The methods of urban resilience enhancement are described as major opportunities for preparedness and planning [1] [2], which are certainly needed in the case of later outbreaks. These methods could also be helpful during probable future waves of this current outbreak or potential spikes in infections or clustered cases that are already happening in some parts of the world (such as in East Asia, Middle East, Europe, etc.). We have seen many cities experiencing lockdown several times just because unexpected new waves created potential clusters of the disease in particular communities.

Therefore, in light of these preparedness and planning suggestions, it is suggested to develop and have in place protocols for rapid return to lockdown or emergencies. In doing so, we require to reflect on some of the early lessons and be as adaptive as possible, not only for spatial management [3] but also for the larger scales of city and community resilience. Hence, the role of resilience in reducing the impacts of pandemics like COVID-19 is significant. **Figure 1** conceptualises the prevalence of COVID-19 and relative urban resilience.

During the COVID-19 pandemic, urban resilience was mostly affected by the following five factors: 1) weakness of critical infrastructures, as well as healthcare services and essential facilities, 2) mobility and transportation networks that contributed significantly to the spread of the disease in communities and between cities/regions, 3) community vulnerability due to immediate and enduring health and socio-economic impacts, 4) lack of support to social services that are meant

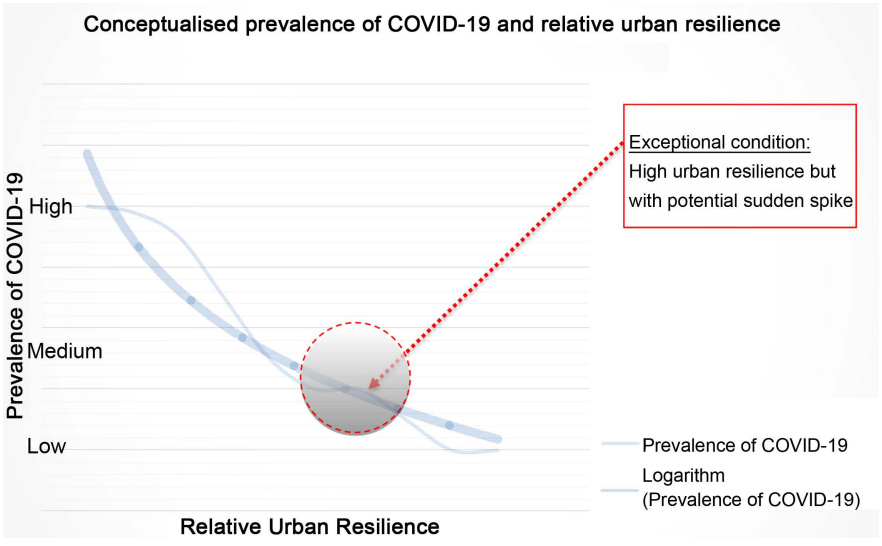

Figure 1. Conceptualised prevalence-resilience model indicating the linkage between high level prevalence and low resilience, and vice versa.

to maintain the wellbeing of the poorer and low-income communities, and 5) lack of preparedness that led to late responsiveness to the containment and control of the outbreak [2]. Therefore, it is evidenced that the influence of COVID-19 on urban resilience could only be managed through early preparedness and prompt city management. The successful examples of control and containment of the outbreak highlight methods of cross-sectoral and multi-sectoral responses to the adversities of the outbreak. Some of these include effective and all-inclusive decision making, temporary policy interventions, and immediate response to protect public health, essential services, as well as societal needs and wellbeing [2]. In sum, urban resilience is directly linked to matters of public health and societal well-being, which are both crucial in the containment process at any scale. The management of public health became ever important from the experience of the Ebola outbreak [4] [5], such as for resilience of health systems [6] and consideration of policy priority areas [7]. We see the importance of public health not only on its own but how it plays its part in making cities and communities more resilient. In essence, the impacts should be managed as early as possible to ensure that the health and wellbeing of society are sustained.

As the pandemic developed (and continue to develop) at a gradual pace, we ought to take steps cautiously and gradually to get back to normal or close-to-normal daily operations. The early lessons that are highlighted here are useful for any potential returns of the outbreak at the city level. The early lessons here reflect on the ongoing situation of this pandemic outbreak, but could effectually help to enhance the resilience of our cities and communities, and especially addressing the protection of public health and societal well-being. As shown in **Figure 2**, we could learn from divers for urban resilience that suggest the relationships between infrastructure and the environment. The same could apply for a non-environmental disaster situation, such as the pandemic.

Globally, we see many examples of preparedness and response plans that worked well in reducing the impacts of the outbreak on the communities, and some truly worked effectively in a short time. This is due to successful methods of maintaining high quality resilience and preparing the communities to face the adversities through sound management procedures [2]. It is evidenced that the early measures enabled the possibility to reduce the later impacts, particularly the more widespread impacts on public health, economies, and local operations [2]. These are narrated as part of lessons learned from urban resilience enhancement that could be adapted to various contexts, depending on the conditions and preparedness of those cities and communities. By shedding light on some of these ideas, we could have a more reflective approach to the happenings around us, questioning in particular how cities managed to cope during the outbreak, and how gradual changes helped us to realize the importance and effectiveness of resilience in our daily operations and city management. These ideas should address issues of vulnerability and help improve cities through the main mechanism of resilience enhancement. This research study goes beyond the boundary of public realms, and also beyond spatio-temporal dynamics of and

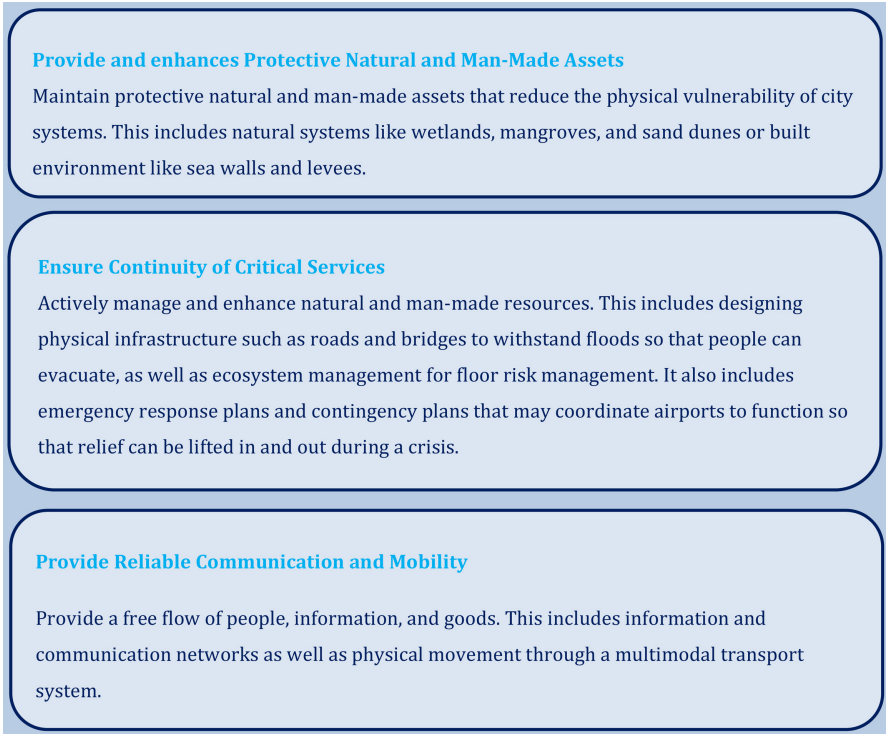

Figure 2. Drivers for urban resilience, in regards to Infrastructure and Environment (Source: Adapted and redrawn by the author from the original version by "100 Resilient Cities" (2018)).

socio-economic factors of cities and society. The aim here is to highlight the move from resilience to better management, something that could be achieved from the many available approaches to city enhancement [8]. This is regarded as adaptive planning through "learning by doing" [9]. Hence, this study briefly reflects on several early lessons for urban resilience enhancement during the COVID-19 and particularly aims to address the importance of preparedness that could make our responsiveness more effective and successful. After all, it is worth preparing for the future, and in particular, against any unexpected spikes in infections; and next time, we hope we could respond with a much-enhanced preparedness. Some of these early reflections could potentially guide future urban transformations [10] [11], which are then more effective in the longer term.

As demonstrated by UN Habitat [12], in their model of resilience thinking, we can verify the importance of the "iterative process" that suggest analytical methods and development of actions for resilience. As shown in **Figure 3**, resilience plays a major part in preparing against the disaster and emergency situations, such as a pandemic like the COVID-19. More importantly, we could verify the role of resilience for the enhancement of essential public and social services, in particular those that are closely associated with public health needs and policy interventions.

This study reflects on two points of "analysis" and "action for resilience" of the UN Habitat's model. In doing so, the study first briefly discusses the role of

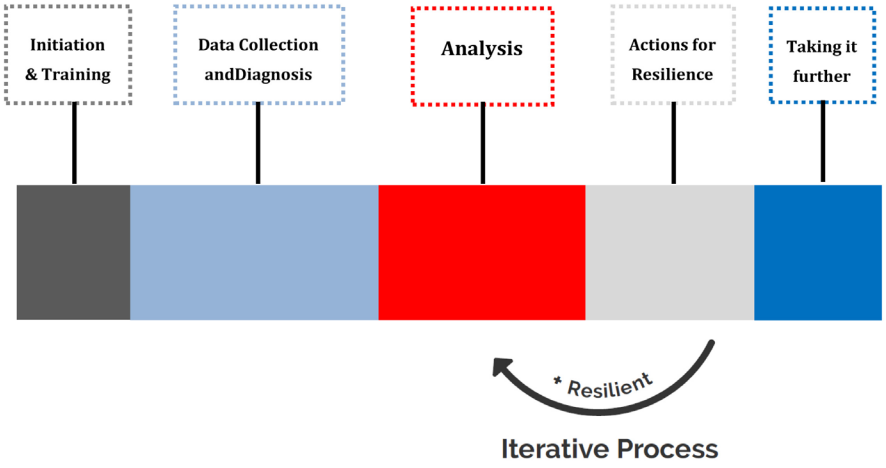

Figure 3. The UN Habitat's model of implementation process for their developed City Resilience Profiling Tool (CRPT) (Source: Adapted and redrawn by the author from the original version by the UN Habitat, 2018, pp. 22-23).

urban resilience in practice. This includes the demonstration of a holistic image of urban or city resilience in relation to four key domains of economy, society, environment, and governance. Later, this study reflects on early lessons for urban resilience enhancement. Through the analysis of the ongoing pandemic and using some of the suggestions from the existing literature, this study provides some suggestions that could be especially useful to protect our cities and communities against pandemics like the COVID-19. Hence, as the pandemic is not yet over, we have to ensure we could analyse the conditions, prepare in the event of future spikes or ongoing effects of the outbreak, and develop action plans. Table 1 demonstrates an example of guidelines developed in Singapore in 2018 after the assessment of the impacts of the MERS outbreak. This example shows the multiplicity of impact assessment and impact management, which could then lead to immediate action plans at various levels and in various conditions.

2. State of the Art: The Role of Urban Resilience in Practice

While we deal with any disease outbreak event, we constantly and simultaneously deal with issues of resilience. Usually, the resilience enhancement occurs through a prioritization plan [2] that suggests directions for keeping the essential units/services safe, maintain adequate public health, and respond to any vulnerabilities in the city. To enhance resilience, we have to be able to address certain factors of urban systems, multiple sectors, governance, and management. These could be seen from the details of urban resilience policy [11], which highlight "a complex and evolving field characterized by significant challenges associated with urban governance systems, political pressures, uncertain and emergent nature of threats, speed of change and the level of complexity of long-lived networks that form cities". Thus, we could reflect suggestions by the UN Habitat [12] on the characterization of urban resilience, which highlights six characteristics of

Table 1. Guideline details of Singapore's "Disease Outbreak Response System Condition (DORSCON)" developed in 2018, and to address three primary factors of 1) nature of disease, 2) impacts on daily life; and 3) advise to public (Source: Adapted and redrawn by the author, from the original table available from Singapore's Ministry of Health).

Colour	Nature of Disease	Impacts on Daily Life	Advice to Public
Green	Disease is mild **OR** Disease is severe but does not spread easily from person to person (e.g. MERS, H7N9)	Minimal disruption e.g. border screening, travel advice	• Be socially responsible: if you are sick, stay home; • Maintain good personal hygiene; • Look out for health advisories.
Yellow	Disease is severe and spreads easily from person to person, but is occurring outside Singapore. **OR** Disease is spreading in Singapore but is: **(a)** Typically mild, *i.e.* only slightly more severe than seasonal influenza. Could be severe in vulnerable groups (e.g. H1N1 pandemic). **OR(b)** being contained.	Minimal disruption, e.g. additional measures at border and/or healthcare settings expected, higher work and school absenteeism likely	• Be socially responsible: if you are sick, stay home; • Maintain good personal hygiene; • Look out for health advisories. (same as Green)
Orange	Disease is severe **AND** spreads easily from person to person, but disease has not spread widely in Singapore and is being contained (e.g. SARS experience in Singapore)	Moderate disruption, e.g. quarantine, temperature screening, visitor restrictions at hospitals	• Be socially responsible: if you are sick, stay home; • Maintain good personal hygiene; • Look out for health advisories; • Comply with control measures.
Red	Disease is severe AND is spreading widely	Major disruption, e.g. school closures, work from home orders, significant number of deaths	• Be socially responsible: if you are sick, stay home; • Maintain good personal hygiene; • Look out for health advisories; • Comply with social measures; • Practise social distancing; avoid crowded areas.

persistent, adaptable, inclusive, integrated, reflexive, and transformative. Such characterization of urban resilience provides an opportunity for us to understand the comprehensiveness of resilience in practice [2] [13]. As such, we could facilitate support to enhance health system resilience [14] [15], but should also do the same for all essential sectors and urban systems [2]. In doing so, we have

to address the needs of sectors individually, collectively, and through a multi-sectoral assessment.

The role of urban resilience in the practice of dealing with a disease outbreak is evident in how cities and communities face the adversities and disruptions. During the outbreak, cities are more vulnerable due to their higher populations, densities, and mobility. This is the reason why urban resilience is associated with the field of resilient urbanism [16] that addresses a range of emergencies, risks or hazards, threats, and disasters. This is also seen in the methods of "creating resilient systems" and those specifically related to three main pillars of "policies", "governance", and "finance" [13]. In this regard, we could reconfirm that resilience is an integrative concept [17], which could be utilized to enhance the safety and capacity of public health, help to promote effective interventions and maintain the societal wellbeing. This could be done in a resilience process development, which supports the idea of having a standardization approach [18], through which we could see the effectiveness of guidelines, measures, practices, and action plans. Moreover, as shown in **Figure 4**, city resilience is measured against four main domains of economy, society, environment, and governance. Hence, its role is relative to multiple aspects and multiple dimensions [2] and cannot be neglected in the event of disaster management and emergency, like pandemics.

This study aims to reflect on early lessons for urban resilience enhancement. This is done through a brief checklist of multiple factors as shown in the next

Figure 4. Measuring city resilience under four key domains of economy, society, governance, and environment (Source: Adapted and redrawing by the author from Organisation for Economic Co-operation and Development (OECD), 2019).

section. These are the global examples that worked in practices to develop resilience in a responsive way. In doing so, this study helps to promote the concept of urban resilience enhancement and suggests these ubiquitous lessons that may seem simple but very effective in the long run.

3. Reflection on Early Lessons for Urban Resilience Enhancement

This study highlights the importance of urban resilience enhancement and how it could be achieved through preparedness and planning. The following early lessons are the ones that worked in cities and regions that are now more confident in relaxing their high-level measures. Some of these cities have also managed to reach the recovery phase, while the infected cases are still increasing exponentially at the global level. These suggestions are summarised in a way so that they could be adapted for any context. The examples below are taken out from the analysis of various examples as well as the proposal for action for resilience as shown in **Figure 3** [12].

3.1. Consider a Holistic Spatial Management

The effectiveness of adaptive measures in spatial management [3] is important in the development of city resilience. Such measures should ideally consider the overarching concept of adaptive planning [2] [9] [19] [20] [21]. Some of these recommended adaptive measures could be used for urban planning guidelines and institutional design [22], and some could be integrated into making cities more resilient [23]. Holistic spatial management is, therefore, important to have a better overview of mobility, spatial networks, socio-spatial dynamics, functionalities, and spatial rearrangements. For instance, the study of spatial epidemic dynamics [24] suggested the need for spatial analysis to prevent the spread of pandemics like COVID-19. Spatial management, however, could be understood at multiple levels. Hence, it is important to verify the needs and measures of each scale, and respond to those through careful action plan. In many cases, we could reflect on successful examples of spatial use for better management of emergencies.

3.2. Pay Attention to Details in a Reflective Manner

During all phases of the outbreak progression, regardless of the severity of the disease outbreak, it is vital to not only address the generalities but also to pay attention to details in a reflective manner. Some of these details are important to make essential sectors safer, safeguard our critical infrastructures [25] [26] [27] [28] and facilities, reduce the disruptions, and address the vulnerabilities [2]. This requires paying attention to details from regular disinfection processes to the enhancement of safety and security teams, medical teams, and essential workers. Some very useful and impactful actions are minimizing cash transactions, prepare the entry and exit points with added control measures, have a reg-

ular monitory and documentation of people's temperature even for taxi drivers and food delivery drivers, etc. [2]. The generalities could often be covered in policy interventions or governance of the outbreak. Through this, the existing examples prove the effectiveness of early interventions that avoided longer health impacts or lockdown measures [29]. Nevertheless, details of specific sectors or units need to be addressed beyond the capacity of often high-level interventions. In this regard, we can see there is a need for action plans specifically for details of controlling and containing the outbreak at multiple scales.

3.3. Early Asset Management and Prioritization Plan

By learning from a war-time situation, we can respond to a war-like emergency time (like the pandemic outbreak) with better management and prioritization plan [2]. This is recognized as a common practice in hospitals and surgeries [30] [31] [32] [33] as well as for communication and care planning [34]. There is no reason why the same cannot occur at the larger scale, where the managed and prioritization are significant in evaluating assets and facilities to combat the disease and contain it in an adequate timeframe. Some examples suggest contingency planning [35], while the others suggest scoring systems for the evaluation of priorities [36]. In all cases, we can reflect on the importance of management and prioritization plan [2]. In recent months, many countries have adapted war-like measures, which have proven to be effective in a short time. Early asset management is recommended in a cross-sectorial approach, including, in particular, transportation services, healthcare services and facilities, provision of essential supplies, and production. By setting a prioritization plan, one sector could support another. This could also develop into a win-win situation. For instance, public transportation services that are possibly redundant at some scale [37] could, in fact, be used to support emergency and health services and their much-intensified operations, or airplanes could bring in essential supplies (such as medical equipment, medicine, food, etc.) [2], and production sector [38] can change its production mode [2] to produce and distribute more essential products. These could also suggest transitioning to different modes for supply and production [39]. In this regard, having early asset management would provide help to priority services and essential workforces.

3.4. Regional Level and Local Level Approach for Implementation

Unless we are dealing with a small-scale country (such as Andorra, Monaco, San Marino, Singapore, etc.), the implementation of action plans against the outbreak cannot simply happen at the national level [2] [40]. As shown in various analytical studies to date [41] [42] [43] [44] [45], the national level data is often aggregated and hard to see the realities of smaller scale contexts or regions. In most cases, we see national-level guidelines, some that then eventually require to be implemented at the smaller scale of the city. These national-level guidelines could, in fact, be further developed in a network of multi-national or sub-regional

strategies [40], which could partly address issues of larger-scale mobility, border control and monitory, and prevention measures at the larger scale. However, in most cases implementation of strategies could only happen at the regional and local levels of cities or communities. The examples of regional strategies at the provincial or federal levels (or equivalent to them) have proven to be more effective than the nationwide strategies that may seem inappropriate to effective prevention strategies. Also, by reflecting on the early lessons, we see that multi-level governance appears to be more effective, particularly when it comes to city-level decision making. At the national level, the guidelines could set directions and larger scale monitory strategies. At the regional level, those guidelines could form into context-specific strategies that could differ from one location to another. This could take into consideration a variety of factors, such as the regional climate conditions [46], regional differences [47] [48], regional networks [49], regional measures [50], etc. For instance, three southern and western federal states in Germany were amongst the most infected ones during the early phases of the COVID-19 pandemic; hence, national-level strategies may seem inappropriate as different locations deal with the outbreak differently due to the variability of impacts and potential threats. Regional strategies could then be adapted to even a more local context, namely at the levels of cities and districts. It is only at this scale that we could see effective implementation of strategies [2], where communities could be protected well and vulnerabilities could be addressed more promptly.

3.5. Early High-Level Measures Are More Effective than Later Restrictions

The early evaluation of the current pandemic outbreak shows successful results in places that adapted early high-level measures [2] [29] [51] [52] in comparison with later restrictions. Examples of these at the city level were the closure of populated—but secondary—public places such as cinemas, galleries, museums, religious buildings, etc. [2]. High-level protection measures imposed at the entry points to healthcare services and facilities also enabled cities to protect their health workforces and support the city's battle against the disease. These measures helped to protect communities [2] [53], high-risk sectors [54], vulnerable groups [55], and essential professionals [56]. The effectiveness of early high-level measures is seen across many cities in Australia, Oceania, Southeast Asia, and East Asia. These measures were later replicated in more vulnerable regions, while we see a higher risk for the ineffectiveness of later restrictions. Early high-level measures could also provide us with better preparedness in the case of next spikes of infections and/or future outbreaks. These should form into protocols and action plan guidelines that could suggest temporary but immediate regulatory changes alongside adaptive measures that could reduce the impacts of the outbreak. In doing so, we could keep our essential sectors safe and prioritize their operations for the safety of the city and society. Early high-level measures could better monitor mobility and transportation, respond to shortfalls of the

production chain, help to address the needs of the vulnerable communities, and support the critical infrastructures. In cities with multiple healthcare centers (*i.e.* mostly in the capacity of hospitals), it is viable to only allocate certain units or facilities to receive infected patients. This could result in keeping the other healthcare facilities, workforces, and daily operations as safe as possible. In the longer term, this approach appears very effective as we can then introduce community-level or district-level nodes for patient treatment across the city. By developing a meso-scale approach (*i.e.* at the community-level all the way to smaller district level), we could also have a better monitory of early high-level measures.

3.6. Include Community Representatives

Bringing back people is recommended as an all-inclusive approach to crisis planning [57]. The city needs its society as much as society needs its government [2]. This approach could include bringing specific groups or communities for decision-making processes [58] [59], or larger groups and actors [2] [60] [61] [62]. In fact, good governance must include both government and people [2]. Hence, by including community representatives, we could push for people-centric approaches to dealing with the impacts of the pandemic on city and society. For instance, successful examples show the immediate development of volunteer mechanisms [2] [63] [64] that could support either the essential workforces or the daily operations of communities. There are examples of larger scale national outreach plans [63] to enhance the pandemic response, and the ones at the smaller scale of clinical level that supported essential workforces [64]. For daily operations of communities, the inclusion of people [57] forms into a community support approach that could directly address issues of communities and provide better community responses. In doing so, community vulnerabilities will not be hidden and nor would they be absorbed to the larger scale economic impacts. In particular, this means identifying the role of people as main actors, who would be able to identify specific vulnerabilities at the community level that could not be seen so easily at the larger scales, and often not even at the city level. In doing so, we could build up trust with communities [2] [57], which is extremely essential to community resilience enhancement and maintaining societal health and well-being.

3.7. Make Good Use of the Right Platforms

We live in the age of new/emerging technologies and digital platforms. It is a senseless mistake if we cannot utilize those technologies or platforms in the right way. With the growing power of social media and non-formal media, we have to be aware of prevalent fake news or misinformation. Such issues could lead to larger-scale anxiety and longer effects of societal fear and wrong perceptions. Hence, regular communication and updates are essential through the main formal media platforms [2], which should be accessible to the general public. At the city level, the governmental authorities should take charge of healthy and trans-

parent communications that could enhance the community's trust as well as the provision of the right education and training. One of the most popular platforms in these days is the use of online teaching, which has accelerated even more than before. Online education could provide support not only to students but also could help to promote the right education to all [2], specifically to vulnerable communities [40] [65]. From infodemic methods [66] to more common innovations and digital technologies [67], the use of such platforms should not neglect the inequalities [68], privacy [69], and governance [70]. By making good use of the right platforms, we should aim to enhance healthy communication through online platforms for regular updates, news, prevention and safety measures, temporary and new regulations, as well as communications with experts and healthcare units. For instance, recent online applications (*i.e.* mostly generated as mobile apps) provide an opportunity for people to get in direct contact with healthcare centers including specialized doctors and nurses. In doing so, we have a chance to reduce sudden and large scale mobility of people to healthcare units, such as hospitals, clinics, and other healthcare facilities. We have to bear in mind that in the current age, it is utterly wrong if we do not use our digital platforms and technologies to support the needs of the city and society.

3.8. Regular Safety Checks, Hygiene, and Prevention

Through examples of high-level safety checks, we see a better progression in hygiene improvement and implementation of prevention measures [2]. For instance, the swift response by the Singaporean Government [29] was meant to ensure safety measures are in place and community transmissions are traced and contained. This was followed by new hygiene measures [29]. The hygiene performances of small scale [71] [72] and nationwide measures of such kind [73] provide us with successful examples through extended temporary procedures. While such measures may not be 100% effective [74], the aim is to ensure public measures are implemented and people comply with them over the required periods [75]. The regularity of such measures helps to reduce stress and anxiety [76], and allow people to adopt personal protective measures [77]. In general, simple—but effective—measures are regular disinfection procedures of more populated areas and public areas, as we have seen to become global through the many examples of supermarket disinfection, public place cleaning, etc. By increasing the community awareness through the right education, we could also enhance the hygiene level that could be practiced but at the individual and collective levels. Also, prevention measures could be practiced more widely and could help communities to protect themselves even further. For instance, the use of facial masks could be a simple—but effective—act. It is scientifically proven that particles from cough and sneeze could travel for several meters. Hence, by wearing a facial mask, we could protect ourselves as well as protecting the others. All these measures alone may seem minimal, but once they are practiced together and at a larger scale, they will be effective in the resilience enhancement of ci-

ties and communities.

4. Summary and Conclusion

To summarize, we could mainly emphasise on some of these early lessons for urban resilience enhancement. Despite the progressive situations in many countries, it is highly recommended to only take gradual actions in reduction of measures and regulations. As the pandemic developed (and continue to develop) in a gradual pace, we ought to take steps cautiously and gradually to get back to normal or close-to-normal daily operations. Moreover, the possibilities of new normal situations and practices are very high [2]. By lifting the measures in a sudden, we risk reversing some of the early progresses and could risk the society with further impacts on its public health and economy. The early lessons that are highlighted here are useful for any potential returns of the outbreak at the city level. After all, restrictions could only be eased either when full containment is reached or a vaccine is developed and made publicly available. As long as we have not reached any of the two scenarios, we have to keep our city and society safe and prepared. This can happen only through resilience enhancement. It is important to ensure cities could enter recovery and post-recovery stages, and this could only happen if we could have gradual progress towards containment, at least the city level. The early lessons here reflect on the ongoing situation of this pandemic outbreak, but could effectually help to enhance the resilience of our cities and communities, specially addressing the protection of public health and societal well-being. It is important to remember that early preparedness would always make our responsiveness more effective and successful.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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