Walkability and the COVID-19 pandemic

How compact cities help us combat epidemics

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August, 2020

This report was produced as part of the Greenest City Scholars (GCS) Program, a partnership between the City of Vancouver and The University of British Columbia, in support of the Greenest City Action Plan.

This GCS project was conducted under the mentorship of City staff. The opinions and recommendations in this report, and any errors, are those of the author, and do not necessarily reflect the views of the City of Vancouver or The University of British Columbia.

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The relationship between cities and epidemics

Covid-19 reached hundreds of countries in a matter of weeks and, to this date, is still spreading in most of them. Very few diseases have had such a global impact, none in recent times. Some of the worst outbreaks occurred in highly populated cities like New York or London. COVID-19 "forced urban denizens indoors, [and] condos and apartments have become substitute offices, restaurants, schools and daycares," explained Andy Yan, Director of the City Program at Simon Fraser University, (Valiante, 2020).

Understandably, people started rethinking their decision to live in urban environments. However, our current urban form was shaped to *resist* epidemics, both infectious and non-infectious. Even modern zoning legislation has its roots in health concerns. We created drinking water and sewerage systems in response to waterborne diseases. Take cholera, for example, which is transmitted through the consumption of feces. While you don't hear much about it, the disease is still making rounds in Africa and Southeast Asia (Schilling & Linton, 2005). Similarly, cities rarely deal anymore with vector-borne diseases like malaria, the leading cause of death in Africa during the last few years (Njoh, 2016).

The life expectancy gap between urban and rural areas continues to increase in favour of the former (Singh & Siahpush, 2014). Highly walkable cities—with their wide range of destinations, companionship, and transport means—increase our levels of physical activity and reduce the risk of chronic disease (Lawrence D Frank, Iroz-Elardo, MacLeod, & Hong, 2019), especially in the absence of air pollution (Howell et al., 2019). Moreover, safer streets and attractive sightings also have an effect on psychology, fostering mental health beyond an augmented sense of community (Núñez-González et al., 2020).

Of course, there are caveats. Population density favours disease transmission through respiratory contact or body fluids (Capolongo et al., 2020). However, it is unclear if this alone is enough to trigger uncontained outbreaks like those of Covid-19. People have rung alarms over the high rate of infections in New York City, but its density (10,400 people per km^2) is not that different from that of Singapore (8,130 people per km^2) and nothing compared to that of Seoul (15,763 people per km^2). Paradoxically, Seoul city was more effective in containing its first outbreak compared to any other major city (Fisher & Sang-Hun, 2020). Density, while playing a role in the spread of respiratory outbreaks, is not a sufficient cause to increase the spread of disease.

Finally, it is crucial to consider the role of human expansion in the spread of epidemics (See Figure 1). Wildlife is a reservoir of many infectious diseases, some of which might become a public health problem. The current epidemic, for instance, is thought to have originated in pangolins (a recent study published in *Cell* showed a 91% match), likely causing the spread to the patient zero in Wuhan (Zhang, Wu, & Zhang, 2020). By keeping population density high, we are doing two things. Firstly, we avoid the invasion of natural reservoirs of viruses and zoonotic infections that are unknown to humans. Secondly, we reduce our carbon emissions, which contribute to global warming. Changing temperatures affect arthropods, which redistribute vector-borne diseases back to the cities (Capolongo et al., 2020; Ryan, Carlson, Mordecai, & Johnson, 2019).

We need to keep building sustainable and healthier cities that accommodate—but not reduce—our density levels to both manage pandemics like Covid-19 and prevent the emergence of future outbreaks. Covid-19, and future pandemics, will continue to represent a significant challenge to public health systems around the world. However, our policy responses should be grounded not only in the immediate need to contain the outbreaks but from a long-term perspective.

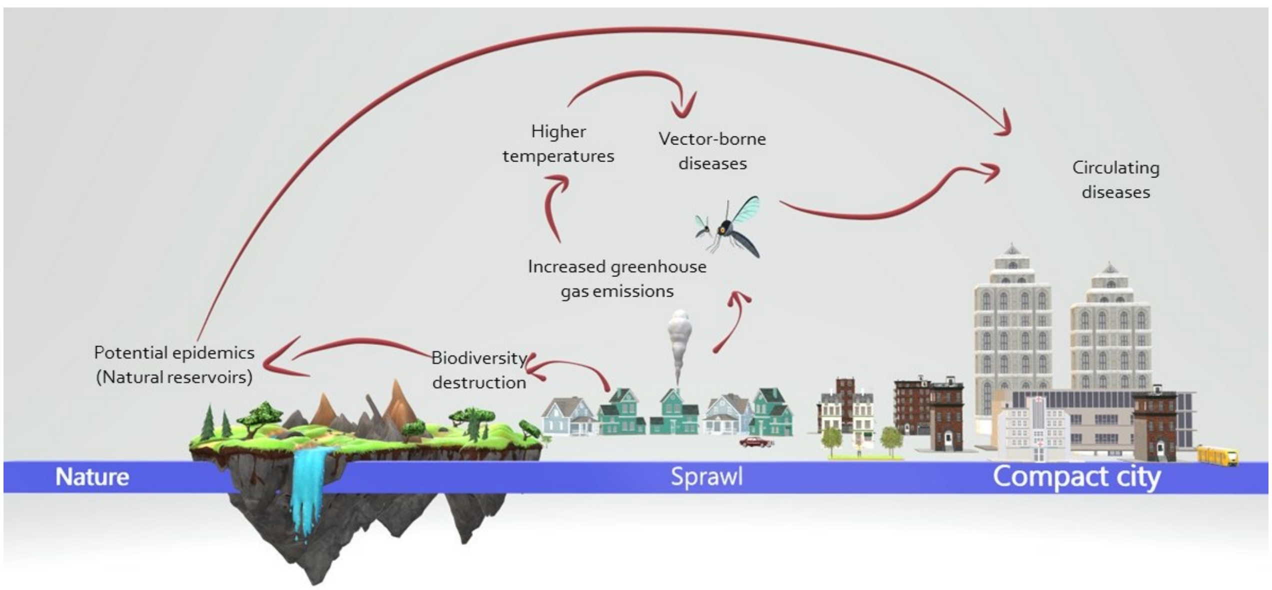

Figure 1. Interaction between population density and epidemics.

The anatomy of an outbreak

At this point, you probably understand that there are several types of epidemics. We have talked about waterborne diseases (you need to ingest the microorganism to get sick), vector-borne diseases (an example would be a worm or insect working as an intermediary), and diseases that spread through body fluid or respiratory contact. In this section, we will focus exclusively on the latter because urban planning and the use of public spaces are mostly relevant for this type of outbreak.

There is a minor, but important, the distinction between a disease that spreads through respiratory droplets and a disease that spreads to even smaller particles in the air. Droplets are somehow gigantic in the microscopic world, and after we cough or sneeze, most droplets will fall within a close perimeter in a matter of seconds. Airborne transmission, on the other hand, means that the infecting microorganisms travel in particles smaller than droplets and could easily diffuse, similar to cigarette smoke.

Transmission

Droplets are small drops of liquid that we produce when we breathe, sing, talk, cough, or sneeze. We can think of them like soap bubbles kids love to play with. But unlike those bubbles, ours are made mainly out of water and mucus. Our droplets, however, can be suspended on air during a very small amount of time (more than heavier drops), and can also carry things inside of them.

Human respiratory droplets typically contain human cells and electrolytes, but sometimes they also carry potentially infectious agents, including SARS-CoV-2, the virus that causes COVID-19. Droplets vary in diameter considerably, ranging from 5 to 1000 micrometres. Once they are expelled from the body (or lifted by toilet water, which is also a relevant mechanism in some viral infections), they either fall to the ground (as far as 5 feet) or evaporate in less than 5 seconds. Some smaller droplets might transform into droplet nuclei and float in the air for prolonged periods (aerosols had been shown to keep viral material for up to 3 hours). The current consensus is that aerosolization is also a route of transmission of SARS-CoV-2 (Morawska & Cao, 2020).

Because we know that SARS-CoV-2 transmits mainly through droplets, our measures focused on:

- Keeping distance beyond the reach of these droplets,
- Stopping them from going on and off people's mouths and noses,
- Cleaning surfaces where these particles might be deposited temporarily, and
- Limiting large gatherings to prevent the accumulation of particles from pre-symptomatic or asymptomatic people.

Of course, environmental conditions affect how droplets spread or the viability of the virus within droplets. Still, we will learn more about that once we look at specific interventions in the following sections. Airborne transmission becomes relevant mainly when people share enclosed spaces for continued periods (current estimates establish a higher contagion risk at approximately 15 minutes). Hence, the public health response has been to promote outdoor activity and to ventilate indoor spaces as much as possible (Morawska et al., 2020).

Contagion rate

The transmission mode defines how infectious a microorganism is, but not how deadly it is. The case-fatality rate (the proportion of people who get infected and ultimately die) is what epidemiologists use to define lethality. Again, urban and community planning cannot do much about how deadly a microorganism is—although we must keep in mind that the Pandemic is more harmful in specific populations, like the elderly and those with preexisting conditions in the case of COVID-19—. However, planning measures can accelerate or reduce the transmission by modifying what epidemiologists call the *basic reproduction number* or R_0.

Assuming you just became infected, R_0 (pronounced "R naught") is the number of people *you* will infect on average, assuming everybody is still susceptible to the disease (in other words, they can't produce specific antibodies). As you can imagine, many factors are playing out in this hypothetical scenario: the number of days you are contagious, the susceptibility of those around you, and the number of people you interact with, as well as the characteristics of such interactions (Dietz, 1993). The take-home message here is that the R_0 is not something intrinsic to the nature of a virus or bacteria. Instead is the result of the interaction between the microorganism, the host, the susceptible individuals, and the environment. That is why once we calculate an R_0, such a number cannot directly be extrapolated to other populations and places (Ridenhour, Kowalik, & Shay, 2014).

Despite its high popularity on regular media, R_0 is not the most useful measure to track an outbreak. Those who devised it did not include the dimension of time in their considerations. Hence, this measure does not tell us how fast a disease spread. By observing the disease over time, we calculate the median daily reproduction number (R_t), a much useful measure to track the speed of an outbreak.

Because new epidemics take us entirely by surprise, new diseases spread completely unchecked during the first few days. However, as time passes and the public implement measures to contain the virus, the R_t changes. Let us look at what happened during the first days of the outbreak in Wuhan, China. The blue line in Figure 2 shows us that during the first month of the outbreak, the number of infected people practically doubled each day. However, one week after travel restrictions (the vertical red line), the R_t approached one (1) most days.

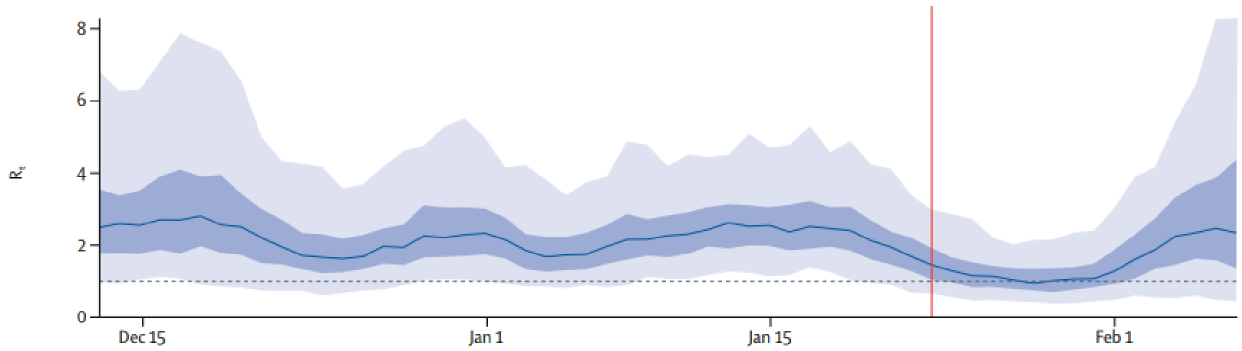

Figure 2. Estimated R_t over time. The dashed line represents an R_t of 1. Blue lines represent median, light blue shading represents 50% confidence intervals of the model estimate, and dark blue shading represents 95% confidence intervals of the model estimate. Source: Kucharski AJ, Russell TW, Diamond C, Liu Y, Edmunds J, Funk S, Eggo R.M., Sun F, Jit M, Munday JD, Davies N. Early dynamics of transmission and control of COVID-19: a mathematical modelling study. The Lancet infectious diseases. 2020 March 11. Image under CC BY 4.0 license.

Phases of an epidemic

We can think of a local outbreak as a spilled glass of water and a lot of liquid travelling to your pile of sensitive documents at R_t speed. Once you realize what just happened and (1) *identify* where the water is, you do as much as you can to (2) *contain* its spread, but if things go wrong, eventually, you end up (3) *mitigating* the damage that is already done. A pandemic is similar, but instead of a single glass, you have something like a domino of water glasses falling one after the other, and many sensitive documents spread through a large desk. More importantly, those fighting the spillover have a limited number of resources, and they will inevitably start fighting each other to get them first.

The World Health Organization (2018) classifies epidemic phases as follows:

Anticipation

While epidemics cannot be predicted, they can be anticipated based on current trends and on our experience. Enhancing our healthcare systems and creating mechanisms to respond to epidemics quickly will increase our chances to combat them successfully.

Early detection (identification)

We learn everything there is to know about the microorganism and its impacts. In our example above, we would need to identify the substance in the glass because water or alcohol would react differently to some surrounding elements, like fire. We respond with quick measures tailored to the specific characteristics of the organism causing the epidemic. Public health authorities will define what it means to be infected using clinical or laboratory findings. A "case definition" is paramount to understand the current spread of the outbreak once we realize we have one happening. At this point, the authorities have also established that the disease is transmitted from human-to-human.

Containment

There is not much to add to the word. The idea is to stop an outbreak from spreading beyond the initial cluster or clusters. At a country level, an effective containment prevents the evolution of an epidemic into a pandemic. Fast and intense mobility of people, with increased transport and international travel, and greater inter-connectivity between megacities amplify the transmission of diseases. This global transformation, coupled with increased contact between humans and animals (natural reservoirs of microorganisms), makes preparedness for containment more relevant than ever before. From a planning perspective, a containment phase is meant to last a brief period, and, as such, more extreme measures might be considered.

Mitigation

As we witnessed with COVID-19, and before that with the AH1N1 influenza virus, sometimes containment fails, and the focus shifts to reduce morbidity, mortality and the social consequences associated with a collapsed healthcare system. A mitigation phase extends over longer periods, and as such, we must restrain from drastic measures if the objective is to sustain behavioural changes over time.

Elimination or eradication

Eliminating an epidemic means making an outbreak manageable, not necessarily making it disappear. Effective treatments or the broad adoption of preventive measures can eliminate an epidemic and, nonetheless, we will still hear about cases within our communities. Eradication, on the other hand, means that there are no new cases of the disease worldwide.

Once an outbreak is finished, the role of planning is to remain prepared for future outbreaks and to prevent the emergence of new diseases by promoting sustainable and healthy cities for everybody.

Resilient communities: how cities to adapt to an epidemic outbreak

The most salient aspect of the adaptation to a respiratory outbreak is, of course, physical distancing, ventilation, and the implementation of physical barriers. For reasons outlined in the previous sections, being apart from an infected person and covering your face reduces the risk of transmission. A metanalysis published in June 2020 concluded that people staying 1 meter apart from COVID-19 patients had, on average, 82% fewer odds of getting infected compared to those staying within a close perimeter. The risk further decreased with higher distances. Similarly, surgical face masks and eye protection reduced the odds of infection by 85% and 78%, respectively (Chu et al., 2020).

By implementing these measures, people are protecting themselves *and* those around them. When we get infected, we act as reservoirs and vectors for the virus. Fewer people getting infected translates into two things: (1) fewer human-to-human transmission and (2) fewer opportunities for the virus to mutate into a more infectious or deadly variant of itself.

Distancing also clusters populations (Prem et al., 2020). Clustering is relevant because it allows authorities to apply targeted approaches to an epidemic. For instance, if we would handle the global population as a single entity, the rising cases as of August 12, 2020, would force us to lockdown every human being on the planet. But if we consider the characteristics of each cluster (in this case represented by countries), we could implement targeted strategies reducing the overall costs and increasing the public health system efficiency. Taiwan and New Zealand had reported a handful of daily cases in the first two weeks of this month, whereas the United States reported nearly 40,000 new cases in the last 24 hours.[1] Using targeted epidemiological surveillance, New Zealand and Taiwan should continue their activities almost normally without much risk. At the same time, other countries still need more strict measures to avoid, or recover from, the collapse of their public health systems.

[1] WHO | World Health Organization. COVID-19 situation report # 205 [Internet]. 2020 [cited 2020 Aug 12]. Available from: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports

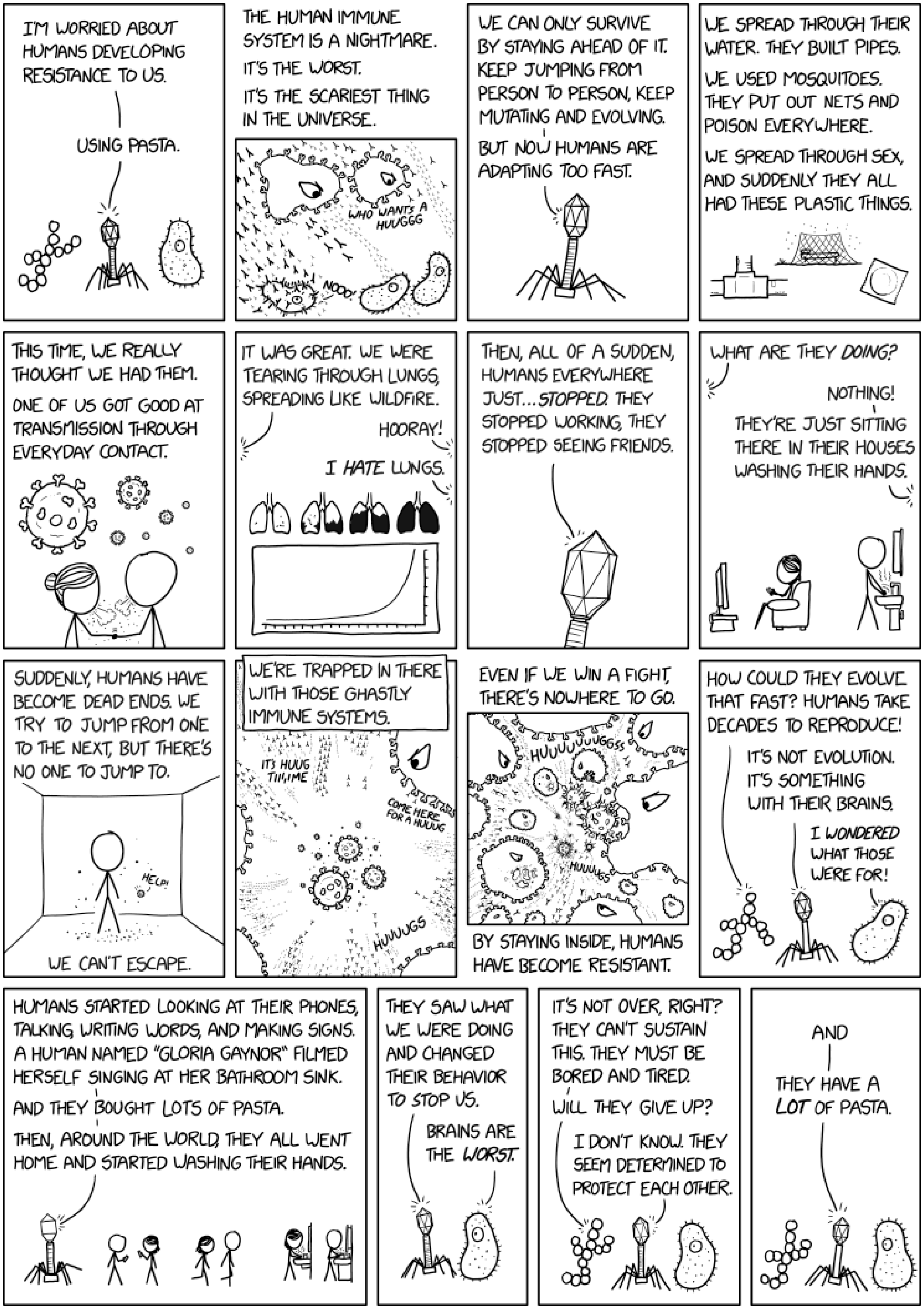

Figure 3. "Pathogen Resistance" by xkcd, shared under a Creative Commons BY NC 2.5 License.

COVID-19 is unevenly spread within countries, too, as we can see by comparing provinces and territories across time in Canada (Prem et al., 2020). While many factors influenced the uneven spread of COVID-19 on each province or territory, geographic regions *remained* different likely due to mobility restrictions. Air and road travel, in fact, played a significant role in the spread of the 2009 Influenza pandemic in China, and of other coronavirus pandemics (Browne, Ahmad, Beck, & Nguyen-Van-Tam, 2016; Cai et al., 2019).

While administrative divisions like provinces or countries are salient, local clustering can occur too, even though its impacts are harder to measure in the absence of disaggregated data. But if we follow the logic applied above, we can easily picture households as cluster units. Once a person in a family gets infected, it would be hard to stop others in the household from getting the disease too. But there is no reason to worry much about their neighbours unless they share common enclosed spaces.

Now, let us think about neighbourhoods. What happens there is quite unique and depends mostly on people's perception of the Pandemic over time.

During the initial outbreak, people learn about a terrible disease making the rounds. Their fear of death or disability leads them to social avoidance. This is good, and often it is easier to enforce social isolation during the containment phase of an outbreak. However, chronic loneliness can trigger feelings of anxiety and depression, and it is common for people to start searching for new relationships with neighbouring peers (Leung, Ball, Sirl, & Britton, 2018).

My neighbourhood probably read the statement above as a script! In mid-March, once coronavirus expanded in the City of Vancouver, and people were told to avoid others, my neighbours started a recurrent "back patio party." After selecting top Latin hits and combining them into a playlist, someone plugged their sound amplifiers and invited everyone else to dance from their own places. People who were asocial or busy before the Pandemic started going out every weekday at five. A few weeks later, they started playing the drums, two or three guitars soon joined, and finally a trumpet. The "social distancing social club" was born (that's their actual name). Funnily enough, they rehearsed for weeks next to a playground surrounded by CAUTION tape.

This social seeking behaviour, of course, is considered a public health hazard within an epidemiological context. However, it is not entirely undesirable during the phase of mitigation. Once an outbreak has peaked, and if appropriate health measures are in place, this pro-social behaviour fosters stronger communities. Communities are required in times of tragedy for running small chores for those who are unable, or invigilating conducts that come along with social isolation (like suicide or intimate partner violence).

As terrible as this sounds, we can think of Epidemics not only as of the terrible crisis they are but also as opportunities to create renewed social and urban structures that promote well-being even in the face of present and future disasters.

Complete communities

Let's imagine Earth has no major continents, only islands. While sea travel is possible, people have optimized their communities to produce local goods utilizing renewable energy sources. They shop locally, work locally, and go to school locally. Yet, they have the benefit of visiting neighbouring islands in their own archipelago, as well as other archipelagos in their country (this is actually the case for a couple of dozen countries). Urbanistically speaking, neighbours can work like those islands, too: maximizing the benefits of having most of the needs covered at foot distance while allowing access to the bigger city services.

Some cities have started implementing this idea. Examples include Barcelona's *Superblocks*, Paris' *Ville Du Quart D'Heure*, and Toronto's *Complete Streets.* Localized travel and production significantly reduce greenhouse gas emissions, incentivize healthy eating, and promote physical activity. By building complete communities, we can impact both planetary and the population's health.

Metro Vancouver's Regional Growth Strategy explains that Healthy and Complete Communities "offer a mix of housing to accommodate (a) people at all stages of life, (b) a good range of jobs, and (c) easy access to stores and services to meet daily needs." In addition, the neighbourhood provides a wide range of mobility choices.[2]

During a pandemic, complete communities can also help contain an outbreak in many ways.

A tight neighbourhood (where most transactions occur locally) will become a *de facto* cluster and will help reduce the spread beyond its "borders." As we explained before, lockdowns modify social networks. People become more likely to interact with those in close proximity (e.g. their neighbours). However, if these interactions were already in place, there is no extra risk of infections as a result of lockdowns. However, if people just start getting to know each other because they feel trapped in their new normality, these new relationships will increase the risk of spread.

[2] Metro Vancouver. Connected, Complete Communities [Internet]. Healthy and Complete Communities. Metro Vancouver; [cited 2020Jun5]. Available from: http://www.metrovancouver.org/metro2040/complete-communities/connected-communities/Pages/default.aspx

Complete communities foster a healthy lifestyle because people exercise more and eat healthier (Leung et al., 2018). Transportation walking decreases the risk of being overweight or obese, preventing the development of chronic diseases. There is less air pollution (less driving and less shipping), and the risk of chronic diseases decreases (having a chronic condition increases your risk of death in case you have COVID-19, independently of age) (Williamson et al., 2020).

Less shipping and more walking also correlate with decreased levels of air pollution. Several studies that emerged during the COVID-19 Pandemic showed a relationship the levels of air pollution increased both the number of infected people and their risk of death, even before the lockdowns (when air pollution is expected to decrease) (Wu, Nethery, Sabath, Braun, & Dominici, 2020; Y. Zhu, Xie, Huang, & Cao, 2020). Hence, a complete community will ideally improve access to free and low-cost recreational areas, like parks and forests.

Complete communities create a strong, cohesive social network. Constant wanderings connect people in the neighbourhood (X. Zhu, Yu, Lee, Lu, & Mann, 2014), which comes handy in times of crisis. Examples include a need for supplies with constrained resources, support for teenagers, and care for kids in the absence of professional services or if self-isolation is required to prevent household transmission.[3] Finally, a social network is critical to counter conditions exacerbated by lockdowns, like partner violence and mental health imbalances.

Resilient cities

Climate change threatens to change the world as we know it. It is expected to be the most significant source of refugee claims during the coming years, and countries are already evaluating what they will look like as ocean levels take over sea-level lands (Docherty & Giannini, 2009; Preston, Yuen, & Westaway, 2011). Climate change also increases the risk of epidemics. According to Harvard Medical School's Paul Epstein, climate instability "contributed to the emergence" of both the hantavirus and West Nile virus in the United States" and amplified already known diseases like dengue and malaria (Epstein, 2005). Scientists anticipate the biggest challenges in the years to come, and that is why the issue of resilient cities has become salient amid the COVID-19 Pandemic.

In 2018, the Organization for Economic Co-operation and Development (OECD) published "Indicators for Resilient Cities," which analyzed which metrics should be considered amid specific catastrophic circumstances (Figueiredo, Honiden, & Schumann, 2018). During an outbreak, the

[3] Province of British Columbia. (2020, May 13). Get Prepared for a Disease Outbreak in British Columbia. Retrieved June 25, 2020, from https://www2.gov.bc.ca/gov/content/safety/emergency-preparedness-response-recovery/preparedbc/know-your-hazards/disease-outbreaks

authors explain, cities need a comprehensive cross-sectoral approach that considers social, economic, and institutional aspects as well as *the built environment* because the latter plays a fundamental role in creating sanitary conditions and providing access to existing health facilities.

As an example, slums are highly conducive to big outbreaks as they do not provide enough interpersonal space and allow for the easy dissemination of respiratory viruses. In turn, spaces with high density but adequate interpersonal space allow people to commute at a safe distance from each other or even to carry out activities together. The public health authorities follow the same logic when they advise against using small closed spaces with poor ventilation (like standard meeting rooms) but do encourage outdoor exercising (as it reduces stress and improves people's health).

While discussing all the actions a city can take to confront a pandemic is out of this document, we will look at a few examples explicitly related to the interaction between walkability and pandemics.

Figure 4. High- and low-risk scenarios for disease transmission. Photos by Charles Forerunner and Valentina Locatelli.

SPACING TRANSPORT PEAK HOURS

Improving walkability in the neighbourhood (which includes other forms of transportation like biking and rolling) is critical to avoid agglomeration in peak hours and to make buses and subways safer as they will likely implement a policy of empty seats to reduce the likelihood of COVID-19 spread. Shifting working hours for different activities and expanding the workdays to include the weekends had both been suggested as a possibility (Capolongo et al., 2020). Public transit must also increase cleaning shifts and ventilation whenever possible.

GREEN SPACE UTILIZATION

Recent research has shown that COVID-19 resulted in increased recreational use of forests and inner-city parks in Oslo, Norway. Biking, walking, running, and hiking all increased amid social distancing measures as measured by STRAVA mobility data and Google mobility, even controlling for seasonality (Venter, Barton, Figari, & Nowell, 2020). Similarly, recreational biking increased in Vancouver during April 2020: travels increased up to 50 % compared to the previous year.[4] It would make sense for a resilient city to improve its access to greenspaces with enough space within trails and adequate signalling requiring its implementation.

FLEXIBLE FRONTIER BETWEEN PUBLIC AND PRIVATE SPACES

The COVID-19 Pandemic also blurred the line between public and private spaces. People experiencing homelessness have been relocated to hotels, and private hospitals have expanded into public parks (Ahahi, 2020; Capatides, 2020). Similarly, small businesses were required to implement physical distance between diners, leading several cities to take space away from cars (which were not circulating that much already) to provide enough room for tables and pedestrians. Both widened sidewalks and flexible mobile infrastructure to adapt to the built environment quickly will slowly become a paradigm of resilient cities. Cities often use similar strategies for holidays and during weekends and, as such, they could quickly develop protocols for extended periods.

[4] City of Vancouver. (2020). COVID-19: Mobility + Public Life Response (pp. 1-60, Rep.). Vancouver, BC: City of Vancouver, https://council.vancouver.ca/20200513/documents/cfsc1presentation.pdf

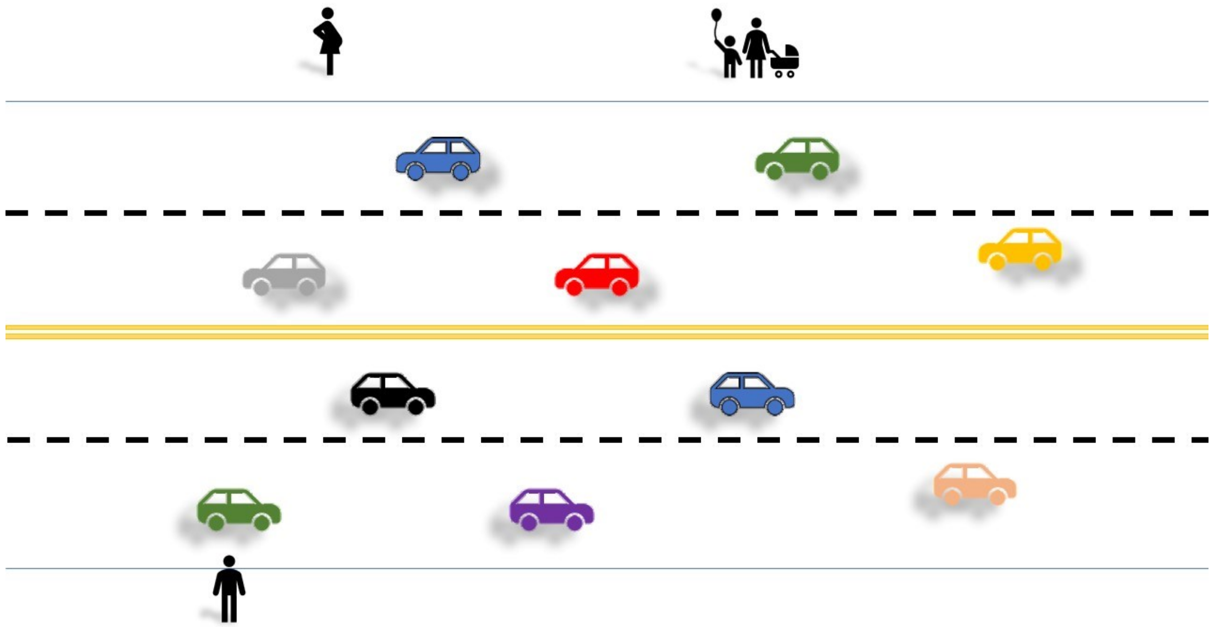

Figure 5. City transportation system before an outbreak. Cars use four lanes and pedestrians use the sidewalks.

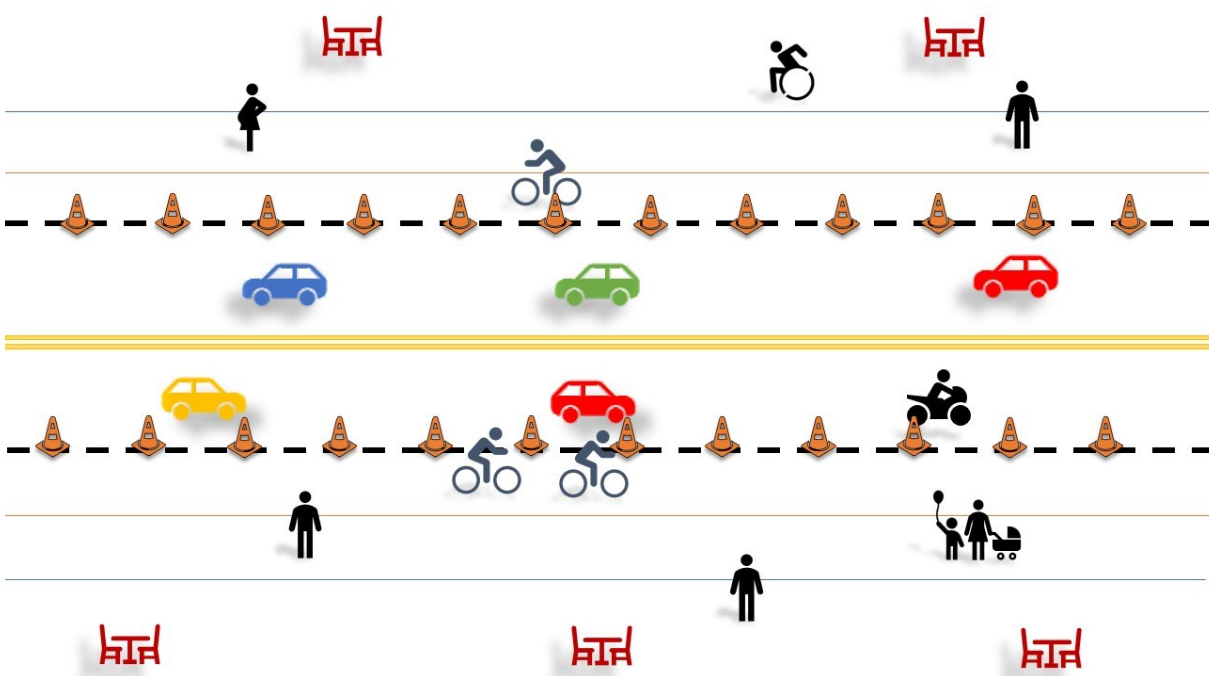

Figure 6. City transportation system during an outbreak. A car lane on each side was temporarily utilized for pedestrian and bike use. The sidewalks, in turn, were taken by local businesses to provide distanced service.

PLACE ATTACHMENT

During an outbreak, people see *their* places—neighbourhood, and urban settings amid an outbreak— transformed into something different, which might alienate their psychology as some of these places constitute part of their identity (Salama, 2020). Positive phrasing and social cohesion should take place when incorporating new elements into the built environment.

DENSITY DONE RIGHT

Because some measures of walkability encompass macro-scales of commercial and residential density (L D Frank et al., 2010), it is worth taking a look at what the ideal density looks like for a pandemic like COVID-19. We already said that density on its own could not be an ultimate measure of disease spread. To quote Richard Florida (2020): "there is a huge difference between *rich dense* places, where people can shelter in place, work remotely, and have all of their food and other needs delivered to them, and *poor dense* places, which push people out onto the streets, into stores and onto crowded transit with one another" (emphasis in the original).

Equity considerations

Every person is unique, and as such, we will be impacted differently depending on our specific circumstances. When considering the interaction between walkability and pandemics, we must pay attention to these unique characteristics in our decision-making processes.

Age and gender

People are at an increased risk of needing a ventilator or dying as a result of becoming infected with COVID-19. Moreover, older people are more likely to have chronic diseases. This group is the most at risk, and as such, there should be careful consideration around their inclusion in any contention plan. Healthy cities increase the lifespan of people compared to sprawled communities, and a higher proportion is expected to live in a walkable neighbourhood. Calculations that correlate walkability and measurements of disease severity should always consider age-adjusted rates. Besides, people at the extremes of life and people with disabilities benefit the most from green spaces so they would profit from having enhanced access. However, it would be wise to designate separate facilities or safe physical distancing strategies to prevent spread among them.

Children are less likely to get infected and, if they do, they are less likely to have severe disease (although there are exceptions and fatal cases too). If kids present no symptoms, it is highly unlikely that they will get infected while playing outdoors with their peers, especially if it is sunny (as most viruses die minutes after being exposed to ultraviolet radiation).

Men are at a higher risk of death compared to women when infected with SARS-CoV-2 due to variations in the immune response (Takahashi et al., 2020). However, women are more likely to fall victim to domestic violence as a result of confinement due to prolonged contact and increased stress. Women also provide most of the informal home care, which in practice means that they will have fewer economic opportunities and the ability to search for a job (Peterman et al., 2020; Wenham, Smith, & Morgan, 2020).

Ethnicity

COVID-19 infected and killed Black and Indigenous people at higher rates compared to other ethnic populations. One of the earliest reports on the subject (dated April 1, 2020) showed how Black people in Connecticut represented 12% of the total population, but 17.2% of the total cases. In the U.S., Black communities tend to live in close communities, have higher poverty rates, and less access to healthcare. Due to their limited income, they are also more likely to work for the service industry, meaning that they were more often part of the so-called "frontline" workers (Laurencin & McClinton, 2020). It is unclear whether something similar is happening in B.C., due to the lack of race data in epidemiological reports. However, the province is expecting to correct that through the Province's COVID Survey (Watson, 2020).

We do know that people from African descent and Indigenous People agglomerate in specific neighbourhoods within Vancouver (Piper, 2019), and special attention should be given to reduce inequities in these and other neighbourhoods. Finally, adequate mechanisms to counter hate crimes towards East Asian minorities should be established.

Impact on persons with disabilities

Persons with disabilities (PWD) are particularly hit during infectious outbreaks. On top of their socio-economic fragility—severe disabilities are associated with at an increased risk of living in poverty—, PWD are less likely to be well-informed due to barriers in communication, they have a higher risk of infection due to weakened immune systems, and some will be unable to respond to increased metabolic demands, typical of infectious outbreaks (Pineda & Corburn, 2020).

Demographically, disabilities become more prevalent with age, which is also a risk factor in several infectious diseases. The Canadian Survey on Disability Reports indicates that the proportion of PWD ranges from 13% to 47% for young adults and those aged 75 years and over, respectively.[5]

[5] Morris S, Fawcett G, Brisebois L, Hughes J. Canadian survey on disability reports: A demographic, employment and income profile of Canadians with disabilities aged 15 years and over, 2017 [Website]. Catalogue Number 89-654-X. Retrieved from https://www150.statcan.gc.ca/n1/pub/89-654-x/89-654-x2018002-eng.htm

From an urban planning perspective, an equitable response should consider the needs of people who use mobility devices to reorganize public spaces as well as accessible media (including sign language and captioning) to explain changes to the existing built environment.

Safety protocols implemented during the contention and mitigation phases of a pandemic might inadvertently create new challenges for PWD. Physical barriers, for instance, could act as obstacles for those using mobility devices. Similarly, the use of face-masks interrupts lip-reading for people who rely on it (Pineda & Corburn, 2020).

Summary

Cities have witnessed agglomeration of COVID-19 cases, prompting questions regarding optimal densities and the future of urban and transportation planning. In this document, we explain how cities fight for infectious and non-infectious diseases by (a) reducing contact with vectors, (b) conserving wildlife (reservoir of potential pathogens), (c) promoting physical activity and reducing the risk of morbidity associated with overweight and chronic disease, and (d) reducing greenhouse gas emissions, on of the biggest threats to world health according to the World Health Organization.

We outline the importance of city resilience for respiratory outbreaks, implementing physical distancing, barriers, and adequate ventilation. Finally, we explore equity considerations that should be considered in response to an outbreak.

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