

Urban Planning in the face of COVID-19: The Case of Sofia, Bulgaria

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Introduction

Despite panicked speculation about the inadequacy of existing urban planning approaches to respond to the COVID-19 pandemic, my research suggests that current sustainable planning theory and practice can indeed provide an adequate response. This is demonstrated through the case study of Sofia, Bulgaria which faces various challenges during COVID-19 specific to its region and locality. This paper provides a detailed case study of Sofia that evaluates the state of housing, public transportation, and public greenspace in order to make recommendations to the city planners in how best to proceed to avoid additional disease spread and mortality. It presents evidence that current planning theory can adequately address the needs of the city, both during pandemic and post-pandemic times, and that the city will benefit greatly from the rapid implementation of these strategies.

Literature Review

In recent months of the COVID-19 pandemic, numerous journalism outlets have published think pieces on the relationship between architectural design and urban planning and the pandemic, specifically in consideration of the present need for self-isolation and social distancing measures, and the future implementation of disease-preventative design. Yet in the face of such prescriptive speculation, the urban planning academic community remained relatively silent during the early months of the pandemic. Current speculation among journalists encourages certain lifestyle changes, such as increased private vehicle use and increased house size, which run contrary to planning notions aimed at reducing environmental damage and improving community stability. Encouragement of such behaviors could hinder the work of planners by lessening public support for viable projects out of fear for public health. Below I review the literature on current theory and planning practices – including densification and decentralization, multimodal transport, and accessible green spaces – to demonstrate how it aims to promote public health and to enumerate the short- and long-term urban solutions to disease mediation and prevention as pertaining to the COVID-19 pandemic.

A multitude of papers and projections attempt to explain the pattern of the pandemic's spread and pinpoint various factors of vulnerability within the population and policy of every country. Such studies include reports on migrant populations in Europe in connection with agricultural economy (Cretan), factors of social connectedness as indicators of future spread location (Kuchler), and presence of preexisting health conditions stratified by ethnicity (Bibbins-Domingo). While interesting to consider the innumerable factors of spread, this inquiry specifically aims to ascertain the impacts of city design, through such elements as housing, public transportation, and public greenspace. This will allow me to assess the success of implemented design solutions and the likelihood of success of long-term practices in efforts to stem the spread of this and future viruses.

Many authors (Allam, Forsyth) cite the revolutionary changes made to urban structure after incidences of disease in the past. Such projects of improved infrastructure following cholera outbreak and plague are prime examples of advancement of innovation instigated by necessity. These outbreaks necessitated better waste management and clean water access. With the

persistence of airborne illness in recent years with SARS, MERS and H1N1, a new challenge arises (Capolongo). Speculators contend that the individualistic lifestyle from which urban planners urge citizens to depart, is actually safer, healthier, and perhaps a long-term solution to the spread of disease. Academics in the field, however, do not support this turn towards isolationism and instead recommit to the goals and practices of sustainable, healthy cities (Forsyth).

Promoting dense, compact, self-sufficient cities can seem counterintuitive in this time of crisis, when medical professions are advising people to keep their distance from one another. Some may wonder how city dwellers can appropriately distance themselves in such a crowded environment. However, it is important to remember all of the services provided by a city, specifically medical services. It is conjectured that there is actually less safety in retreating to less populous areas, because there will not be enough available medical resources when the pandemic eventually reaches these secluded places (Novakovik).

Population density of cities cannot be simply equivocated to danger of disease spread. Much safety lies in the design of the city and its systems, including three major city aspects: housing, transportation, and public space. Each of these areas has the potential to be a safe or an unsafe space, in terms of the pandemic's spread. While popular media urges a reconsideration of these spaces in favor of private, individual alternatives, urban planning research and theory on sustainable cities encourages other modifications improving, not only public health, but also quality of life.

There are many different modifications that can be made to residential buildings to prevent the spread of the virus, as well as ease the discomfort of the lockdown that comes with it. The open floor plan concept may fall out of favor due to its lack of privacy. Households who have the means and desire to find new residential spaces may be inclined to seek out homes with enough separate rooms for each family member, separate office spaces for the predicted work at home boom (Wainwright), and private means of accessing nature. While suburban residents usually have access to nature and greenspace by way of private yards, those in multi-family housing are faced with a challenge. Residents of these dwellings will need to exit the safety of their homes in order to seek out greenspace, which puts them at greater risk and limits the privacy they are able to attain. Studies show that regular time in nature improves mental and physical health, thus expanding access to nature is a necessary step toward safer, happier cities. Providing balconies, courtyards, and green rooves at once remedies the limited access to the outdoors, as well as creates opportunities for community building and resource sustainability. For example, courtyards stimulate outdoor gatherings, which are much safer during this time than indoor gatherings. Additionally, a roof-top space to relax, play, or grow produce would help to alleviate stress, provide healthy hobbies, and make best use of rainwater and uncaptured sunlight (Capolongo).

Other modifications can be more costly than a retrofitted or new build green roof yet may prove necessary depending on the severity and duration of the disease. Ventilation is one important consideration (Dietz). Multifamily residential buildings pose a health hazard that single family homes do not. Generally, the ventilation system is not designed to create separate

flows of air for each individual dwelling, which means that infected residents could be spreading the disease by merely breathing (and coughing, talking, sneezing, and so forth) in their own apartment. As such, it is not only difficult to isolate a COVID positive person from their housemates, but also difficult to effectively isolate them from the rest of the building. There do exist ventilation systems that can filter a high enough percent of particles from the air to be effective in preventing spread. However, these units are costly, and it is very unlikely that all housing stock would be retrofitted given that this level of ventilation is only necessary during such a pandemic situation. Therefore, it is much more likely that hospitals will invest in upgrading their ventilation, while cheaper and easier solutions are employed in the housing stock. Fortunately, Dietz claims that simple window cross ventilation is very effective, especially in combination with allowing sunlight into the home, as nature low levels of radiation can also eliminate much of the particles.

The other significant upgrade to be considered is more applicable to the long-term circumstance of the shutdown as a result of the widespread disease, namely, internet access. As questions raise about the feasibility of online schooling, it is pertinent for city decision makers to consider internet as part of the necessary infrastructure. While those who are now working from home are by and large able to provide themselves with internet access, the same cannot be said for all children across the country. This is an area in which the economic divide becomes very apparent. Some of the largest information and social media companies are already developing research and design implementations that will allow for worldwide internet accessibility, however, not enough is being done to provide low-income school-aged children with the internet access and technology they need in order to continue receiving education during this time. Whereas once kids had the option of free library or café internet access, now a new solution must be put in place to fill the gap that the shutdown has created, such as the work of University of Michigan's Cyrus Peñarroyo.

High density housing can be a factor of increased spread of the virus due to the imminence of close proximity to others (World Health Organization, CDC), however, this does not mean that densification of urban spaces should be reversed. Urban spaces are better equipped to serve those who are infected (Connolly) and, with the appropriate modifications (Dietz), can be just as safe and enjoyable living areas as suburban ones. Much of the danger of infection in high density areas is linked to willingness and ability to comply with recommended social distancing measures. Whereas some individuals may choose to risk exposure, there are many others who are at risk due to factors outside of their control such as being part of the essential workforce or providing housing or assistance to family, friends, or strangers in need (Rosenberg).

A relationship exists between one's socioeconomic status and ability to meet social distancing and other safety standards. Those with higher incomes are more likely to have the ability to work from home, to have statistically fewer people in one residence and more rooms or space per person (WHO), to have fewer children, the ability to order groceries, necessities, online shop and purchase online entertainment, and to have a personal vehicle. By contrast, low-income earners are more likely to be a part of the essential workforce, to take public transit, to have more children and adults in the home (WHO), to have less access to testing and other

healthcare, to have preexisting conditions due to housing, food, and environment quality (Shellenberg), and to have fewer means to order goods and services online. While there are many variables here to consider, safe and healthy housing is foundational in protecting the public from infection, especially among disadvantaged individuals. Amidst all of these suggested solutions to the arising problems of the pandemic, one objective stands firm as it did before the pandemic. The bottom line for improving public health and maintaining safety in our ever more populous cities is to ensure affordable, adequate housing.

As for transportation, scholars stress that multi-modal public transit will always be better than any singular form (Hishan). Through the confusion of the pandemic several major cities across the world have undergone temporary transformations in their transportation methods. Typically promoted modes of transport such as buses, subways, and carpooling have been reduced either by order or by fear from ridership, though they are the only options for many low-income essential workers. Cities now promote walking and bicycling, such as in Barcelona, where superblocs have been implemented (Reuda). These structures allow for personal vehicles and public transit to navigate between large city blocks, while offering safer pedestrian and bike traffic within. It appears that independent modes of transport, be they environmentally friendly and physically healthy or not, are the safest modes of transport during the pandemic. Therefore, it is important to promote green modes of transport, rather than personal vehicles, to avoid serious environmental damage.

Looking ahead to life after the pandemic, when the goal is to prevent subsequent pandemics of airborne illness, planners contemplate the reapportioning of commuters to various methods of transport. A multi-modal approach would fair best in accounting for the differing needs of citizens and the level of healthy separation advised at any given time. If pedestrianism and cycling, or use of other similar small machines, is to increase, portions of car dependents and subway riders would proportionately decrease. In this case, subways and buses might be less crowded and thus lowering the likelihood of spreading disease while commuting. Such is the hopeful outlook on public transportation which does not regress to the increased use of private vehicles, but rather increases simple transportation and incorporates healthy movement into the citizen's daily routine.

This lofty goal of increased mobility is not without challenges, as many choose private transport because they are unable to easily transport themselves otherwise. While the bikes, electric bikes (Reuda), and scooters of rideshare companies are sprouting up in cities across the US, many worry that these endeavors for cheap, green transport will be foiled by the germaphobia to ensue following the pandemic. It is likely that these worries are unfounded, however, as innovative solutions are found with increasing rapidity in times of need. Hopefully, the enjoyment of these services will enable growth beyond metro areas and inspire a call to build more self-sufficient communities. Such areas where necessities, like groceries, entertainment, medical facilities, and social centers, are all nearby are a planning ideal toward which to strive, that will raise public health standards and promote sustainability.

The conceptualization of public spaces may also face change at the hands of the pandemic. During the course of the pandemic many avenues of entertainment have transformed

and continue to do so as it seems necessary. Sports teams devised systems of quarantining and screening their players for the virus and fans are limited to watching from home. Movies are sold exclusively to online entertainment subscription services, and meeting with friends over coffee is strictly an outdoor activity. The adaptation of entertainment and leisure activities to socially distant versions serves to improve the spirits of the isolated, as quarantining by oneself is known to impact mental health (Shellenberg). The real-time consequence of the virus on public spaces manifests in their closure or severe limitation of capacity, with virtual alternatives are the best present solution.

Future prevention and mediation of subsequent viruses begets the question of designing public spaces for a world of health hazards. In all likelihood, greenspace will be all the more advocated for, especially in high density areas, such that access to nature is possible for everyone, as mentioned above in housing. When considering the construction of a new public parks, planners must weigh the needs of the community it will serve. Some communities have more desire for socially oriented spaces, while others will want athletic spaces, or ones for quiet reflection and enjoyment of nature. The public space ultimately built will be resultant not only of community wants, but also of community resources. Thus, less wealthy communities tend to have less expansive parks with fewer or lower quality amenities (Honey-Roses). Ideally, efforts will be made to lessen this socioeconomic inequity of public space to provide well for all who need it.

Urban spaces, our homes, our commutes, and our leisure spaces, have been greatly impacted by the pandemic. In turn, the upgrades, retrofits, and future designs of these spaces are likely to be influenced by the newfound knowledge from the pandemic. Yet much of planning may not be so unlike the visions of planners today, who advocate for sustainable, healthy cities. It is likely that the pandemic will bring matters of planning, such as public transit sanitation and the use of public space, into the public eye, increasing support for the implementation of public health, sustainability, and community-fostering programs and designs.

Case Study

Findings in Sofia, Bulgaria are likely to be applicable in major cities across Eastern Europe, given that much of their city infrastructures were largely constructed under Soviet occupation. However, each city exhibits its own patterns in relation to the differing cultures and experiences of its people. Many housing estates of the Soviet era can still be found across the region, appearing as carbon copies of one another, and those in Russia. Yet while some countries choose to allow these structures to fall into disrepair or demolish them, others actively strive to preserve these estates and retrofit them with innovative green technology. In terms of transportation, the northern city of Tallinn, Estonia is currently struggling with the rise of car culture, and the parking issues that come with it, as opposed to the public transit-centric patterns of most other East European capitals. Therefore, this case study serves as a valuable example of the possible outcomes of decisions to keep or change course from the existing Soviet infrastructure and the urban behavioral patterns associated with it, in the face of a pandemic. This research marks the beginning of a comprehensive investigation of post-Soviet planning in East Europe and its implications for urban life and public health.

Housing

During the Soviet era, many housing estates were built across Russian territory, as well as Eastern Europe. Created to provide housing quickly and cheaply for a great number of people, these housing estates made use of the newly popular prefabrication methods and modern style of architecture. This resulted in monotonous matching structures across the Soviet Union which effectively maintained dense urban cores despite the influx of population during industrialization.

Many Soviet architects and planners, entranced by the Garden City movement and the prospect of incorporating more greenspace into urban life, advocated for plans to decentralize and spread the population across wide tracts of land. However, oftentimes the necessary budget for the building of massive infrastructures required to service these idealized residential layouts simply did not exist. Due to this lack of resources, the strategy to increase housing stock became to densify cities by locating new construction within city limits on unused land, or just outside of the city center in a ring of housing estates.

A major factor in the ability of Soviet housing to keep cities compact lies in the state's housing system and the lack of choice residents had in the matter. Due to state ownership of land and control of the economy, neither the preferences of citizens nor the pressures of the market drove growth in the housing sector. Housing estates were built when available resources and necessity arose. The Soviet housing system assigned residences to individuals, yet due to the limited housing stock, many people had no choice but to live in small apartments, often shared with several generations of family. This led citizens to formulate creative solutions such as marriages and divorces of convenience and a second economy in which individuals could trade housing allotments with one another. Unfortunately, these strategies did not solve the overwhelming issue of insufficient housing.

Inadequate living space and overcrowding are undeniable multipliers in the spread of disease (WHO). Had the COVID-19 pandemic occurred during the height of housing estates, these structures would have been a hotbed for the virus, such as is the case in high-density low-income areas in the US. However, following the end of socialism and the eventual economic rebound of post-socialist countries, citizens heartily embraced the new prospect of suburban and peri-urban living. The experience of overcrowding is no longer standard for housing estates, due to the emigration of those who can afford to live elsewhere. Today many housing estates have been renovated in attempts to preserve the existing housing stock and convert them into more economical and sustainable living spaces. The combined effects of physical improvements and decreased number of residents per dwelling decreases the portion of disease spread rate that can be attributed to overcrowding and unsanitary living conditions.

However, the decision in recent years of post-socialist countries to adopt Western-style suburbanization in their capitals could be a significant factor in the increased spread and death rate of suburban citizens as compared to residents of the urban center. Additionally, given the experience of the US and other Western countries in suburbanizing, which resulted in a loss of vibrant, compact urban centers, post-socialist countries are likely to regret their current support of market-driven, unchecked sprawl. As it currently stands, some cities have growing networks of single-family homes that have yet to be connected to city infrastructure, leaving them without essential services like sewage, maintained roads, grocery stores, and hospitals. This oversight could be very dangerous as the pandemic progresses.

Bulgaria's capital city of Sofia is one such post-socialist city at an important crossroads in urban planning. Since its establishment as the capital city in 1879, Sofia's planners have grappled with the allure of an expanded, decentralized layout, while being constrained by the available funds for constructing and supporting a dispersed city. During the Soviet era, appointed planners claimed that single-family homes were inherently not socialist, further instigating infill and densification of the existing Sofia. This led to a very compact city with the trademarks of socialism, specifically the ring of housing estates and the great number of public parks and squares. Almost no Ottoman influence can be found among Sofia's architecture, partially due to the great damage sustained during WWII (Hirt, 2007).

At the end of socialism, Bulgaria suffered massive inflation, which was so oppressive that 12% of the population emigrated. However, by the turn of the century the economy took to an upward trend, thus fostering a robust private housing market. With all nationalized land returned to its previous owners or sold off, private developments quickly sprang up and continue to be on the rise. This has created an optimal situation for the suburbanization of the city's outskirts, no longer impeded by the will of the government. However, the growth and recomposition of Sofia's outskirts, especially in the southern region of Vitosha, could soon become a problem due to a fundamental lack of infrastructure. Slaev argues that it is the responsibility of planners to shape urban development, through tools such as zoning and infrastructure laws, such that the city's resources are not stretched beyond its means by unchecked development (Slaev, 2013).

In 2007 Bulgarian national parliament approved a new city plan called Sofia2020 which emphasizes decentralization and dispersion into the greenfields at the base of nearby mountains. When questioned about the sustainability of their plan the developers made assertions much like those of the Garden City and City Beautiful movements and claimed that living closer to nature is inherently more sustainable and enjoyable to citizens. Planners also cited a desire to become more like the Western world, which is now battling sprawl and attempting to revitalize its lost compact urban centers, thus suggesting that the Bulgarians may need to learn for themselves the drawbacks of widespread sprawl. Many scholars would like to see Sofia, and other post-socialist cities, keep their compact nature, which makes them such great urban centers in which to live.

Slaev's 2018 findings report a clear presence of suburbanization, but not sprawl. He defines suburbanization as growth into the periphery and sprawl as growth that is dispersed with an undefined pattern. In fact, Sofia's population density has continued to increase over recent years, which Slaev attributes to a Bulgarian tradition of appreciating the city. However, with sentiments toward large spaces, yards, and nature changing, as indicated above, this trend may change in the near future, especially given the demographics of new build ownership in Vitosha.

Hirt's qualitative interview-based study indicated that new residents were found to be younger, more educated, earning higher salaries, more often car owners and commuters to Sofia for work, and a much higher percent moved from Sofia. Hirt describes a cultural clash between the lifestyles and means of the new and old residents of the suburbanizing Vitosha, which allows for speculation as to the likely trend of newcomers in suburbia and their motives for moving. I argue that in addition to the vibrant environment of the compact city, there is much benefit from self-sufficient urban areas, and therefore, if Sofia is to continue suburbanizing and expanding, it must also invest in the expansion of infrastructure to support such peri-urban communities. Without sufficient infrastructure, such as roads, sanitation, and hospitals, areas on the periphery will be vulnerable to adverse outcomes as COVID-19 spreads.

Academics specializing in public health research uphold this claim, supporting it with data collected in the US's struggle to manage the virus. Most US metropolitan areas are greatly comprised of vast suburban areas outside of their cores, often the location of major hospital and healthcare networks. By contrast, less urbanized areas tend to have underdeveloped transportation networks and roads, and a general lack of easily accessible services. Thus, studies analyzing impacts of the lack of resources in micropolitans and rural areas are better suited for comparison to Vitosha's suburban development patterns, given that there is a similar lack of infrastructure in both.

Peters' metric for assessing risk synthesizes demographic factors such as percentage of elderly, immunocompromised, individuals with diabetes and other compounding health factors. Using this information, he concluded that the risk of death or hospitalization of an individual is much higher in less populated areas, not only because of the demographic characteristics of the population, but also due to the stark contrast in capacity and resources of urban versus rural hospitals. Metropolitan areas, on the other hand, while prone to high rates of infection, also correspond to lower rates of serious outcomes. Hence the movement of the population, especially

the fleeing of the wealthy to second homes in less populated areas, is a real factor in the deadly spread to underserved periphery or rural communities.

It is important to consider the similarities of the situation in Sofia's periphery. With the mixed demographics of Vitosha hosting a noticeable percentage of young, city commuters and aged retirees, there is great risk that commuters could bring the virus into the outskirts, where the infrastructure is entirely unable to support the treatment of its inhabitants. For this reason, it is absolutely necessary to improve Vitosha's basic infrastructure, especially hospitals, as soon as possible. It is important for the government to take note of this need because the financial support of individual owners and construction corporations which so readily creates infrastructure in the US's suburbs, does not operate as such in Bulgaria. Thus, while Sofia's suburbanization process is not necessary a risk factor, a sustained lack of infrastructure to support new housing definitely is.

Public Transportation

Public transportation is another component of the built environment which drastically influences the patterns of human life in cities. Its history in post-Socialist countries is inseparable from that of housing estates, as the design of the latter influenced the necessary forms of the former. In the Baltics and the Russian mainland, many cities supported Western-style suburbs made up of housing estates far from city centers. Cities with satellite towns faced the challenge of transporting residents to their places of work, with commutes up to 1 to 2 hours each direction. Problems of congestion also cropped up, especially as the most efficient routes were often more expensive, thus concluding in the severe overcrowding of the very limited and underfunded network of public buses, trolleys, and trams. Additionally, despite the original intentions to create walkable housing estates, very few had amenities or shopping nearby and walking paths were usually informal creations of the residents.

By contrast, many former Soviet controlled East European cities benefited from the Soviets' desire for compactness and their lack of resource to build satellite cities. The effects of this are exemplified in the urban structure of Sofia, which features a ring of housing estates around the city's former outskirts. The proximity of mass housing to the urban center maintained density within the core and ensured a short commute between the housing estates, and the workplaces and amenities of the core. This advantage in turn made the city a much more desirable place to live and increased the value of inner-city housing units.

Unfortunately, the transition away from Socialism eroded much support for public transit, especially in the Eastern Block. Under Socialism the government largely owned and subsidized public transportation methods such as busses, trolley, trams, and metros. Many of these fleets suffered from disrepair due to a lack of funds or replacement parts. Additionally, the long waiting periods and complicated application process involved in car ownership sufficed to keep the general public away from individual cars as modes of transport. In fact, the sudden shift between public transit and car ownership in much of the former Soviet Union can be attributed to the newfound accessibility of car ownership, rather than a newfound desire. This solidified the

notion that public transportation had inherent Socialist qualities, and therefore is bad, and that car ownership marks independence and freedom, therefore making it good.

These normative judgements and political equivalences are poor generalizations which deter the efforts of sustainability-minded academics and policy makers advocating for multi-modal transport and a re-strengthening of public transportation systems. Because of this strong pro-individualism/privatism sentiment, former Eastern Bloc governments face much difficulty in encouraging a decrease in car use through such restrictions as limited and paid parking spots in cities. Many citizens see this as an infringement upon their freedoms, and a Socialist act, yet they do not exhibit the same qualms about other car traffic regulations such as speed limits, traffic lights, policing, and so forth.

Luckily, many metropolitan areas are seeing an increase in bicycling and pedestrianism. Scholars argue both sides of the case for bicycle culture as individualistic or communal, as it displays aspects of both through communal spaces, independent ownership, and freedom of travel. In efforts to curb car usage, due to the pollution and overcrowding it causes, many cities began implementing redistributions of roads, such that bicycles could share the road with cars.

In Sofia, the prevalence of car ownership grew even before the end of socialism. Already by the 1970s car ownership reached a ratio of 117 vehicles to every 1,000 inhabitants of the city. This early trend of car use influenced the structure of Sofia's public transportation systems. As early as 1901 a system of trams provided a popular, above-ground commute option. However, by the 1960s it fell out of favor as a preference for cars developed. In response to this the city decided to instead fund the construction of an underground heavy rail metro system, allowing for the simultaneous existence of public transit and expansion of street capacity for cars. The expensive project faced many setbacks due to indecisiveness and lack of proper funding, causing disappointment and skepticism from the public. By 1998 the first line of the metro finally opened, with plans for two more lines to cover the city. As of August 2020, the third line still has not been completed, yet there is a great deal of positive sentiment toward the project now that a significant portion is operational (Plyushteva).

Slow development appears to be a common difficulty in establishing public transportation infrastructure, as can be seen in many growing American cities like Seattle. The success of such infrastructure in cities such as London, Paris, and New York, however, prove the value in investing time and money in this particular mode of transport. Metros hold the advantage of being able to transport diverse populations such as low-income, disabled, and those without licenses, while also extending the possible length of travel that might otherwise be achieved. Take for instance the difficulty of covering these concerns with other sustainable methods of transport such as car sharing, bicycling, and pedestrianism. Thus, public transportation via metro and buses is an important part of multi-modal structure and should be carefully planned, maintained, and, when necessary, modified by transportation experts to ensure safe, efficient travel for all citizens.

Sofia should continue investment in increasing the range of the metro, while also improving other metrics of mobility, especially in efforts to squelch the pandemic and prevent future spread of disease. While encouraging post-pandemic flexibility of work schedules to lessen the volume of commuters during traditional rush hours (Capolongo) would be able to increase safety on an essential commute path, it is especially important to promote other methods of transport. By travelling by bicycle or on foot as much as possible, one avoids being in close contact with others, without the burden of pollution and congestion created by private vehicles.

Bicycling in particular continues to gain popularity among Sofians, despite the city's less than optimal infrastructure to support it. In a series of studies by Barnfield, bicycling commuters report a severe lack of suitable routes, despite the extensive designation of bicycling paths. These difficulties are due to a lack of maintenance, as well as a lack of consideration of use. Many of these paths involve dangerous and uncomfortable sections including stairs and traffic crossings. Additionally, some paths are shared between bikes and pedestrians, creating an unsafe environment for both. Considering the rising popularity of bicycle usage, as well as the benefits bicycling may provide to the rider, physically and mentally, and to the environment, Sofia should invest in a restructuring of bicycle routes. Increased space for bicyclers is likely to produce positive outcomes for the sustainability and health of the city, such as lower noise and air pollution levels.

Public health researchers are finding that minute particulates in the air, largely produced by vehicles, as is the case in Sofia, can increase the risk of disease in a twofold manner. Firstly, particulates may be able to carry the virus much further than air that is free of pollution. Secondly, those exposed to pollution are negatively impacted by it, creating underlying health issues such as hypertension, asthma, and other non-communicable diseases (Capolongo). These diseases weaken the body and make it more vulnerable to other diseases. In terms of the COVID-19 pandemic, those with preexisting conditions, especially within the lungs, are the most at risk. This relationship is especially distressing for the Bulgarian population due to their comparatively low monitoring and treatment rates of non-communicable diseases (Scott). Thus, it is extremely important not only to improve the response of the Bulgarian medical system to non-communicable diseases, but also to minimize air pollution, and therefore car usage, to lower mortality rates and prevent future spread.

Increased walkability has the potential to both lower air pollution and increase physical activity among citizens. According to Bartzokas-Tsiompras' study of walkability and equity across eight capital cities in Europe, Sofia is a comparatively undesirable place for pedestrians due to low frequency of maintained sidewalks, lighting, seating opportunities, and signaled crosswalks. Interesting, this study also finds that Sofia has a low level of inequity of walkability between persons of differing socioeconomic status. This finding is due to the arrangement of Sofia's density. Researchers observed areas of high density - high walkability in the city's core, a unique manifestation further attesting to the novelty and value of Sofia's vibrant core. With improvements made to the condition of walking paths, and the addition of necessary safety and comfort amenities as mentioned above, Sofia's walkability score could drastically increase. Many of these modifications would be dually beneficial to pedestrians and bicyclers, doubly

increasing the viability of non-vehicular transport. A shift toward commute by these methods stands to increase safety during times of pandemic by giving citizens more open air, uncrowded travel options.

Currently, Sofia's most popular modes of transport include bus, taxi, and private vehicles. The widespread use of buses, while more efficient than private cars, is still less effective than the metro system both environmentally and in terms of physical traffic congestion. The completion of a third rail line and a careful transfer of the carbon-fueled fleet to electric counterparts, as well as the building of a supportive infrastructure for cyclists and pedestrians would do well to minimize traffic and its negative effects. As early as 1974, Sofia's officials expressed a desire for a walkable city center (Plyushteva). Planning officials should work toward this goal for the health and safety of their citizens. In these ways Sofia can boost its level of multi-modality of transport and lower the risk of disease transmission and mortality.

Green space

The Soviet Union's contribution to public green space is surprisingly positive, considering its pitfalls in housing and public transport. As part of the Socialist ideology, public space stood as a necessity in fostering social cohesion and warding off dreaded individualism. While the citizens' relationship with nature held high import to the Soviets, a strict designation lay between private yards and public courtyards. The former signified socioeconomic stratification, and therefore, was bad, while the latter symbolized community connectedness and encouraged preferred behaviors, and so was good. Hence in the creation of large housing estates, the familiar design involved several large buildings turned outwards such that an expansive space lay between, in which residents could walk, socialize, or bring their children to play.

This spatial arrangement came to be not only because of the socialist values of the regime, but also because of their total power over land allocation and construction. Common among the now post-Socialist countries is the occurrence of collectivization of land. In addition to the role this action played in the construction and assignment of housing, it also enabled the government to designate as much land as they liked to public spaces and monuments. Because market competition no longer existed, little barrier stood in the way of generous allotments of land for public purposes. Much of this designation occurred to support political agendas and create an impression of power and ability onto the international scene. Nonetheless, the Soviets also felt a closeness to nature, though sometimes inappropriately expressed through theories of urban dispersal, and left a lasting impact on the sustainability of post-Socialist cities.

How lasting this impact will be is a question to be put to the next few generations of planners, government, and the public in these particular cities. While many cities received the advantages of the installation of vast public spaces, and especially protected green spaces, much of this legacy is deteriorating faster than environmentalists, and even citizens themselves, are happy to see. Following the end of socialism and the subsequent period of economic devastation, the sudden explosion of commercial ventures in post-Socialist cities has brought about a concerning state of development for much of the region's green spaces. In recent studies across

several East European countries and Russia (Arvanitidis, Kronenberg), the privatization and haphazard process of restitution presents opportunities for exploitation and does little to protect existing greenspaces, let alone introduce much needed additional greenspace.

Representatives from cities across post-Socialist Europe, including Germany, indicate a current inadequacy of public greenspace, in both quantity and quality (Arvanitidis). Despite the market's current favor for intense commercialization, individualism, and new development, the next step in the transition back into capitalism may well be the preservation, addition, and upgrading of public parks. According to economic analysts (Arvanitidis), greenspace is significantly linked to economic development, in addition to its health and sustainability benefits. Greenspace has the ability to increase property values due to its attractiveness to both private citizens and corporate investors of various sectors. Additionally, there appears to be a threshold at which quality of greenspace becomes more important than quantity of greenspace in terms of both economic impact and citizen enjoyment. These findings suggest that greenspace and other types of public space will be highly valued in the future, and that the level of citizen concern raised now is what stands between reclaiming parks after the city is overdeveloped and preserving them while they still hold cultural relevance.

In Sofia, the loss of greenspace is quite dire, with a 15% loss over a span of 15 years. Of the cities survey by Arvanitidis, Sofia has one of the lowest ratios of greenspace, as well as the most decided responses from respondents that the city lacks sufficient greenspace. This dissidence between the wants of the citizens and the actuality of land allocation finds its explanation in the inadequate specificity of restitution laws and the eagerness of, often foreign, investors for commercial construction. In the process of restitution, the city government allowed many former public spaces to be claimed by develop, due to the ambiguity of the law. At the end of socialism, designated public courtyards sat adjacent to housing estates, but were not denoted as such. As socialist planners vaguely zoned the entire area as a housing development, these types of public spaces faced development first (Hirt). Additionally, the large tracts of land allocated as public parks sprouting off in all directions from the city center became targets for new development and have seen shrinkage of up to 20% of their original areas.

Greenspace, the once defining feature of Sofia, faces a great threat from the new individualistic, consumer-centric zeitgeist. From satellite view, a clear outline of the border of Vitosha National Park comprised of dense, new-build single-family homes shows the extent to which unprotected land is subject to development with the free market. Yet there is something to be said for the manner in which Sofia's suburban development differs from other post-Socialist countries, tending towards densification, despite the Sofia2020 masterplan advocating for dispersion. Indeed, these losses can be partially attributed to the ineffectiveness of Sofia's masterplan, as evaluated by (Slaev & Nedovic-Budic), having been in place for over 10 years now. The loss of greenspace so far experienced may be difficult to remedy, however, given that the tendency of density over dispersion exists in Sofia in favor of savvy planners, much greenspace may yet be safeguarded. It is important that local planners employ effective tools and strategies for enforcing the vision of the masterplan, especially the use of zoning.

The protection of publicly accessible greenspace is especially significant in consideration of the COVID-19 pandemic. With restaurants and entertainment facilities closed to avoid further infection, the safest option for socialization and physical activity relies on the accessibility of outdoor spaces. Many citizens turn to outdoor gatherings with masks and distance between participants. While this still involves risk, it is much less dangerous than indoor gatherings, where air is poorly filtered. Both socialization and physical activity are immensely important in maintaining good physical and mental health, therefore they should not be discouraged, but rather moved to outdoor venues with appropriate precautions. This creates need for adequate public spaces in which to gather safely. Greenspaces appear to be a superior type of public space for their added health benefits, both short and long term.

Studies (Dzhambov, Kothencz, Vienneau) show the undeniable positive effects of greenspace on human health through variables including the encouragement of socialization and physical activity, as well as cleaner air, lower noise pollution, restorative qualities, and aesthetic appreciation. Vienneau documents the increased benefit received by city dwellers from exposure to greenspaces, with lower rates of non-communicable disease such as stroke, heart attack, and hypertension. This is especially relevant to Bulgaria, due to its current inadequacy in preventing such diseases, as previously discussed. Increased access to and quality of public parks in Sofia should provide some remedy to this problem by offering more opportunity for enjoyable exercise.

Whereas Sofia used to have an extensive network of parks to support the socialist agenda of community building and public service, much of the social aspect of parks has been usurped by privatization and now by the pandemic. Sofians installed ever increasing numbers of fences around their private homes, cutting off access to nature for those who cannot afford suburban luxury. Yet the desire to foster community persisted through the creation of cycling and running clubs throughout the city. These groups educate the public on the accessibility of such outdoor activities as running, walking, and cycling, which helps create support for the extension of resources to serve the community including public parks and green transport infrastructure. Kothencz's study of greenspace use and wellbeing makes use of participatory GIS and run path data providing further evidence of the necessity of public parks in keeping the public healthy. Replication of this study for parks in Sofia could be a powerful tool in obtaining desired amenities and an expansion of the number of parks within the city.

The positive effects of green space extend to mental health as well, especially when socialization is increasingly difficult to safely attain. In terms of the long-term effects of the COVID-19 pandemic, the longer the public is mandated to stay at home, the more important greenspace access becomes for mental health. Dzhambov analyzes the relation between greenspace perception and self-reported mental health of college students in Plovdiv, Bulgaria, finding a significant correlation between good mental health and time spent in greenspaces. While key in the facilitation of safe social interaction, greenspaces also provide a restorative effect by themselves. Students whose residences were situated near public parks were found to have less incidence of common mental ailments such as anxiety and depression, one of several indications that the distance from one's home to a public greenspace is significant in its ability to

provide benefit. This strengthens the argument that both quality and quantity of greenspace is important. The general public needs to have access to greenspace throughout the community, not just in gated suburbs or distant natural scenes.

In summation, the city of Sofia is at a low point in terms of the quality and quantity of its accessible public greenspaces, as is the case in most former Eastern Block countries, despite the once high proportions of greenspace during the Soviet era. However, there is clear desire for a protection and improvement of existing greenspace and an expansion of inner-city greenspace, far greater from Sofian citizens than that of any other post-Socialist capitol (Arvanitidis). This sentiment is likely to guide the development of the city going forward, yet it is still very important that city planners do their part to support public park development by fixing negligent zoning errors and utilizing park use survey methods. These efforts will safeguard the physical and mental wellbeing of the public during the current pandemic, making them less susceptible to mortality, and create a stronger green infrastructure in future incidence of disease.

Conclusion

Of the numerous recommendations to be made for planning in the pandemic and the post-pandemic world, the following suggestions are the most pertinent for Sofia's planners, given the specific state of the city and its development trajectory. The recommendations are a part of the broad urban planning theories of sustainable and healthy cities which face continual improvement as methods are applied and tested in communities around the world. Specifically, the areas of housing, public transport, and public greenspace were evaluated for their current state in Sofia, Bulgaria and relevant suggestions are based on the theoretical and practical studies of a survey of academics from urban planning as well as other relevant backgrounds like public health, law, and economics.

In evaluating the adequacy of Sofia's housing stock and structure to contend with pandemic circumstances, I have found that Sofia is currently in the process of suburbanizing, though it is maintaining much of its densification. Despite the planners' goal of dispersion, which would create the problem of sprawl, the population has a tendency to remain dense. This is an indication that the city may decentralize and form several self-sufficient areas on the outskirts of the city's boundaries. Planners should work to encourage decentralization, especially the creation of infrastructure, as it supports the needs of the new communities and prevents peri-urban citizens from being reliant on city services. Improved roads, hospitals, and other essential services will better protect new areas from disease spread and high mortality of vulnerable populations.

Sofia's public transportation is currently multi-modal, however policy guidance by planners will significantly improve the efficiency and sustainability of the system, as well as improve public health both directly and indirectly. Despite Sofia's history of widespread private vehicle ownership and use, the eventual completion of the metro's first two lines significantly increased citizen mobility. The continued funding and construction of the metro will ensure improved multi-modality and support the rest of the somewhat overcrowded transport system. Additionally, citizens' increasing interest in bicycling and walking as modes of commute and

leisure, if supported by city planners through infrastructure improvements, will offer pandemic-safe alternatives, as well as long term benefits of physical activity and lowered pollution rates.

Similarly, the protection, improvement, and expansion of public greenspace has the capability of vastly improving the everyday lives of citizens, if planners adequately advocate for the needs and wants of Sofians. The once great breadth of public parks, gardens, and other recreational areas in Sofia, has shrunk alarmingly since the beginning of its post-Socialist transition. Actions taken now will minimize the damage done by commercial development and safeguard a precious resource to the wellbeing of citizens. Researcher have made it clear that access to public greenspace is crucial to avoiding non-communicable disease such as hypertension and stroke, as well as mental health concerns such as anxiety and depression. The maintaining general health of the public is essential in preventing disease spread and mortality.

Post-Socialist countries can be expected to experience different urban challenges than Western countries, given their vastly different history of planning policy and theory, and the ideology that shaped them. Yet, as seen through my case study of Sofia, Bulgaria, which in itself displays unique urban patterns such as sustained density after Socialism and early mass car ownership, current planning theory is applicable worldwide and supports public health and safety in the context of COVID-19 and beyond.

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