

## Green Space and Health



A range of bodies, including Government agencies, have promoted the possible physical and mental health benefits of access to green space. This POSTnote summarises the evidence for physical and mental health benefits from contact with nature, such as reducing rates of non-communicable diseases, and the challenges for urban green spaces.

### Background

The 'green spaces' that are the subject of this note are natural or semi-natural areas partially or completely covered by vegetation that occur in or near urban areas. They include parks, woodlands and allotments, which provide habitat for wildlife and can be used for recreation.<sup>1</sup> Research suggests there may be health benefits associated with proximity and access to green space for the 82% of the UK's population now living in urban environments.<sup>2,3</sup> Only half of people in England live within 300 metres of green space and the amount of green space available is expected to decrease as urban infrastructure expands.<sup>4</sup> While this POSTnote focuses on green spaces, other research has suggested that 'blue' spaces such as coastal areas can also provide health benefits (Box 1).

More responsibility has been placed on local authorities to improve public health cost-effectively and reduce deprivations (Box 2), and there is growing evidence to suggest that physical and mental health can be improved with greater access to green space.<sup>2</sup> There is environmental legislation in the UK for the protection of biodiversity, but not for the provision of green spaces (POSTnote 429). A number of NGOs including the RSPB and The Wildlife Trusts, have proposed the adoption of a Nature and Wellbeing Act for the protection of green spaces as a public health strategy.<sup>5</sup>

### Overview

- Physical and mental illnesses associated with sedentary urban lifestyles are an increasing economic and social cost.
- Areas with more accessible green space are associated with better mental and physical health.
- The risk of mortality caused by cardiovascular disease is lower in residential areas that have higher levels of 'greenness'.
- There is evidence that exposure to nature could be used as part of the treatment for some conditions.
- There are challenges to providing green spaces, such as how to make parks easily accessible and how to fund both their creation and maintenance.

### The Quality of Green Space

The design and maintenance of green space is important for whether it is considered 'good quality'. Green spaces that are well designed and maintained attract more visitors, and neighbourhoods with attractive green areas or vegetation are viewed as safer, which makes them more 'walkable'.<sup>6</sup> However, the appeal of green spaces can be reversed if they become derelict and littered, or the focus of anti-social behaviour.<sup>7</sup>

### Green Space and Health Inequalities

Low-income areas are associated with lower quality housing and education, poor diet, and less access to good quality green space.<sup>8,9</sup> Such deprivation is closely linked to poor health (POSTnote 491): life expectancy is on average 7 years shorter for people living in the lowest income areas (lowest quantile) and they will live more of their lives with disabilities. Health inequalities are halved in greener areas. For example, a recent study suggested that in the most deprived groups the number of mortalities are halved in areas with the greenest space.<sup>10</sup> Improving green space use may promote social cohesion by allowing groups from different social backgrounds to interact, which in turn has health benefits, such as reducing stress and depression.<sup>11</sup> However, health inequalities are the result of complex interactions between physical, social and economic environments, not just income.<sup>12</sup>

**Box 1. Blue Spaces**

Blue spaces are areas near to or adjacent to water, including coastal areas, lakes, rivers and even artificial features such as fountains. Studies have shown that when people are asked about preferences they prefer images of urban environments containing blue features over areas with green spaces.<sup>13</sup> The Blue Gym project investigated the potential benefits of activity outdoors in, on or near water,<sup>14</sup> but further research is needed to provide robust evidence for evaluating health benefits; the EU BlueHealth project aims to do this.<sup>15</sup> A recent review of the literature found that proximity to coastal areas is positively associated with better physical and mental health.<sup>16</sup>

**Box 2. Current Policy and Legislation**

- The Health and Social Care Act 2012 delegated duties to local authorities to improve public health and reduce health inequalities.
- There is a range of legislation that protects biodiversity and urban green spaces by regulating planning, contamination and conservation, including the Wildlife and Countryside Act 1981, Environmental Protection Act 1990 and the Planning Act 2008.
- The Natural Environment White Paper addresses the importance of accessible green space and links to human health. Informed by the national ecosystem assessment, it refers to the links between public health and green infrastructure and advises that green space be incorporated into urban developments.

**Evidence for Health Benefits of Nature**

Urban vegetation is known to improve the quality of the local environment; for instance reducing air pollution and noise (Box 3).<sup>17</sup> Research into the direct public health benefits of urban green spaces has focused on three main areas; physical activity, mental health and the development of specific treatments. Different types of study have been used to examine the link between green space and health.

**Study Design**

- *Cross-sectional observation studies:* These studies use regional or national survey data to explore correlations between public health and the amount, or proximity to, nearby green space at a population level. However, green space often correlates with other socio-economic measures so causation cannot be identified.<sup>18</sup> For example, wealthier areas have better housing and health care, and its inhabitants eat a healthier diet. The direction of causation is also unclear as areas with more green space may attract wealthier (and therefore healthier) people.<sup>19</sup>
- *Cohort studies:* These studies select groups from the wider population, which are followed over time to identify changes to physical and mental health as a result of their access to green spaces. These studies can be set up to look forward or can retrospectively look back at past behaviour. For example, one study selected participants from a national survey in England who had moved from areas with more green space to areas with less, or vice versa, and identified changes in their reported mental wellbeing.<sup>20</sup> Despite the possibility of confounding factors, these studies offer better causality evidence than observational ones. However, there are still very few pre- and post-change studies, with a subsequent lack of clarity about what long-term public health benefits could be achieved by increasing access to green space.<sup>21</sup>
- *Experimental studies:* These studies have looked at the direct effects of green space on indicators of health and wellbeing.<sup>22, 23</sup> There are two main types: one looks at the effects of exposure to stimuli associated with natural environment, including sounds or images, and the other looks at direct effects of being outdoors in green space.

**Physical Activity**

Being physically active for 30 minutes a day can directly reduce the risk of strokes, cardiovascular disease, obesity, some cancers and type 2 diabetes.<sup>24</sup> It is estimated that 1 in 4 women and 1 in 5 men in the UK are less active than this and 1 in 4 children spend less than 30 minutes playing outside per week.<sup>5,25</sup> Physical inactivity is the fourth largest

cause of disease and mortality in the UK, contributing to 37,000 premature deaths in England every year.

- *Is outdoor exercise better than indoor exercise?*  
There are no clear physiological health benefits to outdoor activity compared to indoor activity. People participating in outdoor activity are no more likely to participate in activity more frequently or have increased physical health benefits compared to those who exercise indoors.<sup>26,27</sup>
- *Does the amount of green space correlate with levels of physical activity?*  
A link has been found between people's physical environment and their activity behaviour. However, there are only limited studies in the UK that explicitly assess the link between the amount of green space and levels of physical activity. National cross-sectional studies have linked levels of physical activity to the amount of green space, but evidence from regional studies show little or no association. At a national level, levels of physical activity are higher in areas with more green space with people living near the greenest areas achieving the recommended amount of physical activity.<sup>4,28,29,30</sup> However, this was not always explained by increased use of green space and a causal relationship has not been found.
- *Does proximity to green space, quality and accessibility influence physical activity?*  
Those living closer to green space are more likely to use it, and more frequently.<sup>31</sup> Studies outside the UK suggest that people living closer to good-quality green space are more likely to have higher levels of physical activity.<sup>32,33</sup> A national cross-sectional study in the UK found a similar correlation: people who live within 500 metres of accessible green space are 24% more likely to meet 30 minutes of exercise levels of physical activity.<sup>4,30,34</sup> However, there has been no agreement in regional studies and some researchers suggest that it is 'perceived' access rather than measured proximity that influences activity levels.<sup>30</sup>
- *Does the use of green space lower the risk of disease?*  
Large-scale observational studies in the Netherlands have linked increased green space to increased perceived health and reduced prevalence rates of a number of diseases, such as diabetes.<sup>35</sup> In the UK, studies of disease, mortality and green space have generally been in the context of health inequalities. A correlation has been observed between those living closest to greener areas and reduced levels of mortality, obesity and obesity-related illnesses.<sup>10,36</sup> This has been

**Box 3. Indirect health effects**

Urbanisation damages the environment and has a range of implications for human health (POSTnote 448). Increasing urban vegetation could help reduce:<sup>2</sup>

- Flooding – 10,000 trees can retain approximately 35m litres of water per year, reducing flood risk (POSTnote 529).
- Noise pollution – a border of trees and shrubs 30 metres wide can reduce noise levels by 5-10 decibels.
- Air pollution – doubling tree cover across the West Midlands could reduce the concentration of fine particulate matter by 25%, preventing 140 premature air pollution-related deaths in the region.
- The urban 'heat island' (UHI) effect – vegetation creates shade, which reduces the risk of heat stroke and exhaustion.<sup>17,37</sup>

linked to higher levels of exercise, but causality has not been demonstrated.

**Mental Health and Wellbeing**

Psychosis and depression occur at higher rates in urbanised areas and in the UK 1 in 4 people now experience mental health issues.<sup>38,39</sup> Local green spaces may provide important areas for social interaction and integration that can indirectly increase public wellbeing. Access to green spaces may also have more direct and immediate benefits for mental health and wellbeing.<sup>40</sup> However, there are known difficulties in defining and quantifying these benefits.

■ *Do greener areas promote public wellbeing?*

Among cross-sectional studies at a regional or national level there is no agreement on whether greater wellbeing and lower levels of mental illness are associated with greener areas.<sup>41</sup> Cohort studies show that adults who move to greener areas have better mental wellbeing and sustained improvement in self-reported happiness, compared to those moving to less green areas.<sup>20</sup> However, people in greener areas generally experience less deprivations, and the disadvantages of the urban settings may exaggerate the advantages of natural environments.<sup>42</sup> Current studies cannot rule out confounding factors or definitively prove a causal relationship.

■ *Does proximity to green space influence wellbeing?*

While the amount of green space may influence wellbeing, the research into how living closer to green space affects wellbeing and mental health is limited. Living closer to green space encourages use so any therapeutic benefits to mental wellbeing are more likely to be felt by those living closer and visiting more frequently,<sup>2,41,43</sup> but there is no evidence to support this.

■ *Does outdoor activity improve mental health and wellbeing?*

Although people who exercise outdoors may not do so more frequently than those who exercise indoors, control trials have found that people exercising outdoors report higher feelings of wellbeing, and lower feelings of stress or anxiety, than those doing the same activity indoors.<sup>26</sup> In experiments, it has been shown that self-reported feelings of happiness increase and diastolic blood pressure (linked to stress) is lower in groups walking through a nature reserve, or exercising with scenes of nature, compared to those walking along an urban street.<sup>44,45</sup> However, there is debate about blood pressure as an indicator of stress (see below) and limited follow up suggests feelings of wellbeing are not sustained.

■ *Do views of nature affect feelings of wellbeing?*

Views of nature, compared to views of the built environment, have been suggested to reduce feelings of anxiety and reduce anger. However, while participants report a preference, these preferences and their effects on wellbeing, particularly in the long-term, has not been properly studied.<sup>13</sup>

**Therapeutic Use of Contact with Nature**

Nature-based therapy has been suggested as a treatment to relieve mental and physical illness and improve recovery time from stressful situations or medical procedures. A study showed that views of trees reduced the amount of moderate to strong analgesics needed by patients' post-surgery and the number of days in hospital. However, the comparison group had views of a solid brick wall rather than comparable views of the built environment.<sup>46</sup> Patients and hospital staff report feeling happier and more relaxed after spending time in a garden or outdoor space, suggesting that hospitals could incorporate green spaces to improve the wellbeing of healthcare staff, and patients.<sup>47</sup> Some indicators of psychological stress, including blood pressure and heart rate, are reduced in participants exposed to visual and auditory stimuli associated with nature. Cortisol levels in saliva (also linked to stress) decrease upon entering a natural environment.<sup>48,49</sup> However, the use of cortisol levels, blood pressure and heart rate as measures of stress is debated. Stress is not a well-defined term: it can present in a variety of ways and it is not clear whether such indicators are always indicative of a person's wellbeing.<sup>50,51</sup>

The Faculty of Public Health suggests that interaction with nature might be effective in treating some forms of mental illnesses. For example, there is emerging evidence that engaging with nature benefits those living with conditions such as ADHD, depression and dementia, by improving cognitive functioning and reducing anxiety.<sup>52,53</sup> However, mental illnesses, particularly dementia (POSTnote 535), are very complex making explicit studies difficult. Some projects, such as the ecotherapy projects funded by the charity 'Mind', have reported improvements in participants' mood, self-esteem and fitness.<sup>54</sup> It is unclear whether the same improvement would be seen if social and physical activities were conducted indoors. Mind recommend that the best treatments combine interventions and warn against moving away from medication.

**Behaviour Change Interventions**

Green or social prescribing is the referral of outdoor physical activity as well as, or instead of, clinical support and medication. Researchers have used terms such as 'dose of nature' to engage health practitioners and encourage use of exercise prescriptions.<sup>55</sup> NICE has recommended exercise referral schemes as an intervention only for sedentary or inactive patients that have existing health conditions or other factors that put them at increased risk of ill health.<sup>56</sup> GPs prescribe activity to improve physical health and wellbeing, but prescriptions should not replace medication. Randomised control trials in New Zealand found that green prescribing increased patient's physical activity, lowered blood pressure and encouraged weight loss.<sup>57</sup> However, some fulfilled activity requirements indoors at gyms or

swimming pools, and the study did not explicitly discuss the benefits of outdoor activity. 'Green gyms' are now available throughout the UK, where volunteer-led outdoor activities, such as maintaining allotments, are used to increase fitness and burn calories.<sup>58</sup> The 'Be Active' project in Birmingham has used voucher incentives, redeemable at high-street shops, to increase physical activity.<sup>59</sup>

## Challenges to Improving Health with Nature

Beyond evidence of effectiveness, there are a range of challenges to be addressed if green space is to be used to improve health outcomes.

### Making Green Spaces Accessible

Factors such as proximity and connectivity influence the use of green space.<sup>60</sup> Insufficient footpaths or the presence of busy and dangerous roads prevent easy access and deter use, particularly for children.<sup>61</sup>

A number of psychological, cultural and informational barriers have been identified, many of which interlink. Few studies have looked at cultural perceptions of green spaces in the UK, but initial research suggests that preferences for types of green space may vary.<sup>62</sup> Some studies suggest that women are less likely to use green space, particularly open or 'wild' spaces, because of feelings of vulnerability. Only a small proportion of old people regularly use green space, and while health issues may play a part so do a sense of vulnerability from busy roads, fears of crime or poorly maintained facilities.<sup>63,64</sup> People can also be unaware of nearby green space or the facilities available.

Locally run programmes and interventions can help encourage awareness and visitation of green space. For example, the Chopwell Wood Health Project, near Gateshead, has combined GP referral schemes, educational programmes and woodland activities to promote visitation and physical activity. It reported that 91% of referrals complete their prescribed programme, a high attendance for activities (also linked to social cohesion) and an increase in children's understanding of nature.<sup>65</sup> Other studies suggest that 'wild' or 'informal' spaces can be more appealing by improving safety.<sup>66</sup>

### Possible Negative Health Effects

Without appropriate management, increased human contact with green spaces may increase exposure to environmental allergens such as plant pollen and fungal spores. The transmission of vector-borne diseases ([POSTbrief 16](#)), such as tick-borne 'Lyme disease' and encephalitis, are rising in the UK.<sup>67</sup> Incidences of mosquito-borne diseases, including West Nile Virus and Malaria, have increased in Europe with the invasion of non-native mosquito species bringing threats of European dengue and Chikungunya virus ([POSTnote 483](#)).<sup>68,69</sup>

### Financing Green Space

The majority of funding for green spaces in the UK comes from the public sector: 70% from local authorities and 15% from Central Government and the EU. Reduction in central government grants to local authorities has led to a 10.5% decrease in spending on green spaces between 2010/11

### Box 4. Health Savings from Green Space

The direct health benefits of urban green spaces could save the UK health system money, but more accurate estimates are needed that can be applied at a national level. There have been numerous attempts to quantify the financial benefits of improved health resulting from urban green spaces, but these are purely based on assumptions or the results of small scale regional projects. However, Defra has estimated that if everyone had access to sufficient green space the benefits associated with increased physical activity could save the health system £2.1bn per year.<sup>70</sup> As well as direct health benefits, analysis from America has highlighted additional financial savings from green space benefits, including air pollution mitigation and social cohesion, at a total worth of \$16m (Box 3).

and 2012/13.<sup>71</sup> As local parks are not a statutory service protected by law, commentators have cautioned that parks may be sold or cease to be maintained. For example, Lancashire Council has announced that it will cease to maintain 93 forest and recreation sites as early as April 2018. Lack of funding has been consistently highlighted as the main constraint for green space improvement, affecting both its creation and maintenance.

Local businesses and property developers benefit from additional green space through job creation, visitor spending and house prices.<sup>72</sup> For example, it is estimated that living within 600m of a park in London adds 1.9 to 2.9% to property value, while a high quality park could add 3-5%.<sup>73,74</sup> The Town and Country Planning Association reports that developers are paying more attention to green space provision, particularly for upmarket developments. For example, Leeds City Council secured £3.7m extra investment for public parks from both local businesses and developers.<sup>75</sup> Lottery grants and fundraising events have also been successful in raising capital. However, funding opportunities like these are often one-off or small short-term grants that will not secure the long-term cost of maintenance. The annual revenue budget for maintenance of all UK green spaces is approximately £2.7bn, a fraction of the estimated health savings that could be achieved by improving access to green space (Box 4).<sup>76</sup> As part of the 'Active Parks' initiative, Birmingham has looked at redirecting money from the NHS to invest in green spaces used by patients fulfilling 'exercise prescriptions'.<sup>59</sup> In order to provide long-term maintenance costs, park authorities are using income-generating opportunities like cafes and events, such as Bute Park in Cardiff.<sup>77</sup>

#### Endnotes

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