



Green space benefits for health and well-being: A life-course approach for urban planning, design and management



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ABSTRACT

In recognition that the coming century will see a substantial majority of the world's population living in urban areas, the World Health Organisation and the United Nations have developed policy frameworks and guidance which promote the increased provision of urban green space for population health. However, these undertakings do not provide specific guidance for urban policy in terms of the particular design attributes required to tackle lifestyle illnesses and to promote well-being in urban populations. Furthermore, green spaces have generally been treated as a homogenous environment type. In order to address these weaknesses, this paper collates and reviews the evidence linking health, well-being and green space using a life-course approach. The literature generally endorses the view that urban green spaces, as part of the wider environmental context, promote health and well-being across the life course. Based on the evidence, cohort-specific and cross-cutting design interventions are identified and a general integrated green space framework for health and well-being is proposed. This analytical lens facilitates distillation of a vast quantum of research and the formulation of specific planning and design guidance for the provision of more inclusive green spaces that respond to the varying needs of people across all life-course stages.

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1. Introduction

Across the globe, urban policy-makers are increasingly exploring the links between urban planning and public health as concerns rise on the impacts of urban environments on health outcomes and healthy lifestyles. For example, the recent *Habitat III Agenda* (United Nations General Assembly, 2016) places promoting human health and well-being as a key urban goal for the 21st Century, while the European Union has been linking health and the urban environment for more than a decade, illustrated by its *Thematic Strategy on the Urban Environment* with a primary aim to 'improve the environmental performance and quality of urban areas to secure a healthy living environment for Europe's urban citizens' (CEC, 2006; 4). In part, these initiatives echo the early roots of modern urban planning which emerged in the late 19th and early 20th Century to tackle slum conditions in Europe's industrial cities (Barton, 2010). However, the renewed interest in health and urban planning inter-relationships today reflects the growing evidence that the environment is one of the key determinants of health and well-being alongside inherited characteristics and socio-economic variables (Barton, 2009). Despite this interest, Crawford (2010) notes that close working relationships between urban planners and public health

practitioners are remarkably scarce. Moreover, while studies of the environmental and place-based determinants of health and studies of subjective measures of well-being have increased significantly over the last decade, from a planning and design perspective this evidence-base is often piecemeal (e.g. focused on a specific cohort), and translating public health knowledge into urban planning and design interventions and actual proposals remains problematic. In this paper, we address this disconnect by exploring the role of urban green spaces in providing benefits for health and well-being.

Within the academic literature, over the past 10–15 years, there has been a re-emergence of interest examining the impact of the environment on health in advanced economies, with a considerable expansion of theoretical and empirical studies investigating the role of contextual factors in the production and maintenance of health variations (Cummins, Curtis, Diez-Roux, & Macintyre, 2007).¹ While there is a longstanding recognition of the negative impacts on health of environmental 'bads' such as poor air quality and the distribution of various forms of pollution, more recently increasing attention has focused on the potential positive influence on health of environmental 'goods', such as well-designed and walkable cities,

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¹ Understanding the environment as a 'contextual effect' on health implies that similar individuals will have a different health status in different types of places (whereas the 'compositional effects' on health concern individual characteristics within places) (Omariba, 2010).

access to 'nature'/biodiversity and the distribution of urban green space (Lake & Townshend, 2006). 'Lifestyle illnesses' such as heart disease, obesity, diabetes, osteoporosis, mental illness and some cancers are increasingly attributed to the poor quality of the environment in our cities (Corkery, 2015, Barton, 2010, Berke, Koepsell, Moudon, Hoskins, & Larson, 2007, Gast, Frenken, Van Leest, Wendel-Vos, & Bemelmans, 2007, Lake & Townshend, 2006, Frank, Andresen, & Schmid, 2004, Latkin & Aaron, 2003, Gregg, Pereira, & Caspersen, 2000, Coutts, 2016). The literature generally endorses the view that urban green spaces, as part of the wider environmental context, promote health and well-being in cities (Gascon et al., 2016, Sugiyama, Francis, Middleton, Owen, & Giles-Corti, 2010, Kaczynski & Henderson, 2007, Tzoulas et al., 2007, Giles-Corti et al., 2005, Ellaway, Macintyre, & Bonnefoy, 2005, Giles-Corti & Donovan, 2003, Maas, Verheij, Groenewegen, De Vries, & Spreeuwenberg, 2006, WHO, 2016) and provide health services as part of a wider array of ecosystems services (Pretty et al., 2011, Jackson, Daniel, Mccorkle, Sears, & Bush, 2013, Lennon & Scott, 2014). These health services are understood to range from direct positive effects on mental and physical health from increased biodiversity, to improved well-being resulting from increased exposure to nature, physical activity and social engagement in green spaces (Sandifer, Sutton-Grier, & Ward, 2015).

In response to the identified health benefits, high-level policy frameworks and guidance documents have increasingly promoted the creation of health supporting urban environments through the increased provision of urban green space (see for e.g., WHO, 2012, WHO, 2013, WHO, 2010, UN General Assembly, 2015). More recently, *Habitat III*, the United Nations' New Urban Agenda adopted in October 2016, identifies the improvement of human health and well-being as a key priority urban goal. Signatories to the agenda committed to the promotion of a safe, healthy, inclusive, and secure environment in cities and human settlements, specifically highlighting the importance of the creation and maintenance of well-connected and well-distributed networks of green spaces to improve physical and mental health, urban liveability and to enhance resilience to environmental risks. While such policy guidance clearly supports an emphasis on green space provision for population health and well-being, it does not provide detailed guidance for urban policy in terms of the specific attributes required to tackle lifestyle illnesses in multiple cohorts. This is partly consequent on the aggregation and homogenisation of different spatial typologies in much planning and design policy into a measure of so called "green space", without further qualification as to type or quality of such spaces. Of particular significance is how this homogenisation fails to account for the health benefits afforded to different users by different types of green space distributions and configurations (Hartig, Mitchell, De Vries, & Frumkin, 2014, Bowler, Buyung-Ali, Knight, & Pullin, 2010, Velarde, Fry, & Tveit, 2007, Jorgensen & Gobster, 2010, Bedimo-Rung, Mowen, & Cohen, 2005). Furthermore, where locational and demographically specific design guidelines for the planning, design and maintenance of green open space do exist in local contexts, the extent to which they reflect or respond to empirical evidence relating to the green space-health relationship can be disputed. Indeed, the health benefits they assert may instead emerge from designs and practices founded on ecosystems protection, flood mitigation or landscape beautification. Such motivations do not necessarily correspond with improved amenity or health benefits.

This paper addresses these issues by collating and reviewing the large quantity of evidence linking health, well-being and green space, and distilling it in a manner that renders it both accessible and useful for those involved in the planning and design of urban green spaces. This is achieved by adopting a novel life-course approach to examine the evidence for health and well-being benefits accruing from green space from prenatal development through childhood, adolescence, adulthood and old age. A literature search was undertaken using research databases including Scopus, Web of Science and Google Scholar. 'Green-space' and 'health' search terms and their variants were applied

and identified articles were grouped by life-course stage. In order to ensure that all key empirical studies were included, comprehensive review articles were subsequently identified and their references were cross-checked with the initial articles. Finally, the most recent articles in quality peer reviewed journals citing these review articles were identified. Informed by the evidence collated and reviewed hereunder, we propose planning and design interventions for each cohort group. Following this, we synthesise the key findings from the review of cohort-specific studies to formulate a series of cross-cutting interventions for health promoting urban green space. We conclude by suggesting a path for future research and practice. It is intended that this approach can facilitate the formulation of site specific planning guidance for the provision of more inclusive green spaces that respond to the varying needs of people across all life-course stages.

2. Green space and health across the life-course

Numerous studies have investigated whether there is an association between people's access to green space or nature and personal levels of activity. More specifically, studies have examined how the design of the public realm encourages people to be more physically active, if it contributes to improved health outcomes, or if it attracts people to be more active (Ord, Mitchell, & Pearce, 2013, De Vries, Verheij, Groenewegen, & Spreeuwenberg, 2003, Hillsdon, Panter, Foster, & Jones, 2006, Kessel et al., 2009, Coombes, Jones, & Hillsdon, 2010). The majority of such studies have found that living in proximity to urban green space is generally associated with increased physical activity, positive health behaviours and improved health outcomes (Gascon et al., 2016, Sugiyama et al., 2010, Kaczynski & Henderson, 2007, Tzoulas et al., 2007, Giles-Corti et al., 2005, Ellaway et al., 2005, Giles-Corti & Donovan, 2003, Maas et al., 2006). However, rather than definitively verifying the trope that living close to any urban green space results in positive health behaviours, results have often varied by population cohort (see for e.g. Gascon et al., 2016, Maas et al., 2006, de Vries et al., 2003) and their perceptions of green space (Van Dyck, Cardon, Deforche, & De Bourdeaudhuij, 2011, Ord et al., 2013, WHO, 2016).

Furthermore, propensity to spend time outdoors is known to track from childhood. For example, Ward Thompson, Aspinall, and Montarzino (2007), identified a strong relationship between frequent childhood visits to green space and being prepared to visit such places alone as an adult. Consideration of such 'tracking' is important from a health standpoint since childhood inactivity has been identified as a key risk factor in many chronic diseases of later life (Wichstrøm, Von Soest, & Kvaalem, 2013, Marmot & Brunner, 2005), and early socially-stimulating environments have been shown to strongly inform later emotional well-being and cognitive capacity (Danner, Snowdon, & Friesen, 2001, Jenkins et al., 2008). In order to better understand the evidence in a manner which is accessible for planning and urban design professionals, a life-course approach is advanced in order to provide a more nuanced account of green space and health relationships and how these translate to practice and design beyond a one dimensional focus on quantity of provision.

2.1. Prenatal development

The potential benefits of green space to human health have been traced right back to the prenatal condition. The effect of greenness on pregnancy and birth outcomes has been studied extensively and positive associations between greenness and the birth weight of babies have been observed across the majority of studies (Hystad et al., 2015, Agay-Shay et al., 2014, Dadvand, De Nazelle et al., 2012, Dadvand, Sunyer et al., 2012, Markevych, Fuertes et al., 2014, Dadvand, Wright et al., 2014). Studies have also linked increased exposure of pregnant mothers to green space with lower odds of a child being small for gestational age or preterm/premature (Hystad et al., 2015) and lower infant mortality risk (Kihal-Talantikite et al., 2013). Some studies have

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