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Reviews

Promoting Environmental Justice Through Urban Green Space Access: A Synopsis

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ABSTRACT

This article reviews literature on the connection between urban green space access and environmental justice. It discusses the dynamics of the relationship as it relates to factors such as environmental quality, land use, and environmental health disparities. Urban development stresses the landscape and may compromise environmental quality. Since some communities are disproportionately impacted by changes in land use and land cover, understanding the environmental justice implications of changing the landscape is important. Likewise, the additive effects of degraded landscapes and decreased environmental quality have human health implications. The article covers information from a range of disciplines (e.g., urban ecology, sociology, public health, and environmental science) to address collective concerns related to green spaces and environmental justice. This article also articulates a gap in the literature related to empirical research on the subject.

INTRODUCTION

For centuries, natural settings have been associated with enhanced health and well-being in urban environments of the industrialized North.[1–3] Frederick Law Olmsted, the noted nineteenth century landscape architect, referred to trees as "the lungs of a city," a metaphor that illustrates the value of trees and other green space to the urban system. Prior studies define urban green space broadly, including city and municipal parks, forests, community gardens, and natural conservation areas.[3,4] The function and specific requirements of urban green spaces influence the way they are defined and classified throughout the literature.[5] Similar to other definitions,[6] green spaces in this review pertain to a variety of open areas with vegetation. Noticeably, research has also demonstrated uneven, unjust, or inequitable distribution of green spaces across some urban areas.[7–10] This synopsis will cover domestic and international literature on environmental justice and green space access as it relates to human health, landscape planning, and sustainable communities.

Academic interest in environmental justice stems from charges that environmental burdens such as landfills, toxic-emitting facilities, and other environmental hazards are disproportionately located near socially disadvantaged groups.[11–13] Unequal access to urban green spaces is generally not considered in traditional environmental justice research. However, recent conceptualizations have expanded to issues such as equitable access to urban parks and other natural resources. Such access is important because open spaces are associated with economic, psychological, and cultural benefits.[14,15] Fair access to natural resources and balanced land use practices are examples of ecological issues embedded in environmental justice.[16] Social privilege has enabled many middle-class communities to enjoy a greater distribution of environmental amenities such as public parks.[17] For instance, a Los Angeles study on park use suggested that the design and placement of parks failed to meet the needs of urban communities that were vulnerable and socially disadvantaged.[18] Similarly, a Milwaukee study observed that urban forests with a greater percentage of canopy cover were located near white populations with a higher median income when compared to Hispanics.[7] A study in Tampa, Florida used data from the census and remote

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sensing techniques and observed that neighborhoods with a higher proportion of African Americans, renters, and low-income residents had drastically fewer trees on public right of ways.[19]

Studies conducted in other countries have documented similar findings. For example, a study that compared townships throughout Eastern Cape (South Africa) observed an inverse association between low-income areas with the amount and condition of public green space.[20] Conversely, a Phoenix, Arizona study observed that Latino immigrants and African Americans were more likely to live in neighborhoods with access to neighborhood parks.[21] Similarly, blacks were found to live closer to city parks in Baltimore.[22] Overall, there are mixed findings on the equity hypothesis related to urban tree cover for various racial and ethnic groups in the U.S.[19,21] Though scholars in recreational studies have observed ethnic, socioeconomic, and related variations in American park use, many of their research approaches do not consider how the configuration of parks influence their use.[18] While there are exceptions to inequities in public park access, it is important to understand that local conditions influence the observations that are made in a specific location.[23] Overall, the condition of the physical environment has notable implications on human health, social interactions, and connection to the landscape. Literature to support the dynamics between green spaces and human health will be discussed further.

HUMAN HEALTH IMPLICATIONS OF INEQUITABLE GREEN SPACE ACCESS

Public health ecology is a framework that integrates landscape structure and ecosystem functioning with agents and stressors that influence health outcomes.[24] Some research suggests that access to green space reduces pollution exposure and promotes health,[25] it has implications to be considered within this framework. For instance, leaf area index is an indicator of air quality regulation;[26] and trees play an important role in the vegetation strategy for removing pollutants at the community scale.[27] However, it is important to note that not all types of vegetation are created equal. Factors such as tree species, allergenic index, tree condition, and length of in-leaf season impact the services that trees provide.

More broadly, high risk geographic settings with restricted salutogenic resources are "riskscapes" that increase a community's vulnerability to environmental stressors such as air pollution, natural disasters, climate change, and other hazards.[28] Low income and minority communities are more likely to reside in riskscapes and, as a result, are more likely to be exposed to pollutants that exacerbate respiratory illnesses. Reducing the environmental justice impacts of air quality management is also a major challenge.[29]

Similar observations have been made in other countries. For example, a Chilean study analyzed the role of urban forests on air quality by generating data that was incorporated into a model that quantified forest structure (e.g., species, leaf area, and tree condition) and pollution removal rates by trees across three socioeconomic strata.[30] The study observed that low-income regions had the highest concentration of coarse particulate pollution and trees in poorer condition.[30] An Italian study[31] noted that the provision of parks might be a strategy to mitigate the health impacts of soil contamination. Another study in New Zealand documented lower concentrations of particulate matter within an evergreen forest when compared with outside of the forest; supporting the potential role of urban forests to mitigate particulate air pollution.[32] While there have been preliminary observations on the influence of tree cover on air quality, additional research is needed. Even though air quality is one component of the physical environment, green space is also related to other aspects of human health.

The increase of various human health concerns can be attributed in part to environmental changes, yet environmental factors are not rightly regarded in the paradigm of human health research.[33] Even though it can be challenging to investigate the environmental influence on human health, it is still a worthy endeavor. For example health ailments (e.g., asthma, allergies, vector transmitted illnesses, and heart disease) have been linked to consequences of the built environment such as forest fragmentation and stream degradation.[34,35] Initial observations on this subject were made in the context of mental health, physical activity, and recovery from hospital visits. [36]

One study suggested that the availability of natural resources helps low-income women to better cope with stress.[37] Natural settings have also been shown to ease symptoms of attention-deficit/hyperactivity disorder (ADHD) in children.[38] Forests provide other benefits to human health (e.g., medicinal resources, mitigation of infectious diseases) and may be a strategy to ease costs in public health programs.[39] A study in New York City compared the density of street trees to factors such as prevalence of asthma in four and five year olds, asthma hospitalizations, demographic data (e.g., percentage of minorities, percentage in poverty), and proximity to pollution sources to observe that street trees were correlated with a lower prevalence of childhood asthma.[40]

The recreational benefits of green spaces also enhance other dimensions of human health. For instance, a positive correlation was observed between walkable green spaces and the longevity of urban senior citizens in Japan.[41] In a two year study, youth in Indiana were tracked, and it was determined that greenness (normalized difference vegetation index) was inversely associated with body mass index (BMI).[42] The study also implied that preserving green spaces is a potential strategy to address childhood obesity. This benefit would be particularly favorable to minority and low-income populations in the U.S since they experience major health concerns related to a lack of physical activity.[43] Disparities in access to parks and other recreational areas may influence the lower level of physical activity found amongst low-income communities of color.[44]

Another preliminary study investigated the relationship between tree canopy cover and the risk of poor birth

outcomes in Portland, Oregon. Information from birth certificates (i.e., socioeconomic factors, receipt of prenatal care, insurance type), tax records (i.e., housing characteristics, income), and the regional land information system (RLIS) were used to account for various factors.[45] The study concluded that a ten percent increase in tree canopy cover within fifty meters of homes may reduce the risk of small for gestational age (SGA) birth outcomes.[45] A cross-sectional study of eighth, tenth, and twelfth graders from a national study on physical activity, race, and socioeconomic status observed that communities with a higher poverty level and greater percentage of African Americans were less likely to have local parks and green spaces.[46]

A Florida study[47] observed that, although the quantity of green space within a specific distance in census tracts was related to health outcomes, the average distance within tracts and the overall amount in the county was not significantly related to mortality indicators. An English study analyzed the interaction between groups exposed to green space, income deprivation, and health data to imply that populations in "greener" areas experienced fewer health disparities related to mortality from circulatory disease and all causes.[48] As outlined in Table 1, there is other evidence throughout the literature that indicates the role of green space access to promote human health or social justice.

LANDSCAPE PLANNING AND PARTICIPATORY APPROACHES

While land use decisions can impact the landscape's physical features, such activities can also alter the ecological services (e.g., benefits to human health and well being) that it provides.[35,66] For the purpose of not overlooking the value of natural capital, urban planning should consider these services in the decision-making process.[67] Unfortunately, *de facto* planning practices have challenged the development of equitable and healthy land designs.[28,66] With this in mind, understanding the ecological benefits of landscape patterns is necessary for urban planners to promote sustainable development.[7, 68]

Cities cannot afford to view the policy spheres of economic development, environmental protection, and health promotion as separate areas.[69] Accounting for landscape services is a critical component of policymaking.[70] On the contrary, landscape functions and local public input are not adequately considered in several policymaking techniques.[71] Public participation is a foundational strategy for human dimensions to be involved in ecosystem management.[72,73] Harnessing public feedback in planning and conservation issues are important strategies to safeguard public health.[24] Even though promoting participatory landscape development can be a long term learning process,[74] it is also a key element of promoting environmental justice.

Former research on urban tree cover concentrated on neighborhood distribution yet neglected land use.[19] An unaddressed component of environmental justice strategies is the provision of training for local planning and zoning boards to consider the interface between environmental justice, local land use practices, and decision making.[75] Urban planning that is considerate of community needs allows citizens to be engaged in the urban greening process.[76,77] For instance, conflicts between housing interests and preserving green spaces have presented challenges in countries such as India.[78] The acceptance and application of green space planning initiatives can be enhanced by interdisciplinary communication among scientists, planners, and local stakeholders.[79,39]

Even though determining "just" distribution of parks can be a challenging task, a potential strategy could include allocating acres by factors such as persons per unit of space, recreation funds per capita, neighborhood, or socioeconomic status; a drawback of this approach is not accounting for other needs within the population.[80] Collectively, these are important questions to ask as these factors (e.g., eco-physical, social, and economic) promote sustainable development.[81]

CONCLUSIONS

Disproportionate access to the health benefits of green spaces may promote environmental health disparities. Incorporating risk assessment with insight from landscape ecology and ecosystem services will be critical to characterize cumulative responses in the environment.[82] This commentary is not suggesting that other factors (e.g., housing conditions, toxic waste facilities, etc.) are less significant in evaluating environmental justice concerns, rather that greater attention should be given to the physical environment. Considering environmental and social intervention methods will be vital to address environmental health disparities and promote environmental justice.[25] Consequently, achieving environmental justice serves as a strategy to address environmental health disparities.[83]

Likewise, incorporating various intervention strategies is critical to achieve environmental justice and integrate its platform into other areas. Effective policies that promote sustainable development are issues related to the foundational principles of environmental justice.[16,80,85] Green cities have the following unique features: 1) optimization of their natural environments to sustain human life, 2) minimization of their footprint on the land, and 3) incorporation of integrated and diverse strategies to meet their needs.[86] Future research should analyze how factors such as vegetation species, structure, and other environmental qualities influence the services provided by urban green spaces.

The future scholarship of environmental justice should consider how amenities such as parks and other green spaces are distributed throughout the population.[76] Even though the specific mechanisms behind these observations are being debated, wealthier neighborhoods continue to have greater canopy cover when compared to low-income communities.[19] Despite over three decades of research that articulates the benefits of green spaces, there are limited public policy strategies that include such

Table 1. Studies Investigating Relationships between Green Spaces, Human Health, or Social Justice

Author	*Type of study*	*Human health aspect*
Kellert and Wilson (1993)[50]	Interdisciplinary studies synthesis	Innate need to be in contact with biodiversity for psychological well-being and personal fulfillment
Takano et al. (2002),[41] Tanaka et al. (1996)[51]	Epidemiological	Urban green space users have greater longevity
de Vries et al. (2003)[52]	Epidemiological	Urban green space users had better self-reported health
Payne et al. (1998)[53]	Questionnaire and diary survey	Urban park users reported better general perceived health, more physical activity and relaxation
Kaplan (1995),[54] Hartig (2008),[55] and [56] Wells (2000)[56]	Experimental	Natural views restore attention fatigue; and quicken recovery of attention-demanding cognitive performances
Ulrich (1984),[36] Ulrich et al. (1991)[57]	Experimental	Natural views provide relaxation, increased positive self-reported emotions, and recovery from stress
Faber-Taylor et al. (2001)[58]	Experimental	Children with attention deficit disorder who are active in green spaces show reduced symptoms
Kuo (2001),[59] Kuo and Sullivan (2001)[15]	Experimental	Green views increase the effectiveness of people in facing major crises, and lessen aggression by reducing mental fatigue
Korpela (1989)[60] and Korpela (1992),[61] Korpela and Hartig (1996),[62] Korpela et al. (2001),[63] Newell (1997)[64]	Survey	People visit favorite places, often natural settings, for regulation of self-experience and feelings
Kim and Kaplan (2004)[65]	Survey	Natural features and open spaces in a residential area enhance sense of community
Perkins, Heynen, and Wilson (2004)[10]	Experimental	Observed that the majority of trees in a city's planting program were placed on owner occupied properties
Mitchell and Popham (2008)[48]	Epidemiological	A population that was exposed to the "greenest" environment experienced lower health disparities related to income
Lovasi et al. (2008)[40]	Epidemiological	Street trees were related to a lower prevalence of childhood asthma
Bell et al. (2008)[42]	Experimental	Greenness is inversely related to the z-scores for youth body mass index (BMI)
Abercrombie et al. (2008)[23]	Experimental	Reported variation in the distribution of public green spaces; low income areas were negatively associated with the quality of green space
Landry and Chakraborty (2009)[19]	Experimental	There is a lower proportion of tree cover on public right-of-ways in areas with a high amount of African Americans, renters, and low income residents
Coutts, Horner, and Chapin (2010)[47]	Epidemiological	Green space within a defined distance was associated with all cause and cardiovascular mortality
Donovan et al. (2011)[45]	Experimental	Natural environment may influence pregnancy outcomes

Adapted from Tzoulas et al. (2007).[49]

benefits in human health promotion.[86] Environmental justice has a pivotal role in supporting sustainable communities.[87] Urban green spaces constitute a considerable portion of the physical environment that has numerous implications upon the landscape. In essence, everyone plays a role in preserving public lands and bequeathing the heritage of our lands to future generations.[88] Incorporating such perspectives in the paradigm of environmental justice will develop our scholarship, vision, and hopefully our practices.

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