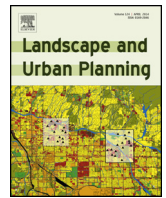




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Research Paper

Urban green space, public health, and environmental justice: The challenge of making cities ‘just green enough’

Jennifer R. Wolch^{a,*}, Jason Byrne^b, Joshua P. Newell^c

^a University of California, Berkeley, 230 Wurster Hall #1820, Berkeley, CA 94720-1820, USA

^b School of Environment, Griffith University, Australia

^c School of Natural Resources and Environment, University of Michigan, USA

HIGHLIGHTS

- Urban green space promotes physical activity and public health.
- Many US minority communities lack green space access, an environmental injustice.
- US and Chinese cities have developed innovative ways to create new green space.
- Urban greening can, however, create paradoxical effects such as gentrification.
- Urban green space projects need more integrative sustainability policies to protect communities.

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ABSTRACT

Urban green space, such as parks, forests, green roofs, streams, and community gardens, provides critical ecosystem services. Green space also promotes physical activity, psychological well-being, and the general public health of urban residents. This paper reviews the Anglo-American literature on urban green space, especially parks, and compares efforts to green US and Chinese cities. Most studies reveal that the distribution of such space often disproportionately benefits predominantly White and more affluent communities. Access to green space is therefore increasingly recognized as an environmental justice issue. Many US cities have implemented strategies to increase the supply of urban green space, especially in park-poor neighborhoods. Strategies include greening of remnant urban land and reuse of obsolete or underutilized transportation infrastructure. Similar strategies are being employed in Chinese cities where there is more state control of land supply but similar market incentives for urban greening. In both contexts, however, urban green space strategies may be paradoxical: while the creation of new green space to address environmental justice problems can make neighborhoods healthier and more esthetically attractive, it also can increase housing costs and property values. Ultimately, this can lead to gentrification and a displacement of the very residents the green space strategies were designed to benefit. Urban planners, designers, and ecologists, therefore, need to focus on urban green space strategies that are ‘just green enough’ and that explicitly protect social as well as ecological sustainability.

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1. Introduction

The world’s cities are becoming increasingly congested and polluted (Blanco et al., 2009). Urban green space provides a wide range of ecosystem services that could help combat many urban ills and improve life for city dwellers—especially their health. Such green space is diverse, varying in size, vegetation cover, species richness,

environmental quality, proximity to public transport, facilities, and services (Dahmann, Wolch, Joassart-Marcelli, Reynolds, & Jerret, 2010; Fuller & Gaston, 2009; Sister, Wolch, & Wilson, 2010). Public green space includes parks and reserves, sporting fields, riparian areas like stream and river banks, greenways and trails, community gardens, street trees, and nature conservation areas, as well as less conventional spaces such as green walls, green alleyways, and cemeteries (Roy, Byrne, & Pickering, 2012). Private green space includes private backyards, communal grounds of apartment buildings, and corporate campuses.

Ecosystem services provided by urban green space not only support the ecological integrity of cities, but can also protect the

* Corresponding author. Tel.: +1 510 642 0831; fax: +1 510 642 7560.

E-mail addresses: wolch@berkeley.edu (J.R. Wolch), jason.byrne@griffith.edu.au (J. Byrne), jpnewell@umich.edu (J.P. Newell).

public health of urban populations. Green space may filter air, remove pollution, attenuate noise, cool temperatures, infiltrate storm water, and replenish groundwater; moreover, it can provide food (Escobedo, Kroeger, & Wagner, 2011; Groenewegen, van den Berg, de Vries, & Verheij, 2006). For example, trees in urban areas may reduce air pollution by absorbing certain airborne pollutants from the atmosphere (Nowak, Crane, & Stevens, 2006). Green cover and urban forests can also moderate temperatures by providing shade and cooling an area, thus helping reduce the risk of heat-related illnesses for city dwellers (Cummins & Jackson, 2001; Nowak et al., 1998).

But within cities, green space is not always equitably distributed. Access is often highly stratified based on income, ethno-racial characteristics, age, gender, (dis)ability, and other axes of difference (Byrne, Wolch, & Zhang, 2009; McConnachie & Shackleton, 2010). Over the past two decades, the uneven accessibility of urban green space has become recognized as an environmental justice issue as awareness of its importance to public health has become recognized (Dai, 2011; Jennings, Johnson Gaither, & Gragg, 2012). The literature has focused on how to measure access to urban green space, primarily parks; the relative access of socio-demographics to these spaces; and how lack of access affects public health. Most has originated from the United States, the United Kingdom and Australia.

The reasons why green space is differentially distributed within the urban landscape are varied, including the philosophy of park design, history of land development, evolving ideas about leisure and recreation, and histories of class and ethno-racial inequality and state oppression (Byrne, 2012; Byrne & Wolch, 2009). Often explanations are interrelated and mutually reinforcing. For example, US histories of property development are intertwined with histories of ethno-racial oppressions, philosophies of park design and land-use systems.

In the United States, people of color and low-income earners typically occupy the urban core and/or low-income inner ring suburbs where green space is either scarce or poorly maintained. Wealthier households often reside on the suburban periphery where green space is abundant, well-serviced, and well-maintained (Heynen, Perkins, & Roy, 2006). This environmental injustice has become a planning priority, leading to parkland acquisition programs and diverse strategies to deploy underutilized urban land for additional green space.

Redressing park-poverty in communities of color and/or low income households can, however, create an urban green space paradox. As more green space comes on line, it can improve attractiveness and public health, making neighborhoods more desirable. In turn, housing costs can rise. Such housing cost escalation can potentially lead to gentrification: the displacement and/or exclusion of the very residents the green space was meant to benefit. In turn, residents may face higher rents and thus become precariously housed, while those who are actually displaced may be forced to leave their communities, ending up in less desirable neighborhoods with similar park-poverty problems. This paradox has negative public health implications, not only because of continued park poverty but also because displacement and precarious housing status themselves have negative public health implications (Bentley, Baker, & Mason, 2012; Centers for Disease Control, 2011).

This paper offers a synthesis of Anglo-American research on the role of urban green space in shaping public health and environmental justice. This literature has focused on urban parks, and to a lesser degree, green cover. Other types of green space (e.g., green roofs, green walls) have yet to be systematically studied. We first review scholarship on urban green space and public health, noting that many studies demonstrate the importance of green space access for health and wellbeing. Then, we review studies of urban green space and environmental justice (Section 3), finding evidence

that access to urban park resources is differentiated by class and ethno-racial dimensions, warranting intervention. In Section 4, we consider these health and justice findings as they relate to the rapidly urbanizing Chinese city of Hangzhou, and assess whether innovative efforts to expand inner-city green space there have been successful. We identify some similarities, but also significant differences. In the final section, we evaluate potential interventions for urban greening, such as adaptive reuse of infrastructure, mindful of lessons from China. Following Curran and Hamilton (2012), we suggest that a primary challenge is to develop strategies that are 'just green enough.' That is, to reap the public health benefits of improved access to urban green space while avoiding the urban green space paradox.

2. Public health benefits of urban green space

Most research on urban green space and health has focused on parks, with studies also examining green cover (Bedimo-Rung, Mowen, & Cohen, 2005; Kuo, Sullivan, Coley, & Brunson, 1998). Lack of park access has been linked to mortality (Coutts, Horner, & Chapin, 2010). Green cover has also been shown to protect health (Villeneuve et al., 2012). Additionally, parks often serve as sites of physical activity, which is associated with enhanced health and reduced risk for all-cause mortality and many chronic diseases (Anon, 1996; Barton & Pretty, 2010; Bush et al., 2007; Casey et al., 2008; Grahn & Stigsdotter, 2010; Hartig, 2008; Kuo, 2001; Woodcock et al., 2009). Indeed, a large number of studies demonstrate linkages between park proximity and physical activity (for example, Brownson, Baker, Housemann, Brennan, & Bacak, 2001; Cohen et al., 2006, 2007; Diez Roux et al., 2007; Evenson, Wen, Hillier and Cohen, 2013; Gordon-Larsen, Nelson, Page, & Popkin, 2006; McCormack, Rock, Toohey, & Hignell, 2010; Sallis, Floyd, Rodriguez, & Saelens, 2012).

Particular attention has focused on parks and the obesity epidemic (Ogden, Carroll & Flegal, 2008). Obesity can be detrimental to children's health (Dietz, 1998), and increase the probability of adult obesity (Freedman, Mei, Srinivasan, Berenson & Dietz, 2007). While genetic factors probably contribute (Stunkard, 1991), rapid increases in obesity suggest that individual behavior patterns, including low levels of physical activity, appear to powerfully influence obesity trends (Hill & Peters, 1998). Children with more access to parks and recreational facilities are more active than children with less access, and most results for adults are similar (Diez Roux et al., 2007; Timperio, Salmon, Telford & Crawford, 2005).

For example, Giles-Corti et al. (2005) outlined the importance of attractiveness and size of open space. A series of studies in Perth, Australia (Giles-Corti & Donovan, 2002; Giles-Corti, Macintyre, Clarkon, Pikora, & Donovan, 2003), using cross-sectional surveys and data on environmental facilities, found that parks were more likely to encourage physical activity if they were perceived as esthetically pleasing (minor traffic, sidewalks, trees, retail shops). Veitch, Ball, Crawford, Abbott, & Salmon (2012) studied park use as well as physical activity in Victoria, Australia, before/after improvements, finding significant increases in park use following improvements.

Curiously, public recreation has seldom been studied in regard to physical activity and obesity. Dahmann et al. (2010), however, in a cross-sectional study, audited recreation programs from southern California municipalities. Findings indicated that areas with higher population density, lower incomes, and a greater share of minority residents had inferior access to public recreational programming.

Recent studies show that both parks and recreational programs are important to the development of obesity. Wolch et al. (2011) controlled for a wide range of built environment factors—including the foodscape (Leal & Chaix, 2010), pollution exposure and traffic

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