Landscape and Urban Planning 130 (2014) 14–23

Contents lists available at ScienceDirect

Landscape and Urban Planning

journal homepage: www.elsevier.com/locate/landurbplan

Research paper

Socio-economic inequalities in access to nature on public and private lands: A case study from Brisbane, Australia

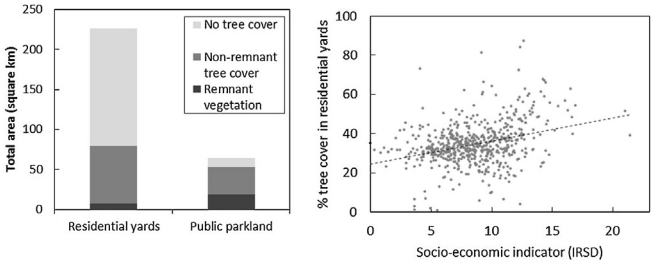
D.F. Shanahan[a,*], B.B. Lin[b], K.J. Gaston[c], R. Bush[d], R.A. Fuller[a]

[a] School of Biological Sciences, University of Queensland, St Lucia, 4072, Australia
[b] CSIRO Climate Adaptation Flagship and CSIRO Marine and Atmospheric Research, PMB 1, 107-121 Station Street, Aspendale, Victoria, 3195, Australia
[c] Environment & Sustainability Institute, University of Exeter, Penryn, Cornwall, TR10 9EZ, U.K.
[d] School of Population Health, University of Queensland, Brisbane, Queensland, 4072, Australia

HIGHLIGHTS

- Tree cover is higher in more socio-economically advantaged neighbourhoods in Brisbane, Australia.
- This socio-economic bias occurs on both public parkland and residential yards.
- High quality remnant vegetation is much more even shared across the socio-economic gradient.
- Most tree cover across the city occurs within residential yards.
- Thus, greening efforts on private land could help promote equal access to nature.

GRAPHICAL ABSTRACT



ARTICLE INFO

Article history:
Received 2 August 2013
Received in revised form 30 May 2014
Accepted 11 June 2014

Keywords:
Urban green space
Vegetation cover
Residential yards
Public parkland
Neighbourhood age

ABSTRACT

Opportunities to experience nature are important for human wellbeing, yet they are often inequitably distributed across society. Socio-economic variation can explain some of this inequity, but there has been relatively limited consideration of how access to different kinds of nature experiences varies across society. Here we examine how tree cover (as a measure of the general 'greenness' of urban environments) and native remnant vegetation cover (as a measure of access to higher quality natural areas) varies across the socio-economic gradient within public parkland and residential yards in Brisbane, Australia. We found that most tree cover was provided on residential land, and spatial regression models revealed that tree cover in both public parkland and private spaces was strongly positively related to socio-economic advantage. Conversely, most remnant vegetation cover was located on public parkland, and this was only weakly positively related to socio-economic status. These results suggest that municipal management of remnant vegetation can support equity in access to high quality nature experiences across the socio-economic gradient. However, the results also highlight the important role of residential yards in providing access to nature in general, as these areas provide the majority of overall tree cover. Thus, while public policy can enhance equity in access to nature on public lands, strategies such as social marketing and incentives that enhance nature within private spaces are important particularly within more disadvantaged neighbourhoods.

* Corresponding author at: Goddard Building, School of Biological Sciences, University of Queensland, St Lucia, 4072, Australia. Tel.: +61 420723233.
E-mail addresses: danielleshanahan@gmail.com, d.shanahan@uq.edu.au (D.F. Shanahan), Brenda.Lin@csiro.au (B.B. Lin), k.j.gaston@exeter.ac.uk (K.J. Gaston), r.bush@uq.edu.au (R. Bush), r.fuller@uq.edu.au (R.A. Fuller).

http://dx.doi.org/10.1016/j.landurbplan.2014.06.005
0169-2046/

1. Introduction

The world's urban population is continuing to grow rapidly (World Health Organization, 2013), intensifying the challenges of maintaining green spaces and natural areas in and around cities (Bekessy et al., 2012; McDonald, Kareiva, & Forman, 2008). There is emerging concern that people are becoming increasingly disconnected from nature, undergoing an 'extinction of experience' (Pyle, 1978) associated with urbanization and sedentary lifestyles. Coupled with this is the growing understanding that human interactions with nature are important for physical, social, and mental wellbeing (Bodin & Hartig, 2001; Dearborn & Kark, 2010; Han, 2009; Keniger, Gaston, Irvine, & Fuller, 2013; Maas, Verheij, Groenewegen, de Vries, & Spreeuwenberg, 2006; Shinew, Glover, & Parry, 1984; Ulrich, 1984). However, given that urban landscapes are biologically heterogeneous (Luck & Smallbone, 2010; McKinney, 2006) and land access arrangements are highly variable, it is inevitable some people will have greater access to nature experiences in their local neighbourhoods than others (Pickett et al., 2008). An important question is therefore whether there is 'environmental equity' in access to this resource in urban landscapes; in other words, do all socio-economic groups have similar opportunity to experience nature in the city (Cutter, 1995)? Moreover, given that some of the benefits that can be derived from nature may be greater in areas with higher species richness (Fuller, Irvine, Devine-Wright, Warren, & Gaston, 2007), are there socio-economic biases in access to the most natural green areas within urban landscapes? Answers to these questions could have significant policy implications as socio-economic biases in the availability of green space could be a symptom of, or even exacerbate, disadvantage (Heynen, Perkins, & Roy, 2006).

There is some evidence, particularly from the northern hemisphere, of inequality in access to green space. Socio-economically disadvantaged neighbourhoods have been found to have less overall vegetation cover in many instances (Iverson and Cook, 2000; Pham, Apparicio, Seguin, Landry, & Gagnon, 2012; Talarchek, 1990; Tooke, Klinkenberg, & Coops, 2010), and in some cities advantaged neighbourhoods have more public parkland (Boone, Buckley, Grove, & Sister, 2009), a greater number of street trees (Landry & Chakraborty, 2009) and relatively higher species richness and vegetation abundance (Clarke, Jenerette, & Davila, 2013; Martin, Warren, & Kinzig, 2004; Strohbach, Haase, & Kabisch, 2009; van Heezik, Freeman, Porter, & Dickinson, 2013). These patterns may arise for a diverse range of reasons. More advantaged populations can potentially afford larger properties in older neighbourhoods, thus higher levels of vegetation cover could be driven by the availability of space and the presence of more mature vegetation (Kirkpatrick, Daniels, & Zagorski, 2007; Lowry, Baker, & Ramsey, 2012; Mennis, 2006; Pham, Apparicio, Landry, Seguin, & Gagnon, 2013; Smith, Gaston, Warren, & Thompson, 2005). However, socio-economic indicators have been found to explain additional variation beyond that addressed by neighbourhood age and availability of space (Mennis, 2006; Pham et al., 2013). Social factors suggested to drive this relationship include different levels of participation in neighbourhood greening activities (Conway, Shakeel, & Atallah, 2011), as well as differences in land management behaviours influenced by culture, demographics, housing type and ownership (Grove, Troy, & et al., 2006; Perkins, Heynen, & Wilson, 2004; Talarchek, 1990; Troy, Grove, O'Neil-Dunne, Pickett, & Cadenasso, 2007). Differences in green space management can also be driven by top-down regulation and public policy; for example, tree removal might be considered more important to create the perception of safer spaces in socio-economically disadvantaged areas if crime rates are higher (Forsyth, Musacchio, & Fitzgerald, 2005), and unequal power relationships between communities and local governments could influence investment in and provision of public areas (Heynen, 2006; Heynen et al., 2006; Pedlowski, Da Silva, Adell, & Heynen, 2002).

Nature provision can differ notably between public and private locations (Mennis, 2006; Pham et al., 2013), yet the observed patterns in these areas do not always vary in a similar fashion across socio-economic gradients. Barbosa et al. (2007) found that in Sheffield, UK, public parkland was in fact well provided for socially disadvantaged groups and older people, though there was less space available for vegetation cover within residential yards than in more advantaged neighbourhoods. Conversely, disparities in vegetation cover across the socio-economic gradient in Montreal, Canada were more pronounced on public than private land, with higher levels provided for more advantaged groups (Pham et al., 2012). Such differences in the availability of nature within public and private spaces could have important public policy implications as the initiatives that aim to enhance vegetation within these locations will necessarily take different forms.

In addition to inequalities in nature provision, public and private spaces can play a different role in people's lives. Public parkland is accessible to all yet only a low proportion of the population actually visits public parks; visitation rates are strongly influenced by factors such as park characteristics, age, gender, cultural background, preferences, and socio-economic advantage or disadvantage (Elmendorf, Willits, Sasidharan, & Godbey, 2005; Jones, Hillsdon, & Coombes, 2009; Lin, Fuller, Bush, Gaston, & Shanahan, 2014; McCormack, Rock, Toohey, & Hignell, 2010; Reis, Lopez-Iborra, & Pinheiro, 2012). For example, Jones et al. (2009) found that while over 40% of people in the most advantaged socio-economic group visited parks in Bristol, UK, only 27% of those in the least advantaged group visited parks despite greater provision. On the other hand, private residential yards offer an immediate and easily accessible opportunity for people to access nature (Lachowycz & Jones, 2012). A number of studies have demonstrated the importance of nature close to the home. For example, Hanski et al. (2012) found a reduced incidence of allergies in Finnish children where biodiversity was greater around the home, and Kaplan (2001) showed that a view of green space through a home window was associated with improved psychological wellbeing. A study in the Netherlands found that greener residential areas promote social cohesion, stress reduction and physical activity (Groenewegen, van den Berg, Maas, Verheij, & de Vries, 2012).

In addition to the different roles that public and private spaces have for people, these spaces are managed in very different ways which will inevitably influence the availability of nature itself. The biodiversity within private spaces is heavily influenced by individual behaviours and circumstance, such as garden management, house ownership, wildlife feeding or availability of space (Daniels & Kirkpatrick, 2006; Fuller, Warren, Armsworth, Barbosa, & Gaston, 2008; Grove, Troy, & et al., 2006; Head & Muir, 2005; Loram, Warren, Thompson, & Gaston, 2011; Smith et al., 2005; Smith, Gaston, Warren, & Thompson, 2006; Smith, Warren, Thompson, & Gaston, 2006; Talarchek, 1990). Conversely, public parkland is usually directly controlled through top-down planning and management by local municipalities (Kendal, Williams, & Williams, 2012), and public policy objectives commonly aim to ensure a minimum target area of parkland is available to each resident (e.g. Brisbane City Council, 2000), typically within a minimum walking distance (Barker, 1997; Harrison, Burgess, Millward, & Dawe, 1995; Wray, Hay, Walker, & Staff, 2005). Thus, public parkland and residential yards inevitably provide highly different arenas for nature experiences, and understanding these differences will allow planners to address inequalities in access to urban nature.

While there is a growing body of research exploring environmental equity issues associated with the availability of vegetation cover across urban landscapes, there is only a limited