

**NATURE AND HEALING IN URBAN COMMUNITIES:  
BIOETHICAL ANALYSIS OF HEALTH  
AND GREEN SPACES**

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## ABSTRACT

The health benefits of nature are numerous, wide-ranging, and often overlooked. An ever-growing body of research has started to document, substantiate, and even in some cases quantify the significance of interacting with nature and its effect on human health and well-being. These directly measurable health benefits are also compounded in urban environments by environmental and social benefits. For example, the inclusion of green spaces in urban communities has been shown to reduce violence. Green spaces are important for overall health, but also specifically for healing. The benefits of natural spaces in hospitals have been explored in the literature and shown to benefit not only patients but also family and visitors, as well as staff, by creating a healing and restorative environment that helps to reduce stress and alleviate anxiety.

Lack of green space in urban communities is creating and exacerbating health disparities. Urban hospitals are often limited in their ability to include extra space, and particularly green space, in their campus, yet it is their patients who need these healing benefits the most. Particularly urban communities of low socioeconomic status are often those with the least access to green spaces, or only have access to low-quality, poorly maintained, unsafe green spaces. Yet the residents of these communities are those who stand to benefit the most from access to nature and a greener environment. Improving the accessibility, quality, safety, and square footage of natural green spaces in urban environments will help improve health equity by mitigating negative effects of the urban built environment on health and well-being, increasing the agency of these communities to live healthier lives, and allow them to reap the physical, emotional, and social benefits of green spaces.

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# CHAPTER 1

## INTRODUCTION

Green space is important. It has numerous benefits – both quantifiable and unquantifiable. In many cultures, nature has been at the heart of healing for centuries, with herbs and plants being used for specific medicinal properties, and specific locations or landscapes used for their healing powers. As the field of medicine has evolved away from natural healing remedies, its core mission has not strayed – to prevent and cure disease, and maintain health. Modern medicine has done much for the former – with the bulk of investigations and research into diseases and mechanisms and treatments and techniques, many people are given a chance to far outlive their life expectancy had they been born 400 years earlier. In the modern age, and often in the western world, this has taken on a particularly biologic definition of disease – both in how to cure and how to prevent. But, this latter aim of health maintenance and disease prevention is not simply a natural result of medicinal cures and interventions.

In 1948, with the creation of its constitution, the World Health Organization (WHO) defined health as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (World Health Organization). While this definition has received criticism and debate for being overly broad (Gregis et al., 2021), it has reframed the conversation around health and medicine as more than a binary between ‘diseased’ or not. Modern medicine has helped to shade in the conversation around disease to a more nuanced discussion of conditions, diagnoses, symptoms without a specific disease, and diagnoses that one lives with, which are no longer terminal. There is

much in the WHO's definition of health that is traditionally thought of as outside the purview of 'medicine' – but if the definition sticks, medicine should indeed be concerned with the maintenance of well-being in all these spheres. If medicine wants people to be healthy, it needs to be concerned with more than the absence of disease.

In his 1971 book on Bioethics, physician Van Rensselaer Potter argued that bioethics was a bridge between humankind and nature, and science and the humanities (Lee, 2017). For health to be achieved, in the WHO's definition, medicine needs to go beyond the limits of biological sciences, and bioethics can help navigate those paths and bridge the gap between disciplines that are all connected to health and well-being. This thesis uses a bioethics lens to analyze the connections between health and green spaces.

The study of nature and the natural world is the focus of numerous different disciplines, as is how humans and societies interact with and live in that world. The medicinal and health attributes of nature, and their effect on humans, have been observed for centuries, but have increasingly become the focus of study and academic research in the past few decades. Green space is important for the health of humans, but it may affect everyone differently, as cultural and societal influences shape the interactions and relationships between individuals and their surroundings. With its numerous health and wellness benefits, the importance of greenery and natural outdoor spaces – both inside and outside of medical facilities – cannot be denied. What is left is to create opportunities for everyone to access these spaces and benefits. The purpose of medicine is achieving health – complete physical, mental, and social well-being – but it needs the help of other fields and disciplines to create and sustain that state for all people. Bioethics bridges the gap by helping to frame the conversation around how – and why – these opportunities are

created. The existence of and access to nature and green spaces is an issue not just of health, but of health equity.

Scholar and physician Paula Braveman and her colleagues defined health equity as a state where “everyone has a fair and just opportunity to be as healthy as possible” (Braveman et al., 2017, p. 2). They also defined health disparities as “plausibly avoidable, systematic health differences adversely affecting economically or socially disadvantaged groups” and health inequity as “a particular kind of health disparity [...] that is not only of concern for being potentially unfair, but which is believed to reflect injustice” (Braveman et al., 2017, p. 11-12). Understanding, identifying, and addressing the injustices that lead to health inequities are hugely important, but not the focus of this work. Unequitable access to nature and green spaces is an issue not just of health, but health equity, and is one of the causes of numerous health disparities seen between wealthy ex-urban areas and low-income urban ones. While this in itself is likely a symptom (or perhaps a direct result of) systemic injustices such as racism (particularly in the United States), this paper will focus specifically on health disparities.

## **CHAPTER 2**

### **BENEFITS OF GREEN SPACE**

#### Living Environment

The health benefits of nature are numerous, wide-ranging, and sometimes overlooked. Wilson's 1984 hypothesis of Biophilia proposed that humans have an innate, partially genetic, instinct to connect with nature and living things. It is this natural tendency that creates a positive response to the natural world and green space (Leavell et al., 2019; Martin et al., 2021; Tseung et al., 2022). The continued draw of gardening and horticulture, hiking, bird watching, and other such pastoral pastimes give strength to this argument. Humans are drawn to nature, in a myriad of ways. The existence of horticulture therapy and its proven benefits underscore that nature can impact humans in both direct and indirect ways, and emphasize the benefit of nature in healing (Davis, 2011). Yet, the basis for the connection to and value of nature and its therapeutic properties have continued to be debated (Hartig et al., 2014; Leavell et al., 2019). Stress Recovery Theory (SRT) takes the Biophilia hypothesis a step further, proposing that the genetic or intrinsic attraction to nature is due to the psychological support and benefits of stress reduction that it gives (Leavell et al., 2019; Ulrich et al., 2020). Attention Restoration Theory (ART) took this even further to propose that part of the psychological support was because of nature's capacity to reduce mental fatigue and promote wellness (Leavell et al., 2019). None of these theories or hypothesis can be explicitly proven or explain the connection, but the unquestionable fact remains that it exists, and it is to humans' benefit.

An ever-growing body of research has started to document, substantiate, and even in some cases quantify the significance of interacting with nature and its effect on human health and well-being (Gascon et al., 2016; Gregis et al., 2021; Hartig et al., 2014; Hunter et al., 2019; Kuo, 2015; Leavell et al., 2019; Pasha, 2013; Twohig-Bennett & Jones, 2018). The direct health benefits include increases in physical activity and decreases in obesity (Ali et al., 2019; Frumkin, 2002; Koh et al., 2022), improved breathing/respiratory conditions, pregnancy outcomes (Koh et al., 2022; Liu et al., 2014; Nowak et al., 2006; Robinson et al., 2022), cardiovascular health (Akpınar, 2016; Brown et al., 2018; Brunner, 1997; Devarajan et al., 2020; Dzhambov et al., 2018; Jennings & Bamkole, 2019; Koh et al., 2022; Lachowycz & Jones, 2011; Richardson et al., 2013), stroke mortality (Devarajan et al., 2020), risk of diabetes (Hunter et al., 2019; Jennings et al., 2017), stress reduction (Devarajan et al., 2020; Heinrich & Gullone, 2006; Hunter et al., 2019; Jennings et al., 2017; Kaplan, 1995; Leavell et al., 2019; Richardson et al., 2012; Taylor & Hochuli, 2017), mental health improvements (Aerts et al., 2018; Devarajan et al., 2020; Koh et al., 2022; Leavell et al., 2019; Wolch et al., 2014), and all-cause mortality (Hunter et al., 2019; Jennings et al., 2017). Some of these benefits can be specifically tracked and measured with biometrics – reduction in heart rate, blood pressure, infant birth weight – but the less precise or specific changes in stress and improvements in mental health are equally, if not more, important for overall health, as they can underpin and modulate all of these biologic disease processes. In addition to specific health outcomes, a number of environmental benefits are associated with green space, and particularly urban green space, which in turn can benefit health: mitigating urban heat, minimizing air pollution – particularly important for respiratory health and



cancer risks, and controlling flooding (Devarajan et al., 2020; Koh et al., 2022; Twohig-Bennett & Jones, 2018; Wolch et al., 2014).

All these effects of nature and green space do much to improve the physical and mental well-being of people, which is much of what is considered ‘health’ under medical standards, but this is only 2/3 of the WHO’s definition, as noted above. The effects of social connection on physical health have been well studied (Koh et al., 2022; Kondo et al., 2018; Leavell et al., 2019), and social isolation is a documented risk factor for many conditions, including dementia, cardiovascular disease and overall mortality (Holt-Lunstad et al., 2017; Leavell et al., 2019; Martino et al., 2017). The effects on mental health have also been well researched, but they were explicitly realized by most of the world during the early days of the COVID-19 pandemic, when much of the world was unable to physically connect or gather together, and collectively felt a diminishment of social well-being. In summer 2020, when it deemed safe to gather outside at distances, people flocked to parks and backyards and any unroofed corner that could accommodate social distancing. But even before 2020, the benefits of green space and time outdoors with exposure to nature were being researched as avenues to encourage social connection and reduce stress through building relationships (Kondo et al., 2018; Leavell et al., 2019).

Some of the mental and social benefits of green space have also been seen specifically through studies on specific patient populations. Two populations that seem to benefit from outdoor exposure are the elderly and those with dementia (Dahlkvist et al., 2016). An Australian study (Ng et al., 2023) found that being in an outdoor environment increased dementia patients participation in various activities of daily life by motivating and engaging them. While an improvement in mood and engagement with people around

you may not have a direct health benefit for all groups, for these patients, better interactions with caregivers and an improved willingness to eat and engage in their own care could mean both greater quantity and quality of life.

One of the common associations between increased green space and physical health is increased physical activity and weight loss / obesity prevention. It is well known that a lack of physical activity contributes to obesity, as well as other chronic diseases and metabolic syndrome. There is a focus on physical activity particularly among youth, as childhood inactivity and obesity rates are skyrocketing (Masoumi, 2017). It has been observed that there is a generational gap in this trend, with children today not spending time outside the way previous generations did. Their inactivity and health problems in youth will contribute to unhealthy lifestyles in adulthood and put huge portions of the population at risk for lifelong health conditions (Shams-White et al., 2021). While green space is not the entirety of the answer to this epidemic, there is a positive association between parks and recreation settings with the physical activity of children and youth, and there is a dose-dependent benefit of physical activity on health (Devarajan et al., 2020; Masoumi, 2017). Across all age groups, an association has been seen between proximity to large green spaces and higher physical activity levels, and those who live in greener, safe, walkable neighborhoods seem to be more physically active (Andersen et al., 2022; Bird et al., 2018; Devarajan et al., 2020; McGrath et al., 2015; Sallis & Glanz, 2006). Green spaces invite physical activity, which brings a host of health benefits from fighting obesity to lowering mortality (Devarajan et al., 2020; Twohig-Bennett & Jones, 2018).

While physical activity in any environment will yield certain biological health benefits (cardiovascular health, weight loss, strength and fitness, etc.), physical activity in nature specifically has been shown to have increased benefits in other ways, for certain populations. In one study, pairs of mothers and daughters went for 20 minute walks through a mall (indoors) and an arboretum (outdoors) (Izenstark & Ebata, 2017). After the outdoor nature walk, the pairs were noted to have greater cohesion and to be more relaxed, and said they had more fun together. Active outdoor leisure can not only provide health benefits but impact family bonds (Izenstark et al., 2021; Leavell et al., 2019). In another study, children with ADHD were found to concentrate better after a walk through a park than a walk of the same length through a downtown environment (Taylor & Kuo, 2009). These two studies highlight that the benefits of nature and green space go beyond the physical health benefits the space may afford, and may in fact improve the mental benefits from that activity.

In addition to all of these personal benefits on health and well-being, green space can affect – for good or bad – population level morbidity and mortality through its association with violence, and specifically with gun violence. Particularly due to the spike following the COVID-19 pandemic, gun violence is now the leading cause of death among children and teens (Jay et al., 2022). A study in Cincinnati, OH found saw that the loss of tree canopy from an insect infestation was associated with increased violence (Kondo et al., 2017a). Other studies in different cities have also seen inverse associations between the tree coverage of particular neighborhoods and the rates of crime and violence- the greater the tree coverage, the lower the crime rates (Shepley et al., 2019). Jay et al. proposed some possible explanations for this association – that possibly the

heat-mitigating effects of tree coverage would reduce the likelihood of aggression and agitation; green space is associated with stress reduction, and the positive social benefits could encourage neighborhood ties and deter aggressive behavior (Jay et al., 2022).

While the specific mechanisms are not fully clear, the results are. A study from Philadelphia, PA saw that there was a reduced risk of injury from a firearm associated with increased time spent under tree canopy (Kondo et al., 2017b). Increasing green space and human contact with nature seems to decrease the incidence of gun violence, specifically in urban settings.

While green space – regardless of its surroundings – has an impact on human health and well-being, there is growing literature showing that green space within urban environments specifically has strong correlations with health benefits (Devarajan et al., 2020; Gregis et al., 2021; Maas et al., 2009). Part of this difference is the effect of those surroundings – our built environment – on both humans and nature. Our entire surroundings affect our well-being – physically, mentally, spiritually, socially (Stichler, 2007). The built environment and the design of spaces where people work, live, and spend their leisure time are directly related to how much time people spend outdoors (Sallis et al., 2012). The effects of green space above are taken in tandem with the influences of the built environment on the same outcomes – while nature tends to encourage physical activity, a less green built environment tends to be associated with less physical activity (Andersen et al., 2022; Devarajan et al., 2020). Part of what affects how the built environment influences human health and behavior is not just the physical materials and presence or absence of greenery, but how the environment makes people feel. Those living in walkable neighborhoods tend to have greater physical activity, but an

important mediator of that effect is the qualification that the walkable neighborhoods are safe. Neighborhood perceptions of safety stem from the built environment and characteristics of a residential area. In looking at children's physical activity levels through their transportation to school, improving the safety of the roadways can improve children's health and physical activity levels by creating less risk of traffic accidents and allowing them to more safely walk or bike to school. These programs do not need to add or change any nature or green space specifically, but by improving the built environment they are able to positively influence physical activity, and therefore health, in the community (Boarnet et al., 2005; Leden et al., 2006). While the effect from any one aspect of the built environment – green or otherwise – varies by exposure, context, and health outcome, the growing evidence that it has a significant effect on human health and well-being has led to public health organizations advocating for attention to this issue, and investment in the built environment and natural green spaces around the world in order to improve population health outcomes (Badland & Pearce, 2019; Jackson et al., 2013; Robinson et al., 2022).

### Healing Environment

The benefits of nature and green spaces on both physical, emotional, and mental well-being emphasize its importance in maintaining health under the entire definition of the word: physical, mental, and social well-being. Numerous studies, as discussed above, have looked at the effect of green spaces in the environment and its effect on human health. One space these benefits, particularly the mental health and stress reduction benefits, are acutely needed is in the medical setting, and particularly the hospital setting.

The environment of the hospital can directly affect outcomes. Prior to the 20<sup>th</sup> century, many of these outcomes were not positive; Florence Nightingale noted in the 1800s in London that patients seemed to have a higher risk of dying in the hospital than at home (Stichler, 2007). Thankfully these statistics are no longer true, with modern sanitation, infection control practices and improved medications; however, the physical built environment of a hospital can still impact outcomes.

The first and seminal work supporting this concept was published by architect and pioneer of evidence-based healthcare design Roger Ulrich in 1984. He described differing patient hospital courses in two groups of patients undergoing the same procedures and recovering in rooms on the same floor – one group had a window looking at a brick wall, and one group looked out onto trees. The group who looked at a brick wall stayed in the hospital longer, used more painkillers, and were generally less pleasant and more unhappy (Ulrich, 1984). Since this study, numerous others have shown that the physical environment of the hospital itself is an essential element in the quality of the healthcare patients receive and experience (Brambilla et al., 2019; Henriksen et al., 2007). While a patient's experience in an environment is complex, studies have shown that single factors can both positively, and negatively, affect health outcomes, such as light intensity, music, noise levels, and window views (Sandal et al., 2019). In a 2004 report, Ulrich et al. found over 700 studies documenting the effect of particular hospital attributes on patients, as well as staff. They concluded that environmental factors were linked with reduction in staff stress and fatigue, improvement of patient safety and in patient outcomes, as well as improvement in overall quality of healthcare (Ulrich et al., 2004).

Ulrich's initial study highlighted the necessity of evidence-based design in hospitals. Subsequent research in this area has revealed not just problems, but design solutions that can improve outcomes, including anxiety reduction, lowering blood pressure, reducing the need for pain medications, and shortening hospital stay (Ulrich et al., 2010). As this field has grown, recommendations, have consistently advocated for design elements that will not only improve medical outcomes, but psychosocial outcomes also (McLaughlan, 2018). The hospital environment can add to or reduce stress among patients, families, and providers, and can affect the healing process.

Unfortunately, hospitals are fighting somewhat of an uphill battle when it comes to stress in their environment. Hospitals are, with few exceptions, stressful places and filled with people experiencing stressful encounters. Most often the physical stress of illness or injury is the first thought for patients in the hospital, but there is great mental and emotional stress and anxiety that is also associated with a hospital stay, and not just for patients. Family and friends supporting their loved one in the hospital experience high levels of stress (Ulrich et al., 2020). A taskforce of the society of critical care medicine has in fact named post-intensive care syndrome-family (PICS-F) as a form of post-traumatic stress following a loved one's ICU stay. If hospitals are meant to be places of help, treatment, and healing, they cannot successfully live into their mission to protect and promote health if they are not appropriately addressing the physical burden and stress of even being in a hospital. This is particularly true when the side effects of hospital treatment, like stress, can have such widespread detrimental effects in physical, mental, emotional, and behavioral realms. Unlike catching an infection, which could be treated with antibiotics, stress cannot just be treated – the effects accumulate over time, and can

further amplify poor outcomes, particularly for mental health, down the road (Leavell et al., 2019). To combat this stress and negative outcomes, numerous disciplines, including EBD, have called on the need for hospitals to support and create a healing atmosphere through their built environment (Brambilla et al., 2019). One of the ways to do this is through the incorporation of green space.

The concept of a healing garden is an ancient one, and can be traced back to Mesopotamia, Rome, and Greece (Pasha, 2013). In the Middle Ages, hospitals were often associated with monasteries, and patients were treated in cloistered gardens with fresh air. As recently as the 20<sup>th</sup> century, sanatoria for tuberculosis were outside and included much “fresh air” in their healing regimens (Allison et al., 1998). Ulrich’s seminal work showed the importance of nature in healing, even if just from a window: a view of the trees outside accelerated the healing time of patients who were able to see it (Ulrich, 1984). More recent studies continuing to examine the relationship between nature and hospitals found that green space creates a healing and restorative atmosphere within a hospital environment (Ma et al., 2021). Much research has shown that outdoor spaces and hospital gardens are important not only for patients, but for family, visitors and staff also – all of whom have reported reduced stress and enhanced emotional well-being following the use of hospital gardens (Cordoza et al., 2018; Rodiek, 2002; Ulrich et al., 2020; Whitehouse et al., 2001).

The specific addition of greenery and nature within outdoor spaces and designed healing gardens is crucial for users to experience stress-reducing benefits and positive treatment outcomes for patients (Tseung et al., 2022; Ulrich et al., 2008). Ulrich et al. ran a study on the emotions of family members who used either a waiting room or a garden



to take breaks when visiting their loved one in an ICU (Ulrich et al., 2020). The study showed a statistically significant difference in the reported improvement of “sadness” for those who went into the garden. Though there was not statistical significance, there was a numerical trend that those who went into the garden also experienced greater improvements in feeling afraid, angry, and worried. They also noticed that family members chose to use the garden more frequently than they chose to wait inside. The authors speculated that, as the Biophilia theory hypothesizes, humans have an innate preference for nature, particularly in times of stress. The EBD field has encouraged healthcare facilities to not ignore the benefits of giving family and visitors a stress-reducing setting with ‘abundant’ natural features.

For patients that are able to join their family and visitors in a garden, the natural space can promote healing and improve health outcomes and overall well-being (Iqbal & Abubakar, 2022; Nedučin et al., 2010; Pasha, 2013). One study in an acute care setting demonstrated a positive impact on patients through decreased pain, stress, and anxiety (Tseung et al., 2022). In another study, those who used the garden had improved mood after being outside (Marcus, 2002). Natural spaces have also been shown to improve physical and occupational therapy outcomes for patients who were able to have their sessions outside (Davis, 2011; Tseung et al., 2022). But some of the benefits are more indirect, and harder to specifically quantify. A study in pediatric hospitals noted that there was less socialization for patients and parents as newer hospitals have moved to individual rooms rather than a ward layout (McLaughlan, 2018). While there is a benefit to families of parents being able to stay the night with their child, the children are less easily able to socialize with one another. The hospital garden was a place for them to

come together for group play, and a place to for parents to socialize and support one another. Though the peer support was a direct benefit to the parents, specifically in pediatric patients the stress of parents and caregivers, or lack thereof, can have direct effects on the well-being of the patient. In non-pediatric hospitals, prior to COVID-19, many hospitals did not have entirely private rooms for their patients. Outdoor spaces were noted to be places where family could come and visit and get some moments of privacy, with ample places to sit for family members, and a more welcoming environment for children to play. For some families, this was the only place that their children or younger family members were able to visit them, and made a significant difference to patients' well-being (Tseung et al., 2022).

In a good number of hospital settings, it is not possible for patients to leave their beds, rooms, or wards (e.g., ICU patients, patients under isolation precautions, etc.). These patients may not be able to access a hospital garden or green space outside, but many studies have shown that even viewing the greenery outside through a window can make a difference in their hospital course (Brambilla et al., 2019; McIntosh et al., 2022; Schreuder et al., 2016; Tseung et al., 2022; Ulrich et al., 2020). This view of nature was indeed what Ulrich studied in his seminal paper (Ulrich, 1984). Exposure to daylight and views of nature have been shown to enhance comfort, reduce length of stay, and improve patient depression (Choi et al., 2012; Halawa et al., 2020; Schreuder et al., 2016). Windows and visual access to nature will also allow patients that are unable to go outside due to the climate to continue to reap the benefits of greenery, despite inclement weather. Windows and visual access to green spaces and outdoor areas can be even more important during cold (or hot) seasons and in bad weather when the climate preclude a

physical visit outside, in order to bring many of the same stress reducing effects as being in a garden itself (Tseung et al., 2022). EBD has also investigated the use of planters and other such features in efforts to bring nature inside, particularly for when it is unreachable outside. Findings have shown that the effects of prominent natural elements inside, such as plants and windows for seeing daylight, have been measurably effective in mitigating the stress of family and visitors (Ulrich et al., 2020).

Hospitals are in the business of patient care, so the patient can feel like the most important, or sometimes the only, of hospitals and health systems. But, as shown above with the effects of hospital stays and environments on families and visitors, it is short-sighted to not look at how the environment affects everyone in it. The other group that absolutely must be considered when looking at design and environmental effect is hospital employees. If a hospital would not exist without patients, it equally would not exist without staff, and they equally need restorative and healing environments in order to best do their work (Edge-Gumbel, 1996). The same stressful environment that will affect how well a patient is able to heal can affect how well providers are able to do their job, which will obviously impact patient care (Iqbal & Abubakar, 2022). Supporting hospital staff at work, particularly due to the mentally and psychologically distressing nature of their work at times, is imperative for ensuring their health and well-being. In one study in Texas, staff shared that they particularly enjoyed taking breaks in the gardens as it helped them feel as if they were getting out of the hospital environment (Pasha, 2013). Providing gardens and green outdoor spaces in hospitals is one of the measures that studies have shown is important for and effective at improving job satisfaction, increased morale,

relieving stress, and ultimately staff retention (Davis, 2011; Iqbal & Abubakar, 2022; Marcus, 2002; Ng et al., 2023).

One of the most important benefits of hospital gardens specifically for staff is preventing burnout (Edge-Gumbel, 1996). Burnout among nurses specifically has been associated with PTSD, high staff turnover, and medical errors (Cimiotti et al., 2012; Cordoza et al., 2018; Mealer et al., 2009; Poghosyan et al., 2010). This issue was also thrown into the spotlight during the COVID-19 pandemic, as hospital staff and particularly front-line providers experienced incredibly high rates of burnout (Iqbal & Abubakar, 2022). Taking breaks in a natural outdoor environment or garden has been found to be effective at reducing symptoms of burnout, depression, and trauma faced by staff. In one study, nurses spent less time on their break in a garden, but the reduction in burnout was statistically significant when compared to longer breaks taken inside, and improvement was noted in feelings of anger and tiredness after time in the garden (Cordoza et al., 2018).

### Intentional Design

A hospital garden or outdoor, natural space that can confer all these benefits is difficult to specifically define or describe. The understandings of “garden,” “green space,” “natural space,” etc. are incredibly varied. Location, climate, and cultural variations alter how these spaces and terms are understood. Much research has gone into the design of the hospital facility and buildings in order to achieve efficiency and positive health outcomes, but there is a convincing and ever-growing body of literature describing layout and design choices, as well as methods for evaluating and understanding their

influence, for hospital gardens and natural outside spaces (Alvaro et al., 2016; Halawa et al., 2020; Heo & Bell, 2023; Lacanna et al., 2019; Marcus, 2016; McIntosh et al., 2022; McLaughlan, 2018). Hospital gardens need to be designed carefully to be used intentionally, and research has shown that certain elements - such as shade, seating, location, and artistic touches - can promote or hamper the intended benefits (Davis, 2011; Iqbal & Abubakar, 2022; Pasha, 2013; Tseung et al., 2022). The inclusion of lots of vegetation and nature has been shown to be more effective at reducing stress than gardens with predominant hardscape, and natural materials, such as stone and wood, will help foster a much more relaxing atmosphere than concrete and wire mesh (Cordoza et al., 2018; McIntosh et al., 2022; Ulrich et al., 2020).

One of the most important features of the garden that can moderate its effectiveness is accessibility. Just creating healing gardens does not assure they will be used. No one will use it if they do not know that it is there, or that it is available for their use (Pasha, 2013; Tseung et al., 2022). Seeking input from staff, visitors, and patients before or during the design phase can also contribute to better knowledge of the garden space and its use later on (Davis, 2011; Iqbal & Abubakar, 2022) Inclusion of particular elements that will invite and entice users, as well as adequate provision for the continuing management and upkeep of the space, are key to making sure that a hospital garden can indeed be a benefit to users.

Designing a space that will please everyone is nearly an impossible task. One study found that patients and families were deterred from sitting in a garden if they saw staff there (Tseung et al., 2022) and studies looking at staff use of hospital facilities have shown that staff often wish to spend time away from patients during their breaks and may

not fully relax in shared outdoor space (Iqbal & Abubakar, 2022). Some scholars have suggested that different gardens of different outdoor spaces be designated and designed with different groups in mind – one for staff, one for physical therapy patients, one for waiting families, one for visitors with small children, etc. (Davis, 2011; Martin et al., 2021). While this model would certainly allow for each space to be better customized to its users and their particular needs and preferences, and theoretically provide greater benefits to each user group, it is not realistic for many hospitals due to space, building, and economic constraints.

Because each user group, and even each user individually, is likely seeking something different from their time in a garden or other outside space at a hospital, it is important to be clear in the design and the understanding of what the space is, or is not, able to achieve. One space may not be able to accommodate everyone, meet every group's needs, or fix everyone's problems, does not mean that the entire premise should be abandoned. A study that surveyed nurses who were not able to go outside and use their hospital's garden on breaks still felt it was a valuable addition to the environment (Davis, 2011). Perhaps they were able to sense the improvement in the demeanor and outlook of these around them who were able to visit the garden, and to derive an indirect benefit from the garden's healing and restorative nature.

Unfortunately, this is a difficult premise to specifically and accurately quantify. One of the problems with understanding how a hospital garden can benefit the environment is through how it is studied. Because there is no universal understanding or definition of the numerous descriptions of natural spaces (e.g., healing garden, outside space, green space, natural space, therapy garden, etc.), each study can assess them

slightly differently, look for different outcomes, and assess different user groups (Andersen et al., 2022; Gregis et al., 2021). Assessing at different times of year, or comparing gardens in different climates, may look in meta-analysis like the statistical significance is not always met. But this is very often a reflection of the research design, not necessarily what is truly being studied.

Much of the research trying to understand hospital garden or green space benefit is qualitative research, not specifically quantitative, and collected through subjective and self-reported means (Engineer et al., 2020; Ulrich et al., 2020). Self-reported metrics often request participants quantify qualities – how much are they feeling – on a 5-, or 7-, or 10-point scale. Humans do not feel emotions on a particular scale or in discreet and equal quantities, and feelings are not specifically measurable. This is easily seen through the evaluation of pain in hospital patients – the same condition can be a 10/10 on the pain scale for one patient, while another may only say 4/10. It can also be difficult to parse through different emotions being felt at the same time, which are also likely feeding into one another, in order to pinpoint an exact percentage of “sad” vs “angry” vs “stressed” when filling out study questionnaires. Thus, it may be difficult for studies quantifying human emotions to consistently show statistical significance, particularly if they are not adequately powered or carefully designed. Additionally, it can be difficult to isolate single factors when assessing green space benefit due to numerous mediating factors (Sandal et al., 2019; Sandal et al., 2015). Studies from different parts of the world, even different regions of a country, may have slightly different results based on a particular community’s cultural and demographic attributes, so it is often necessary to repeat studies in each place as results may not always be perfectly generalizable to all societies.

Similar research barriers exist – understanding of green space, definition of garden, designation of neighborhoods, calculation of tree canopy coverage, etc. – for studying the effect of green space and nature on communities. In these studies, it can be even more difficult to tease out various moderating factors or isolate particular attributes. One of the repeated limitations of these studies is the definition of neighborhood, and the use of census tract or zip codes to define a neighborhood. While useful for some statistical purposes, using these artificially dictated definitions can induce homogeneity across neighborhoods, and blur both the assessment of the existing landscape as well as any benefit from specific interventions. Not properly examining the local conditions and the impact of street-street differences in different areas may be why some studies have struggled to “prove” statistical benefit from green space in urban communities.

The lack of overwhelming “formal” (usually understood as quantifiable and/or RCT studies) research and “hard” statistical evidence that is universally generalizable quantifying the benefit of green spaces and particular design elements limits the ability of some places and groups to incorporate certain features into their facilities. Though each individual research article may have small cohorts, or qualitative and anecdotal data, and not necessarily compare easily across papers, the fact that so many articles do exist and so many groups are looking at this area stands in support that this is an important and impactful issue. The positive trends seem universal (Engineer et al., 2020).



## **CHAPTER 3**

### **BIOETHICAL IMPERATIVE**

With the growing body of evidence of the numerous benefits of green space to so many different groups, it would seem an easy choice and in fact a bioethical mandate to include green space in all hospitals. Bioethics traditionally is concerned with the balance of the principles of non-maleficence/beneficence, justice, and autonomy within healthcare. Adding green space to hospitals, when viewed through a bioethics lens, is a normative claim. When designed thoughtfully and correctly, a hospital garden should not produce or cause harm to anyone (non-maleficence) and should be giving great benefit to users (beneficence); the opportunity for benefit should justify the use of resources, and the creation and upkeep can be done without excess extravagance (justice); no one – staff, patient, visitor – would be forced to use the space, but it would be yet another option for them to choose (autonomy). A healing green space is a well-balanced bioethical addition to any healthcare facility.

And yet, they are not universal. Perhaps it is easier to imagine a hospital garden in a more spacious suburban setting than in a confined urban center. Arguably, large green spaces are less specifically necessary within the walls of a rural hospital when nature and outdoor space are abundant, visible, and easily accessible. Their design needs may include turning out to make use of the natural resources in their environment, rather than creating new internal facilities. But in an urban environment, the dearth of gardens in healthcare facilities reflects not only the trends in healthcare that have glossed over the

value of gardens in healing (Dobson, 2017), but also a larger disparity in these communities of green space and access to natural outdoor spaces more broadly.

Green space is a scarce resource in urban environments, yet this is where the benefits from green space would be most acutely felt. Because of this, prioritizing the protection and enhancement of existing natural green spaces as well as the cultivation and creation of new spaces is most needed in urban environments. As greater urbanization continues to threaten existing green spaces, it is increasingly crucial to protect them. This is an urban bioethical imperative according to the principle of social justice, as equity must also be a consideration in the distribution of resources.

Urban communities are disadvantaged by their lack of green space in that this lack affects residents' health – mental, physical, and social. Per Braveman et al.'s definition of health equity, “everyone has a fair and just opportunity to be as healthy as possible” (Braveman et al., 2017, p. 2), there are two vital pillars on which equity is built: improving the health of those groups who have been disadvantaged historically, and improving both the healthcare offered and the social determinants that are impacting their health (Braveman, 2019; Marmot et al., 2008). Health disparities were only formally recognized in the US in 1985 (GlobalSurg Collaborative and NIHR Global Health Research Unit on Global Surgery, 2022). Eliminating health disparities at their root, not just reaching equal outcomes through better healthcare, is a vital part of health equity (Marmot et al., 2008; Rigolon et al., 2021). It means not just treating the people who come through the hospital doors, but removing the barriers to being healthy that keep pulling certain populations through those doors over and over again, particularly when these populations are historically excluded or marginalized within society. Urban

populations will never achieve health equity with their non-urban peers if they are not given adequate access to green space within their communities.

Lack of green space is an environmental hazard causing health disparities in urban populations. However, it is not only the added hazards and specific negative effects of living in an urban environment, such as air pollution causing increased risk for lung disease, that is creating these disparities. The lack of green space within urban environments is not allowing populations to thrive and reach their fullest potential, curbing their agency to achieve full health and well-being. In one study, as discussed above, mother-daughter pairs were sent on walks in an indoor mall and through an outdoor arboretum, and researchers found that the pairs were more relaxed and felt closer to one another after the nature walk (Izenstark & Ebata, 2017). While this is promising for families with an opportunity to go for a walk in nature, urban families that do not have the access to adequate green space to enjoy nature together are left a step behind in this area, and must work harder to find those opportunities for relaxation and bonding. While this lack of opportunity does not specifically cause a detriment to their health or well-being, it holds them back from thriving and does not allow them equal or adequate opportunity to be well.

Other studies have shown that time outside is critical in bolstering resilience to stressors (McIntosh et al., 2022). For urban communities without this access, the compounding stress of the urban environment and the inability to relieve stress and build resilience to stressors leaves residents woefully disadvantaged; there is no opportunity to stop either the compounding or adding of further stress, nor opportunity to intervene in a protective manner to improve resiliency. While these may not be specific negative effects,

causing a specific disease or detracting from ‘baseline’ health, the lack of access to opportunities to move the needle up and improve mental, social, and physical well-being beyond baseline removes the agency of these communities to achieve full health. It systematically lowers the baseline of health and well-being for these populations.

Access to adequate green space has already been recognized in many circles as an issue of environmental justice because the distribution among social and demographic groups, even within urban spaces, is not equal. Research has shown that neighborhoods and blocks with a higher percentage of green space is associated with lower percentages of people of low income, people of color, and people with lower educational levels (Heo & Bell, 2023). Access to green space is another systemic suppression of the ability of these communities to reach full health and well-being. Communities of higher socioeconomic status (SES) in urban environments are more likely to be able to leave that environment and seek out larger or better or more verdant natural spaces and environments for physical activity and stress relief or relaxation. The inclusion of green space in their environment is not as specifically beneficial as it is for lower-SES communities, especially since there exists less green space in marginalized and lower socioeconomic populations (Badland & Pearce, 2019; Devarajan et al., 2020). One meta-analysis concluded that both socioeconomic and demographic factors are significant modifying effects of the health benefits of green space exposure (Kabisch, 2019; Rigolon et al., 2021). The health benefits of green space are particularly potent for low-SES urban communities.

Numerous studies – both national and international – have found that socially disadvantaged and marginalized groups disproportionately bear the burden of poor

quality environmental characteristics (Badland & Pearce, 2019). Lower-SES communities are disproportionately exposed to not only constant, non-green urban landscapes, but hazardous environments within those urban settings – exposure to pollutants, higher crime, living near garbage or landfills, proximity to high-traffic roadways, etc. (Rigolon et al., 2021; Schroeder et al., 2019). These communities are often also limited by worse access to healthcare and health-promoting resources, leaving them stuck at lower levels of baseline health (Heo & Bell, 2023). In neighborhoods with less green space and higher crime, for example, there are lower levels of physical activity on average; these communities are often low-SES and higher percentage minority ethnic/racial groups, (Schroeder et al., 2019). Low physical activity levels are not only an indicator of poor health within a community, due to the association with obesity and metabolic syndrome, but this is also an indicator of the built environment obstructing the neighborhood’s agency and capacity for health by limiting their opportunities to achieve greater health and well-being.

Scholars have argued that positive environmental exposures, including green space, can help raise the bar toward health equity by mitigating negative environmental exposures and providing health protective-effects (Jennings et al., 2017; Rigolon et al., 2021). Communities without access to green space are going to be less healthy than communities who do have access and are able to reap all of the benefits, both health promoting (i.e., physical activity) and health protective (i.e., stress relief). Studies have supported this hypothesis, showing that green space can help to reduce differences in cardiovascular mortality and mental health outcomes based on socioeconomic status (Koh et al., 2022). The research has shown that built environment matters, as discussed

above, so to help communities overcome their social determinant of health, which is living in an urban environment, and particularly a low-SES urban neighborhood, there is a bioethical imperative to improve health equity by improving urban green space. In one study, mortality rate was lower in areas with higher green space metrics, meaning this is not just a matter of some pretty flowers to brighten the sidewalks, but is life or death in some communities (Heo & Bell, 2023).

For many urban residents, the issue is not simply the existence of green space within their proximity, but it is the quality of that space. Green space that is good quality should mean it has an adequate level of accessibility, perceived safety, maintenance upkeep, lack of trash and detritus, and appropriate amenities (Marselle et al., 2014; Robinson et al., 2022). Studies have shown that not only is there less quantity of green space in many low-SES communities, but that those communities have less access to quality green space than higher-SES communities (Allain & Collins, 2021; Duncan et al., 2013; Liu et al., 2021; Robinson et al., 2022). Research thus far shows that this seems to be a particularly American issue, as more than a dozen US studies found inequities in park quality but only two found them in European contexts (Rigolon, 2016; Rigolon et al., 2021). UK evidence demonstrates that larger parks are associated with more beneficial health effects, but that larger parks are less likely to be located in disadvantaged communities, underscoring the inequity of green space distribution (Badland & Pearce, 2019; Mitchell et al., 2011). US research has shown similar findings, that larger parks are more likely to be in higher-SES and white neighborhoods, but that there are a larger number of parks in black and low-SES neighborhoods (Heo & Bell, 2023). This study showed that green space and vegetation levels were higher in suburban

areas than in the most densely populated urban centers, but that park entrances were more accessible in more populated areas. It was a particularly interesting finding when correlated with the fact that mortality rate was lower for areas with higher greenspace, and higher in areas with greater park accessibility. Clearly, quantity is not everything, and the quality of a green space, including its size, is important for realizing all of the possible health benefits. The existence of an accessible green space does not automatically infer measurable benefits; the quality of the space and the ability of communities to use it are important mitigating factors.

One of the most important mitigating factors that will change how a neighborhood uses or perceives its environment, including green space, is safety. People in dense urban environments, as compared to those in suburban environments, may have easier access to a park, or even parks, based on physical proximity, but they will not use them if they are deemed low quality or unsafe (Rigolon et al., 2021). Having a neighborhood which is considered conducive for walking and outdoor play is important for adolescents, particularly those living in low-SES neighborhoods (Andersen et al., 2022), but the security concerns of parents will negatively affect children's activity, and this is more prevalent in urban, inner cities than in suburban neighborhoods (Masoumi, 2017). One group demonstrated that lower-SES youth living in a "walkable" neighborhood were not benefiting from this supposed attribute (Shams-White et al., 2021). Safety is often perceived to be worse in neighborhoods that are older and denser – usually also considered more walkable – and those that have more traffic on narrow streets, and in lower-income areas with more crime (Molina-García et al., 2017). Being in a "walkable" neighborhood based on proximity to necessities, including parks and outdoor green

spaces, does not mean residents will walk and gain the benefits of time outdoors and physical activity if they deem their environment to be unsafe. Studies have tried to use traffic accidents as a measure of safety for walkability. Some have shown that traffic incidents for pedestrians are higher in low-SES neighborhoods, while others have not been able to make the connection, as neighborhoods with “safe” streets are not seeing the health benefits of the supposed physical activity a walkable neighborhood would bring (Badland & Pearce, 2019).

It is important to understand these statistics, and the habits they are meant to represent, in context. Lack of traffic accidents does not inherently make a street safe, as there are many other factors contributing to a feeling of safety and walkability. There might be a low number of pedestrian traffic accidents if there are a low number of pedestrians, because no one feels safe walking. Perhaps no one is walking because the sidewalks are in disrepair and they fear physical harm (i.e., tripping and falling); perhaps it is other criminal activity in the neighborhood that is taking place on the streets, leading people to choose not to walk whenever possible. And, there are always those on the other side of the spectrum who have no choice but to walk, regardless of safety or other concerns, due to economic and societal pressures, which may hide a lack of ‘walkability’ in a study if residents must walk anyway.

There is ample evidence that the perceived conditions of a neighborhood may be more important than objectively measured characteristics of the space (Hillsdon et al., 2015; Pratt et al., 2015; Schroeder et al., 2019). The physical “accessibility” of a green space or park based on distance to a park entrance for residents, as used in studies discussed above, does not tell the whole story. The accessibility, and the attainability of



that access, is just as important for green spaces in urban communities as its existence at all (Kim & Yoo, 2019).

One aspect of the attainability of access, in addition to safety, is the quality of the green space and its general upkeep. As noted above, the quality of a space includes its maintenance status and an absence of trash or other detritus. Studies have shown that the maintenance of green spaces and recreational facilities is often worse in low-SES neighborhoods when compared to higher-SES neighborhoods, and these parks often have fewer or lower quality amenities (Andersen et al., 2022; Crawford et al., 2008; Rigolon et al., 2021). Additional research has shown higher crime rates in parks located in low-SES and minority communities (Rigolon, 2016; Rigolon et al., 2021; Williams et al., 2020). Studies looking at objective data attempting to quantify green space have sometimes been unable to draw conclusions on the link between health benefits and “amount” of green space, likely for this reason (Heo & Bell, 2023; Koh et al., 2022). The quality of the green space is more important than the quantity, and maintenance and safety specifically impact its usability by communities.

Maintenance is particularly key when considering interventions to expand and improve the amount of and accessibility of green space, specifically quality green space, in communities. Planting a tree to increase green coverage is not adequate. For the longevity of the intervention, tree planting, for example, also requires services for longer-term maintenance – leaf removal, pruning, etc. – and the provision for these services into the future. In communities that are chronically underserved by municipal services, likely lower-SES communities that are already hurting from the lack of green spaces, there is a need to plan and think carefully about the long-term arrangement for maintenance and

upkeep in the future (Jay et al., 2022). This is not just a practical concern, but also an ethical issue because being a member of a disadvantaged group, specifically racial groups, is correlated with living in communities that have inferior access to government services, educational and employment opportunities, and a safe built environment (Jay et al., 2022). Working toward health equity means focusing on these communities that have been marginalized and are facing health disparities due to these societal factors that are beyond individual control.

Intervening on green spaces in urban environments is paramount for health equity, despite the difficulties in teasing out specific cause and effect with statistical significance. Physical and mental health, overall well-being, social and environmental outcomes cannot be extricated from one another but interact in a complex system (Hunter et al., 2019). The benefits of green space will therefore be multifactorial, and must be considered as such, both for responsibility of undertaking interventions as well as supporting the long-term plan and realizing the larger benefits. The broader social and environmental benefits alongside health benefits promote multifunctional green space interventions in urban communities, as they will impact multiple domains and can, comprehensively, demonstrate greater value (Hunter et al., 2019). Multidisciplinary approaches that intervene on community and population levels, rather than on the individual, have the ability to reach further and compound possible multifactorial gains.

For example, the WHO has been calling for a reduction in physical inactivity (Devarajan et al., 2020). Helping urban communities achieve these goals requires green space and improvements in their built environment, as well as access to adequate space for physical activity. Developing a community-wide environment that will support this

goal, rather than individual-level health-promoting campaigns, has the potential to facilitate population-wide improvements in health for the long-term (Hunter et al., 2019). Research indicates that physical activity in natural spaces yields more benefits across emotional, cognitive, and physiological domains, when compared with urban outdoor hardscapes (Hartig, 2008; Pretty et al., 2005). As well, certain individual-level interventions may not reach all corners of a neighborhood or community, and will not have equal effect on people facing other social or economic concerns that are inhibiting their activity – poverty, disability, etc. (Jennings et al., 2017). Integrating the expansion and improvement of green space into larger community-wide campaigns will yield better results than simply providing more built spaces for physical activity alone. This will allow for more members of a community to benefit from the intervention, particularly in some of the health protective measures that impact social and mental well-being, as all corners of the community can gain from enhancing their built environment, particularly with green space.

Intervention results will be more marked in low-SES urban communities than higher-SES communities (Twohig-Bennett & Jones, 2018). Disadvantaged populations are at a lower health baseline than their higher-SES neighbors and will benefit more from intervention as they have so much more to gain (Marmot et al., 2008; Rigolon et al., 2021). Not only will green space interventions in certain environments help mitigate or reduce specific environmental health hazards, they may also help to close the gap in preventive health disparities also. Research has shown that green space had more protective effects for low-SES groups than for high-SES groups (Twohig-Bennett & Jones, 2018). Specifically, it is public green space and not tree canopy or green cover that

is protective (Rigolon et al., 2021). Public green space that is safe, well-maintained, and accessible will allow communities to reap all of the possible benefits from exposure to green space and doing activities in that space, as opposed to simply planting more trees between concrete hardscapes. Coverage and measuring vegetation levels give some sense of density of green space, but they give no further usability or accessibility of green space the way larger public green spaces, such as parks, do (Heo & Bell, 2023).

Interventions need to be carefully thought through, and ought to be as equitable as the current landscape is inequitable. Different neighbors interact with their environment in different ways, and these variations need to be understood and taken into account when planning an intervention. Community engagement is critical, as is a multidisciplinary and multisector approach, which will likely look different in different communities and cultures (Hunter et al., 2019). It will also be important to evaluate an intervention(s) from many different angles, as meta-analysis or a poorly designed study may not show specific benefit if the parameters are too generalized or homogenous to pick up the differences in community members. This does not mean that the intervention is not successful or beneficial. Different measurements of greenspace and markers of health benefit can reflect different pathways that influence health and well-being, so it is important not to dismiss the experience of some simply because it was not accounted for in a study design (Drinkwater et al., 2019; Hartig, 2008; Leavell et al., 2019). For example, research has shown that individuals who did not have a childhood connection to nature or outdoor spaces may need additional support for them to feel comfortable in the outdoors as adults (Asah et al., 2012). Understanding lived experience is central to understanding how

individuals and communities will relate to their environment, and how an intervention may, or may not, be received and therefore judged as successful and beneficial, or not.

It is a daunting task to accommodate for everyone's lived experience when considering, planning, or measuring a particular intervention, and it may be impossible to do with only one action. So, there are numerous ways to improve access to green space and allow communities to benefit from nature in urban environments. Greening urban spaces and improving the built environment by increasing the quantity, and quality, of parks and vegetation in urban neighborhoods has already been shown to be a promising strategy to reduce violence-related disparities (Jay et al., 2022). In one study, a statistically significant reduction in gun assaults was seen along with decreased stress and greater physical activity of neighborhood residents over 10 years after greening vacant lots in Philadelphia, PA (Branas et al., 2011). In another study, which was a randomized controlled trial of greening vacant lots, saw a statistically significant reduction in the total number of crimes and gun assaults as compared with the neighborhoods surrounding the non-greened lots (Garvin et al., 2013). Cities other than Philadelphia have seen this phenomenon also – reduction in violent crime were associated with tree planting in Portland, OR (Burley, 2018). Another study looked at greening from a broader environmental lens and not specifically on natural green space expansion. They examined the impact of sustainable drainage systems, including planting trees and creating rain gardens, on crime. The results included significant reductions in narcotics possession, narcotics manufacture, and burglaries, as well as non-statistically significant reductions in homicides and assaults in areas surrounding the interventions (Kondo et al., 2015).

Reducing all-cause mortality by reducing gun violence is extremely valuable. It is also important to make sure that any increases in quantity of life are also met with an increase in quality, and that people have the capacity to receive the myriad other benefits that are possible from greening initiatives. Similar studies have also found individual health benefits with greening vacant lots also. Another Philadelphia study found that greener lots may significantly reduce stress in neighborhoods through looking at individual biometrics (i.e., heart rate) (South et al., 2015). While this is an important benefit for these neighborhoods, reducing stress by removing a stressor is not equivalent to restoration and stress relief. It just moves disadvantaged populations closer to the baseline of their neighbors in greener and more affluent communities. It does not close the gap between the two groups and confer the benefits of strengthening resilience and fully interrupting the cycle of compounding stress, even if the cycle is slowed by the removal of some stressors.

While the population-level benefits of reduced crime rates are important, these studies additionally help to illustrate that there are numerous ways to go about “greening” an urban environment, all with potential for benefit for the neighborhood. As mentioned above, different facets of a community may derive different benefits from one intervention and derive the same benefit from different interventions. To more fully support an entire community, it will be important to create diverse access to green spaces that will meet the needs of a diverse population. This includes moving past the local park as the only opportunity for green space or greening interventions. Studies above have shown that there are often more parks, or greater park ‘accessibility’ (as defined through proximity and distance, without regard for quality) in urban neighborhoods. This both

presents more opportunities for interventions, and less opportunity for variety of intervention. Park improvements, while important, are not the only way to introduce or improve green space in a community. Particularly in communities, often lower-SES neighborhoods, which have historically been underfunded and deprived equal municipal resources and attention to public works, funding for the long-term management and upkeep of a municipal or public green space, such as a local park, may not always be available or prioritized by future local governments (Hunter et al., 2019). Additionally, these communities may not have the communal resources to privately fund these endeavors from within the community itself, through a “friends of the park” or similar social group, and a smaller community space may risk not catching the attention of outside funding groups either. These are tragic scenarios to consider, and in an equitable world parks and public natural spaces would be properly and adequately funded, and for all neighborhoods regardless of demographics. However, in today’s world, it is important to be aware of and looking for other ways to incorporate green space into the community and to improve the quality of existing spaces, municipal parks or other.

One of the concerns with new and different modes of greening neighborhoods is that some interventions may not be fully studied and understood. Yes, more long-term data is going to be important in understanding the benefits of certain initiatives, and for continuing to improve efforts. As well, continued studies looking at how to mitigate or prevent unintended consequences and evaluating adverse effects are important. Studies have already begun to show that greening initiatives, while providing some population health benefits, may also be contributing to widening inequalities rather than working to dismantle them (Hunter et al., 2019; Koh et al., 2022). “Green gentrification” is now

becoming an issue in certain communities and creating further environmental injustice (Robinson et al., 2022). When low-income areas are developed and green spaces are improved, very often neighborhood property values increase and the existing low-SES residents, often in the US these are non-white communities also, are unable to afford living in their neighborhood anymore and are displaced by new residents (Badland & Pearce, 2019; Heo & Bell, 2023; Jay et al., 2022; Rigolon & Németh, 2018; Robinson et al., 2022; Wolch et al., 2014).

The fact that greening initiatives are increasing property values and improving neighborhoods to such a degree that gentrification becomes a problem underscores that green space is vital for neighborhoods and the well-being of residents, such that those who are able to seem willing to pay more for access to green space in their environment. It also highlights the necessity of employing greening initiatives carefully and thoughtfully, and ensuring that they are bringing benefit to their intended recipients. It is the people in the neighborhoods that need the green space, not the zip code. The average health of a zip code can change drastically if a new development brings in a large, new, and different demographic of healthier residents, and the health of the previous residents may not change or may change for the worse, despite an improvement of the average.

As discussed above, the existence of a green space does not necessarily mean people will use it. One review found that marginalized communities feel more disconnected and out of place in newly developed green spaces in their neighborhoods, so they are more likely to use the space less often than those who have newly moved to the neighborhood (Robinson et al., 2022). Greening initiatives must fit the neighborhood and the population for the most benefits to be seen. There is not a one-size-fits-all model, and



initiatives that bring green space to a neighborhood without engaging the residents cannot be deemed a success.

## CHAPTER 4

### CONCLUSIONS

The health disadvantages that urban communities face from inadequate green space in their built environments means urban hospitals will likely see patients coming in sicker, and more frequently, than hospitals in more suburban and affluent neighborhoods. If urban populations can benefit so profoundly from improving and including green space in their built environment, they will seemingly gain equally from having green space in their healthcare environments. As well, urban dwellers, and particularly those in low-SES communities, are more likely to have chronic conditions from environmental exposures and hazards and are probably going to be visiting a hospital more often than their healthier, affluent, suburban neighbors. Hypertension is more prevalent in populations that are older, less educated, non-white, and have lower household incomes, and studies have shown that hypertension remains the leading risk factor driving preventable deaths globally (Koh et al., 2022). As discussed above, green space can have rather drastic effects on a person's health, and on a patient's hospital stay, particularly around stress and stress relief. Chronic stress is often disproportionately seen in communities with low resources and has been linked to numerous negative health outcomes (Jennings et al., 2017). If patients do not have the opportunity for stress relief or building resilience to stress in their home environments, and may in fact be exposed to excess stressors, they likely will experience greater stress in a hospital setting. They would also, therefore, experience greater benefit from greening initiatives and the incorporation of gardens and green spaces in healthcare settings. Urban hospitals have a bioethical imperative to

attempt to incorporate green space into their facility or campus designs to help combat health inequity among the patients they serve.

As with greening initiatives in urban communities, hospitals and healthcare facilities need to take care with how they plan and implement the inclusion of green spaces within their footprint. Urban facilities may not have the built environment or surrounding footprint in which to include outdoor spaces, but they can get creative with options that are not strictly an outdoor garden requiring expansion of their facility campus – roof top gardens, solariums, big windows, etc. Because many hospitals are non-profit and may need to carefully budget for such an initiative, it is important also that the cost can be justified because of the benefits to patients (Edge-Gumbel, 1996). Healthcare systems place emphasis and priority on cost-efficient services and optimizing facilities to be able to provide quality care, and this definition must include green spaces and gardens (Halawa et al., 2020). Research as discussed above has shown that there are clear benefits to patients, staff, and visitors by having a healing garden. However, many of these benefits may not be measured in exact dollars and cents, so further research may be needed into investigating both direct and indirect costs. Additionally, they may need to rely on more than economic data to determine the feasibility and worth of the intervention. The dearth of evidence to support restorative experiences in natural environments is due to a lack of well-controlled studies, not inefficacy (Hartig, 2008). Not providing or allowing access to green space, in the face of its health benefits, violates the principle of non-maleficence. Places of health and healing must live into their bioethical principle of beneficence, adding benefit to their community rather than taking

it away, and work to repair the health disparities plaguing urban communities due to the lack of green spaces.

The positive impacts of green space on human health and well-being are vast and wide-reaching, even if they are at times unquantifiable or difficult to study. That these positive effects are more marked and more needed in urban communities, particularly for low-SES and marginalized communities in urban environments, is measurable and has a growing body of literature to support it. Helping to green these neighborhoods will bring not only positive health benefits, but environmental and economic benefits as well. As the threat of climate change grows ever stronger, buffeting urban communities against negative climate events and slowing the changes in these communities is paramount. Particularly since the urban population is only continuing to grow, as urbanization pushes suburbia further out and eats into previously natural and rural landscapes. It is estimated that up to 70% of people will live in urban settlements in the next three decades (Badland & Pearce, 2019; Gregis et al., 2021). Maintaining and expanding green space quantity and quality in the face of growing urbanization was recognized in the UN Sustainable Development Goals as a global challenge (Hunter et al., 2019). This increase in urbanization will also bring with it growing social and health inequities as well (Giles-Corti et al., 2016). Larger urban environments will only mean more dense, more diverse, and more disparate communities will exist, unless interventions can be undertaken to work on eliminating the inequities that exist, rather than allowing them to flourish.

As urban spaces continue to grow and greater numbers of the population live in urban spaces, urban bioethics issues will become just bioethics, as the scope will not be unique but universal. The principles of beneficence, non-maleficence, autonomy, and

justice will continue to stand, but the agency of communities to achieve health, and the work to eliminate health disparities and focus on health equity through social justice and solidarity will become imperative. There is a growing need in light of continued urbanization to determine how to optimally intervene, and quickly, to provide enough exposure to urban green space in all communities, for all of society to realize the evidenced health and well-being, social, and environmental benefits (Hunter et al., 2019). Optimal intervention for one neighborhood may not be the same for another, so it is even more important to understand how to create effective interventions that will allow communities to derive benefit, rather than creating interventions that never actually reach through to those that need them most.

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