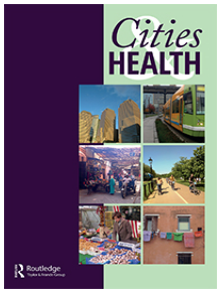

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COMMENTARY AND DEBATE

The impact of COVID-19 on public space: an early review of the emerging questions – design, perceptions and inequities

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ABSTRACT

Restrictions on the use of public space and physical distancing have been key policy measures to reduce the transmission of COVID-19 and protect public health. At the time of writing, one half of the world's population has been asked to stay home and avoid many public places. What will be the long term impacts of the COVID-19 pandemic on public space once the restrictions have been lifted? The depth and extent of transformation is unclear, especially as it relates to the future design, use and perceptions of public space. This article aims to highlight emerging questions at the interface of COVID-19 and city design. It is possible that the COVID-19 crisis may fundamentally change our relationship with public space. In the ensuing months and years, it will be critical to study and measure these changes in order to inform urban planning and design in a post-COVID world.

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COVID-19; design; planning; public space

Introduction

Restrictions on the use of public space and physical distancing have been key policy measures to reduce transmission of COVID-19 and protect public health. We are currently witnessing unprecedented restrictions in the use of public spaces worldwide. Half of the world's population has been asked to stay at home or restrict movement in public (Sandford 2020). Most people are complying with public health recommendations as evident in the striking images of empty city streets, parks, beaches, plazas and promenades. Cities well-known for their active street life such as New York, Rome or Barcelona now appear ghostly as city-dwellers stay home for the collective public good.

In the midst of the COVID-19 crisis, we feel the sting of having lost our familiar, vibrant, social and lively public places. We write from different locations[1] where the pandemic is in different phases and our respective cities have implemented different measures: full lockdown; recommended stay at home measures, and one co-author is in Wuhan where public space is re-opening. While some us are prohibited from being in public unless performing an essential service, others are able to enjoy some parks and green areas. Despite these different experiences, we share an uncertainty about what lies ahead and fear that our sense of place and space may be permanently transformed. When we venture outside our homes, we observe unfamiliar and distant social interactions, raising questions about how social relations in public spaces may be changing.

Planners, designers, architects, landscape managers and journalists are already writing about how this crisis will transform our relationship with public space (Alter 2020, Florida 2020, Roberts 2020). We are still in the early stages of the crisis and it is likely we will be adapting to an evolving global pandemic in the next eighteen months. It will still be weeks until many of us will be able to return to our public spaces, but it is not too early to think about how our professions may have changed or need to adapt.

There is great uncertainty about how COVID-19 will impact future public space design, use and perceptions. How will our relationship with public space change? How long will the changes endure? What is the relationship between public space design and disease transmission? Will the new social behaviours we observe today remain or be ephemeral? Will people's

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Table 1. Summary of the emerging questions about how the COVID-19 episode may change the design, use, behaviours and perceptions in public space.

Use, Behaviour and Perceptions
1. Will we observe fewer people in public?
2. Will we change what we do in public?
3. What is the future of large public gatherings?
4. Will our perceptions of public space change?
5. Will our intuitive carrying capacity for public spaces decrease?
6. What will be the impacts on public transit?
7. What will happen to micro-mobility and mobility sharing?
8. Will we observe changes in the use and regulation of interior public spaces?
9. Will we experience infringements on civil liberties?
Design
10. Will the temporary transformations during the crisis inspire permanent changes?
11. Will streets be re-designed?
12. Will the pandemic accelerate the mainstreaming of health criteria into the design of public spaces?
13. Will green space planning need new designs, uses and practices?
14. Do we need a new typology for public space?
Inequities and Exclusions
15. How will the needs of vulnerable groups such as racial minorities, immigrants, women, the poor, elderly, children, disabled and the homeless be accounted for in future public space designs, practices, and rules?
16. Will cities in the Global South attempt to constrain further or regulate the informal street economy?
17. Will COVID-19 change who moves in and who moves out of newly redeveloped urban centers?
18. Will everyone be able to shift to active transit?
19. Will the pandemic permanently disrupt the interconnected global settlement system and freedom of movement?

emotional connections with places change? How will the benefits we derive from urban nature change? Will the pandemic teach us new lessons to incorporate into our street designs? Is the attention devoted to COVID-19 distracting us from the existential challenges of sustainability and climate change? Or, optimistically, will this global experience lead us to rethink the way we develop and (re)design our cities?

Many scholars and public observers are weighing in on these important questions (Florida 2020, Markusen 2020, Roberts 2020). The contours of this debate are just beginning to emerge. This article aims to summarize preliminary research questions, ideas and conjectures about how the COVID-19 crisis might change our relationship with public space. We recognize the great uncertainty associated with the ideas put forward. The author Eugene Ionesco once said 'You can only predict things after they have happened'. Nevertheless, our focus is on what the world might be like once the pandemic has passed and the restrictions on the use of public space and physical distancing policies have been lifted. We understand that cities may go through more than one peak of the virus outbreak, thereby producing an extended period of physical distancing for 12 to 18 months (Kissler *et al.* 2020). This paper tries to think beyond the current measures to consider which changes will stay with us once the immediacy of the pandemic has passed.

Will the impact on public space be transformational?

The size, scope and speed of the crisis make it feel like we are living through a profound transformation. It is as if we are experiencing a tectonic shift, where the ground is moving beneath us, changing the fundamental principles and rules that have governed our practice. Periods of stability can be interrupted by sudden breaks with rapid change. Evolutionary biologists refer to the theory of *punctuated equilibrium*, in which evolutionary changes are not cumulative and gradual, but rather transpire in specific moments (Gould and Eldredge 1993). Thomas Kuhn conceptualizes these changes as paradigm shifts (Kuhn 1962). These breaks are opportunities to embark on radically new and bold projects. One might conceptualize this moment as a potential counter shock to disaster capitalism (Klein 2007). These moments re-define what is acceptable or radical, shifting what policy makers call the Overton window (Lehman 2019, Crabtree 2020). These periods create opportunities to carry out endeavors previously thought impossible but now are feasible or necessary. When in the midst of this change, which lessons from the past can we still grab onto and what previous understanding must we discard?

It is unclear if the impacts of COVID-19 on public space will be as profound as they are in other aspects of our life (Corbera *et al.* 2020). In the realm of public space and design, a key question concerns how long these impacts will be felt, and the degree to which they will be transformational. The uncertainty we confront concerns not only what changes we might see, but if they will materialize at all. It may take years before we are able to ascertain how the global pandemic has changed the planning and design of public space. Will 2020 define a before and after in planning and design?

Perhaps such predictions are clouded by the immediacy of the moment. Rather than a profound transformation, perhaps the pandemic will merely refine our practices, yet leave our fundamental approaches and values unchanged. Our respective disciplines have already created a deep body of knowledge, understanding and methods for studying public space. COVID-19 is not our first pandemic, nor is this the first time planning and design has focused on improving public health. Improving the sanitary conditions of cities motivated planners, architects and engineers to re-design cities in the late 19th century (Sennett 2018). Since the 1990 s there has been a resurgent interest in work at the nexus of health and urban planning, and the field has become a well-established area of expertise, with an active scholarly community and focused academic journals with strong repute. This field is nourished by scholars from diverse disciplines such

as public health, environmental psychology, planning, and landscape architecture. Seen from this perspective, we should be able to build on existing expertise to update our practices and adapt. Better yet, COVID-19 may present an opportunity to integrate a health perspective into planning in new ways.

Many disciplines are likely to refocus their attention on how they interface with public health. But how will these new ideas be integrated into practice? And how might we leverage the crisis to build more just, healthier and greener cities? Below we review the key dimensions of this debate as it refers to public space which we define as a geographical dimension in which there exists free, legal, unbiased access for all (Benn and Gauss 1983, Carr *et al*. 1992, Lawrence 2001). The emerging questions identified are the result of conversations and exchange between the co-authors, as well as attention to social media and online narratives from practitioners, researchers, policy makers and journalists (Table 1). As co-authors, we do not necessarily agree on what the future may hold, nor is consensus our aim. Rather, we aim to raise the critical new questions that have emerged as a result of our current global health crisis in order to guide future research and policy.

While there are many potential impacts of COVID-19 on land use, urban density, telecommuting, energy, transportation, retail, and so forth, our focus is on how the current pandemic may change public space. Our list of emerging questions is extensive but not exhaustive. We also anticipate circumstances to change between the time of writing and reading. Things are moving fast.

The emerging questions on COVID-19 and public space

Use, Behaviour, and Perceptions

Will we observe fewer people in public?

The most basic question concerns total use of public space. In the post-COVID city, will people flee from public spaces or flock to them? In terms of total use of public space, what spatial and temporal patterns might we observe?

Public life studies often count people in streets, parks or squares in order to assess use patterns and evaluate how the site is functioning (Gehl 2013, Anderson *et al*. 2018, City of Vancouver 2018, Akaltin *et al*. 2019). Often, the presence of people in a space is interpreted as indicative that a public space is functioning and healthy (Gehl and Svarre 2013, Sadik-Kahn and Solomonow 2017). Professional planners speak of 'sticky streets' where people stay and linger (Toderian 2014). Downtown associations and retailers count pedestrian traffic in order to estimate potential rents for commercial real estate or to estimate retail revenue. The scholarly work on pedestrian measurement and modelling (Hankey *et al*. 2012, Ryus *et al*. 2016) may undergo a major upheaval following the pandemic. In some cities, the pandemic may show a break from the past, and pedestrian models that rely on past data might need re-calibration. In a post-COVID world, how might we change how we gather and interpret data on public life?

We might also expect changes in the temporal patterns and spacing of users over the day, as people try to avoid peak hours. Will we see the rationing of hours for retail, use of parks, public transport or other places? How might these imposed schedules affect use and perceptions of place? One would expect very different responses in each city, space or context. Once again, it is unclear if the short term changes observed during the pandemic will persist, implying a fundamental shift in the patterns of public use. To answer this question researchers will often rely on digital data sources collected by mobile devices and sensors in the built environment which are 'always on' and capture ongoing changes (Salganik 2017). Such data collection devices may be used for a variety of purposes including government surveillance, raising legal and ethical questions.

Will the users of public space be different? Are men more likely to venture outside than women? Will the elderly be more likely to stay at home? The pandemic may reinforce social and class differences in the use of public space. Lower income households are more likely to be in public because of employment obligations. Geospatial data has shown that lower-income workers continued to move around in the midst of the pandemic, while higher income workers were more likely to work from home (Valentino-DeVries and Dance 2020). Skilled workers in the knowledge economy can more easily shift to online and distance working, thereby minimizing exposure. Lower income workers may not have this choice. If this teleworking model becomes more entrenched, it could change *who* is using *which* public spaces and further exacerbate social divisions and inequalities. Knowledge economy workers may make more use of parks, promenades and green spaces, whilst those who cannot work from home will be more exposed working in public spaces and streets. Some public spaces may cease to be places for social mixing by class, education level or income. The structural production of spatial segregation in public spaces creates political and moral dilemmas for future design and investment in urban space.

Will we change what we do in public?

The modern notion of public space was born in the 19th century when city dwellers strolled the boulevards of Paris, London, or Barcelona (Solà-Morales 2008). Those who walked the wide streets were

captivated by the beautiful window displays, as the emerging consumer culture contributed to the development of public space. At the same time, early window shoppers were aware of each other. They came outside to see and be seen (Sennett 2018). These two early activities in public space, shopping and socializing, are precisely the activities that are most likely to be impacted by COVID-19. In other words, COVID-19 is challenging the two activities that brought people out into the city in the first place, when the very idea of public space was born.

The concern that online shopping may decimate brick and mortar stores is a topic that will receive ample attention by other authors, and they will do more justice to this issue than we can. Here we merely emphasize that COVID-19 is likely to produce a drop in pedestrian traffic associated with commercial activity, and that this reduced pedestrian traffic will have negative multiplier effects on many local stores, coffee shops and retailers, which ultimately will threaten to change neighbourhoods.

Our social behavior in public may also change. During the pandemic, neighbours have found creative ways to stay connected and combat isolation by communicating across balconies or driveways (Siossian 2020). At the same time, the pandemic may limit our ability to develop new relationships, especially among strangers. Public space might still be a place for social interaction, but it may be more difficult for the spontaneous and informal. These forms of exchange are often needed to build community. To understand the impacts of COVID-19 on socialization and informal social interactions, we will need observational and qualitative field work once the restrictions have been raised. It may also be useful to revisit past public life studies that collected data on average group size in public.

Cities such as Lisbon, Barcelona, Palermo, New York, Bangkok, Cape Town, Mecca, or Sydney that rely on tourism are likely to notice significant reconfiguration of street activities, especially near major attractions or on streets that rely on foot traffic from visitors. The look and feel of these highly visited cities will change. In China there are signs that in some cases, tourism can rebound. During the Qingming Holiday in early April 2020, an estimated 20,000 tourists wearing protective face masks crowded the mountain trails of Huangshan (Hardiman 2020). Will the impact of COVID-19 be more severe in cities that are a tourism destination and how will these cities respond?

What is the future of large public gatherings?

An obvious potential consequence of COVID-19 is a generalized aversion to large crowds. Concerts, cultural events, sporting events, ceremonies, markets and political protests all bring together many people, often in public squares and plazas, and create a vibrant social and cultural life. In the immediate future, these gatherings will be restricted. But will the public develop a permanent aversion to large public gatherings?[3]

Such a shift could have implications for how we design our cities but also have important cultural and political consequences. Large public spaces have provided citizens with a space to organize, form groups, come together and voice political dissent throughout human history. Consider the Zócalo in Mexico City, Tiananmen in Beijing, Madan in Kiev, Tahrir in Cairo, Gezi Park in Istanbul, among others (Luisa Martin 2014, Özgen 2014). Turning our backs to these spaces would debilitate our notion of public space as 'agora,' as spaces of civic action, and threaten to restrict opportunities for coming together. Will the social, civic and recreational uses of the public realm need to be rediscovered and reinvigorated?

A permanent aversion to large public gatherings might change how cities are designed. Most cities have at least one large space to accommodate for large gatherings. Designers often intentionally avoid placing benches, fountains or other permanent infrastructure in large squares to allow for these gatherings, even if infrequent. This practice could be reversed, premised on other urban needs, and go largely unnoticed.

On the other hand, a post-COVID world might value these large flexible spaces as assets. Public spaces are a key feature of a resilient city, in part because of their ability to be transformed for emergency health purposes (Polko 2010). Our current public health emergency has demonstrated the value of flex spaces. Large green spaces and convention centres have been converted into emergency field hospitals in Vancouver, New York, and London (Booth *et al.* 2020). In India, empty malls are being turned into shelters for migrant workers who are unable to return to their villages. The value of large public spaces may push us toward modular and decentralized designs that permit this flexibility.

How urbanites will respond to large gatherings is likely to depend on contexts, as well as the expectations about future outbreaks. The perceived risks associated with large gatherings are likely to be highly sensitive to cultural norms and heterogeneous across cities and regions. In many cities and cultures, large gatherings are simply too important for a city's identity, culture or economy. Many religious and cultural celebrations have been celebrated for centuries, having survived countless disruptions, droughts, war and unrest. While it might be possible to postpone or delay celebrations and events temporarily, in many circumstances it will be impossible to halt significant religious or cultural gatherings and ceremonies altogether.

Will our perceptions of public spaces change?

Urban designers aim to create places where people feel welcome, comfortable and safe. Perceptions of public

space are an important field of research (Pugalis 2009, Heffernan *et al.* 2014) and public perceptions may dictate what is designed and how. However the current pandemic threatens to profoundly change our relationship with these spaces, especially when other people are present.

The lockdown and stay at home measures may change how children and youth develop a sense of attachment and intimacy with public places. Not generic public space, but the city places previously associated with their emotions and feelings, such as squares, parks, alleys, river fronts – places where people may have had romantic or cultural experiences. Youth might become less attached to these places as a result of the prolonged absences, or might grow more accustomed to online isolation.

More optimistically, those who have lived through severe or lockdown may have a renewed appreciation of parks and plazas, although this may not be the case for everyone. There are likely to be heterogeneous effects by individuals, and perhaps gender and age, and other dimensions. We can also expect large variation by city, country or region. It is also possible that the changes in perceptions will correlate with the severity in which COVID-19 impacted a city, the severity of the lockdown measures during the crisis, the economic impact on the household, among other correlates.

COVID-19 has motivated health authorities in Latin America to restrict access to large shopping areas and malls. For high-income families, this has forced a change in consumption habits and obliged some to venture into less familiar neighbourhoods. The pandemic may generate new patterns and configurations of use, potentially reshaping public space in Latin American cities. While certain public spaces might become more valued, the restrictions may also increase perceptions of insecurity, – an issue that strongly dictates use (or lack thereof) of public space in Latin America.

Will our intuitive carrying capacity for public spaces decrease?

After years of systematic observation, William Whyte proposed that spaces appear to have a natural carrying capacity (Whyte 1980). He observed that individuals would cluster on the steps outside of office buildings in New York City, and the total number of people would hover around a certain maximum. He hypothesized that each space had a carrying capacity, and individuals would intuitively leave if the area was close to capacity. He suggested that each of us have an intuitive feeling about what 'too many people' feels like. This might vary by gender, age, personality or cultural norms (Hall 1966, Sommer 1969). But we suggest that the COVID-19 crisis may alter our intuitive natural sense of what the 'right' number of people for a particular space might be.

What will be the impacts on public transit?

There is serious concern that the public will reject public transportation in favour of private motor vehicles. People are afraid, with good reason, to travel by public transport. A study in Hubei showed COVID-19 spread from one person to nine over the course of a single long-distance bus journey (Null and Smith 2020). Where there will be a choice, people will likely prefer their own vehicles or taxis or ride-sharing services that can be regulated with virus-free drivers and deep cleaning.

It would be naïve to assume that people will happily return to public mass transit without major adjustments to vehicle design and operations, as well as to infrastructure in public spaces to help prevent the next spread. In China, private car usage nearly doubled when lockdown ended (Rannard 2020).

Busses and trains will have to carry fewer and more dispersed passengers, public space is needed to disperse the ingress and egress at stations and bus terminals; this introduces crowd management policing to keep order and manage compliance with physical distancing for the increased queues. Transit and vehicle installations will need more space and staff for much more frequent disinfection. Various steps in this direction can already be seen around the world – in Wuhan, Kigali, Rome, Washington DC, New York, Hong Kong, Istanbul, Barcelona (EFE 2020, Null and Smith 2020, TUMI 2020).

The pandemic has highlighted that lower income and working class are more dependent on public transit (Bureau of Labor Statistics 2019). Therefore investing in public transit is key to avoid exacerbating socio-spatial inequalities and to achieve transit justice. Even before the pandemic, many transit agencies were already under budget pressures or operating at a loss (Acitelli 2019). There is concern that public transit systems will not be viable with lower ridership and the implementation of distancing measures. Maintaining a 2 m physical distance would reduce the rush hour capacity of the London Underground to 15% of normal (Rannard 2020) and cut daily revenues.

A worst case scenario is that public transit systems go bankrupt as a result of the massive fall in ridership. Without public support these systems may be privatized or dismantled. The impacts on city public space will be deleterious – increase in road congestion, pollution, and more social division (Mehmet 2020, Rannard 2020).

What will happen to micro-mobility and mobility sharing?

Micro-mobility and mobility sharing were booming prior to the pandemic, and their widespread adoption was leading to major disputes over space on sidewalks,

curbs, parks and other urban places (Abend 2019). Micro-mobility devices have been struggling for space on the streets, competing with pedestrians, bikes and motorized vehicles. As individualized transport, these smaller devices might be welcome in a post-pandemic world and could benefit from street re-designs that allow for wider sidewalks or enlarged cycling lanes. The affordability of these devices may also make them attractive when the economy is in a downturn. Some cities such as Milan are encouraging e-scooters to replace cars (Rannard 2020).

At the same time, the sharing model might be hurt by the perceived health risk of sharing vehicles with an unknown community. All mobility sharing models (car, bike, e-scooter) will need to invest in regular hygiene and vehicle cleaning. These additional costs may make the financial model unviable for the service provider or increase costs for users. On the other hand, it is possible that users are not dissuaded, and that sharing rebounds after the pandemic as a preferred alternative to public transit. It will also be valuable to track where mobility conflicts increase or decrease as a result of the changes to street designs and mobility patterns.

Will we observe changes in the use and regulation of interior public spaces?

Interior spaces, exterior spaces and public space are closely related. Many older cities invest heavily in public space precisely because the living quarters in homes are more cramped, smaller, and darker. How will the pandemic change the relationship between interior and exterior spaces? The stay-at-home measures, and lockdowns in particular, have already shattered traditional use designations inside our homes. Those of us confined to small apartments, especially with young children, have entirely transformed our home interiors. A kitchen is no longer merely a place for cooking and a bedroom is no longer a place for resting. We have discovered new corners and functions for small spaces, walls, ceilings, windows, balconies, and unused rooftops. Some residents also have managed to make greater use of community ground floors and playgrounds. Confinement has led to multifunctionality, creativity, fluidity and adaptation (Rosel 2020).

Fears of contagion in closed indoor spaces may increase demand for more exterior spaces and improved ventilation. COVID-19 may provide particular challenges for the design of libraries, government office buildings, waiting rooms, schools, or other public services, which might need more exterior spaces and more ventilation. Service industries and restaurants might need to reorganize themselves to accommodate for more outdoor spaces where the risk of transmission is lower, or locate fewer tables located further apart. Those new uses might also trigger new conflicts with pedestrians.

Interior spaces are heavily regulated by many codes and laws, and like all regulatory systems, the rules are contextual and value-laden. To-date, interiors have been largely shaped by minimum distances. Common minimum distances include those for residential hallways, corridors, or distances between urinals, and dimensions between seats in classrooms. Most of these are significantly smaller than the recommended COVID-19 physical distances.

If, over the long-term, there was a decision to enact changes to regulations governing interiors that are more in line with recommended 'physical distances', the consequences would be much larger than envisioned at first sight. The dimensions of buildings and their associated footprints would grow considerably, since regulatory minimums are typically used for the most common everyday spaces within buildings. The effects of this would be heavily felt across the urban landscape space, as urban densities will have to increase to accommodate an additional 2.5 billion urban dwellers by 2050 (van der Berg 2020). For example, one can easily foresee city-scale regulations responding to the additional space requirements for higher interior minimums with higher floor space allowances, meaning higher buildings. As such, any changes to regulatory minimums required for interiors must ultimately be weighed against its systemic impacts on city building, land use requirements and design.

Will we experience infringements on civil liberties?

Surveillance systems, tracking technology, and restrictions in movement were essential strategies that have allowed governments to slow down the outbreak (WHO 2020). These strategies have been implemented via control measures such as physical barriers, police checks, permit systems, robots, drones, and CCTVs. In China such systems have also been installed inside apartment buildings to control when individuals leave their home (Gan 2020, Tan 2020). Many of these systems have been installed without much public discussion over the past decades; but COVID-19 has legitimised them. Increasingly, public spaces are being 'panopticonned' (Foucault 2012). For instance, France has used CCTV in the Paris metro to estimate face-mask use.

Phone apps for tracking virus exposure and transmission and for contact-tracing are developing rapidly, and largely accepted by the public (French and Monahan 2020). There are more than 50 state-driven tracking app projects in 30 countries in addition to the Apple-Google collaboration (GDPRhub 2020). The technology and applications are moving so fast it would be unwise to make predictions. Two approaches dominate: (A) geo-tracking via GPS,

where the system identifies if the paths of two people have crossed, and (B) peer-to-peer connections via Bluetooth to identify interaction. When a user develops symptoms or tests positive for COVID-19, then that user's history is shared to all app-enabled phones (if decentralised), or to the health authorities (if centralised). Everyone contacted may voluntarily – or be compelled – to return home, self-isolate and await testing.

Critics of these technologies cite data breaches, false positives, privacy violations, the harassment of identified carriers, and ultimately, the misuse of data by authorities. In Australia users of the COVIDSafe app were promised that the data would be stored in Australia and only accessible to health authorities. The health minister declared "not even a court order" would allow police or other authorities to access it, and all data should be wiped after 21 days. But these data have already been hacked. Officials in France have called for tech firms to relax their privacy protections because they want to build an app "tied" to France's massive centralized healthcare databases (Burgess 2020a).

Despite government calling on altruistic social responsibility to 'flatten the curve' there appears to be some resistance to surveillance via phone apps. Even in Singapore, a normally compliant population, only 1/6th took up the Government's contact tracing app after a month; and in Iceland, only 40% of residents were using Ranking C-19, the most extensive contact-tracing app in the world (Burgess 2020b). Our awareness of surveillance and tracking efforts might itself contribute to changes in mobility patterns, – a type of spatial-Hawthorne effect for movement in public space. To avoid being tracked, some might choose to leave their devices at home. For racialized minorities and immigrants, the use of surveillance methods might create new fears of control, restrictions, and arrests, thus discouraging their presence in public.

Pervasive surveillance and monitoring may also change use patterns in public space. China is trialing a strategy that tracks potential infections with controls in public places. Officials check for the use of face masks, conduct temperature checks, and verify individualized QR (Quick Response) health codes that are obtained online from the health authorities. The QR code serves as an electronic voucher for individuals to enter and exit buildings, subway stations, parks, shopping malls, supermarkets.

Structurally, the crisis may be used to crack down on the civil liberties of Freedoms of Peaceful Assembly (Article 20 of the UN Universal Declaration of Human Rights) and of movement, by preventing large gatherings (UNOHCR 2020). Restricting movement may be an effective strategy to reduce COVID-19 transmission, but they can easily be used to deny mass gatherings and suppress political opposition, as seen in Spain, Hungary, Brazil, Venezuela, Hong Kong and elsewhere (Amnesty International 2019, Brannen 2020, CELAG 2020, Gebrekidan 2020).

Design

Will the temporary transformations seen in cities inspire more permanent changes?

Our cities have felt different during the pandemic. Particularly in cities with severe lockdown, residents have noticed major reductions in noise and air pollution and even a return of wildlife (Millan Lombrana and Roston 2020, RSA 2020). These temporary changes have allowed residents to re-imagine their city as a place that smells better, sounds more peaceful, and permits better sleep. Satellite data show massive reductions in air pollution across China when restrictions were in effect (NASA 2020). While the links between urban air pollution and premature death are well established, if these are extended to higher mortality rates in cases of COVID-19, cities will have strong arguments to make these temporary changes permanent, with far-reaching positive effects on health at both ends of the age scale (Martelletti and Martelletti 2020, Null and Smith 2020, Wu *et al.* n.d.). A mid-April survey in the UK found that a clear majority would welcome these changes as permanent, while just 9% want 'a complete return to normal' (RSA 2020).

Cities such as Vienna, Boston, Oakland, Philadelphia and Minneapolis have closed roads to give more space to pedestrians and cyclists (Laker 2020). These temporary road closures and other short-term measures are serving as testing grounds for changes that may eventually become permanent (Bliss 2020). Bogotá has widened bike lanes and added 76 km of temporary bike, Milan has added 35 km, and Mexico City has a plan for something similar (Armario 2020, Wray 2020). Researchers in the United States are building a database of cities that have implemented cycling and pedestrianization projects in response to COVID-19 (Combs 2020), even cities that are more car-dependent such as Oakland or Minneapolis. Many are arguing that the temporary road closures will serve as a catalyst for embarking on more ambitious projects in cyclepaths, pedestrianization, and public space enhancement that citizens have demanded for years (Bliss 2020). Australia and many other governments have made funding available for temporary projects (widening walkways) and more permanent, long-term projects (added crossing points) towards public space intervention projects (Thompson 2020).

The urban experiments in pedestrianization and traffic reduction provide a valuable precedent. Yet permanent transformations will still require changes in personal habits, policies, incentives, and urban infrastructures. Researchers may consider tracking

how these experiments have influenced the views and opinions of residents or changed the perceived political feasibility of these initiatives among decision makers. Following up on the long-term impact of the COVID-19 street closures will also help us learn about where and why some of the changes have become adopted. This may also provide a critical learning opportunity for theory development in tactical urbanism (Lydon and Garcia 2015).

Will streets be re-designed?

Optimists argue that COVID-19 is an opportunity for city planners to liberate more street space for pedestrians and cyclists, moving us closer to greener cities and a low carbon economy (Nieuwenhuijsen 2020, Roberts 2020). In the early days of the crisis there was considerable discussion about the need to widen sidewalks and re-design pedestrian crossings in order to meet physical distancing recommendations (Alter 2020). Famously, New York City was talking about making such a move (Bliss 2020), however Milan appears to be the first to announce permanent changes, with the widening of sidewalks, 35 km of new bike lanes and the removal of lanes for vehicles (EFE 2020). Other large cities including Boston, London, Vancouver, Brussels, New York, Paris, and Barcelona have begun reconfiguring streets to accommodate more cyclists and pedestrians over longer distances (Hawkins 2020, Mehmet 2020, Topham 2020).

Sidewalks in the Global South tend to be crowded, irregular, if they exist at all. Sidewalks are occupied by street vendors, pavement dwellers and a range of informal activities. In India, the physical distancing measures announced have meant 'jugaad'[2] style appropriations of streets. In efforts to direct physical distancing while queuing, sidewalks leading to shops have been marked with yellow circles a meter and a half apart. Cities in both the Global North and South have to consider adding more space to accommodate for new queuing norms at the entrances of shops, services and public facilities.

It now appears that an extended phase of physical distancing will be put into effect once the stay at home measures have been lifted. This period may invite cities to implement low cost and temporary street-calming and pedestrianization projects through new funding programs, potentially following principles of tactical urbanism (Lydon and Garcia 2015, Stokes 2020). Feminist activists in London have deployed guerilla actions to reclaim street space against cars and for pedestrians and cyclists (Rannard 2020). Cities might revisit Barcelona's superblock model, in which vehicular traffic is redirected in and out of the neighbourhood in a U-turn preventing non-residents from traversing a neighbourhood but still allowing local access (Speranza 2018, Rueda 2019). Barcelona has already developed several superblocks and has made plans to expand them over the city grid (Zografos *et al*. 2020).

Streets might need to be re-designed to meet other emerging needs besides physical distancing. Online shopping and home food delivery have taken off, creating a huge demand for drop off and delivery space. This increased demand for curb space may force us to revisit our ideas about curbside street parking, not only to meet new delivery needs, but also to free space for pedestrians.

Any future changes to street design will be politically fraught and contentions. Re-designs are likely to remain contentious. It also is unclear which cities will be able to act on the re-design ideas being proposed, and if so, how quickly. The space restrictions will not change, and there will still be a competition for right of way. The redesign and repurposing will also still depend on broader challenges such as individual transportation choices and regional transit funding.

Will the pandemic accelerate the mainstreaming of health criteria into the design of public spaces?

Including health considerations in the design of public space is not new, yet its application remains highly uneven (Nieuwenhuijsen 2016, Nieuwenhuijsen and Khreis 2019). The inclusion of health criteria in public space design is incipient, even if several authors have developed tools that may assist planners and designers to conceptualize, design and build with a health perspective (Bird *et al*. 2018, Public Health Scotland 2019). It remains to be seen how these ideas are mainstreamed and what physical form they will take.

Street re-designs that free space for pedestrians and active mobility can help meet several public health objectives, notably through physical activity and the reduction of pollution exposure. The health arguments for active mobility have existed for years (Saelens *et al*. 2003, Nieuwenhuijsen *et al*. 2019), but have not always received the attention they deserve. The pandemic has focused attention on healthy cities unlike anything seen in a generation. And yet this current focus is mostly on disease control. Will the current focus on disease control in cities take momentum away from the trend in urban health that focuses on salutogenesis or somehow change our underlying model of urban health? In a post-COVID world, will stakeholders take the health arguments in planning more seriously? And most importantly, will they succeed in transforming streets to become healthier, safer, greener and more livable?

Will green space planning need new designs, uses and practices?

A pivot toward healthy cities is likely to be accompanied by a more serious effort to make cities greener. Yet the pandemic may change the type and distribution of green spaces we want, as well as our

expectations about what green spaces should provide. We foresee a greater demand for smaller green spaces or neighbourhood parks which serve as places of refuge from the loud and bustling city. These places of refuge might be preferred whether or not they are green or grey, a small park or an alley.

Our changing preferences and expectations about green spaces may lead to new designs, uses and practices in green space planning. For example, green space designers might need to create more spaces for individualized recreation in place of team sports. Running trails and paths might be widened. And new expectations regarding physical distancing may require re-assessing where individuals might be able to exercise within green spaces. We also might need new or expanded exercise infrastructure given that existing green spaces may not be able to absorb the influx of people at the revised levels of appropriate density. What will be the impact on longer term management planning for landscapes, parks and places?

In cities with stay at home orders, we have observed more use of green spaces, with pressure growing on large urban parks. The small neighbourhood parks also seem to be undergoing a renaissance (van der Berg 2020). Are these changes permanent? Will planners begin to prioritize the design of smaller local, neighbourhood green spaces? Or instead will they focus on protecting large open spaces where physical distances are easier to achieve? In the design of larger parks, will more focus be given on ensuring physical distancing for those exercising? Cities with an existing decentralized network of small green spaces such as Valencia (Spain) or Nantes (France) will be better prepared to provide easily accessible opportunities for the enjoyment of nature. From a biodiversity perspective, continuous networks of green spaces with large parks as important hubs will still be more valuable than isolated patches (Forman 1995). Yet a decentralized network of smaller green spaces will make it easier for residents to have their 'daily dose' of nature. Even visual access to nature has been shown to have important physical and mental health benefits (Velarde *et al.* 2007).

Ample scientific literature has documented the health benefits of green spaces, although there is still work being done to understand the mechanisms and pathways that explain improved health outcomes (Gascon *et al.* 2015, van den Bosch and Ode Sang 2017, Rojas-Rueda *et al.* 2019). Social interactions have also been identified as a major pathway in which greenspaces improve health (De Vries *et al.* 2013, Litt *et al.* 2015). The degree to which the social pathway is able to generate health benefits in green spaces in the future may need re-consideration or nuancing.

In the aftermath of the crisis, cities may revisit the potential of unused spaces such as brownfield sites and building rooftops. Cities have a staggering amount of rooftops that are underused, poorly equipped and not meeting their full potential. Chicago has led the way (Francis and Jensen 2017), and Barcelona has identified thousands of grey rooftops, of which only a few have been converted into rooftop gardens (Sanyé-Mengual *et al.* 2016). Community gardens represent another aspect of the urban green fabric and are particularly adaptable to health policies regarding physical distancing while allowing for meaningful social and emotional connection. These spaces, whether in the sky or on the ground, are likely to receive renewed attention as open air refuges for stress relief, recreation, cultural activities and social connection.

If there is new attention and interest in urban green areas, a fundamental question becomes: How will cities fund the extension, redesign and long-term management of landscapes, parks and places?

Do we need a new typology for public space?

The pandemic could force planners and designers to create a new vocabulary or typology to describe places in terms of social density, distances, crowding, or public health risks. The pandemic will create a new lens through which to think about public space, and this new conversation will need a new vocabulary to help organize our ideas and analyze spaces.

For green spaces specifically, the pandemic might force us to revisit our existing green space typologies (Cvejić *et al.* 2015), with local neighbourhood parks, pocket parks, avenues, and informal green spaces getting greater focus (Rupprecht and Byrne 2014), while larger parks may take on a different function and use during a pandemic (Samuelsson *et al.* 2020), with e.g., larger parks becoming more important for physical exercise. In order to ensure physical distancing, temporary design and recreation management measures have been taken. This also implies that typologies should focus on the level of the individual green/public space, but also include ownership and management consideration covering the whole range of private to public land.

Neoliberal economic policies have produced a surge in the privatization of public space, often ostensibly for 'public' use, but as places of consumption. New York City has lost open access public space at 'a grand scale' (Samuelsson *et al.* 2020), and parks under some form of public-private ownership and management are becoming more common.

Ways should be found to include consideration of how individual spaces are part of public space networks with their own specific functionalities. New public space typologies should also consider the temporary uses of green space as illustrated by the temporary hospitals in New York's Central Park, and the appropriation of public space for burial grounds.

Inequities and Exclusions

How will the needs of vulnerable groups such as racial minorities, immigrants, women, the poor, elderly, children, disabled and the homeless be accounted for in future public space designs, practices, and rules?

Public spaces serve a variety of purposes for different demographics and are particularly important for socially vulnerable residents (Anguelovski *et al.* 2020). COVID-19 is already exacerbating existing inequalities (Kluth 2020) and access to public space is not exempt. Public spaces are often the only recreational outdoor spaces for low-income residents and provide relief from cramped living conditions. Since green spaces in lower-income neighborhoods of the global North are often smaller, under-maintained, and less numerous than those in wealthier neighborhoods (Heynen *et al.* 2006, Dahmann *et al.* 2010), physical distancing is more difficult here. In the Global South, neoliberal urban policies have produced segregated and fragmented cities, especially in Latin America (Carrión and Dammert-Guardia 2019), with important differences in the quantity and quality of public spaces between high and low income neighbourhoods (Vicuña *et al.* 2019). In addition, if public spaces become more heavily controlled and isolated, these closures might accelerate the proliferation of gated communities and privatized spaces for the wealthy.

In Latin America, the limited quality of public spaces in lower income neighborhoods is compounded by the absence of safety and security, as criminal groups have taken functional control of these spaces. In Chile, Bolivia, or Venezuela, the pandemic has led authorities to reassert control of the streets to enforce the quarantine and restrict movement, thereby making these spaces safer for health workers or essential services, but unusable for the general public. This raises new questions with regard to police-based, militarized and surveillance approaches to ensuring safety in city spaces (Luneke 2015). Our current condition is creating a powerful precedent, and public opinion is divided on how much of a police-state we are willing to accept in exchange for safer cities. The risk is that the formulation of new surveillance-based and policed spaces will deepen patterns in segregation and fragmentation in the Latin American city.

In addition, racial minorities, the homeless, and the poor have been harder hit by COVID-19 because they have less access to health care, are often front-line workers, and face greater difficulties in safe self-isolation (Du *et al.* 2020). In India, economically vulnerable groups such as pavement dwellers, migrant workers, and street vendors depend on public space for basic needs such as shelter and livelihoods. Not only have they lost access to basic services, but in some cases have also been subject to increased surveillance and even violence, all enacted in public space (Mawani 2020). This surveillance might negatively impact other vulnerable groups across the world as well. Undocumented immigrants, racialized minorities, and homeless residents might avoid public spaces in the future if those are more patrolled, controlled, and 'securitized'. Homeless residents may feel the same pressures. Yet, in some cases, some public spaces might become more secure with increased policing, leading to the decrease of criminal activities, allowing others to use those spaces again.

Will we see more overt racial attacks and violence in public space? During the pandemic we have witnessed disturbing attacks on minority groups around the world. Racial slurs, mockery, insults, verbal and physical abuse are increasingly being seen in public. What will be the impact of racist attacks on minorities in their use, acces and perceptions of public space? Will the pandemic deepen inequities regarding fear of surveillance, control, and violence? In the US, the recent murder of Ahmaud Arberty and George Floyd remind African Americans yet again that streets and green spaces are not safe spaces for them (Summers 2020). Black lives and bodies have been historically surveilled and controlled by police and citizen violence. Now other racial groups may confront increasingly brazen attacks in public.

Public spaces are particularly important for the elderly, children and women. Children and youth depend on public spaces for socialization and recreation (Christian *et al.* 2015). For seniors living alone, public spaces provide social interactions that mitigate isolation and loneliness. Women's access to public space and safety have been impacted by lockdowns and stay at home orders. In the UK, phone calls to domestic abuse helplines have jumped 700%; in Spain, domestic abuse reports went up 18% in the first two weeks of COVID-19 lockdown; with similar patterns seen elsewhere (Felbab-Brown 2020, Townsend 2020). Religious minorities may experience further discrimination in public space as associations are made between class, religion, and the spread of disease. In India, for instance, the media linked the spread of COVID-19 to a Muslim gathering in New Delhi, leading Muslim public spaces to become viewed even more suspiciously than before (Ellis-Petersen and Rahman 2020).

All in all, there is no guarantee that redesigned and reimagined public spaces will be truly accessible, inclusive, and welcoming to all residents, especially vulnerable groups. However, putting their needs at the center of post-pandemic public space planning should be an environmental justice priority.

Will cities in the Global South aim to constrain further or regulate the informal street economy?

The hum and shouts of street vendors is a vital part of the economic and social life of many cities and towns in the Global South (Brown *et al.* 2010, Janoschka and Sequera 2016). Millions of households depend on the informal economy that unfolds in public space (International Labour Organisation 2018). In Mexico alone, 31.3 million people work in the informal sector, representing over half of its working population (INEGI 2020). In the short term, many street vendors are already forced to decide between the risk of illness or the risk of not being able to provide for their families. The policy demands of physical distancing and stay at home are not just difficult, but often impossible (Wasdani and Prasad 2020). What response, resistance or re-organization might we see in street vendor communities in the Global South?

The pandemic is likely to push street vendors and other informal workers into a long term economic recession. In Bangkok, for example, earnings of street vendors are down 80% since implementation of a mandatory lockdown by the Thai government (Taylor *et al.* 2020). Consumers may increasingly walk away, as bustling outdoor street markets may be seen as hazards or sources of contamination (Wertheim-Heck 2020).

The state of emergency in Latin American countries is severely impacting the informal economy, where this sector represents between 30 and 40% of the workforce. The situation is especially difficult in Colombia, Peru, Chile, and Ecuador that have received a large influx of undocumented workers, many from Venezuela, who are a large proportion of informal street workers. With a weak welfare state, workers are unprotected, ignored and vulnerable to sanctions or unfair treatment (Vaccotti 2017, Schlack Fuhrmann *et al.* 2018). The situation risks generating a situation of profound humanitarian crisis and massive political unrest (Kluth 2020). Additionally, the political crisis of legitimacy currently being sustained by most governments in Latin America reduces the ability to articulate agreements with the opposition and organized civil society, postponing urgent problems such as the situation of the undocumented where their fundamental human rights are being systematically violated and xenophobic discourses proliferate on the part of some groups of nationalist ideology.

How will governments engage with the informal sector working in the streets? How feasible is it to restrict these activities when so many families rely on street trade for their livelihoods? For now, the regulation of the informal economy in public space appears to face the same challenges as before COVID-19 – the system is complex, poorly documented and with little data to understand its true dimensions. As a result, it may be impossible to regulate or restrict regulations or improve the economic situation for such vulnerable informal workers, even after the pandemic mandates have been lifted.

Will COVID-19 change who moves in and who moves out of newly redeveloped urban centers?

Over the last twenty years, historically marginalized urban areas have become revitalized with new investments and redevelopments. However, the 'return' to the city center has also been accompanied by gentrification and the displacement of working-class, minority, and immigrant residents (Lees *et al.* 2015). In the US, such trends reversed previous white flights to the suburb in the 1970 s and 1980 s, with cities such as Boston, Washington, Philadelphia, or New Orleans receiving an influx of higher income residents 'rediscovering' the city (Brown-Saracino 2013). In Europe, tourism and commercial gentrification have also deeply affected cities such as Barcelona or Lisbon and their public spaces (Anguelovski 2014, Janoschka and Sequera 2016). Most recently, green gentrification has become an added concern as urban greening interventions have become associated with the displacement of long-term residents from public spaces and neighbourhoods (Anguelovski *et al.* 2018).

In post-COVID cities, will privileged residents permanently leave the city (again), in search for peri-urban and rural lifestyles? Will access to nature be further limited by class or the ability to telecommute, while lower-income workers remain in urban centres that rewind to decline and abandonment? Such a scenario would reverse current trends and socio-spatial inequalities produced over the last 20 years. It would not be a white flight to the suburbs, but rather a rural or neo-rural gentrification flight. How might such a trend change rural communities? In such a scenario, continued investments in quality green spaces in city centers, especially previously 'gentrified' spaces, will be key to ensure environmental justice.

Will everyone be able to shift to active transit?

As cities push for active transit in the post-COVID city, we should be asking who will have access to active transportation infrastructure and who might be left behind? What are cities doing to ensure equitable access to active transit? Might the push for active transit entail systematic exclusion of certain groups, populations and neighbourhoods? Walking and cycling is ideal for the short distances (5–10 km) but more challenging for longer commutes. Active commuters tend to live closer to their workplace often because they have the financial means to afford more expensive city life. However, those who live in the urban periphery might not benefit from these investments and be excluded from the active transportation network. Scholars and city planners should be sensitive to the inequities in active transit proposals, so as

to anticipate critique based on class or race, as seen in the US in which many bike lanes are viewed as 'white lanes', especially when running through black neighborhoods (Hoffmann 2016).

Will the pandemic permanently disrupt the interconnected global settlement system and freedom of movement?

While other disciplines have developed global regulatory systems, work at such scale has not been seriously considered in urbanism. Does this crisis open the door for regulating the movement of individuals based on city or region of origin and thus constrain migration and segregate 'dangerous' 'unsafe' groups or countries? Racist discourses against Chinese immigrants or travellers already underpinned border closure during early Spring 2020. Will the decisions of cities ripple out with global consequences faster than even before? In a time of global interconnection where a relatively localized regulatory decision can have global ramifications, is it necessary to start thinking about urban-scale regulations at a global scale? Until now, this idea has hardly been taken seriously by urbanists, with a few exceptions.

Constantinos Doxiadis predicted this conundrum 50 years ago with his writing on the Ecumenopolis, which he believed was the inevitable trajectory of the human settlements given technological and socio-economic evolution (Doxiadēs *et al.* 1974, Villagomez 2018). Many thought this idea of a global city was a far flung idea at the time. Yet, five decades later, we are now dealing with what he foresaw: an interconnected global settlement system so intimately connected that it is virtually impossible to draw clear boundaries between settlements around the world.

Conclusion

In this article, we aimed to examine the emerging questions at the intersection of COVID-19 and urban life, starting with the hypothesis that the pandemic may fundamentally alter how we perceive, use, and design public space.

In this final section, we return to the overarching questions on if and how our physical, social, emotional, economic, and material relationships with public space will change, temporarily or fundamentally, as a result of COVID-19. Our early review of these questions suggests that this public health and socio-economic crisis will change public space design, perceptions, use and management in diverse ways, across and within cities. Rather than taking strong positions on normative ways forward, we have attempted to engage with the uncertainties influencing these questions and discuss the range of outcomes that might emerge.

Yet some fundamental and shared concerns underpin our inquiry. Particularly there are concerns around how these emerging questions will be addressed and to what end. It has become cliché to claim that the COVID-19 crisis is an opportunity. And while we are uncomfortable with the word 'opportunity', we do regard this as a crucial moment that will move our respective fields in new directions. Urban planning and design are inextricably entangled with our physical and mental health (Simmel 2017). Public space has been central to these debates, with issues around gender, race, identity, and power recognized as crucial to public space planning and design (Schmidt and Németh 2010). Given the new impacts of COVID-19 on cities, how will the diverse ways in which COVID-19 influences our public spaces evolve and change across contexts? Will our future cities be hyper-hygienic, absent of crowds and public life, patrolled, controlled, further segregated, and surveilled? These dystopian futures cannot be dismissed. Or can we reimagine and plan cities in ways that are ecologically sustainable, healthy, and just?

Our future city is not preordained. It will be the result of negotiated interests, power relations, priorities, and decisions that shape public space. We hope that public spaces in the post-COVID world will remain valued for the possibilities they offer for socialization, recreation, claims-making, community building, and identity formation. Given the pace, scale, and diversity of transformations unfolding around the world, measuring changes in use and perceptions of public spaces in the ensuing months will be critical in order to inform future planning and design.

We see this as a time for humility yet boldness. Public spaces will persist in the post-COVID world, but public space for whom?

Notes

1. This article has been produced by co-authors located in Ahmedabad (India), Barcelona (Spain), Morelia (Mexico), Regina (Canada), Santiago (Chile), Vancouver (Canada) and Wuhan (China).
2. Roughly translated in English as a resourceful, innovative approach of 'making do' given the emergent needs and multiple constraints shaping any context. For more on this, see (Roy 2011).
3. The global gatherings in memory of George Floyd - at a global scale - suggest that the pandemic has not created a generalized aversion to large public gatherings.

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References

Abend, L., 2019. Cyclists and E-Scooters are clashing in the battle for europe's streets. *Time Magazine*. Available at: https://time.com/5659653/e-scooters-cycles-europe/

Acitelli, T., 2019. *Why the T struggles, explained*. July. Boston: Curbed Boston. Available at https://boston.curbed.com/2019/7/16/20696003/boston-t-debt-funding-problems

Akaltin, D., *et al*., 2019. *Life in Poblenou: observing Spaces in Transition*. Vancouver, Canada. DOI:10.14288/1.0384917

Alter, L., 2020. Urban design after the coronavirus. Available at: https://www.treehugger.com/urban-design

Amnesty International, 2019. Spain's conviction for sedition of Jordi Sánchez and Jordi Cuixart threatens rights to freedom of expression and peaceful assembly. Available

at: https://www.amnesty.org/en/latest/news/2019/11/spain-conviction-for-sedition-of-jordi-sanchez-and-jordi
Anderson, R., *et al*., 2018. *Life in Poblenou: observation and Exploration*. Vancouver, Canada. DOI:10.14288/1.0372821
Anguelovski, I., 2014. *Neighbourhood as refuge: community Reconstruction, Place-Remaking, and Environmental Justice in the City*. Cambridge, MA: MIT Press.
Anguelovski, I., *et al*., 2018. Assessing green gentrification in historically disenfranchised neighborhoods: a longitudinal and spatial analysis of Barcelona. *Urban Geography*, 39 (3), 458–491. Routledge: doi:10.1080/02723638.2017.1349987.
Anguelovski, I., *et al*., 2020. Expanding the boundaries of justice in urban greening scholarship: toward an emancipatory, antisubordination, intersectional, and relational approach. *Annals of the American Association of Geographers*, 1–27, Routledge. 10.1080/24694452.2020.1740579
Armario, C., 2020. Bogotá Encourages Bicycle Use to Prevent COVID-19 - San Diego Union-Tribune en Español. *Associated Press*. Available at: https://www.sandiegouniontribune.com/en-espanol/noticias/story/2020-0317/bogota-fomenta-uso-de-bicicletas-para-prevenir-covid-19
Benn, S. and Gauss, G., 1983. *Public and private in social life*. New York: St. Martin's Press.
Bird, E.L., *et al*., 2018. Built and natural environment planning principles for promoting health: an umbrella review. *BMC Public Health*, 18 (1), 1–13. doi:10.1186/s12889-018-5870-2
Bliss, L., 2020. Mapping How Cities Are Reclaiming Street Space. Available at: https://www.citylab.com/transportation/2020/04/coronavirus-city-street-public-transit-bike-lanes-covid-19/609190/(accessed 8 April 2020).
Booth, W., Spolar, C., and Rolfe, P., 2020 Vast coronavirus 'field hospitals" fill spaces that hosted wedding expos and dog shows - The Washington Post'. *The Washington Post*. Available at: https://www.washingtonpost.com/world/europe/coronavirus-fieldhospitals/2020/03/31/3a05ba28-6f0f-11ea-a156-0048b62cdb51_story.html.
Brannen, S., 2020. Will Covid-19 End the Age of Mass Protests? *Center for Strategic & International Studies*. Available from: https://www.csis.org/analysis/will-covid-19-end-age-mass-protests
Brown, A., Lyons, M., and Dankoco, I., 2010. Street traders and the emerging spaces for Urban voice and citizenship in African cities. *Urban Studies*, 47 (3), 666–683. doi:10.1177/0042098009351187
Brown-Saracino, J., 2013. *The gentrification debates: a reader*. New York: Routledge.
Bureau of Labor Statistics, 2019. *Economic news release. 24*.
Burgess, M., 2020a. Coronavirus contact tracing apps were meant to save us. They won't. *WIRED UK*, April. Available at: https://www.wired.co.uk/article/contact-tracing-apps-coronavirus
Burgess, M., 2020b. Just how anonymous is the NHS Covid-19 contact tracing app? *WIRED UK*, May. Available at: https://www.wired.co.uk/article/nhs-covid-app-data-anonymous
Carr, S., *et al*., 1992. *Public space: environment and behavior*. Cambridge, UK: Cambridge University Press.
Carrión, F. and Dammert-Guardia, M., 2019. *Derecho a la ciudad: una evocación de las transformaciones Urbanas en América Latina*. Lima: IFEA, CLACSO, FLACSO.
CELAG, 2020 Geografía política del coronavirus en América Latina. Análisis Político. *CELAG*. Available at: https://www.celag.org/geografia-politica-de-coronavirus-en-america-latina/
Christian, H., *et al*., 2015. The influence of the neighborhood physical environment on early child health and development: a review and call for research. *Health and Place*, 33, 25–36. doi:10.1016/j.healthplace.2015.01.005
City of Vancouver, 2018. *Downtown vancouver public space and public life study*. Vancouver:City of Vancouver .
Combs, T., 2020 Local Actions to Support Walking and Cycling During Social Distancing Dataset. Available at: http://pedbikeinfo.org/resources/resources_details.cfm?id=5209
Corbera, E., *et al*., 2020. Academia in the time of COVID-19: developing an ethics of care. *Planning Theory & Practice*, 1–9. doi:10.1080/14649357.2020.1757891
Crabtree, J., 2020. Optimism in the time of Coronavirus. Available at: jamescrabtree.com (accessed 22 March 2020).
Cvejić, R., *et al*., 2015. *A typology of Urban green spaces, ecosystem provisioning services and demands*. Available at: https://greensurge.eu/working-packages/wp3/files/D3.1_Typology_of_urban_green_spaces_1_.pdf/D3.1_Typology_of_urban_green_spaces_v2_.pdf
Dahmann, N., *et al*., 2010. The active city? Disparities in provision of urban public recreation resources. *Health & Place*, 16 (3), 431–445. 10.1016/j.healthplace.2009.11.005
De Vries, S., *et al*., 2013. Streetscape greenery and health: stress, social cohesion and physical activity as mediators. *Social Science and Medicine*, 94, 26–33. Elsevier Ltd:. doi:10.1016/j.socscimed.2013.06.030
Doxiadēs, K.A., Papaiōannou, J.G., and Kentro Oikistikēs, A., 1974. *Ecumenopolis: the inevitable city of the future*. New York: Norton.
Du, J., King, R., and Chanchani, R., 2020. Tackling inequality in cities is essential for fighting COVID-19. *World Resources Institute*. Available at: https://www.wri. org/blog/2020/04/coronavirus-inequality-cities (accessed 16 April 2020).
Ellis-Petersen, H.E. and Azizur-Rahman, S., 2020. Coronavirus conspiracy theories targeting Muslims spread in India. *The Guardian*. https://www.theguardian.com/world/2020/apr/13/coronavirus-conspiracy-theories-tar- geting-muslims-spread-in-india.
EFE, 2020 Milán le quitará al coche 35 km de carriles para dárselos a la bici y el peatón. *El Periódico*, Available at: https://www.elperiodico.com/es/internacional/20200421/milan-le-quitara-al-coche-35-km-de-carriles-para-darselos-a-la-bici-y-el-peaton-7935410.
Felbab-Brown, V., 2020. COVID-19 can augment violence to Mexican women. *Bookings Institute*. Available from: https://www.brookings.edu/blog/order-from-chaos/2020/04/13/covid-19-can-augment-violence-to-mexican-women/ [Accessed 10 April 2020].
Florida, R., 2020. We'll need to reopen our cities. But not without making changes first. *CityLab*. Available at: https://www.citylab.com/equity/2020/03/coronavirus-
Forman, R.T.T., 1995. *Land mosaics: the ecology of landscapes and regions*. Cambridge, United Kingdom: Cambridge University Press.
Foucault, M., 2012. *Discipline and punish: the birth of the prison. vintage books. (Original work published 1977)*. New York: Vintage.
Francis, L. and Jensen, M., 2017. Benefits of green roofs: a systematic review of the evidence for three ecosystem services. *Urban Forestry & Urban Greening*, 28, 167–176. doi:10.1016/j.ufug.2017.10.015
French, M. and Monahan, T., 2020. Disease surveillance: how might surveillance studies address covid-19? *Surveillance and Society*, 18 (1), 1–11. doi:10.24908/ss.v18i1.13985
Gan, N., 2020. China is installing surveillance cameras outside people's front doors and sometimes inside their

homes. *CNN*, April. Available at: https://edition.cnn.com/2020/04/27/asia/cctv-cameras-china-hnk-intl/index.html

Gascon, M., *et al*., 2015. Mental health benefits of long-term exposure to residential green and blue spaces: a systematic review. *International Journal of Environmental Research and Public Health*, 12 (4), 4354–4379. doi:10.3390/ijerph120404354

GDPRhub, 2020, Projects using personal data to combat SARS-CoV-2. Available at: https://gdprhub.eu/index.php?title=Projects_using_personal_data_to_combat_SARS-CoV-2 (accessed 28 May 2020).

Gebrekidan, S., 2020. For autocrats, and others, Coronavirus is a chance to grab even more power. Leaders around the world have passed emergency decrees and legislation expanding their reach during the pandemic. Will they ever relinquish them? *The New York Times*. Available at: https://www.nytimes.com/2020/03/30/world/europe/coronavirus-governments-power.html

Gehl, J., 2013. *Cities for people*. Washington, DC: Island Press.

Gehl, J. and Svarre, B., 2013. *How To study public life. how to study public life*. Washington DC: Island Press. doi:10.5822/978-1-61091-525-0_1

Gould, S.J. and Eldredge, N., 1993. Punctuated equilibrium comes of age. *Nature*, 366 (6452), 223–227. doi:10.1038/366223a0

Hall, E., 1966. *The hidden dimension*. Garden City: N: Doubleday.

Hankey, S., *et al*., 2012. Estimating use of non-motorized infrastructure: models of bicycle and pedestrian traffic in Minneapolis, MN. *Landscape and Urban Planning*, 107 (3), Elsevier B.V.:, 307–316. 10.1016/j.landurbplan.2012.06.005

Hardiman, J., 2020. *20,000 Tourists flock to Chinese national park after free entry offered*. https://www.ladbible.com/news/news-20000-tourists-flock-to-chinese-national-park-after-free-entry-offer-20200406

Hawkins, A.J., 2020. There's no better time for cities to take space away from cars. *Verge*. Available at: https://www.theverge.com/2020/3/23/21191325/cities-car-free- coronavirus-protected-bike-lanes-air-quality-social-distancing

Heffernan, E., Heffernan, T., and Pan, W., 2014. The relationship between the quality of active frontages and public perceptions of public spaces. *Urban Design International*, 19 (1), 92–102. doi:10.1057/udi.2013.16

Heynen, N., Perkins, H.A., and Roy, P., 2006. The political ecology of uneven Urban green space: the impact of political economy on race and ethnicity in producing environmental inequality in Milwaukee. *Urban Affairs Review* 42 1 3–25 10.1177/1078087406290729

Hoffmann, M.L., 2016. *Bike lanes are white lanes*. Lincoln, Nebraska: University of Nebraska Press. doi:10.2307/j.ctt1d4v13q

INEGI, 2020. *Resultados de la encuesta nacional de ocupación y empleo. Cifras durante el cuarto trimestre de 2019. Mexico*. Mexico. Available at: https://www.inegi.org.mx/app/saladeprensa/noticia.html?id=5547

International Labour Organisation, 2018. *World employment and social outlook: trends 2018. Geneva, Switzerland*: *International Labour Organization*.

Janoschka, M. and Sequera, J., 2016. Gentrification in Latin America: addressing the politics and geographies of displacement. *Urban Geography*, 37 (8), 1175–1194. doi:10.1080/02723638.2015.1103995

Kissler, S.M., *et al*., 2020. Projecting the transmission dynamics of SARS-CoV-2 through the postpandemic period. *Science*, eabb5793. doi:10.1126/science.abb5793

Klein, N., 2007. *The shock doctrine: the rise of disaster capitalism*. Toronto: Knopf Canada.

Kluth, A., 2020. This Pandemic Will Lead to Social Revolutions. *Bloomberg Opinion*. Available at: https://www.bloomberg.com/amp/opinion/articles/2020-04-11/coronavirus-this-pandemic-will-lead-to-social-revolutions

Kuhn, T.S., 1962. *The structure of scientific revolutions*. 1st ed. Chicago: University of Chicago Press.

Laker, L., 2020. World cities turn their streets over to walkers and cyclists. *The Guardian*, 11 April. Available at: https://www.theguardian.com/world/2020/apr/11/world-cities-turn-their-streets-over-to-walkers-and-cyclists#maincontent

Lawrence, L., 2001. *The future of ideas*. Michigan: Random House.

Lees, L., Shin, H.B., and Morales, E.L., 2015. *Global gentrifications: uneven development and displacement*. Bristol, UK: Policy Press.

Lehman, J., 2019. *A brief explanation of the Overton Window*. Available from: https://www.mackinac.org/OvertonWindow

Litt, J.S., *et al*., 2015. Exploring ecological, emotional and social levers of self-rated health for urban gardeners and non-gardeners: A path analysis. *Social Science & Medicine*, 144, 1–8. doi:10.1016/j.socscimed.2015.09.004

Luisa Martin, R., 2014. Occupy: the spatial dynamics of discourse in global protest movements. *Journal of Language and Politics*, 13 (4), 583–598. doi:10.1075/jlp.13.4.01mar

Luneke, A., 2015. Inseguridad ciudadana y diferenciación social en el nivel microbarrial: el caso del sector Santo Tomás, Santiago de Chile. *EURE - Revista de Esudios Urbanos Regionales*, 42, 125.

Lydon, M. and Garcia, A., 2015. *Tactical Urbanism*. Washington, DC: Island Press.

Markusen, A., 2020. Will COVID-19 drive us farther apart, or bring us together? Will we all move away from each other? Not likely. Available at: https://minnesotareformer.com/2020/04/07/will-covid-19-virus-drive-us-farther-apart-or-bring-us-together/ (accessed 8 April 2020).

Martelletti, L. and Martelletti, P., 2020. Air pollution and the novel Covid-19 disease: a putative disease risk factor. *SN Comprehensive Clinical Medicine*, 2 (4), 383–387. doi:10.1007/s42399-020-00274-4

Mawani, V., 2020. Vulnerability and the governance of public space in the Post-COVID city. *OSF Pre-print*. doi:10.31219/osf.io/aj9bz

Mehmet, S., 2020. TfL and Mayor unveil post-lockdown London infrastructure programme. *Intelligent Transport*. Available from: https://www.intelligenttransport.com/transport-news/98627/tfl-and-mayor-unveil-post-lockdown-london-infrastructure-programme/

Millan Lombrana, L. and Roston, E., 2020. With humans in hiding, animals take back the world. *Bloomberg Green*, 8 April. Available at: https://www.bloomberg.com/news/photo-essays/2020-04-08/with-humans-in-hiding-animals-take-back-the-pandemic-world.

NASA, 2020. Airborne nitrogen dioxide plummets over China. National Aeronautics and Space Administration. *NASA: Earth Observatory*. Available at: https://www.earthobservatory.nasa.gov/images/146362/airborne-nitrogen-dioxide-plummets-over-china.

Nieuwenhuijsen, M. and Khreis, H., 2019. Integrating human health into the urban development and transport planning agenda: a summary and final conclusions. *In*: M. J. Nieuwenhuijsen and H. Khreis, eds. *Integrating human*

health into Urban and transport planning. New York, NY: Springer, 707–718. doi:10.1007/978-3-319-74983-9

Nieuwenhuijsen, M., Khreis, H., and Verlinghieri, E., 2019. The role of health impact assessment for shaping policies and making cities healthier. *In*: M. J. Nieuwenhuijsen, eds., *Integrating human health into Urban and transport planning*. New York, NY: Springer, 609–624. doi:10.1007/978-3-319-74983-9

Nieuwenhuijsen, M.J., 2016. Urban and transport planning, environmental exposures and health-new concepts, methods and tools to improve health in cities. *Environmental Health*, 15 (1), S38. doi:10.1186/s12940-

Nieuwenhuijsen, M.J., 2020. Urban and transport planning pathways to carbon neutral, liveable and healthy cities; a review of the current evidence. *Environment International*, 140, 105661. doi:10.1016/j.envint.2020.105661

Null, S. and Smith, H., 2020. COVID-19 could affect cities for years. here are 4 ways they're coping now. *TheCityFix: World Resource Institute (WRI)*. Available at: https://www.wri.org/blog/2020/03/covid-19-could-affect-cities-years-here-are-4-ways-theyre-coping-now

Özgen, N., 2014. Power-identity and city squares: a socio-politic geography analysis. *Urban and Urbanization*: 228–241. Available at: https://www.research gate.net/publication/297403556_POWER-_IDENTITY_AND_CITY_SQUARES_A_SOCIOPOLITIC_GEOGRAPHY_ANALYSIS_Nurettin_OZGE

Polko, A., 2010. Public space development in the context of urban and regional resilience. *Cambridge Journal of Regions, Economy and Society*, 3, 1.

Public Health Scotland, 2019. The place standard tool. Available at: http://www.healthscotland.scot/health-inequalities/impact-of-social-and-physical-environments

Pugalis, L., 2009. The culture and economics of urban public space design: public and professional perceptions. *Urban Design International*, 14 (4), 215–230. doi:10.1057/udi.2009.23

Rannard, G., 2020 Coronavirus: challenge of reshaping UK cities after lockdown. *BBC News*. Available at: https://www.bbc.com/news/uk-52524807 (accessed 9 May 2020).

Roberts, D., 2020. How to make a city livable during lockdown. *Vox*. Available at: https://www.vox.com/cities

Rojas-Rueda, D., *et al*., 2019. Green spaces and mortality: a systematic review and meta-analysis of cohort studies. *The Lancet Planetary Health*, 3 (11), e469–e477. doi:10.1016/S2542-5196(19)30215-3

Rosel, L. (2020) Josep Bohigas: El confinament fa que ens replantegem la manera de relacionar-nos amb la família, els veïns i la ciutat. *ARA*, 29 March. Available at: https://www.ara.cat/suplements/diumenge/confinament-replantegem-manera-relacionar-nos- familia_0_2425557436.html

Roy, A., 2011. Slumdog cities: rethinking subaltern urbanism. *International Journal of Urban and Regional Research* 23 (1), 15–24. doi:10.1111/j.1468-2427.2011.01051.x.

RSA, 2020. *Time for change. brits see cleaner air, stronger social bonds and changing food habits amid lockdown*. London. Available at: https://www.thersa.org/about-us/media/2019/brits-see-cleaner-air-stronger-social-bonds-and-changing-food-habits-amid-lockdown

Rueda, S., 2019. Superblocks for the design of new cities and renovation of existing ones: barcelona's case. *In*: M. Nieuwenhuijsen and H. Khreis, eds.. *Integrating Human Health into Urban and Transport Planning*. New York, NY: Springer, 135–153.

Rupprecht, C.D.D. and Byrne, J.A., 2014. Informal urban greenspace: a typology and trilingual systematic review of its role for urban residents and trends in the literature. *Urban Forestry & Urban Greening*, 13 (4), 597–611. doi:10.1016/j.ufug.2014.09.002

Ryus, P., *et al*., 2016. *Guidebook on pedestrian and bicycle volume data collection. Guidebook on pedestrian and bicycle volume data collection*. Washington DC:The National Academies Press. DOI:10.17226/22223

Sadik-Kahn, J. and Solomonow, S., 2017. *Streetfight: handbook for an urban revolution*. New York, NY: Penguin.

Saelens, B.E., Sallis, J.F., and Frank, L.D., 2003. Environmental correlates of walking and cycling: findings from the transportation, urban design, and planning literatures. *Annals of Behavioral Medicine*, 25 (2), 80–91. doi:doi:10.1207/S15324796ABM2502_03

Salganik, M.J., 2017. *Bit by bit: social research in the digital age*. Princeton: NJ: Princeton University Press.

Samuelsson, K., *et al*., 2020. Urban nature as a source of resilience during social distancing amidst the coronavirus pandemic. *Research Gate Pre-print (April)*. doi:10.31219/osf.io/3wx5a

Sandford, A., 2020 Coronavirus: half of humanity now on lockdown as 90 countries call for confinement. *Euronews*, 4 April. Available at: https://www.euronews.com/2020/04/02/coronavirus-in-europe-spain-s-death-toll-hits-10-000-after-record-950-new-deaths-in-24-hou.

Sanyé-Mengual, E., *et al*., 2016. Resolving differing stakeholder perceptions of urban rooftop farming in Mediterranean cities: promoting food production as a driver for innovative forms of urban agriculture. *Agriculture and Human Values*, 33 (1), 101–120. doi:10.1007/s10460-015-9594-y

Schlack Fuhrmann, E., *et al*. 2018. Tres tipos de comercio. Tres maneras de influenciar la esfera pública de los barrios. *Revista INVI*, 33 (92), 89–122. doi:10.4067/S0718-

Schmidt, S. and Németh, J., 2010. Space, place and the city: emerging research on public space design and planning.

Sennett, R., 2018. *Building and dwelling: ethics for the city*.

Simmel, G., 2017. The metropolis and mental life. *The City: Critical Essays In Human Geography*, 49–64. doi:10.1007/978-1-349-23708-1_4

Siossian, E., 2020. 'Dinner on the driveway' events help people feel connected despite COVID-19 isolation. *ABC News*. Available at: https://www.abc.net.au/news/2020-04-12/dinner-on-the-driveway-covid-19-events-keep-connections-alive/12135026.

Solà-Morales, M., 2008. *Ten Lessons on Barcelona. 2nd Editio*. Barcelona: Col.legi d'Arquitectes de Catalunya.

Sommer, R., 1969. *Personal Space. The Behavioral Basis of Design*. Ann Arbor, MI: Prentice Hall.

Speranza, P., 2018. A human-scaled GIS: measuring and visualizing social interaction in Barcelona's Superilles. *Journal of Urbanism*, 11 (1), 41–62. Routledge:. doi:10.1080/17549175.2017.1341426

Stokes, R., 2020. How the coronavirus is already reshaping the design of parks and streets in New South Wales. *The Guardian*. https://www.theguardian.com/commentisfree/2020/may/08/how-the-coronavirus-is-already-reshaping-the-design-of-parks-and-streets-in-new-south-wales [Accessed 8 May 2020]

Summers, B.T., 2020 What Black America Knows About Quarantine. *The New York Times*, 15 May. Available at: https://www.nytimes.com/2020/05/15/opinion/sunday/coronavirus-ahmaud-arbery-race.html#click=https://t.co/HKCBno1YN3

Tan, C., 2020. Robot reminds visitors of safe distancing measures in Bishan-Ang Mo Kio Park. *The Straits*

Times, 8 May. Available at: https://www.straitstimes.com/singapore/robot-reminds-visitors-about-safe-distancing-measures-in-bishan-ang-mo-kio-park

Taylor, M., Chanran, R., and Ruetors Foundation, T., 2020. Asia's street food hawkers struggle during coronavirus lockdowns - Reuters. Available at: https://www.reuters.com/article/health-coronavirus-asia/asias-street-food-hawkers-struggle-during-coronavirus-lockdowns-idUSL4N2BH2ZA.

Thompson, A., 2020. More cycleways, streets to shut, footpaths widened under NSW's COVID-19 plan. *The Sydney Morning Herald*. Sydney. Available at: https://www.smh.com.au/national/nsw/more-cycleways-streets-to-shut-

Toderian, B., 2014. Let's make sticky streets for people! *Planetizen* Available at: https://www.planetizen.com/node/69454

Topham, G., 2020, London pedestrians and cyclists may get more space on roads.

Townsend, M., 2020. Revealed: surge in domestic violence during Covid-19 crisis. *The Guardian*. Available at: https://www.theguardian.com/society/2020/apr/12/domestic-violence-surges-seven-hundred-per-cent-uk-coronavirus.

TUMI, 2020. Fighting Corona in Transport. Available at: https://www.transformative-mobility.org/corona (accessed 18 April 2020).

UNOHCR, 2020. COVID-19: states should not abuse emergency measures to suppress human rights – UN experts.

Vaccotti, L., 2017. Migraciones e informalidad urbana. Dinámicas contemporáneas de la exclusión y la inclusión en Buenos Aires. *EURE - Revista de Esudios Urbanos Regionales*, 43, 129.

Valentino-DeVries, L. and Dance, G.J.X., 2020. Location data says it all: staying at home during Coronavirus is a luxury. *The New York Times*. Available at: https://www.nytimes.com/interactive/2020/04/03/us/coronavirus-stay

van den Bosch, M. and Ode Sang, 2017. Urban natural environments as nature-based solutions for improved public health – A systematic review of reviews. *Environmental Research*, 158, 373–384. doi:10.1016/j.envres.2017.05.040

van der Berg, R., 2020. How Will COVID-19 Affect Urban Planning? *TheCityFix*. Available at: https://thecityfix.com/blog/will-covid-19-affect-urban-planning-rogier-van-den-berg/.

Velarde, M.D., Fry, G., and Tveit, M., 2007. Health effects of viewing landscapes - Landscape types in environmental psychology. *Urban Forestry and Urban Greening*, 6 (4), 199–212. doi:10.1016/j.ufug.2007.07.001

Vicuña, M., *et al*. 2019. Integración urbana y calidad de vida: disyuntivas en contextos metropolitanos. *Revista INVI*, 34 (97), 17–47. doi:10.4067/S0718-

Villagomez, E., 2018 *The laws of settlements: 54 laws underlying settlements across scale and culture*. Independently published.

Wasdani, K.P. and Prasad, A., 2020. The impossibility of social distancing among the urban poor: the case of an Indian slum in the times of COVID-19. *Local Environment*, 25 (5), 414–418. doi:10.1080/

Wertheim-Heck, S., 2020. The impact of the COVID-19 lockdown on the diets of Hanoi's urban poor | international Institute for Environment and Development. Available at: https://www.iied.org/impact-covid-19-lockdown-diets-hanois-urban-poor (accessed 16 April 2020).

Whyte, W., 1980. *The social life of small urban spaces. Project for public spaces*.New York: New York.

WHO (2020) *Global Surveillance for human infection with coronavirus disease (COVID-19). Interim Guidance*. Available at: https://www.who.int/publications-detail/global-surveillance-for-human-infection-with-novel- coronavirus-(2019-ncov).

Wray, S., 2020. Bogotá expands bike lanes to curb coronavirus spread. *SmartCitiesWorld*. Available at: https://www.smartcitiesworld.net/news/news/bogota-expands-bike-lanes-overnight-to-curb-coronavirus- spread-5127.

Wu, X., *et al*., n.d. *Exposure to air pollution and COVID-19 mortality in the United States: a nationwide cross- sectional study Xiao. medRXIV*. DOI: 10.1101/2020.04.05.20054502.

Zografos, C., *et al*., 2020. The everyday politics of urban transformational adaptation: struggles for authority and the Barcelona superblock project. *Cities*, 99, 102613. doi:10.1016/j.cities.2020.102613