Nature and Ageing Well in Towns and Cities

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Nature and Ageing Well in Towns and Cities:

Why the natural environment matters for healthy ageing

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Executive summary and key recommendations

We live in a world with a growing, ageing and increasingly urban population. We know that living and ageing well in our towns and cities is inextricably linked to the natural environment, yet our knowledge about why is still imperfect. Contemporary society faces a particular challenge to secure the essential foundations for healthy urban ageing whilst also ensuring that the decisions made today do not compromise the health and wellbeing of future generations. Making the right decisions now can provide those foundations and also have wider benefits for biodiversity and future climate resilience.

Urban green infrastructure – the multi-functional network of 'green' and 'blue' spaces in our towns and cities – makes valuable contributions to human health and wellbeing for people of all ages. Older people may have greater health needs, but they often play an active and important role in protecting, maintaining and enhancing urban 'green' (e.g. parks, trees, private gardens) and 'blue' (water-related) spaces. Far from older people being a burden to society, their activities bring benefits for all urban dwellers as well as for themselves. However, opportunities to participate and to benefit from urban green and blue spaces are not shared equally and this is one of the ways in which health inequalities can emerge and persist. Such inequalities can lead to marked differences in health outcomes and average life expectancies between people living in one community compared to another.

This report sets out findings from a three-year research project aiming to understand the benefits and values of urban green infrastructure to older people and how green infrastructure attributes and interventions can best support healthy ageing in urban areas. The project was conducted in Greater Manchester and run as a partnership between a range of researchers, organisations, practitioners, and community groups. Each brought a different perspective on green infrastructure, health and wellbeing, and how to value the contributions of urban green and blue space for health and wellbeing in later life. The project team also worked with older people, not only as participants but also as co-researchers helping to shape and deliver the programme of work. Findings are presented for the Greater Manchester city-region but are expected to have wider resonance given that Greater Manchester has many physical, social and economic characteristics shared with other urban areas.

The report demonstrates:

- How and why the natural environment matters for healthy ageing in urban areas;

- Why urban nature and natural green and blue spaces are integral to what makes an urban area 'age-friendly';

- Why multiple perspectives are needed to understand what actions are required in a range of sectors of policy and practice.

The report makes a series of key recommendations. It also provides specific recommendations for urban residents and for practitioners working in the green infrastructure, age-friendly cities, health and wellbeing, and arts and heritage sectors.

Who has the most urban green and blue space?

There are marked differences in neighbourhood provision of green and blue space according to age and income. If you are older and live in a city, you are more likely to live somewhere with more trees, shrubs, grass and water than if you are younger and live in a city. However, neighbourhoods associated with older adults on lower incomes are considerably *less* green than neighbourhoods associated with older adults on higher incomes, for example:

- On average, neighbourhoods with the least affluent older residents comprise only around 50% 'green' or 'blue' cover, compared with almost 70% for neighbourhoods with the most affluent older residents.

- Neighbourhoods with the least affluent older residents have only around 20% tree canopy cover compared to around 26% for the most affluent older residents.

- Even public parks and recreation areas are less green in neighbourhoods with the least affluent compared to most affluent older residents, an average of 82% compared to over 90% respectively.

In some neighbourhoods with older residents on lower incomes there is very little green and blue space at all. Although there is evidence of a systemic difference in green infrastructure provision in urban areas, averages also mask a large amount of variability within neighbourhood groups. Some older people have far fewer opportunities to receive urban green infrastructure related benefits and fewer opportunities to contribute to protecting, maintaining and enhancing local urban green and blue spaces.

What do the data tell us about the links between health and green infrastructure for older people?

Although people with higher incomes live in greener places, even after income is taken into account, people's local health status is still linked to the quantity, quality and proximity of green and blue spaces. The higher the quantity and environmental quality of green and blue spaces found in neighbourhoods, the healthier their residents tend to be. It is not only the amount of cover which is important but also its diversity, i.e. where there is a range of tree, grass, shrub and water cover types. There are some differences in the type and strength of associations between health and green infrastructure for different demographic and income groups:

- Proximity to public parks and recreation areas (within 100m) is the only green infrastructure characteristic associated with better health in neighbourhoods with older residents on lower incomes.

- In neighbourhoods with older, higher income residents, better health is associated with a wider range of natural characteristics, including the size and diversity of natural spaces, and the abundance of grass cover, tree canopy and other greenery.

Recommendation 1:

Improving the environmental quality of local public parks and recreation areas could bring further health benefits to older, low income residents. Consider measures like more diversity of land covers and vegetation types. There is a particular health and wellbeing imperative to protect and enhance public parks and recreation areas in low income and deprived neighbourhoods because of the benefits that they bring.

What to bear in mind - Quantitative evidence of health benefits at the city-scale is very important but it does not always tell us about why associations are seen. Fortunately there is a lot of independent evidence that helps us to understand why green and blue space is important for health. Although healthier people may choose to live in greener areas, there are many reasons why greener areas actively promote health too. For example, there is sound scientific evidence that greener areas in cities have better general air quality, better temperature regulation and lower noise levels. Green and blue spaces also provide more opportunities to exercise in the fresh air, to experience nature, to meet others and to gain a whole range of positive wellbeing outcomes, only some of which are directly observable. Furthermore, while it is true that wealthier people may have more options in choosing greener places to live, it also seems to be true that they then receive a longer-term health advantage as a result. This is an advantage which could be brought to other people who have had fewer choices about where they live. We can also understand more about what is important and why by asking people for their views and comparing evidence gathered in a range of different ways. In turn, this helps to shed further light on associations found through quantitative analysis, and helps to find more ways to support engagement.

How do older people themselves value green space for their health and wellbeing?

In considering the value of green and blue spaces for health and wellbeing it is important to consider how they contribute to helping to realise what people can be and what they can do with their lives. Simply having the possibility to visit a local park or canal does not mean that it will improve someone's life. What is important is how the existence of the park or canal helps that person to achieve the various things he or she values doing or being, such as having meaningful social relationships, being able to have independence and autonomy, having a means of achieving self-respect, or facilitating thinking, learning and the sharing of knowledge. Information about these sorts of values is best collected, organised and analysed using participatory methods. We developed and applied a valuation method which can be readily applied by others, and which is also available as an online tool.

There are four main groups of health and wellbeing values that older people tell us they derive from urban green and blue spaces. Urban green and blue spaces are important for health and wellbeing in later life due to:

- The personal and social memories that they embody;

- The opportunity they provide to connect with nature and volunteer with others;

- The opportunity they bring for active outdoor activity and adventure; and

- The opportunity they bring for social relationships, independence and growth.

Recommendation 2:

When developing interventions, consider the range of wellbeing values that green and blue spaces can provide for different groups of older people, from protecting spaces with personal and social histories through to providing varied spaces with opportunities for a wide range of activities and experiences.

What can we learn from assessing interventions?

Despite physical activity being one of the reasons older people value green and blue spaces, it cannot be assumed that all interventions will increase physical activity or observable wellbeing behaviours. Testing a small-scale local intervention using our newly developed quantitative methodology did not reveal a change in older adults' physical activity or any other observable indicators of wellbeing. Qualitative work in the same sites suggested why this might be. One reason was that smaller urban green spaces and those within particular residential settings seem to be perceived differently to large green spaces, for example if they are not considered public and open to all.

Our method for assessing observable wellbeing behaviours has been developed and validated in several contexts. MOHAWk (Method for Observing pHysical Activity and Wellbeing) is now being tested on a range of larger interventions with over 500 hours of observations conducted to date in multiple sites in Greater Manchester and elsewhere. The method is easy to use, and we are keen to support practitioners to use it to evaluate their own interventions.

Recommendation 3:

Try to use a range of methods - both quantitative and qualitative - to help to understand values, and to develop and assess interventions. Local contexts are always important and can help to explain local variations and differences in outcomes.

More could be made of interventions which are already happening in urban parks, such as dementia walks. Our analysis of observable behaviours during such walks suggested that at the moment participants may gain more from social and physical activity than wellbeing outcomes relating to contact with nature.

Recommendation 4:

Consider how social prescribing and activities like dementia walks could be designed and delivered in bespoke ways that interweave the needs of walk participants with opportunities to have more and specific contact with nature in local parks, or other areas of green and blue space.

- Local authorities have a key role to play in designing and maintaining high quality, multifunctional and multisensory local parks.

- Carers could enhance the wellbeing outcomes for participants by engaging them in direct contact with nature during dementia walks.

- Older adults could be more involved in the design and delivery of activities. They provide a wealth of knowledge and experience to share, both as individuals and through community groups.

Urban green and blue spaces help to reduce exposure to many environmental hazards which can otherwise have a negative effect on physical **health when outdoors.** There is already quite a lot known about how green infrastructure regulates local environmental hazards such as noise and heat stress, but this is not the case for all environmental hazards, such as some forms of air pollution. We found that concentration counts of Ultra Fine Particles (<0.1 μm, far smaller than particle size fractions that are currently regulated) were generally *lower* in areas with larger amounts of low-level vegetation, in particular shrub-level vegetation. Concentrations were also lower in summertime, and have *decreased* markedly over the last ten years. This means that using spaces with higher amounts of green space and vegetation barriers is likely to reduce personal exposure to this type of air pollution. Since greener areas also tend to have better overall air quality, they tend to result in lower exposures to a range of air pollutants. Exposure to air pollution and other environmental stressors can be reduced inside buildings as well as outside of them leading to wider health benefits.

Recommendation 5:
Consider establishing vegetation barriers. They can be used to reduce concentration levels of some of the very smallest air pollution particles which are known to be harmful for health but for which health-related air quality standards are not yet available. Such barriers are also known to have wider benefits, such as to reduce noise and provide more diverse habitats.

What role can green infrastructure and environmental volunteering play in later life?

Environmental volunteering by older people in urban areas brings reciprocal benefits. The act of volunteering is itself known to have positive benefits for wellbeing. Volunteering provides a basis for social connection and sharing, for developing social relationships, and for providing opportunities to care and contribute. Environmental volunteering provides further opportunities for learning and sharing and a basis through which connections with nature can be forged, re-established or nurtured. In turn, older people play a key role in environmental stewardship and activism, in environmental education, in urban nature management, and in conservation for the benefit of present and future generations.

What motivates people to engage more with urban green infrastructure in later life?

Although engagement with urban green and blue spaces yields health and wellbeing benefits, health does not appear to be the primary motivator for older adults. A wide range of motivations have been identified which provide a basis through which others may be attracted to engage with urban green and blue spaces. Although independently derived from interviews and participatory creative practice, they also re-enforce the specific values for health and wellbeing revealed through our valuation research, for example including:

- *Individual factors* motivating engagement with urban green and blue spaces
  - Emotional & personal connections to particular places
  - Opportunity for personal achievement
  - Opportunity for variety and change, including as a result of life transitions
  - Having time for participation
- *Social factors* motivating engagement with urban green and blue spaces
  - Opportunity to meet new people
  - Opportunity to share knowledge and skills
  - Availability of older place-makers and organisations to which different individuals can relate, both personally and culturally

- *Environmental factors* motivating engagement with urban green and blue spaces
  - The environmental quality and character of particular places – interesting plants or wildlife and particular colours, shapes, scent & movement
  - Signs of care and caring, such as through environmentally sensitive maintenance and links to people and organisations with dedicated maintenance roles
  - Accessibility and facilities that help to support engagement

Recommendation 6:

Encourage more engagement with urban nature through taking account of the factors which tend to motivate and demotivate older adults to participate.

Some examples found in this study include:

- Consider supporting a range of opportunities through which people can connect with nature and natural areas, for example keep in mind what older people have said that they value and what motivates them.

- Consider supporting a range of ways which offer different levels of contribution to activities and which provide stepping stones to greater engagement over time for people that want it.

- Consider ways to open up empty spaces in specific areas of high-density housing and high health deprivation while also managing expectations and providing a duty of care, e.g. through removing the fear and threat of loss or developing social contracts for temporary use.

- Encourage and support the role of older 'place-makers' (i.e. older people who are already championing activities in their local areas) and tap into their skills and knowledge and their expertise in intergenerational learning and sharing.

- Evidence and document urban nature activism, care and use.

- Enhance the role of local cultural institutions and community organisations as hubs and sites of knowledge exchange and skills development for involvement in natural environments in towns and cities.

- Make available the learning from how people take action themselves and in what contexts.

- Use arts and creativity (and older 'creatives', i.e. older adults who are themselves already engaged in arts and creative practice) to respond to challenges and communicate solutions or how solutions might be achieved.

Losses of urban green infrastructure result in losses of health and wellbeing for older adults in local communities. We often think about the health and wellbeing gains that green and blue spaces bring. However, it is important to also recognise how losses of green and blue spaces negatively affect members of the community who have been deriving benefits, and who have been engaged in the direct use of spaces. Even the threat of loss can impact older people's health and wellbeing and may undermine their willingness to participate and engage in the future. In some communities with limited green and blue space of high environmental quality the impacts can be particularly severe. Ultimately, there must be some provision of green and blue spaces of good environmental quality to allow people to engage and to enable wider direct and indirect benefits to be gained.

Why do these results matter to me? Specific recommendations

These findings relate to Greater Manchester but there is much about the city-region which is representative of towns and cities in other parts of the UK. In Greater Manchester there has also been integrated thinking across a range of sectors to develop strategic objectives around green infrastructure, age-friendly neighbourhoods and cultural provision. Some of this thinking is transferable, as are the findings, tools and methods produced through the research. The following sections suggest what you might do.

If you are a Resident

- Set up or get involved with local community groups to increase, protect and enhance green and blue spaces, to help design them and to support others' engagement.

- Share your knowledge about your local green spaces.

- Consider using vegetation barriers such as long grasses, shrubs and trees, and think about how green and blue space might be diversified in your local area.

- Speak up using our tools. See the Further information section.

  - Tell us what you particularly value about urban green and blue spaces in Greater Manchester by using our Value Tool

  - Find out about what the green and blue space provision is like in your area by using our Extract tool

If you work in Green Infrastructure professions

- Protect and enhance the environmental quality of local parks and recreation areas, especially in neighbourhoods with older residents on lower incomes.

- Consider ways in which low income neighbourhoods can be targeted for increased provision of green and blue spaces, especially spaces of high environmental quality.

- Bring in more visible signs of care in green and blue spaces and carers of green and blue spaces, while ensuring that maintenance is environmentally sensitive and supports diversity. Places which seem to be uncared for tend to discourage participation.

- Consider the role of creative practice (such as arts-based activities) and the wide range of motivations (and demotivations) for older communities from all backgrounds to participate in urban green and blue spaces.

- Consider the wider health and wellbeing values in decision-making for protecting, maintaining and enhancing green infrastructure provision and making it more multi-functional, including the provision of necessary infrastructure to support access and use by older adults. To capture the full range of benefits, green and blue spaces could offer opportunities for stimulation, social engagement and adventure through to opportunities for reflection, remembering and independence.

- Recognise that the benefits and value from interventions for people in later life are highly variable according to size, setting and context. There are some benefits from smaller interventions, however, interventions which lack ongoing care, variety and context may have a limited impact for older people's health and wellbeing in cities. Avoid attempts to simplify places as singular narratives.

- Simple interventions in existing green and blue spaces can encourage older adults' participation. However, lack of appropriate infrastructure is a major barrier.

- Recognise the health and wellbeing damage when green and blue spaces are lost, whether formal, informal or personal spaces.

- Shrub-level planting can mitigate summer exposures to Ultra Fine Particles, the very smallest air pollution particles (<0.1 μm) for which there are no current health-based standards but which are known to have negative impacts on physical health.

- Use our tools to help evaluate green infrastructure interventions for improving the health and wellbeing of older people. See the Further information section.

If you work in Health, Wellbeing or Social Care professions

- Recognise that health is not always the primary motivation for engagement in green and blue spaces and that there are a range of values and motivations.

- Recognise the health and wellbeing damage when green and blue spaces are lost, whether large or small.

- Consider ways that carers can encourage greater connection with the natural environment, including in designing and running activities like dementia walks.

- Consider recommending green and blue space activities where there is specific infrastructure to support engagement. This could include nearby cafés, transport or social support through community groups. Participants in studies frequently mention the importance of places to sit. There may be a physical need to sit or sitting is the main way that a benefit can be experienced (e.g. benches as exercise bench-marks during recuperation). Some communities also require more private and enclosed spaces.

- Use our tools for exploring the project results and for carrying out evaluations. See the Further information section.

If you work in Arts, Heritage or Creative Practice professions

- Recognise that cultural institutions could reach out to engage communities and record their engagement with urban green and blue space, something that may be particularly important where places are lost or under threat.

- Recognise that cultural institutions could benefit from active out-reach into communities and the particular spaces that communities gather, including outdoors and through the chance to archive the legacy of social action and the values held in green and blue spaces.

- Involve local artists interested in ecology and the environment to support innovative practices, create interventions and connect people.

- Explore ways of working collaboratively with other practice areas in environment and health.

- Consider events like the Who Cares? Residency at Manchester Museum as a possible replicable model. See the Further information section.

- Use our tools for exploring the project results and for carrying out evaluations. See the Further information section.

If you work on Ageing agendas

- Consider the range of values which underpin health and wellbeing benefits and how the specific characteristics of green and blue spaces (such as their diversity) can be enhanced to improve the quality of natural areas in towns and cities and the natural experience they provide.

- Note that physical activity in older adults is likely to only be promoted through larger interventions. Some smaller interventions in areas which are already largely green seem to have a negligible impact on physical activity and other observable aspects of wellbeing. However, this does not mean that they have no other value.

- Note that there are some benefits from smaller interventions, however, interventions which lack ongoing care, variety and context may have a limited impact for older people's health and wellbeing in cities. Considering longer-term and legacy dimensions of interventions can be very important.

- Support the protection and enhancement of existing green and blue spaces for their health and wellbeing value to older adults.

- Consider the range of motivations for engagement, including how people are motivated to care for places which trigger fond memories and which further strengthen emotional connections.

- Join up with other areas of practice to help design and deliver green infrastructure interventions with the potential to meet wider health and wellbeing goals.

- Read about what some of our partners say about their experiences. See our Partner Perspective boxes.

- Use our tools for exploring the project results and for carrying out evaluations. See the Further information section.

How can I generate evidence? A summary of tools and methods

- The project developed new data, approaches, tools and understanding and used different research approaches, including quantitative analysis, mapping, monitoring, interviewing, creative practice and observational methods, such as before-after 'natural experiments'. We also produced a set of online tools for exploring results. They are detailed in the Project findings section and on www.ghia.org.uk.

- Participatory methods and creative practice were fundamental to the research and many of its activities. For example the visual expression facilitated through creative practice is especially important for people who speak English as a second language, and with experiences of trauma and exclusion. Loneliness and social isolation is a challenging topic to be addressed directly, especially with vulnerable groups. Creative practice techniques were an important way to engage people on such topics.

- The Who Cares? participatory creative practice Residency was built on engagement with older adults in local community green spaces, through volunteer groups and themed focus groups run as part of a Heritage Futures Studio. This provides a model which could be more widely replicated. See the Further information section.

- The benefits and value from interventions for people in later life are highly variable according to size, setting and context. Collecting contextual information is important as part of formal evaluations.

Project findings

1. 'Green infrastructure' and our ageing society – why does it matter?

We are an ageing and increasingly urban society. In 2019 the median age of people in Europe was 42 and Europe had the highest proportion of people over 65 of any continent (18%).[1] The median age – the age at which an equal proportion of people are younger and older - is expected to increase everywhere in the coming years (Figure 1). In 2016, 18% of the UK population was already over 65 years of age, a proportion which is expected to rise to around 25% over the next 50 years.[2] At the same time the proportion of the population living in urban areas is increasing. The 2018 Revision of the World Urbanization Prospects puts the current proportion of urban dwellers in Europe at 74%.[3] It has been estimated that 83% of the UK population live in urban areas, a figure set to rise to 90% by 2050.[3]
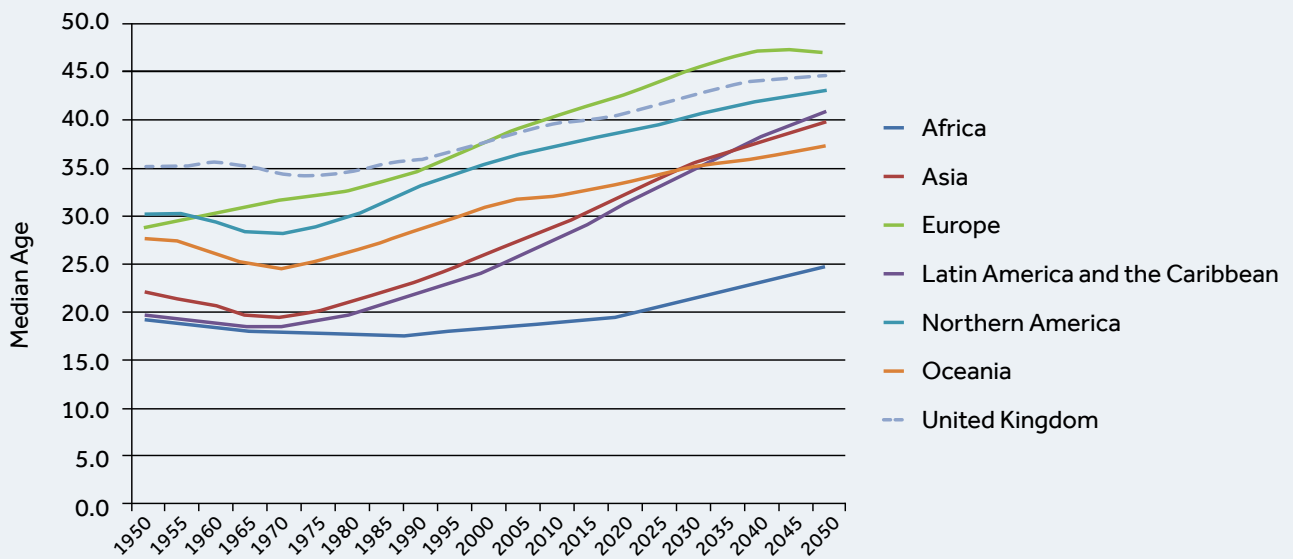
Figure 1: *The UK had a median population age of 40 in 2015, lower than Europe as a whole but more than in any of the other continents of the world when taken as a whole.[4]*

1   United Nations, Department of Economic and Social Affairs, Population Division (2019). *World Population Prospects 2019*, custom data acquired via website.

2   Office of National Statistics (2018) *Living longer: how our population is changing and why it matters. Overview of population ageing in the UK and some of the implications for the economy, public services, society and the individual.* [Online] [Accessed 12th Dec 2019] https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/ageing/articles/livinglonger howourpopulationischangingandwhyitmatters/2018-08-13#how-is-the-uk-population-changing

3   United Nations, Department of Economic and Social Affairs (2019). *World Urbanisation Prospects, the 2018 revision.* [Online] [Accessed 12th Dec 2019] https://population.un.org/wup/Publications/Files/WUP2018-Report.pdf

4   United Nations (2019). *United Kingdom: Median age of the population from 1950 to 2050 (in years).* Statista. Statista Inc. Accessed: November 27, 2019. https://www.statista.com/statistics/275394/median-age-of-the-population-in-the-united-kingdom/

"In 50 years' time, there is projected to be an additional 8.2 million people aged 65 years and older in the UK, a population roughly the size of present day London"[5]

Our ageing urban population brings both opportunities and challenges. There is much to celebrate about later life, such as having the time to try new things and the opportunity to bring a wealth of life experience to others. However, there are also challenges. Some of the most pressing include how to support independent living and living well with long-term conditions and complex co-morbidities.[6] Urban areas may benefit from higher densities of services and associated infrastructure, such as for health, social care and transport, but there are also higher burdens from environmental stressors such as pollution and noise. Stressors are likely to have a disproportionate impact in later life due to the increasing sensitivity and lower adaptive capacity which tend to come with age. For the increasing numbers of people who live in urban areas this can lead to a greater potential for negative impacts on health and wellbeing. Such negative impacts can be mitigated and managed.

Urban green infrastructure – the multi-functional network of 'green' and 'blue' spaces in our towns and cities – makes valuable contributions to human health and wellbeing. A rich evidence-base is emerging on the health and wellbeing benefits of different sorts of green and blue (water-related) spaces. These green and blue spaces exist in many forms. They exist as large patches (e.g. as urban parks and lakes), as corridors (e.g. canals and waterways) and also as a multitude of smaller green and blue spaces within the wider urban landscapes (e.g. private gardens). The existing evidence is helping to inform local, regional, national and international action. However, there are still uncertainties and gaps in our knowledge in helping to understand what is particularly important for health and wellbeing as well as where, for whom and why urban green and blue spaces matter.

Studies have shown positive links between green spaces and health in England.[7,8] Furthermore, a recent review of 93 separate studies into green-blue spaces and health revealed that most were conducted at the neighbourhood scale and most showed positive associations too.[9] Some benefits are felt more directly than others but all have a value in terms of the holistic definition of health used by the World Health Organization (WHO)[10], including

5 Office of National Statistics (2019) *Overview of the UK population: August 2019* [Online] Accessed 12th Dec, 2019 https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/articles/overviewoftheukpopulation/august2019

6 Oliver, D., *et al.* (2014) *Making Our Health and Care Systems Fit for an Ageing Population* [Online] Accessed 12 Dec, 2019 www.kingsfund.org.uk/publications/making-our-health-and-care-systems-fit-ageing-population

7 Mitchell R. and Popham F. (2007) Greenspace, urbanity and health: relationships in England. *J Epid Com Health* 61:681–3

8 Wheeler, B.W., *et al.* (2015) Beyond greenspace: an ecological study of population general health and indicators of natural environment type and quality. *International Journal of Health Geography* 14:17

9 Labib, S.M., Lindley, S. J. and Huck, J. J. (2020) Spatial dimensions of the influence of urban green-blue spaces on human health: A systematic review, *Environmental Research*, 180 doi.org/10.1016/j.envres.2019.108869

10 World Health Organization. (1947). *Constitution*. Geneva, Switzerland

for physical health[11], mental health[12] and wider human wellbeing.[13],[14] The more indirect benefits range from mitigating extreme weather and moderating pollution[15] through to helping to foster community ties.[16] It is important to recognise these multiple influences, particularly where the amount of green and blue space is limited and the need for benefits is great.

Health and wellbeing benefits from urban green and blue spaces are not shared equally amongst the population, particularly in urban areas. The need for, and access to, green and blue spaces for health and wellbeing benefits are not equally distributed geographically, socially, culturally or demographically.[17] Research shows that older people are most likely to suffer from poor health, yet this group may be the least likely to benefit from green and blue spaces and their role in underpinning a good quality of later life.[18] Older people living in towns and cities may be one of the groups particularly reliant on urban green and blue spaces, since they are less likely to travel to surrounding areas.[19]

Urban green and blue spaces are important for health and wellbeing in later life, but older people play an active role in developing and caring for urban green infrastructure too. People are more likely to volunteer in later life compared to their younger days, and – as we explore in this report – this can mean that older people become important guardians of green and blue spaces in cities.

This means that that there is the potential for a virtuous circle of ageing, better urban environments and higher rates of health and wellbeing – an important counter to the view that ageing consists of a vicious circle of decline and dependency.

Urban green and blue spaces have value beyond what they bring to people. Some urban green and blue spaces also provide vital biodiversity functions (e.g. habitat provision and landscape connectivity). This - in turn - helps to support nature and ecosystems more widely. Indeed, it may be the very biodiversity of our green and blue spaces which underpin many of the health and wellbeing benefits that we see. Such benefits are valuable throughout the life course.

Urban green and blue spaces are integral to what makes a city 'age-friendly'. However, we lack comprehensive evidence taken from a range of different viewpoints. For instance, we know little about the role of green infrastructure-based interventions for different aspects of health and wellbeing for older adults. Neither do we know very much about what motivates older people to participate in environmental volunteering in our towns and cities, or what aspects of green and blue spaces are particularly valued and why. All of this information is needed to help us to develop a greener strand to the thinking around age-friendly cities, to develop better interventions to tackle the range of issues facing people in later life and to support wider actions for ageing well.

11 Maas, J., Verheij, R.A., *et al.* (2008) Physical activity as a possible mechanism behind the relationship between green space and health: A multilevel analysis. *BMC Pub Health* 8:206

12 Fuller, R.A., Irvine, K.N. *et al.*, (2007) Psychological benefits of greenspace increase with biodiversity. *Biology Letter*s. 3. pp.390-394

13 Tzoulas, K., *et al.* (2007) Enhancing ecosystem and human health through Green Infrastructure: A literature review. *Land & Urban Plan* 81, 167-178

14 Nieuwenhuijsen MJ, *et al.* (2014) Positive health effects of the natural outdoor environment in typical populations in different regions in Europe: a study programme protocol. *BMJ Open* http://dx.doi.org/10.1136/bmjopen-2014-004951

15 Speak, A. F., *et al.*, (2012) "Urban particulate pollution reduction by four species of green roof vegetation in a UK city." *Atmospheric Environment* 61: 283-293

16 Kazmierczak, A. (2013) The contribution of local parks to neighbourhood social ties. *Landscape and Urban Planning* 109(1), pp. 31-44.

17 Kazmierczak, A. and Cavan, G. (2011). Surface water flooding risk to urban communities: Analysis of vulnerability, hazard and exposure. *Landscape and Urban Planning* 103(2): 185-197

18 Días, S., Demissew, S., *et al.*, (2015) The IPBES Conceptual Framework – connecting nature and people *Current Opinion in Environmental Sustainability* 14:1-16

19 Nieuwenhuijsen M. J., *et al.*, (2014) Positive health effects of the natural outdoor environment in typical populations in different regions in Europe: a study programme protocol. *BMJ Open* http://dx.doi.org/10.1136/bmjopen-2014-004951

This report sets out findings from a three year research project aiming to understand the benefits and values of urban green and blue spaces to older people and how green infrastructure attributes and interventions can best support healthy ageing in urban areas. The project was conducted in Greater Manchester and run as a partnership between a range of researchers, practitioners and other research users and community groups, each with a different perspective on green infrastructure, health and wellbeing and how to value the contributions of urban green and blue space for health and wellbeing in later life. See the Further information section for details of the project team and their range of specialisms.

The project team worked with older people both as participants and co-researchers. A range of co-researchers made active contributions to the research process through shaping, creating and delivering activities alongside the research team. Co-researchers had a range of backgrounds and skills and came from across the city-region. They helped to sense-check data collection approaches and interview schedules, identify participants and carry out interviews. Co-researchers also co-created an archive of documents, images, found objects, ecology specimens, and artefacts connected to experiences and activities culminating in a creative residency at Manchester Museum in 2019.

The project developed new data, approaches, tools and understanding and used different research approaches, including quantitative analysis, mapping, monitoring, interviewing, creative practice and before-after 'natural experiments'. Any approach to understanding health and well-being needs to consider a range of data and recognise the limits of what can be measured so that important understanding does not disappear from view.

Participatory methods and creative practice were fundamental to the research and many of its activities. Creative practice was especially important in particular community contexts and helped to uncover new understandings of the value of green and blue spaces. It helped some communities to uncover and better articulate feelings which did not emerge using traditional methods. Visual arts practices also facilitated the expression of values in ways which were less reliant on an individual's skills in articulation or proficiency in the English language.

2. Why Greater Manchester?

Greater Manchester is a large urban agglomeration with many characteristics which make it typical of other urban areas. With a population of some 2.8 million people, Greater Manchester has a large urban core, several satellite towns, and a varied landscape of lowland plains and rural upland hinterlands. The physical geography of the city-region has helped to shape its historical development, and while Manchester was the world's first industrialising city the same historical legacy of land cover, land use and community change can be seen in cities across the UK, in Europe and beyond. The city-region contains neighbourhoods which differ considerably in terms of their environmental characteristics and the nature and type of green and blue spaces they contain.

In common with other urban areas, Greater Manchester's population is ageing. Within 20 years around 37% of Greater Manchester's population will be over 50 years of age.[20] As of 2015 there were some 907 thousand people over 50 years of age resident in Greater Manchester – the age threshold considered for the Greater Manchester Age-Friendly Strategy.[20]

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20 Greater Manchester Combined Authority (2018) Greater Manchester Age-Friendly Strategy. [Online] [Accessed 12 July 2019]
Available at: https://www.greatermanchester-ca.gov.uk/media/1166/gm_ageing_strategy.pdf

By 2040, around 625 thousand people in Greater Manchester are expected to be 65 years of age or above, some 20% of the expected population of 3.1 million.[21]

Greater Manchester has very varied communities and neighbourhoods. Community charateristics are highly diverse in terms of age and health as well as social, cultural and ethnic backgrounds. Greater Manchester's older population includes the relatively frail, income deprived and socially isolated to the relatively fit, affluent and socially connected. Overall, as of 2014-16, male and female healthy life expectancy in Greater Manchester was 59.4 and 60.6 years respectively (3.3 years and 3.9 below the national average).[22] There are other challenges too, including high levels of income deprivation and pensioner poverty in some neighbourhoods, and high rates of reported bad health in some communities, for instance for 61-70 year olds, 86% of Bangladeshi people report being in bad health, compared to only 34% of white English people.[23]

Creating an age-friendly city is central to wider Greater Manchester priorities set out in _Greater Manchester Strategy: Our People, Our Place._ Three other of its 10 priorities are highly relevant to themes in the research project, including: creating a green city-region with high quality culture and leisure for all (Priority 7); creating safer and stronger communities (Priority 8); and supporting healthy lives with quality care for those that need it (Priority 9).[24]

The research outputs can therefore help to underpin immediate local policy visions as well as providing transferable learning and tools to support an understanding of the role and value of urban green infrastructure for supporting better health and wellbeing in later life.

Greater Manchester is a test-bed for the devolution of greater fiscal and economic responsibilities. Health and social care devolution will focus more on preventative work in the community – putting strategies in place to keep people healthy and as independent as possible.[25] The expectation is that the lessons learnt from Greater Manchester's devolution can be passed on to other urban areas.

Greater Manchester is therefore a highly appropriate place to carry out the research. The characteristics of the city, commitment to age-friendly and green infrastructure agendas, and the opportunities from devolution of fiscal and economic responsibilities, makes Greater Manchester an excellent testbed for understanding ageing, health and wellbeing, and the role of the urban green infrastructure. Greater Manchester also represents a generalizable case for academic research, given the wide variety of economic and social conditions across the region.

21 Greater Manchester Combined Authority (2019) Ageing Hub Digest [Online] [Accessed 12th Dec 2019] Available at: https://www.greatermanchester-ca.gov.uk/media/1835/n5667-gmca-ageing-brochure-new-v7.pdf

22 Greater Manchester Combined Authority, (2018). Greater Manchester Strategy: performance report update –final. [Online] [Accessed 12th Dec 2019] Available at: https://www.greatermanchester-ca.gov.uk/ourpeopleourplace

23 Greater Manchester Combined Authority (2018) Greater Manchester Age-Friendly Strategy. [Online] [Accessed 12th Dec 2019] Available at: https://www.greatermanchester-ca.gov.uk/media/1166/gm_ageing_strategy.pdf

24 Greater Manchester Combined Authority (2017) Greater Manchester Strategy [Online] [Accessed 12th Dec 2019] https://www.greatermanchester-ca.gov.uk/media/1084/greater_manchester_summary___full_version.pdf. _An age-friendly Greater Manchester_ is Priority 10.

25 Greater Manchester Combined Authority (2018)Taking charge of our Health and Social Care in Greater Manchester [Online] [Accessed 12th Dec 2019] http://www.gmhsc.org.uk/wp-content/uploads/2018/04/GM-Strategic-Plan-Final.pdf

3. Who has the most urban green and blue space?

People living in urban neighbourhoods with the least green and blue space tend to be the most socially deprived. In neighbourhoods with less than 20% green and blue cover, social deprivation is markedly high compared to social deprivation in the greenest neighbourhoods. These results for Greater Manchester (Figure 2) resonate with what has been found on average in England as a whole.[26] The results were found using new and very precise datasets derived from satellite imagery combined with existing datasets from project partners (Figure 3), and detailed land-use data (Figure 4). For more technical detail, see Box 1 (page 32).

Take a look
Explore the datasets for any part of Greater Manchester
 using the tools developed in the project
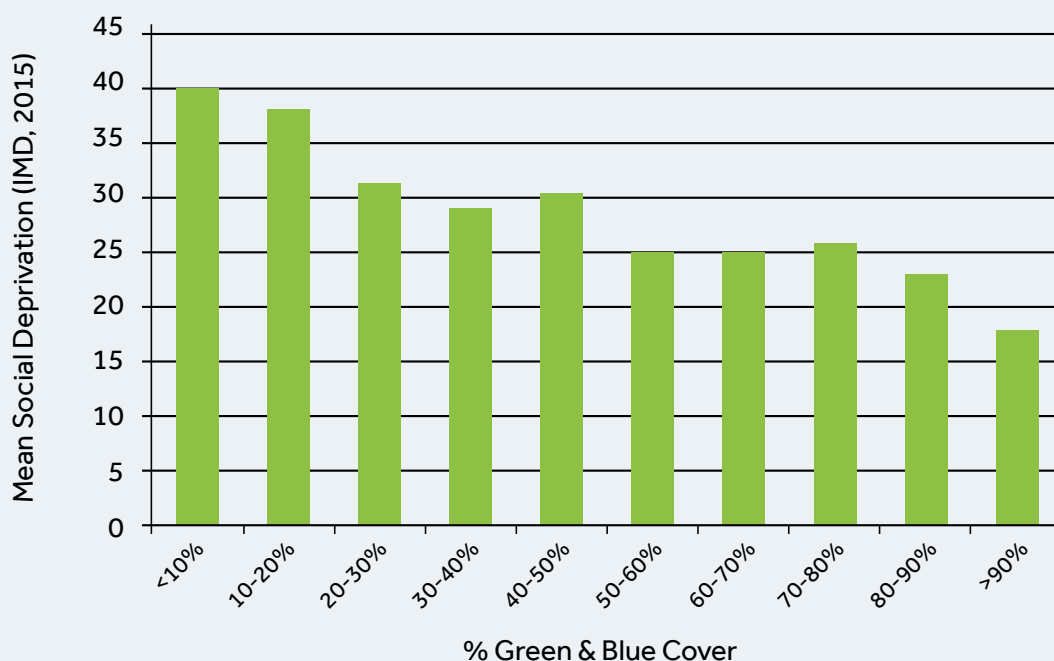(see the Further information section).

Figure 2*: Urban neighbourhoods with the lowest amount of green and blue cover tend to have the most socially deprived residents.*

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26 Mitchell R., Popham F. (2007) Greenspace, urbanity and health: relationships in England. *J Epid Com Health* 61:681–3

Figure 3: *Distribution of urban built and non-built cover in Greater Manchester.*
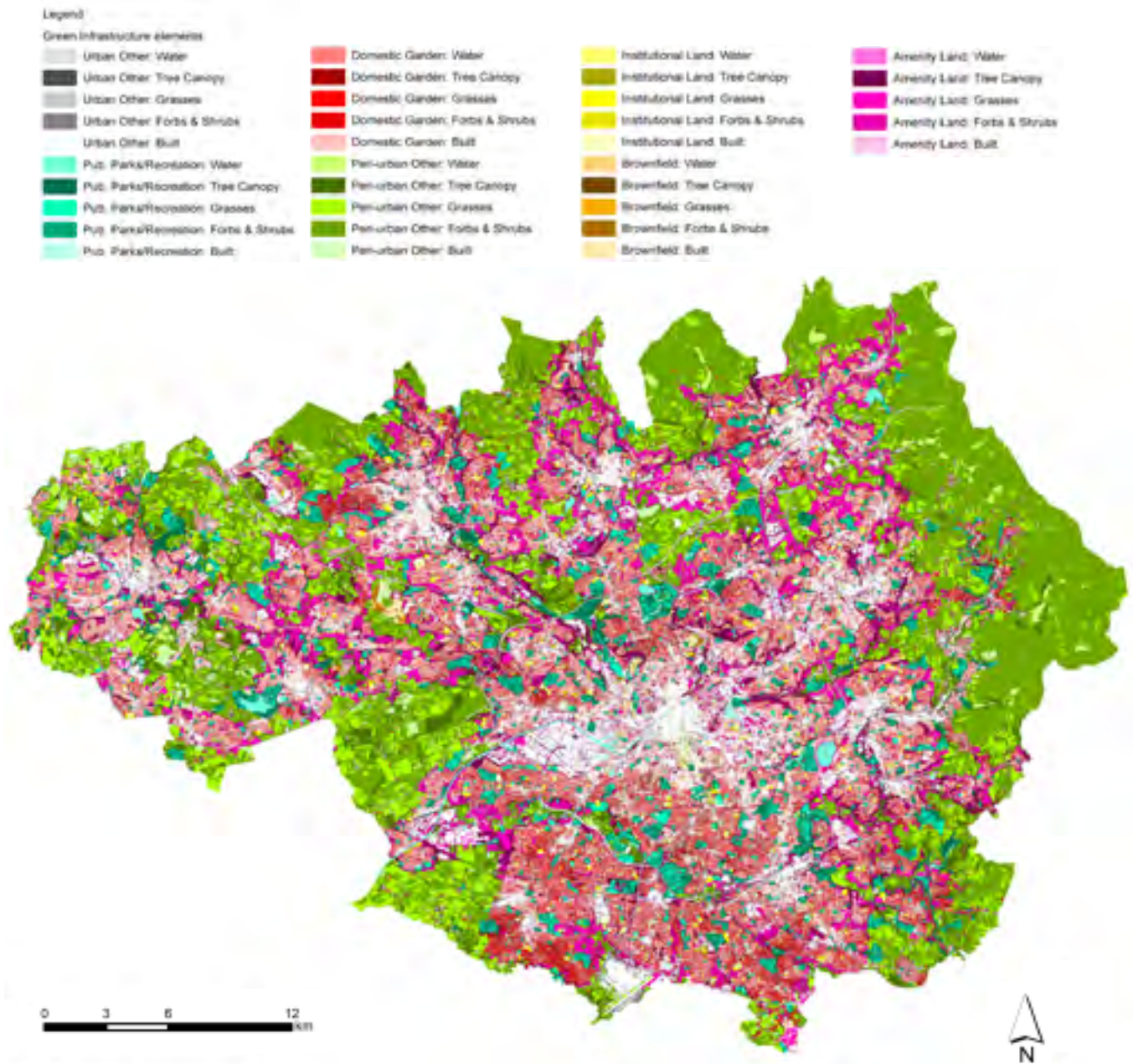
Legend

Green infrastructure elements

Urban Other: Water	
Urban Other: Tree Canopy	
Urban Other: Grasses	
Urban Other: Forbs & Shrubs	
Urban Other: Built	
Pub. Parks/Recreation: Water	
Pub. Parks/Recreation: Tree Canopy	
Pub. Parks/Recreation: Grasses	
Pub. Parks/Recreation: Forbs & Shrubs	
Pub. Parks/Recreation: Built	
Domestic Garden: Water	
Domestic Garden: Tree Canopy	
Domestic Garden: Grasses	
Domestic Garden: Forbs & Shrubs	
Domestic Garden: Built	
Peri-urban Other: Water	
Peri-urban Other: Tree Canopy	
Peri-urban Other: Grasses	
Peri-urban Other: Forbs & Shrubs	
Peri-urban Other: Built	
Institutional Land: Water	
Institutional Land: Tree Canopy	
Institutional Land: Grasses	
Institutional Land: Forbs & Shrubs	
Institutional Land: Built	
Brownfield: Water	
Brownfield: Tree Canopy	
Brownfield: Grasses	
Brownfield: Forbs & Shrubs	
Brownfield: Built	
Amenity Land: Water	
Amenity Land: Tree Canopy	
Amenity Land: Grasses	
Amenity Land: Forbs & Shrubs	
Amenity Land: Built	

Figure 4: *Distribution of land covers by land use in Greater Manchester. These data were processed with additional landscape metrics to assess green infrastructure characteristics like land cover diversity.*

Bar chart: % cover of neighbourhood by neighbourhood resident group

Oldest-Highest Income — % Tree Canopy: 25.5, % Green-Blue: 69.3
Oldest-Lowest Income — % Tree Canopy: 20.2, % Green-Blue: 52.5
Youngest-Highest Income — % Tree Canopy: 20.9, % Green-Blue: 49.1
Youngest-Lowest Income — % Tree Canopy: 19.5, % Green-Blue: 47.3

x-axis: % cover of neighbourhood (0, 10, 20, 30, 40, 50, 60, 70, 80)

Legend: ■ % Tree Canopy   ■ % Green-Blue

Figure 5: *Comparison of proportions of total green and blue space cover and tree canopy cover by neighbourhood resident group.*
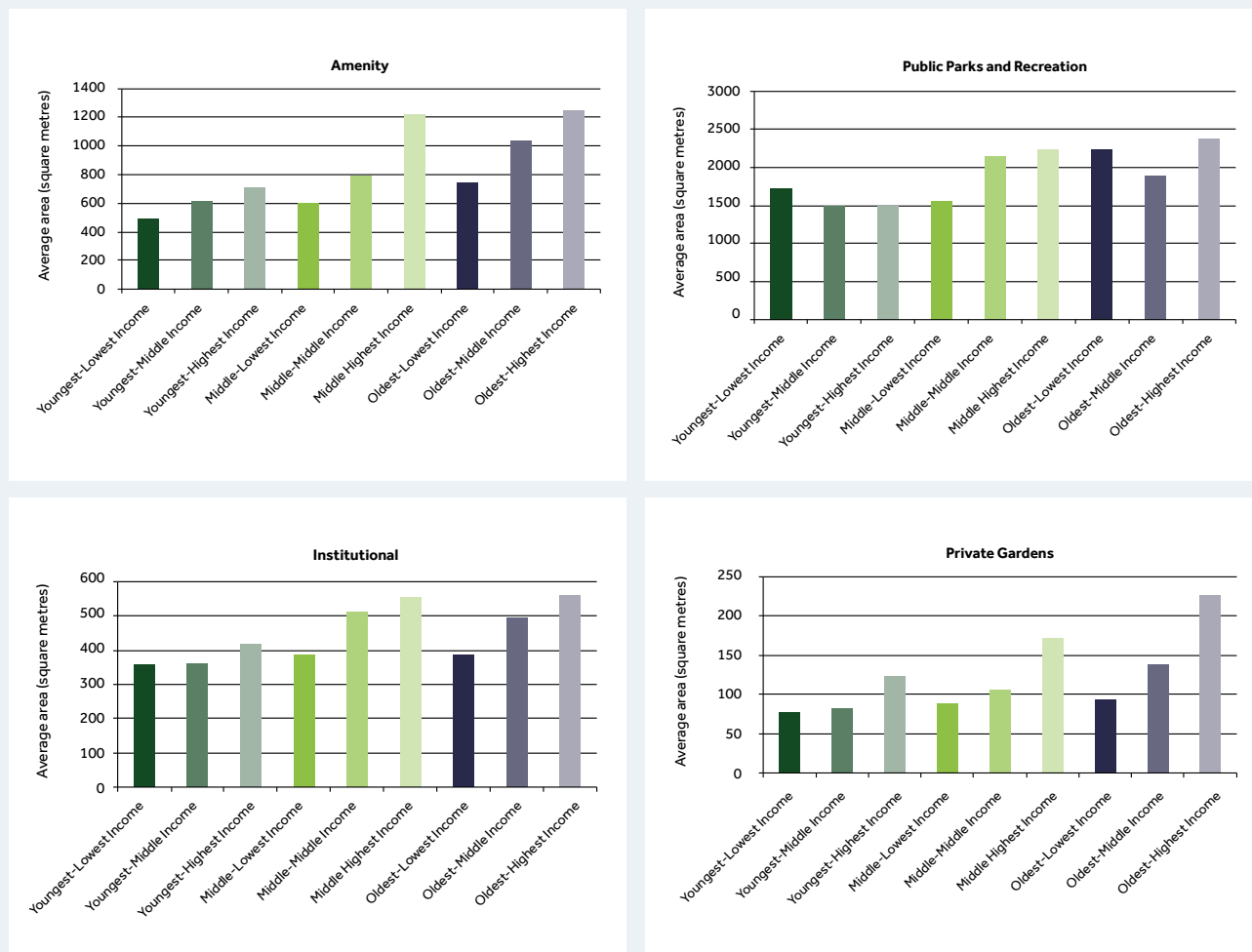
Figure 6: *Gradients of average green and blue space provision by neighbourhood resident demographic and income group. Note: Amenity space refers to informal communal areas normally around housing.*[27,28]

27 Manchester City Council (2017) Manchester Residential Quality Guidance. [Online] [Last accessed 12 July, 2019] https://secure.manchester.gov.uk/downloads/download/6682/residential_quality_guide

28 Dennis, M., Barlow, D., Cavan, G., Cook, P. A., Gilchrist, A., Handley, J., James, P., Thompson, J., Tzoulas, K., Wheater, P. & Lindley, S. (2018), 'Mapping urban green infrastructure: a novel landscape-based approach to incorporating land-use and land-cover in the mapping of human-dominated systems', *Land*. https://doi.org/10.3390/land7010017

If you are older and live in a city, you are more likely to live somewhere with more green and blue space than if you are younger and live in a city. When considering green and blue space characteristics in nine different groups of neighbourhoods classified according to resident age and income characteristics (Box 2), the greenest neighbourhoods tend to be the ones with the oldest residents. On average, the neighbourhoods of Greater Manchester with the oldest residents have around 66% green or blue space cover. This compares with less than 48% for the neighbourhoods with the youngest residents. Even the neighbourhoods with the most affluent younger residents have less than 50% green and blue cover, on average (Figure 5). Furthermore, neighbourhoods with the oldest residents tend to have larger areas of amenity space, formal green space (public parks and recreation areas) and private gardens (Figure 6). Older people therefore have more local provision overall and more potential for local health and wellbeing benefits. Although the neighbourhoods with the youngest residents have less overall provision, younger residents can also be assumed to be less reliant on very local spaces.
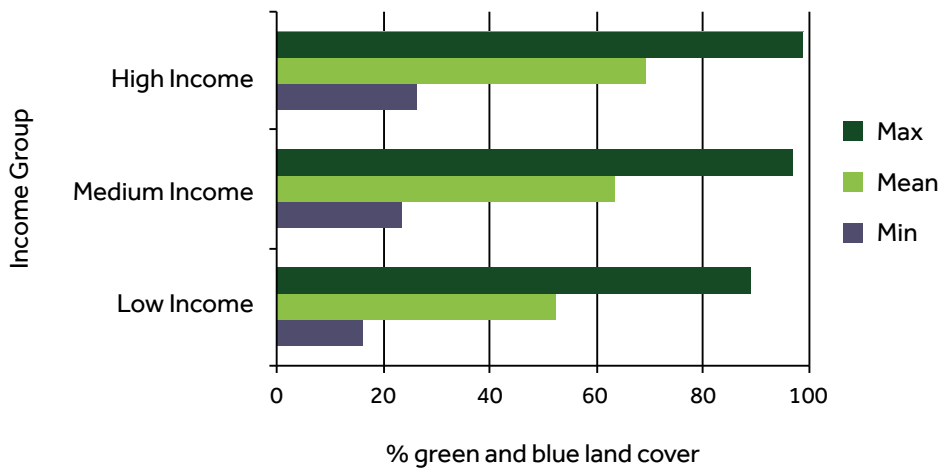

Figure 7: *Income-related variations in average, minimum and maximum green and blue space provision as a proportion of neighbourhood size in neighbourhoods with the oldest residents.*

Neighbourhoods associated with older adults on lower incomes are considerably *less* green than neighbourhoods associated with older adults on higher incomes. With the exception of public parks and recreation areas, all other types of urban green and blue space are smaller on average in the least compared to the most affluent neighbourhoods in the older category (Figures 6 and 7). It is also likely that there are further social and ethnic dimensions to these distributions given that particular groups tend to be associated with low income areas.[29] There are a number of different ways in which neighbourhoods associated with older adults on the lowest incomes are less green than those associated with older adults on the highest incomes. For example:

- On average, neighbourhoods with the least affluent older residents comprise only around 50% 'green' or 'blue' cover, compared with almost 70% for neighbourhoods with the most affluent older residents (Figures 5 and 7).

- Neighbourhoods with the least affluent older residents are less leafy. On average, they have only around 20% tree canopy cover compared to around 26% for the most affluent older residents (Figures 5 and 7).

- Neighbourhoods with the least affluent older residents have much less private green space. Private gardens in neighbourhoods with the least compared to most affluent older residents are on average less than half the size (94 m^2 compared to 227 m^2) (Figure 6).

- Even public parks and recreation areas are less green in neighbourhoods with the least affluent compared to most affluent older residents, an average of 82% compared to over 90% respectively.

Formal public green spaces are a particularly important element of urban green and blue space provision in neighbourhoods with generally older, lower income residents. Neighbourhoods with older, lower income residents contain the second largest average size of public park and recreation areas of all neighbourhoods in Greater Manchester (Figure 6). Although neighbourhoods associated with older adults on higher incomes have the largest average sizes of public park and recreation areas overall, they also have the lowest proportion of people living near to park access points (Figure 8). This lower proximity is offset by the generally lower reliance on public green spaces in these neighbourhoods, given that they also tend to have a higher provision of other local green space types, including private gardens.[30]

29 Francis-Devine, B., Booth, L., and McGuinness, F. (2019) *Poverty in the UK: statistics Briefing Paper Number 7096*, House of Commons Library [Online] [Accessed 12th Dec, 2019] https://researchbriefings.files.parliament.uk/documents/SN07096/SN07096.pdf

30 Dennis, M., Barlow, D., Cavan, G., Cook, P. A., Gilchrist, A., Handley, J., James, P., Thompson, J., Tzoulas, K., Wheater, P. & Lindley, S. (2018), 'Mapping urban green infrastructure: a novel landscape-based approach to incorporating land-use and land-cover in the mapping of human-dominated systems', *Land*. https://doi.org/10.3390/land7010017

The chart shows % Population of Neighbourhood for categories:
- ≤200m to 2 ha public parks and recreation land
- ≤100m to public parks and recreation land
- ≤200m to public parks and recreation land
- ≤300m to public parks and recreation land

Legend: High Income, Medium Income, Low Income

Figure 8: *Income-related variations in proximity to public parks and recreation areas in neighbourhoods with the oldest residents.*

In some neighbourhoods with older residents on lower incomes there is very little green and blue space at all. Although the data reveal evidence of a systemic difference in average green infrastructure provision *between* neighbourhood groups in urban areas, averages also mask a large amount of variability *within* neighbourhood groups (Figure 7). Neighbourhoods with older residents on lower incomes have the greatest variations in overall green cover. Some older people therefore have far fewer opportunities to receive urban green infrastructure related benefits and fewer opportunities to contribute to protecting, maintaining and enhancing local urban green and blue spaces. This can be a source of health inequalities.

Box 1: A new method for measuring the amount, type and quantity of green infrastructure in urban areas

The research project developed a new green infrastructure map at a very high 10m spatial resolution. The map differentiated types of blue and green cover and a set of urban landscape types. It was used to develop a set of green infrastructure 'metrics', including connectivity, patch (area) size and access data which could then be used to analyse health associations. These data were also used to understand the characteristics of study areas used in other parts of the project, e.g. for natural experiments of the influence of example greening interventions on physical activity.

The data were also used to characterise the specific urban landscapes of Greater Manchester based on green infrastructure characteristics. The areas are combined from Census units, allowing social and demographic characteristics to also be assessed for these areas. More information about the methods used and the data resources produced can be found in a dedicated, open-access publication.[31]

Dense Greyscape

Garden City

Encapsulated Countryside

Amenity Suburbs

Leafy Residential

Peri-urban Fringe

Parklands

Rural Hinterland

Figure B1.1: *Eight distinctive landscape types and their distributions.*

31 Dennis, M., Barlow, D., Cavan, G., Cook, P. A., Gilchrist, A., Handley, J., James, P., Thompson, J., Tzoulas, K., Wheater, P. & Lindley, S. (2018), 'Mapping urban green infrastructure: a novel landscape-based approach to incorporating land-use and land-cover in the mapping of human-dominated systems', *Land*. https://doi.org/10.3390/land7010017
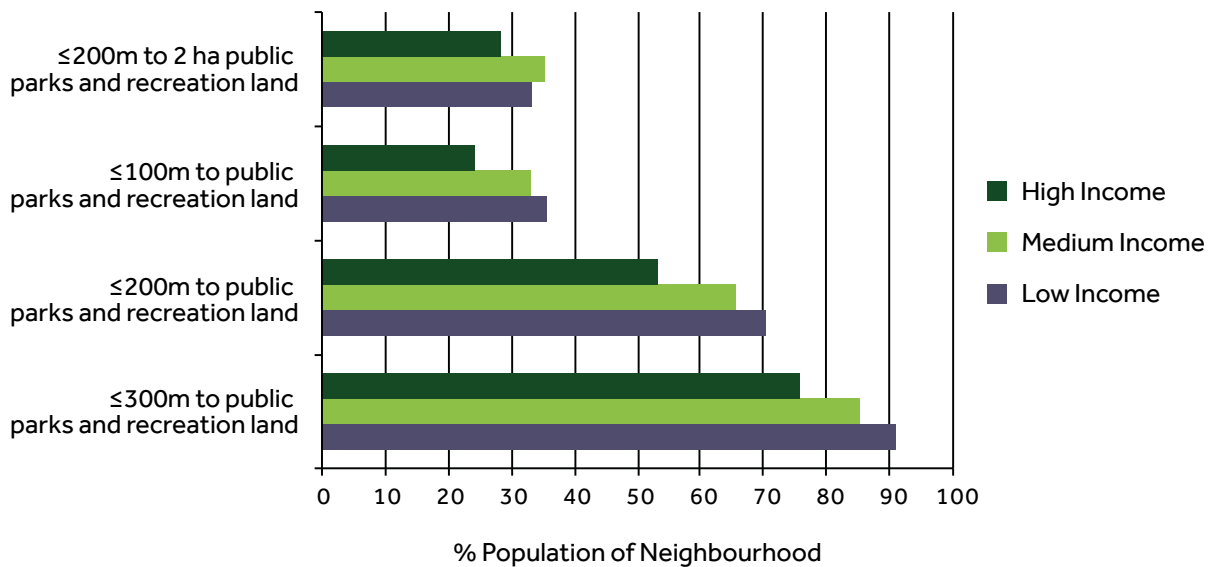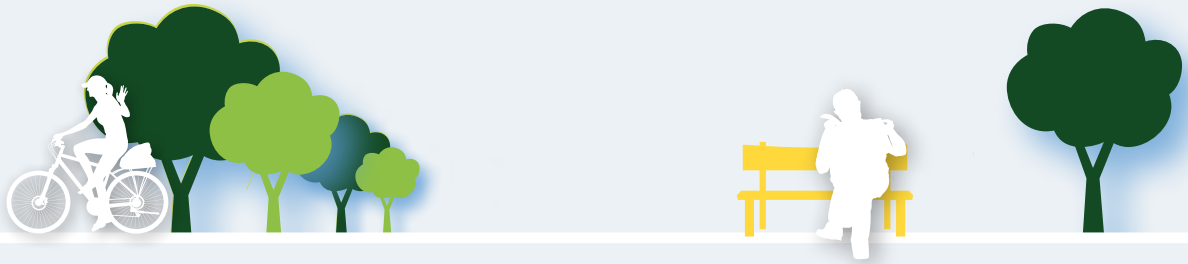
Box 2: Examining statistical associations between health and green infrastructure

The project team analysed statistical associations between health and green infrastructure in Greater Manchester. The analysis considered not only the amount of different non-built land covers, but also their proximity and their environmental quality. Quality was measured using number of specific green infrastructure metrics (such as patch size, overall abundance and ecological indicators like connectivity and diversity). This is one of the ways that the analysis in this report differs from other studies which have been reported in the international literature.

The analysis used an Index of Multiple Deprivation health indicator while correcting for the impact of income. Although there are other health measures which could be used their use is limited, for example because of issues of data confidentiality. The health measure used in this work represents chronic morbidity as a whole rather than any specific acute or chronic condition or outcome.

The project team used nine different neighbourhood types which were differentiated by age and income (Figure B2.1). Neighbourhoods with older residents on low incomes are taken to mean neighbourhoods which have around 30% of their population over 60 years of age on average and are in the top third for income deprivation according to the 2015 Index of Multiple Deprivation. Neighbourhoods with older residents on high incomes have around 30% of their population over 60 years of age on average and are in the bottom third for income deprivation according to the Index of Multiple Deprivation. More information on the age profiles of the neighbourhood groups is given in Figure B2.2. A research paper has been submitted covering this work (see Further information section). [32]

		Least Affluent ⟷ Most Affluent		
		Top third for income deprivation	**Middle third for income deprivation**	**Bottom third for income deprivation**
Youngest ↑	**Mean of 12.6% of residents aged ≥ 60 (youngest third)**	**Younger residents on lower incomes**	**Younger residents on middle incomes**	**Younger residents on higher incomes**
	Mean of 20.4% of residents aged ≥ 60 (middle third)	**Mid-age residents on lower incomes**	**Mid-age residents on middle incomes**	**Mid-age residents on higher incomes**
Oldest ↓	**Mean of 28.9% of residents aged ≥ 60 (oldest third)**	**Older residents on lower incomes**	**Older residents on middle incomes**	**Older residents on higher incomes**

Figure B2.1: *Nine neighbourhood types and their characteristics.*

32 Dennis, M., Cook, P.A, Wheater, C. P. James, P. and Lindley, S. J. (under review) Relationships between health outcomes in older populations and urban green infrastructure size, quality and proximity, *BMC Public Health*
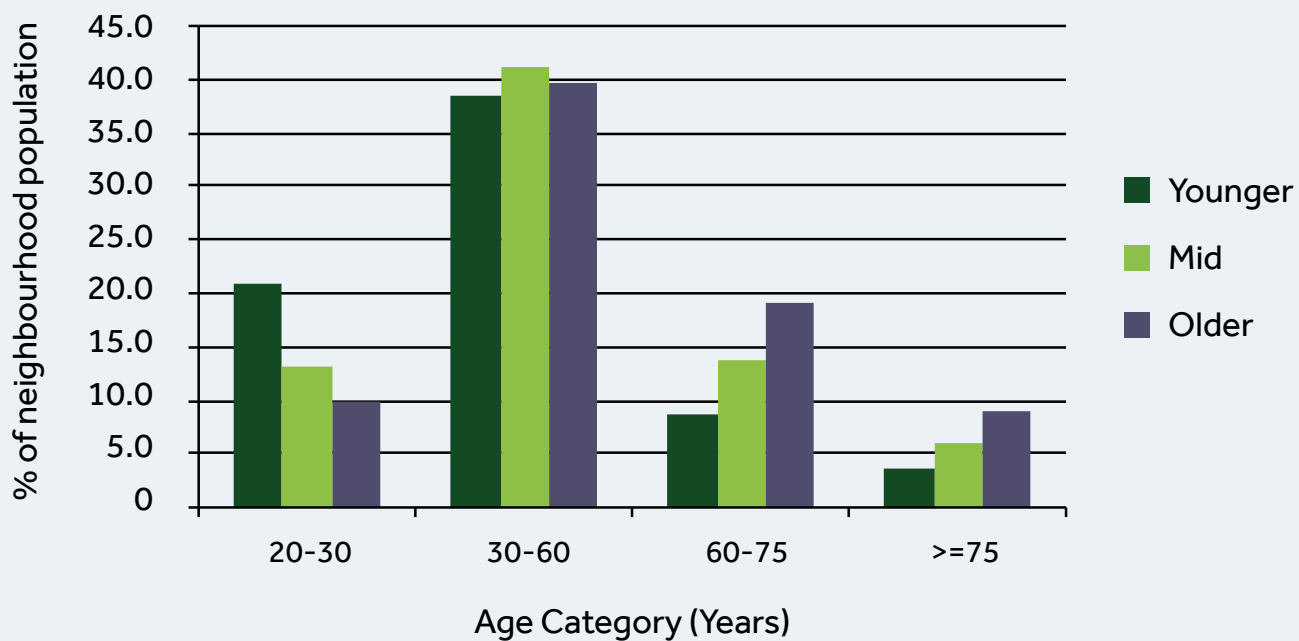
Figure B2.2: *Detailed age profiles for the neighbourhood age groups used in the research.*

We're a partner in

Manchester
City of **Trees**

Partner Viewpoint – City of Trees

City of Trees is an innovative and exciting movement set to re-invigorate Greater Manchester's landscape by transforming underused, unloved woodland and planting a tree for every man, woman and child who lives there, within a generation.

City of Trees actively looks for opportunities to work with Universities to help develop the evidence base on the impacts of green infrastructure. As a Community Forestry organisation, City of Trees is inherently interested in the links between the urban forest and health and wellbeing. It was fascinating to delve into and learn more about health and wellbeing from an ageing perspective. The GHIA project was a great opportunity to feel part of the research development and delivery in this area.

The findings from the GHIA research project resonate with City of Trees' emerging strategy, *All Our Trees: a tree and woodland strategy for Greater Manchester*. Both findings present visual, map based, opportunities for enhancement of green infrastructure to target specific areas of need or key agendas. Both are complementary pieces of work that sing together well and will be launched similar times – excellent timing for the green infrastructure agenda.

The findings presented in map form showing evidenced health and wellbeing inequalities in relation to green infrastructure across Greater Manchester are fascinating. We will be using the statistics to inform future work and some of the qualitative findings will influence our engagement work – especially relating to biodiversity awareness.

City of Trees has made new contacts through GHIA and developed existing relations with partner organisations. For example City of Trees will be working with the Whitworth Art Gallery on developing a Natural and Cultural Health Service.

4. What do the data tell us about the links between health and green infrastructure for older people?

People's local health status is linked to the quantity, quality and proximity of elements of green infrastructure, even after income is disregarded. However, there are variations in the extent and types of links depending on the age and income profiles of the neighbourhoods in question. In other words, the data analysis carried out suggested that the social contexts of neighbourhoods matter. Social contexts matter in terms of the type of association between health and green infrastructure as well as what sorts of green and blue spaces tend to be available to residents.

Older people in urban areas are likely to receive important benefits from access to nature close to where they live. In neighbourhoods with older and higher income residents there are many links between health and the type, abundance and quality (e.g. diversity) of local green and blue spaces. The higher the quantity and quality of green and blue spaces found in these neighbourhoods, the better the health of their residents tends to be. Proximity to public parks and recreation spaces is also important. The closer residents live to public green space access points, the better their health. The metrics that were found to be particularly important include: the diversity of green and blue space types, the abundance of grass cover, tree canopy and other greenery, the patch size of green areas and living within 100m of a park or recreation area. These sorts of characteristics of urban green and blue spaces could be indicative of the importance of more biodiversity, greater availability, greater accessibility and more generally green living environments for ageing well in cities. This is important because people aged 70 and over spend most of their time within their home and neighbourhood.[33]

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33 Horgas, A.L., Wilms, H.U., & Baltes, M.M. (1998) Daily life in very old age: everyday activities as expressions of everyday life. *Gerontologist* 38 (5) 556-68

Proximity to green infrastructure is the key association with better health in neighbourhoods with older, low income residents. Indeed, within these older, low income neighbourhoods the proportion of people within 100m of public parks and recreation land is the *only* statistically significant association with health. Health is not significantly associated with any other green infrastructure metric. Proximity to public parks and recreation spaces is therefore a vital component of ageing well in Greater Manchester's older, lower income neighbourhoods. Where such spaces exist, there is an imperative to protect them for the future health and wellbeing of older people in the city, especially within income-deprived communities.

"There is a health imperative to protect, maintain and further improve urban public parks and recreation spaces, especially within neighbourhoods with income-deprived, older residents"

Improving the environmental quality of public parks and recreation areas could bring further health benefits to neighbourhoods with older, lower income residents. The findings for areas with older, higher income residents suggest that as well as maintaining and further improving accessibility to public parks and recreational areas, there may be further benefits from increasing their environmental and ecological quality.

On average, public parks and recreation areas in neighbourhoods with older, lower income residents currently have around 82% green or blue cover. This compares to over 90% cover in neighbourhoods with older, higher income residents. Seeking ways to improve existing areas and establish new and diverse interventions have the potential to increase health benefits.

Quantitative evidence of health benefits at the city-scale is important but taken in isolation it can have some limitations. For example, although we can speculate about possible pathways through which health is affected, we cannot always prove them, or show that links are causal without using further information and enhanced methods. Furthermore, issues like scale and location can be important to understand what effects are seen.[34] Finally, we often want to understand the human dimensions of issues being investigated and this sometimes necessitates more direct involvement of people as participants in the research process. However, collecting only qualitative information from a relatively small number of people may miss opportunities to understand bigger picture issues and wider contexts for decision-making.

There are many possible explanations of links between health and green infrastructure for older people. Empirical evidence of benefits might be explained in several ways. For example, one pathway for improved health relates to how green and blue space helps to *regulate* some of the environmental hazards which could otherwise lead to negative health outcomes (e.g. by acting as a noise buffer or by cooling high temperatures during heat waves).[35] Another pathway is that green and blue spaces provide *opportunities* for enhancing health through encouraging physical activity.

34 Labib, S.M., Lindley, S. J. and Huck, J. J. (2020) Spatial dimensions of the influence of urban green-blue spaces on human health: A systematic review, *Environmental Research*, 180 https://doi.org/10.1016/j.envres.2019.108869

35 Lindley, S. J., Cook, P. A., Dennis, M., Gilchrist, A. (2019) Biodiversity, Physical Health and Climate Change: A Synthesis of Recent Evidence *Biodiversity and Health in the Face of Climate Change*, 17-46

Further pathways also exist, such as related to emotional responses, cognitive responses, stress reduction and cultural responses.[36],[37] The research team therefore carried out further research to understand the impacts of specific *local* interventions. Many wellbeing benefits are difficult to measure and quantify but are none-the-less important in a holistic assessment of the value of nature's contributions to people in cities. Without taking these into account, decisions can be made which inadvertently erode health and wellbeing with wider impacts on society, the environment and the economy. It is therefore also important to understand what older people themselves value about the natural environment for their health and wellbeing.

Individual people have very different needs, histories and interests and require different things from their lives, communities and neighbourhoods for a good quality of life. Places matter to people in different ways, and this is also true of urban green and blue spaces. The particular needs and values that people have for their health and wellbeing also change over time. These sorts of variations are important to understand. They can be linked to individual, social and environmental factors and are often highly context specific.

5. How do older people value green space for their health and wellbeing?

Green and blues spaces matter for the health and well-being of individuals in a number of different and sometimes conflicting ways. Various methods have been developed to try and make sense of the multiple and complex ways that nature has value for human health and wellbeing and to help practitioners make decisions, for example about urban development or whether to carry out a particular intervention.

There is no perfect method through which the value of urban green and blue spaces for health and wellbeing can be measured as each has a set of issues and problems. Participatory non-monetary valuation and deliberative approaches have an important role to inform decision making. For example, they encourage decisions which are based on the judgements of individuals as citizens and not their private preferences as consumers.[38] Some of the reasons why it is important to consider non-monetary valuation methods are outlined in Box 3.

36 Tzoulas, K., *et al.* (2007) Enhancing ecosystem and human health through Green Infrastructure: A literature review. *Land & Urban Plan* 81, 167-178.

37 Días, S., Pascual, U., Stenseke, M., Martín-López, B., Watson, R., Molnár, Z., Hill, R., Chan, K., Baste, I., Brauman, K., Polasky, S., Church, A., Lonsdale, M., van Oudenhoven, A., van der Plaat, F., Schröter, M., Aumeeruddy-Thomas, Y., Bukvareva, E., Davies, K., Erpul, G., Failler, P., Guerra, C., Hewitt, C., Keune, H., Larigauderie, A., Lavorel, S., Leadley, P., Lindley, S., Demissew, S. & Shirayama, Y. 2018, 'Assessing nature's contributions to people', *Science*, vol. 359, no. 6373, pp. 270-272. https://doi.org/10.1126/science.aap8826

38 Sagoff, M. (2008) On the Economic Value of Ecosystem Services *Environmental Values*, Volume 17, Number 2, May 2008, pp. 239-257(19)

Box 3: Why is non-monetary valuation important?

Existing methods of valuing green infrastructure, for example through monetary willingness to pay measures can exacerbate inequalities. The marginal value of money – how much an additional £ is worth – is much greater for a person on a lower income. Hence, those on lower incomes will express lower willingness to pay for green infrastructure compared to higher incomes. The preference satisfaction view of wellbeing that underpins this approach is subject to problems of 'adaptive preferences'. The preferences of those with less who live in places of lower environmental quality can adapt to that situation so they expect and aspire to less.[39] Finally, values that cannot be expressed in monetary terms are lost in final decision-making. These will include many local and historical values that places have for people that are expressed in the personal and social narratives they tell about them.[40] There is a strong need for alternative, more participatory approaches to valuation that can include the full range of values that individuals hold and give people an equality of voice in their expression. There is a need to see how the values held by older groups can be represented and how alternative valuation models can be used in decision-making.

In considering the value of green and blue spaces for health and wellbeing it is important to consider how they contribute to helping to realise what people can be and what they can do with their lives. Simply having the possibility to visit a local park or canal does not mean that it will improve someone's life. What is important is how the existence of the park or canal helps that person to achieve the various things he or she values doing or being, such as having meaningful social relationships, being able to have independence and autonomy, having a means of achieving self-respect, or facilitating thinking, learning and the sharing of knowledge (see Box 4 on page 40). Whether the park or canal will make a difference to health and wellbeing depends on a multitude of personal, social and environmental factors leading to a very complex and context specific picture.

Wellbeing can be thought of as comprising a number of different dimensions each of which can be partially expressed in statements about the known benefits from green and blue spaces identified from scientific research. The project team developed a methodology to establish which statements about the benefits of green and blue space people tended to agree with or to disagree with, and to what extent.[41] There were 40 statements in total and some of them were about potential harms from green and blue space. The statements were created from evidence contained in published studies. They were selected to exemplify the ways that urban green and blue spaces might support, or undermine, realisation of the wellbeing dimensions listed in Box 4 (see Box 5). Participants sorted and ordered statements according to the central question "*What do you value about urban green and blue space for your health and wellbeing?*" The ordered statements were then analysed by the research team.

39 Sen, A. 2009 *The Idea of Justice* Cambridge Mass. Harvard University Press

40 O'Neill, J., *et al.* (2008) *Environmental Values*. Routledge

41 O'Neill, J., Christian, R., J, Austin, A., Jeffares, S., Gilchrist, A. Wossink, A. & Lindley, S. (2019) *How is green and blue space in Greater Manchester valuable to you? Exploring the value of green spaces for the well-being of older people.* GHIA Internal Report.

The analysis revealed patterns in the responses and helped to highlight which wellbeing dimensions were considered particularly important to the participants involved. Each sorting exercise completed by a participant was followed up with an interview to help to establish why statements had been ordered in the way that they had.

A varied group of older participants was involved in the valuation exercise. Of the 96 participants involved, 82 people were 65 years of age or over and represented their own views. From this group, just over half considered themselves to be relatively active with no significant physical or cognitive impairment. A third reported one or more significant physical or cognitive impairments. The remainder were carers and responded about older people in their care or in their professional field. As well looking at all participants together, the method also enables a more nuanced view of values by separating out responses for groups of people with different personal and social characteristics (such as health status, gender or cultural background) or for those living in particular types of neighbourhoods (such as with more or less green and blue space). An online version of the method was also developed through which a wider set of participants, and people of different ages, could be involved.

Box 4: Dimensions of wellbeing considered in the valuation methodology

Wellbeing can be thought of as comprising a number of different dimensions representing aspects of what people can be or do with their lives. One representation developed by Nussbaum (2000)[42] includes:

"1. Life - Being able to live to the end of a human life of normal length; not dying prematurely, or before one's life is so reduced as to be not worth living.

2. Bodily health - Being able to have good health, to be adequately nourished and to have adequate shelter.

3. Bodily integrity - Being able to move freely from place to place; to be secure against violent assault, including sexual assault and domestic violence; having opportunities for sexual satisfaction and for choice in matters of reproduction.

4. Senses, imagination, and thought. Being able to use the senses, to imagine, think, and reason—and to do these things in a 'truly human' way, a way informed and cultivated by an adequate education, including, but by no means limited to, literacy and basic mathematical and scientific training. Being able to use imagination and thought in connection with experiencing and producing works and events of one's own choice, religious, literary, musical, and so forth. Being able to use one's mind in ways protected by guarantees of freedom of expression with respect to both political and artistic speech, and freedom of religious exercise. Being able to search for the ultimate meaning of life in one's own way. Being able to have pleasurable experiences and to avoid non-beneficial pain.

5. Emotions - Being able to have attachments to things and people outside ourselves; to love those who love and care for us, to grieve at their absence; in general, to love, to grieve, to experience longing, gratitude, and justified anger. Not having one's emotional development blighted by fear and anxiety...

6. Practical reason - Being able to form a conception of the good and to engage in critical reflection about the planning of one's life....

7. Affiliation - (A) Being able to live with and toward others, to recognize and show concern for other human beings, to engage in various forms of social interaction; to be able to imagine the situation of another. (B) Having the social bases of self-respect and non-humiliation; being able to be treated as a dignified being whose worth is equal to that of others. This entails, at a minimum, protections against discrimination on the basis of race, sex, sexual orientation, religion, ethnicity, caste, or national origin. In work, being able to work as a human being, exercising practical reason and entering into meaningful relationships of mutual recognition with other workers.

8. Other species. Being able to live with concern for and in relation to animals, plants, and the world of nature.

9. Play. Being able to laugh, to play and to enjoy recreational activities.

10. Control over one's environment. (A) Political. Being able to participate effectively in political choices that govern one's life; having the right of political participation, protections of free speech and association. (B) Material. Being able to hold property (both land and movable goods), and having property rights on an equal basis with others; having the right to seek employment on an equal basis with others; having the freedom from unwarranted search and seizure."

These dimensions are fully compatible with the World Health Organization's definition of health "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." and the core WHO principle that "The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition". They have also been used to frame analyses of wellbeing and quality of life for specific older groups.[43,44]

42 Nussbaum, M. C. (2000) *Women and Human Development: The Capabilities Approach* Cambridge University Press Quoted from pp.76-78

43 Alzheimer's Society (2010) *My Name is not Dementia* People with dementia discuss quality of life indicators. [Online] Accessed Dec 13th, 2019 https://www.cardi.ie/userfiles/My_name_is_not_dementia_report%5B1%5D.pdf

44 Austin, A. (2018) *'Living Well with Dementia Together: Affiliation as a Fertile Functioning'* Public Health Ethics 11, pp.139–150'

Box 5: Representing the dimensions of wellbeing for addressing the central question "What do you value about urban green and blue space for your health and wellbeing?"

The research used a Q-Methodology approach, with Q-Sort statements organised into the following themes. The themes were informed by a critical examination of the broad dimensions of wellbeing suggested in the academic literature, by the results of previous research on the dimensions of wellbeing of particular significance for different groups of older people, and by interviews with older people (see Box 4).

1. Adventure, activities, mobility. 2. Autonomy, independence, freedom, self-respect. 3. Participation. 4. Relations to nature. 5. Relations to other people. 6. Security, safety. 7. Memory, heritage, legacy, place, generational ties. 8. Physical health. 9. Sensory experience. 10. Emotions and mood.

The following examples of the wider set of statements have been used as the basis for an online Value tool through which wider perspectives can be gathered, e.g. from different age groups (see Further information section). Negative as well as positive statements were used to avoid assuming that everyone feels positively about urban green and blue spaces.
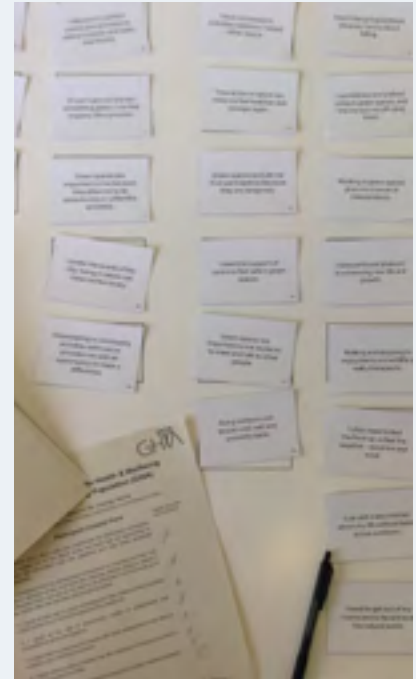
1. I need to get out of my home and be active in the natural world.

2. Being outdoors can be just cold, wet and uncomfortable

3. Working in green spaces gives me a sense of independence.

4. Green spaces are important to me as places to meet and talk to other people.

5. Simple connections with nature can give me a buzz, be it a robin at the door or watching a butterfly.

6. Volunteering in community activities with nature provides me with an opportunity to make a difference.

7. Uneven ground in green spaces and by trees in streets make it difficult for me to get around.

8. I sometimes worry about crime in green spaces, and this can put me off using them.

9. Trees have a history and connect me to my past and to the people who will come after me.

10. Green places evoke memories of people, events and adventures that have shaped who I am.

11. Regular exercise or walks in green spaces make me healthier

12. I often need to feel the fresh air or feel the weather - sunshine and wind.

13. Green spaces offer rare moments of tranquillity and help erase the stress of modern life.

14. I prefer the bustle of the city: being in nature can make me feel lonely.

15. Green spaces are places to learn and share knowledge of nature.

Overall, four broad perspectives on the health and wellbeing value of urban green and blue spaces for older people were identified. Each of the perspectives represents a sub-group of the full set of participants. People associated with a sub-group tended to hold similar views. In turn, their views tended to be more distinct from people associated with another sub-group. Each sub-group therefore represents a different perspective on what is valued about urban green and blue space for health and wellbeing in later life. However, there are connections and overlaps too, and views of particular individuals may transition as changing personal circumstances lead to changing values. Nevertheless, these four broad perspectives represent some of the principal sets of values which represent particular aspects of wellbeing which are not necessarily well captured in other forms of valuation.

1. **Urban green and blue spaces are important for health and wellbeing in later life due to the personal and social memories that they embody.** This was the most dominant perspective in the set of responses obtained. What was most distinctive about this perspective was the importance of memory and history, with distinguishing statements including '*Trees have a history and connect me to my past and to the people who will come after me*' and '*Green spaces evoke memories of people and events that have shaped who I am*'. However, another distinctive dimension was the relatively high rank placed on the statement '*Seeing birds and animals gives me a feeling of inner peace*'. The statement '*The sights, sounds and smells of nature lift my spirits and improves my mental well-being*' was also ranked highly.

- People gave a range of reasons and talked about how urban green and blue spaces connected them personally to their past. For example,

"I love trees and I like remembering the past, my childhood, my father, my family, my mum. I just like remembering them."

Another person spoke of the comfort from being able to connect in this way,

"Trees, when you go in the park and you have been going in the park, the same park from being a child, the trees are the first thing that you notice when you go in, and they have been there since you were this small to now, so when I walk in I feel as if it's a comfort zone... it gives me a sense of wellbeing that I'm still here and they're still there, those familiar things."

The memories were not only of local parks and trees, but also canals and other green spaces, for example,

"I can think of me going to the canal with my dad, walking along the canal bank or watching the narrowboats going past."

- Some people spoke about the social and natural history of particular places, e.g. of Moston Hall and the Mersey Valley linking to life experience and the sharing of knowledge.

- While some of these memories may be specific to people who have spent much of their lives in a particular place, we might look to ways to help newcomers to make new memories and connect with their own personal memories and knowledge no matter where they were formed.

- Far from being solely backward looking, people who were associated with this perspective also frequently expressed concern about the wellbeing of future generations. Some felt that today's children tended not to have the chance to experience green and blue spaces in the same way as they had been able to in their own childhoods. As one participant put it "*are my great grandchildren going to be able to see what I can see?*"

2. **Urban green and blue spaces are important for health and wellbeing in later life due to the opportunity to connect with nature and volunteer with others**. The second most dominant perspective was about connecting with nature and working with other people, the latter linking strongly with environmental volunteering as being beneficial for health and wellbeing. Respondents in this group tended to agree with statements about noticing and connecting with the natural world. Statements distinctive to this group were '*Simple connections with nature can give me a buzz, be it a robin at the door or watching a butterfly*', '*Being outdoors can remind me that the world is a wonderful place.*' and '*Volunteering in community activities with nature provides me with an opportunity to make a difference.*' People also talked about the value of being able to create new community spaces, to feel included, and to participate in activities which improved existing spaces. People in this group were distinctive

in tending to disagree with statements about the value of green and blue space for evoking personal memories.

Some of the reasons given by participants included,

"I do belong to couple of community groups and I do, I do find it very rewarding and do feel I'm making a difference to some degree. Though there are moments when it's perhaps hard going doing community work. But you do feel that you are making a difference."

- People talked about their experiences reclaiming unloved or forgotten spaces in woodlands, alleyways and parks and being able to transform them and bring them back into use for the benefit of their local communities. What came through was the pivotal role that some in the older community play in this process. Their caring for spaces inspired others to do the same. The cared-for places then took on a wider social value for everybody.

3. **Urban green and blue spaces are important for health and wellbeing in later life due to the opportunity they bring for active outdoor activity and adventure.** People associated with the third most dominant group tended to agree with statements like '*I need to get out of my home and be active in the natural world*' and '*Regular exercise or walks in green spaces make me healthier*'. These group members also valued the opportunity for new experiences - to be able to explore, imagine and think, for example agreeing with statements like '*Green spaces are important to me because they allow me to do adventurous and unfamiliar things*' and '*I enjoy the thrill of being outdoors*'.

- In their interviews, people spoke about the value of walking in fresh air. For example,

"I find that my mind works a little bit better, I can think better, I can remember in my student days, in those days I used to jog and run also and I found that if I wanted to do something it cleared my mind."

Others explicitly talked about combining exercise with the chance to connect with nature. For example,

"It improves your general wellbeing to go and see the same places at different times of the year, different seasons... you know, in lots of parts of the city you wouldn't really notice the changes."

Another participant noted how the opportunity to get out is important during periods of ill-health

"Yes, I do or have, suffered with depression and I know that being outside just makes me feel better."

Some of the reasons people gave for why green and blue spaces allowed adventure included "*adventuring up passageways and seeing where they go to*" and "*you know, sort of, poking about in little corners in a place that often people don't... like*" and the chance to discover new things.

4. **Urban green and blue spaces are important for health and wellbeing in later life due to the opportunity they bring for social relationships, independence and growth.** In this case the particular value placed upon green spaces was due to their role as places in which older people could meet others and relieve isolation, and in which they gained a sense of independence and self-respect from growing things. People in this group agreed with statements like '*Green spaces are important to me as places to meet and talk to other people*' and '*Working in green spaces gives me a sense of independence*' and '*I take part in outdoor events and activities to relieve isolation and make new friends*'. They tended to disagree with statements about the importance of green and blue spaces for evoking personal memories and the feeling that '*Being outdoors can be just cold, wet and uncomfortable*'.

• In their interviews, people talked of the value of allotments to them,

"It's the part of interacting with people as well, that's very important, you know. And help, also being around the allotment thinking about other people as well, you're not just thinking about yourself, you know, because there's a lot of older people as well as younger people."

People were interested to meet other people in their communities, whether old or young. For example,

"We are very international now we have all nationalities. Whereas originally it was just English and Irish now we have Asian, Nigerian, you know people from every nationality. Which is good."

People also spoke about the sense of independence and control that working in green spaces gives them,

"And I guess for me it's also something about feeling that I'm fit and healthy and I can garden and I can look after my land, and I can grow things and I can nourish myself if I need to."

This was something that carers also recognised very well. Activities did not always need to be in a group setting. Participants were careful to differentiate between loneliness and solitude, the latter being something that some older people actively enjoyed about green spaces.

Value perspectives provide a basis for deliberating options and supporting decision-making about particular interventions. While value perspectives are interesting in their own right, they are also helpful for informing further debate and for decision-making. Understanding why older people think that green and blue spaces matter for their health and wellbeing is an important first step in being able to understand what sorts of interventions might work, where they might work, for whom and why. Value perspectives allow group-based exploration of options and assist with negotiating complex decisions where there are multiple and conflicted opinions. The research team are conducting deliberative panels with groups of older people and practitioners, and producing outputs to support others to use the research findings (see Further information section). One challenge for this kind of approach is to include the full range of different perspectives and participants. Although we worked with older adult co-researchers, the co-researchers and broader participants did not fully represent the diversity of communities across Greater Manchester.

6. What can we learn from assessing interventions?

Greater Manchester has a long history of interventions implemented through the planning system, from 'garden city' models (e.g. in Wythenshawe) to historical Victorian parks (e.g. Heaton Park). Historical interventions have now become part of the fabric of the urban landscape and a touch-stone for many people who have lived and worked in the city for all – or a large proportion - of their lives.

Communities, organisations and individuals continue to support numerous interventions to establish, to improve or to make more use of green and blue spaces. Interventions might be focussed on specific activities with direct or indirect benefits to health and wellbeing. The project team tested a range of interventions in a number of different ways. They included: natural experiments of the influence of small-scale enhancements of local community green spaces on behaviour and physical activity (i.e. green spaces within the wider urban matrix); dementia-walks in local parks (i.e. 'patches' of green), and the potential of different green infrastructure components to regulate ultra-fine particle count concentrations. The project team also produced new assessment methods for participation-based interventions. Methods were informed by frameworks which account for the core types of behaviours known to have a positive influence on wellbeing, such as the 'Five Ways to Wellbeing'.[45]

45 Aked, J. and Thompson, S. (2010) *Five Ways to Wellbeing New applications, new ways of thinking* New Economics Foundation [Online] Accessed 12th Dec, 2019. https://neweconomics.org/uploads/files/d80eba95560c09605d_uzm6b1n6a.pdf

Even small scale interventions can have an impact for some elements of wellbeing. For example, the project team found that growing initiatives run by older adults in the Manchester Bangladeshi Women's Organisation supported a number of benefits for health and wellbeing. They are discussed in section 7 of this report. However, the project team also found that elsewhere some smaller scale interventions may not have an appreciable, long-term impact on other elements of health and wellbeing, such as physical activity and wider indicators of observable behavioural change.

The MOHAWk (Method for Observing pHysical Activity and Wellbeing) tool was developed to help improve the basis for assessing the health benefits of greening interventions. This newly developed observation tool enables assessment of three levels of physical activity intensity (Sedentary, Walking, Vigorous) and two other evidence-based behavioural indicators of wellbeing (Connect: connecting with others, and Take Notice: taking notice of the environment). It has been developed to help with 'before and after' assessment of interventions (also called natural experiment studies). As well providing a systematic way of recording behaviour change, MOHAWk also assesses people's characteristics, including age, gender and ethnicity. Importantly, the approach developed by the project team involves the identification of a number of matched comparison sites. The comparison sites are used to help identify whether changes at the intervention site are statistically different to those seen in other similar neighbourhood settings, i.e. without an intervention.

This helps to give more confidence in making a judgement about whether changes are because of the intervention and not because of other factors that may be influencing multiple sites at the same time. Publications and contacts are given in the Further information section.[46],[47]

A small scale intervention within an area of existing green space tested using the tool did not reveal a change in older adults' physical activity or any observable indicators of wellbeing. Four small interventions consisting of tree and flower planting, and artificial tree decorations were established along residential streets in Withington in south Manchester by Southway Housing Trust. After one year, there was a slight increase in the number of older adults observed using the intervention sites (+0.06 per hour) and a reduction in the number of older adults observed using the comparison sites (-1.14 per hour). However, after controlling for day, time of day and rainfall, the difference between groups was found to be not statistically significant. Thus, the project team concluded that this particular intervention did not impact older people's wellbeing.[48] Qualitative 'walk-along' interviews in the area of the intervention suggested why this might be: many of the interventions were too small to be noticed in relation to other ongoing changes. Furthermore, many of the intervention features were not perceived positively, even when they were noticed.[49]

46 Benton, J., Anderson, J., Cotterill, S., Dennis, M., Lindley, S. & French, D., (2018) Evaluating the impact of improvements in urban green space on older adults' physical activity and wellbeing: protocol for a natural experimental study *BMC Public Health*. 18 DOI: 10.1186/s12889-018-5812-z

47 Benton, J., Anderson, J., Cotterill, S., Dennis, M. & French, D. (2018) The impact of new walking infrastructure and changes to green space along an urban canal on physical activity and wellbeing: protocol for a natural experimental study Open Science Framework DOI: 10.17605/OSF.IO/ZCM7V

48 Benton, J. S., Cotterill, S., Anderson, J., Macintyre, VG, Gittins, M., Dennis, M., Lindley, S. J. and French, D. P. (2019) Impact of small changes in urban green space on older adults' physical activity and wellbeing: a controlled natural experimental study. Conference of the European Health Psychology Society, Dubrovnik, Croatia

49 Macintyre, V.G., Cotterill, S., Anderson, J., Phillipson, C., Benton, J. S. & French D. P. (2019). "*I would never come here because I've got my own garden*": Older adults' perceptions of small urban green spaces. *International Journal of Environmental Research and Public Health* 16; 1994.

Smaller urban green spaces were perceived differently to large green spaces. The research team interviewed 15 older people about their views of the intervention tested with the MOHAWk tool. The interviews revealed three themes:[49]

- The first was that smaller urban green spaces were considered to belong to other people and to not be for wider public use. People spoke about being more likely to use larger spaces because they were clearly public spaces and intended for shared use. For example, one person noted,

"This is their little island, isn't it?... For these houses, which looks nice doesn't it? If you lived here, it looks nice. It makes you want to you live here."

Respondents felt that the intervention did improve the neighbourhood, but not for everyone, for example one participant noted,

"Well peoples opposite, you know, if you live there and you've got nice green outside and it's maintained, it's nice isn't it? You're looking out the window to a bit of green where if you're overlooking something like a brick house, it's a bit more… it doesn't want to make you go out, you just feel like you want to stay in all the time… You think oh that's nice, you know, if you was buying a house like you see all these nice houses that you want to buy. You go round and think oh they're nice houses but they're all facing each other. But when you see something like this, suddenly it makes you want to go live there doesn't it? Because you think you've got your own park, got my own space, yeah."

Some people felt that it would be odd to use the space for themselves, further confirmed by the lack of seats and obvious places to be. As one person points out,

"I would design chairs, comfortable seats that, well maybe comfortable benches facing each other, so that a whole family could either have a picnic or just talk to each other under a shady tree and, not just families but elderly people, who may be a widow or a widower, want to sit under a tree and sit face to face with a neighbour, who might look out of the window and say 'oh Nelly's there, I haven't seen Nelly for ages cause I never see anybody, I'm in the house all the time, and they've got some new chairs so I'll go and sit facing Nelly', and then they'll probably do that every day for life then, they'll become good friends and that's what social housing is about, social cohesion."

Without that sort of encouragement one person noted

"Well as a single person, for me to get the bus there, I could go and sit on that lump of a tree there. You know, I don't know anybody there sort of thing and, 'who's that old fella sat there like', you know, I'd feel a bit conscious... no I don't, I don't think I would wander down there."

The second was that some older people just preferred larger green spaces for what they particularly wanted to get from them. As one person notes,

"When it's just a grass verge, there's not much they can do with it, only make it pleasant and tidy, keep it tidy and... there's nothing really else they can do with them."

Some people wanted activities and people, something that matches well with the values discussed in section 5, or did not feel the need to use small spaces because they had their own gardens or were able to go elsewhere.

The final theme was that older people felt that despite the limitations of smaller urban spaces, greenery was still important to their neighbourhood – especially when it is well-maintained. For example

"It just gives a better impression to the area if it's being looked after. You know, everybody's looking after bits and pieces, you know, for... people like to live in a nice area."

Otherwise,

"I think if it's wild, people start dumping stuff because they think, oh it's a tip let's go dump something. Oh we can hide that in that grass over there, just chuck the bike frame in there or the old, you know, it starts to become a dump then, wouldn't it?"

Maintenance was also needed to prevent trees from being a nuisance, bringing up pavements, blocking light or dropping branches,

"The mature trees really do bring a special energy to this place, and sitting under a mature tree is a wonderful feeling but there's nowhere to sit except on the ground... I mean just look, you can sit here and look through the dappled sunlight of the leaves. It's amazing but if you plant other trees around it, you won't see the sun. It would block out the sun, just through these mature trees."

Some of the residents' comments help to corroborate the perspectives on values for health and wellbeing discussed in section 5. For example, one person talked about the little 'recesses' hidden away and only revealed when walking

"I love that because when you're walking down the main road you've not just got houses, houses, houses, you've always got a little break every so often with somewhere pleasant."

Despite physical activity being one of the reasons older people value green and blue spaces, it cannot be assumed that all interventions will increase physical activity or observable wellbeing indicators. Values are dependent on a range of contextual factors, such as how interventions have come about, who is involved and the form and scale of what is being done. Outcomes may also be affected by the sense of ownership that residents felt they had over the space and the intervention. The sense of whether areas were cared for was also important.

To help to explore this element of care in greater detail, this theme became the main focus of the research team's participatory arts research activity. This activity considered a range of different types and sizes of green infrastructure elements in a range of communities, exploring ways to overcome barriers to engagement for those in socially marginal groups as well as older adults more generally (see section 7).

More could be made of interventions, such as dementia walks, which are already happening in urban parks. Two groups of people with early stage dementia were observed during organised walks. The walks took place in Alexandra Park, Manchester, and in Worthington Park, Trafford. The walking locations were characterised by medium levels of sensations, and by mainly supportive route, path, and park design characteristics (Figure 9 and Figure 10). The observed behaviours suggest that dementia walk participants may gain social and physical activity wellbeing outcomes, but wellbeing outcomes relating to contact with nature may be minimal. During the walks participants were mainly connecting, talking to people within the group, and looking at nature (Figure 11).

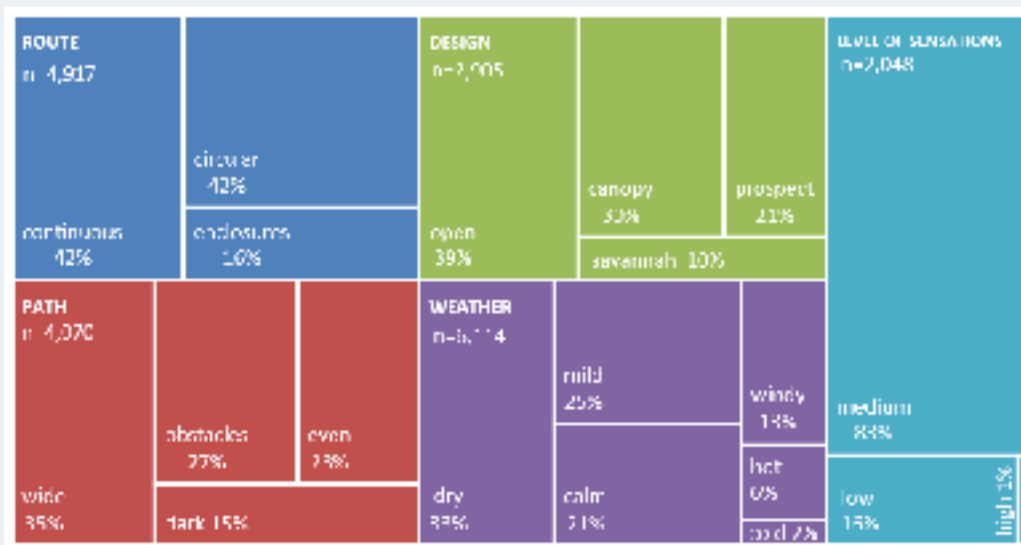**Figure 9:** *Observed dementia walks' location characteristics (% of observations, n varies).*

Note: Observations for level of sensation are mutually exclusive; observations for route, path, park design, and weather are not mutually exclusive.

Patterns of behaviour during organised walks for people with early stage dementia may be tied to specific circumstances rather than be affected by specific environmental factors. For example, walk participants may have been looking around more in the presence of enclosures (i.e. clearly delineated attractive areas) than when enclosures were absent, but participants may not have been looking at the enclosures *per se* (Figure 12, inset A). In addition, more connecting behaviours were observed in areas with scattered trees (i.e. savannah design) than in areas overhung with mature trees (i.e. canopy design, Figure 12, insets B and C). Such potential links were unanticipated because a canopy park design may present more potential visuo-perceptual challenges to walk participants than a savannah park design. The results suggested that urban parks might be suitable places for dementia walks, but there are missed opportunities to engage with and derive further benefits from contact with nature.

Dementia walks could be designed and delivered in bespoke ways that interweave the needs of walk participants with opportunities for contact with nature in local parks. Local authorities have a key role to play in designing and maintaining high quality, multifunctional and multisensory local parks. Carers could enhance the wellbeing outcomes for participants by engaging them in direct contact with nature during the walks. For example, this could include short stops and talks, perhaps in collaboration with environmental, arts or heritage organisations. Short stops and talks could be about common wildlife seen, flowering and fragrant plants, or tactile natural or artificial elements (pet dogs, plants, tree bark, sculptures). Furthermore, water features, public monuments and art work, other park activities taking place (children playing, sports, maintenance work), flower beds, special park features (heritage, protection designations, design element, cafés) or memorable places could also be suitable prompts for engagement. Overall, unless specifically engaged with nature, participants of dementia walks may gain more social and physical activity wellbeing outcomes than wellbeing outcomes relating to contact with nature in urban parks.
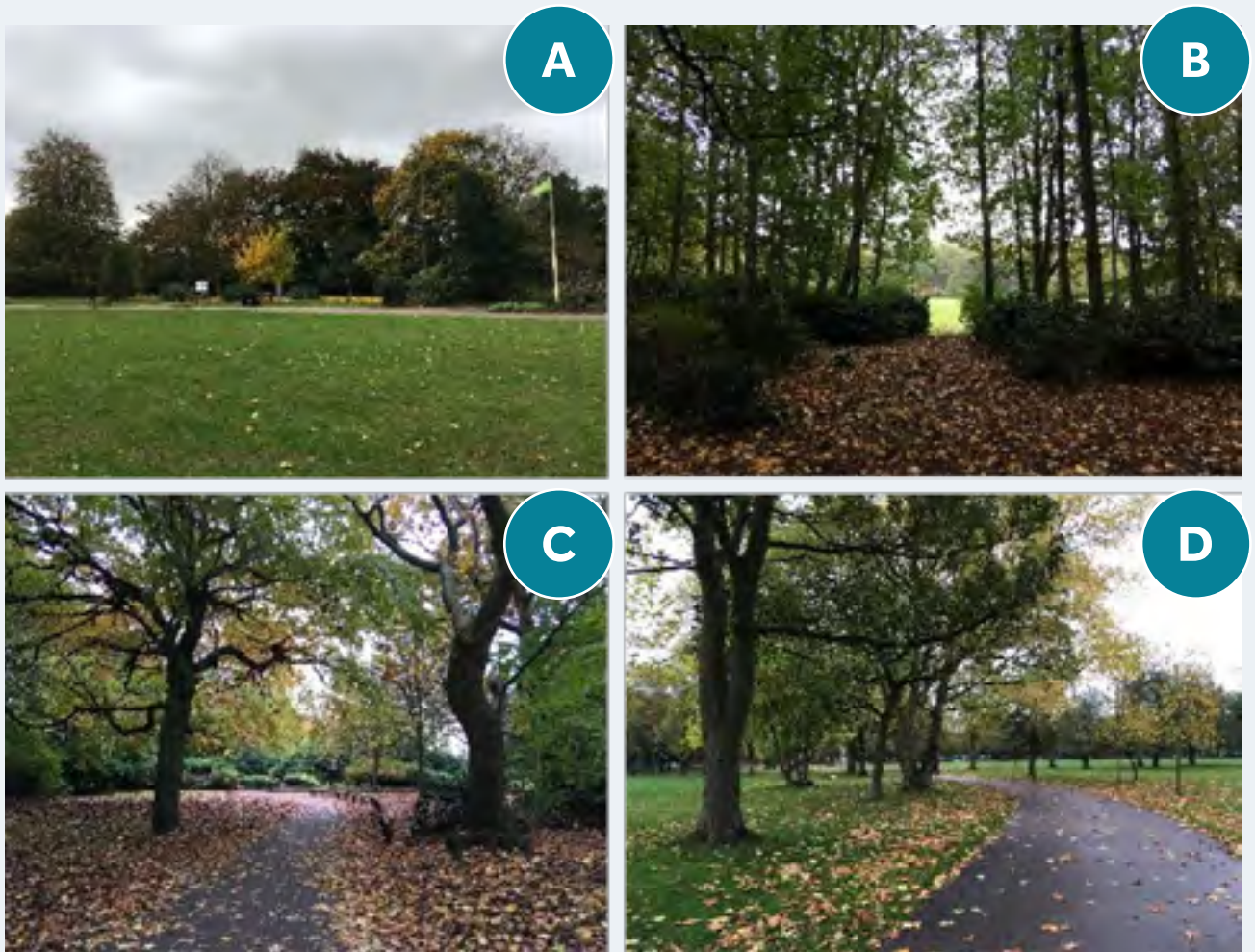
Figure 10: *Park design characteristics of observed dementia walks.*

Note: A: open; **B:** prospect; **C:** canopy; **D:** savannah; **A, B & C:** Worthington Park, Trafford;
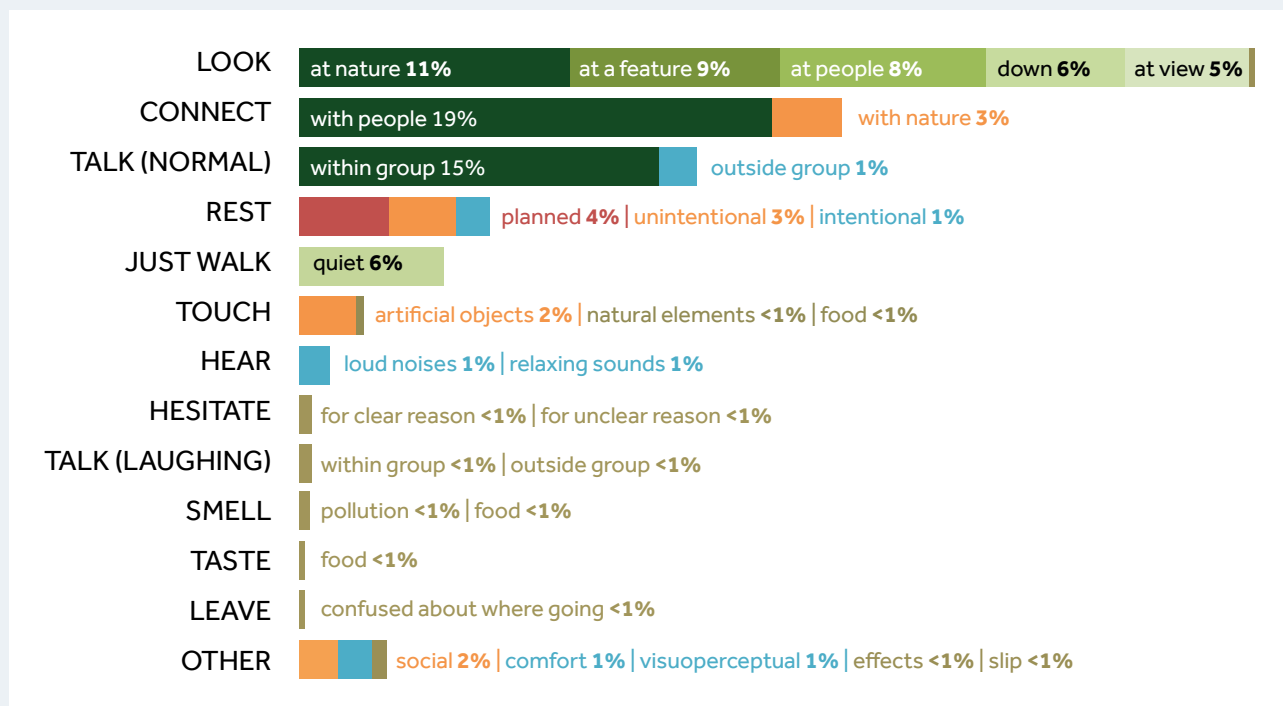**D:** Alexandra Park Manchester; © K. Tzoulas

Figure 11: *Observed behaviours during dementia walks (% of observations, n=3,459).*

Note: Thirty-two specific behaviours were observed (coloured font) across thirteen behavioural categories (capital font)
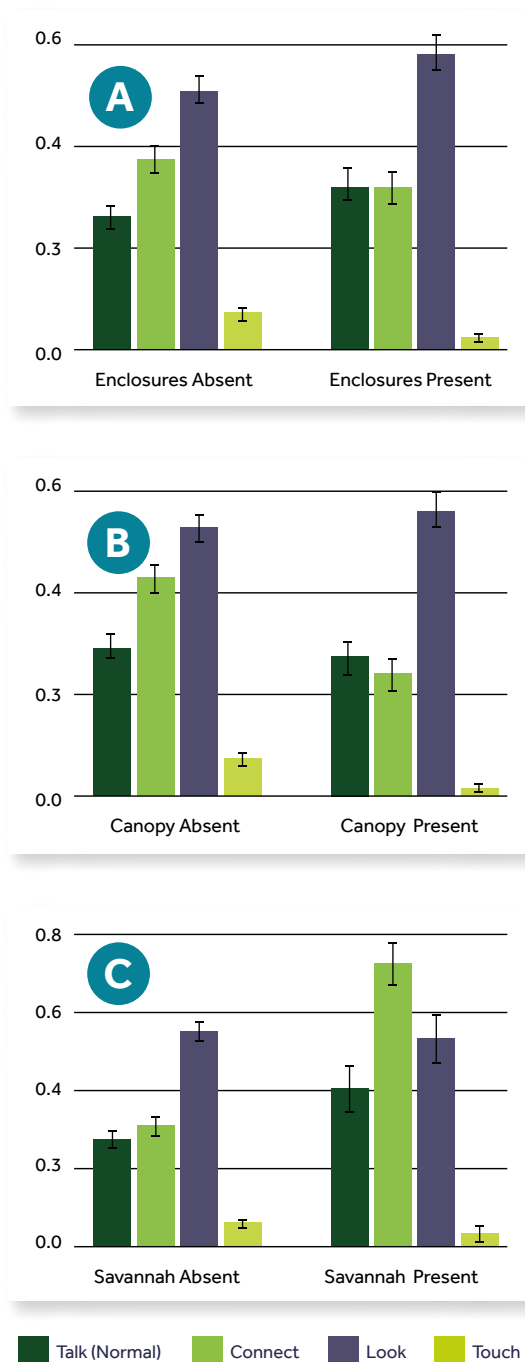
Figure 12: *Proportion of selected behaviour observations and park design characteristics in which they were observed.*

Note: Enclosures: delineated attractive areas, Canopy: areas overhung with mature tree, Savannah: areas with scattered trees

Urban green and blue spaces help to reduce exposure to many environmental hazards which can otherwise have a negative effect on health and wellbeing when outdoors. There is already quite a lot known about how green infrastructure regulates local environmental quality but this is not the case for all environmental hazards. Indeed, urban green and blue spaces might increase exposure to hazards in some cases. As part of this project, the research team looked into geographical patterns of ultra-fine particle air pollution and its association with green infrastructure as a particular environmental hazard about which relatively little is known (see Box 6). This is important as such hazards can act as stressors for health and wellbeing and we need to understand whether increased use of green and blue space might have negative consequences as well as positive ones.

There are lower concentrations of ultra-fine particles in summer compared to winter. The research team collected data from 54 sampling locations stratified from a set of 232 monitoring sites which had been sampled 10 years previously.[50] Sites were visited three times each during the summer (June –August) and winter (January-March) months to collect 3-minute mean concentrations. Monitoring took place at different times of day but always between the hours of 10am and 3pm (week days only). Overall, average concentrations of ultra-fine particles for the study periods were of the order of 10,500 particles per cubic centimetre of air, comparable to other European cities.[51] Summer concentrations were statistically significantly lower than concentrations in the winter (Figure 13).[52] This is important as it means that the same level of outdoor activity in the summer could to lead to a lower exposure compared to in the winter, all other things being equal.

50 Harris, P., Lindley, S., Gallagher, M. and Agius, R (2009) "Identification and Verification of Ultrafine Particle Affinity Zones in Urban Neighbourhoods: Sample Design and Data Pre-processing." *Env Health* 8, no. S5(2009)

51 Wolf, K., Cyrys, J., Harciníková, T., Gu, J., Kusch, T., Hampel, R., Schneider, A. and Peters, A., 2017. Land use regression modeling of ultrafine particles, ozone, nitrogen oxides and markers of particulate matter pollution in Augsburg, Germany. *Science of the Total Environment*, 579, pp.1531-1540.

52 Dennis, M. and Lindley, S. J. An integrated land-use-land-cover regression model for predicting ultra-fine particles in an urban city region (in preparation).
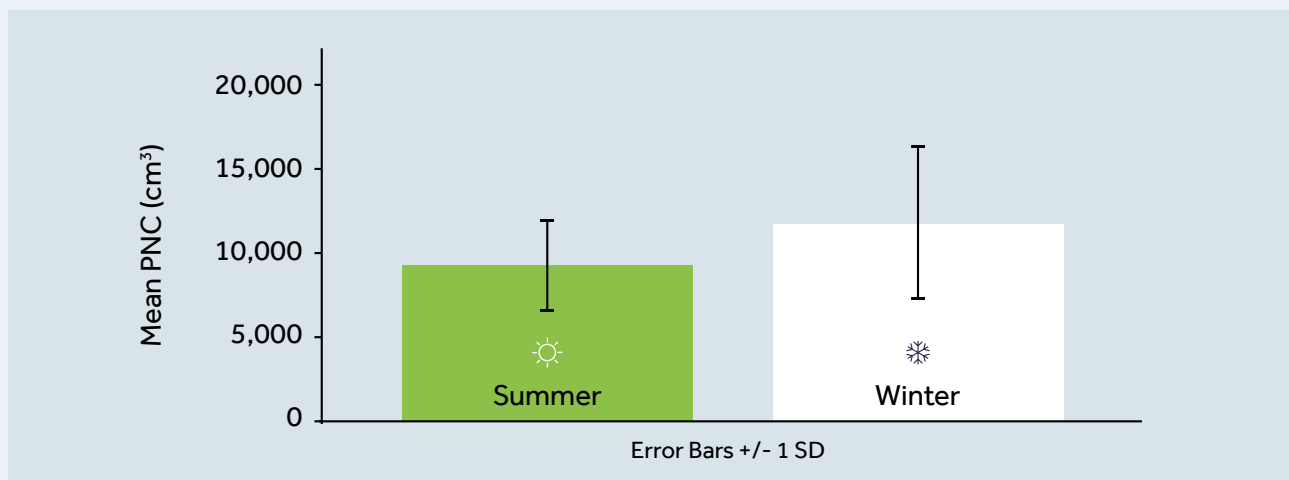
Figure 13: *The difference between summer-time and winter-time ultrafine particle count concentrations.*[50]

Box 6: Ultra-fine particles in the urban environment and their implications for health

Ultra-fine particles are a form of air pollution which exist as a sub-set of coarser particulate matter. With diameters smaller than 100 nm (≤0.1 μm) they are much smaller than PM_{10} (≤10 μm) and behave differently.[53] Although they have a range of sources, they are thought to be derived principally from traffic-related combustion sources.

Ultra-fine particles can have high toxicity and have been linked to a range of adverse physical health outcomes including cardio-vascular and respiratory disorders, diabetes and cancers.[54],[55] Some of these health outcomes may particularly affect older people, especially when combined with other environmental stressors. Studies are starting to quantify the health burdens associated with ultra-fine particles but there is still much which is unknown. For example, one study suggested a 6-day average increase of 2750 particles/cm³ was associated with a 9.9% increase in respiratory mortality, though the reported results were not statistically significant.[56],[57] Due to uncertainty over health impacts, there are no current air quality standards for ultra-fine particles in the UK.[53] Green space has been shown to influence the geographical distribution of ultra-fine particle counts.[58],[59] However, there is inconsistent evidence about the effects of different types of green infrastructure.[60]

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53 Air Quality Expert Group (2018) Ultrafine Particles (UFP) in the UK [Online] Accessed 12th July, 2019 https://uk-air.defra.gov.uk/assets/documents/reports/cat09/1807261113_180703_UFP_Report_FINAL_for_publication.pdf

54 Beckerman, B.S., Jerrett, M., Finkelstein, M., Kanaroglou, P., Brook, J.R., Arain, M.A., Sears, M.R., Stieb, D., Balmes, J. and Chapman, K., 2012. The association between chronic exposure to traffic-related air pollution and ischemic heart disease. *Journal of Toxicology and Environmental Health*, Part A, 75(7), pp.402-411

55 Chen, H., Burnett, R.T., Kwong, J.C., Villeneuve, P.J., Goldberg, M.S., Brook, R.D., van Donkelaar, A., Jerrett, M., Martin, R.V., Brook, J.R. and Copes, R., 2013. Risk of incident diabetes in relation to long-term exposure to fine particulate matter in Ontario, Canada. *Environmental health perspectives*, 121(7), p.804.

56 Lanzinger, S., Schneider, A., Breitner, S., Stafoggia, M., Erzen, I., Dostal, M, *et al.* (2016). Associations between ultrafine and fine particles and mortality in five central European cities - results from the UFIREG study. *Environ Int* 88:44–52, PMID: 26708280, 10.1016/j.envint.2015.12.006.

57 Lanzinger, S., Schneider, A., Breitner, S., Stafoggia, M., Erzen, I., Dostal, M., *et al.* (2016). Ultrafine and fine particles and hospital admissions in Central Europe. Results from the UFIREG study. *Am J Respir Crit Care Med* 194(10):1233–1241

58 Weichenthal, S., Farrell, W., Goldberg, M., Joseph, L. and Hatzopoulou, M., (2014). Characterizing the impact of traffic and the built environment on near-road ultrafine particle and black carbon concentrations. *Environmental Research*, 132, pp.305-310.

59 Cattani, G., Gaeta, A., Di Menno di Bucchianico, A., De Santis, A., Gaddi, R., Cusano, M., Ancona, C., Badaloni, C., Forastiere, F., Gariazzo, C., Sozzi, R., Inglessis, M., Silibello, C., Salvatori, E., Manes, F., and Cesaroni, G. (2017): Development of land-use regression models for exposure assessment to ultrafine particles in Rome, Italy, *Atmos. Environ.*, 156, 52–60

60 Hagler, G.S.W., Lin, M-Y., Khlystov, A., Baldauf, R.W., Isakov, V., Faircloth, J., and Jackson, L.E. (2012) Field investigation of roadside vegetative and structural barrier impact on near-road ultrafine particle concentrations under a variety of wind conditions. *Sci Total Environ*. 419:7-15. doi: 10.1016/j.scitotenv.2011.12.002.

Summer-time concentrations of ultra-fine particles were found to be generally lower in areas with larger amounts of low-level vegetation, in particular shrub-level vegetation. Lower ultra-fine particle concentrations were also found in areas which contained a diversity of vegetation types overall, which might make them a more effective barrier than single vegetation stands.[60] This is because diverse vegetation has higher structural complexity and density.[59] Lower level vegetation may also be important due being closer to traffic emission sources. Vegetation and diverse planting schemes may offer a means of reducing ultra-fine particle exposures as part of wider green infrastructure interventions in urban areas like Greater Manchester. Vegetation barriers can help to reduce exposures and may bring other added benefits such as increased amenity value and biodiversity gains in urban environments. Vegetation barriers are also thought to be more widely beneficial for air pollution mitigation, though there are considerations for their placement, and also other factors to bear in mind such as wind flows and the inter-relationships between different forms of pollution.[61]

7. Exploring caring through participatory action research and creative practice

Creative practice encourages curiosity, engagement and discussion around green infrastructure and its value for health and wellbeing. The *Who Cares?* participatory arts research activity was built on engagement with older adults in local community green spaces, through volunteer groups and themed focus groups run as part of a Heritage Futures Studio Residency in collaboration with the Manchester Museum and MA students from the University of Manchester's Institute of Cultural Practices. Intergenerational exchange between younger and older participants was embraced and desired by older participants and co-researchers.

The combined methods established a framework for co-research with community groups and individuals living and working in locations of high health deprivation, as well as students, creative practitioners and museum professionals. In total, around 85 people collaborated in this part of the research project. They included: 19 individual interviewees (who were not participating as part of a group); 15 case study participants (who were very active in the research process); 2 older co-researchers (who supported critical development of methods); 25 general participants (additional participants, contributing at different stages); 16 post-graduate students; 3 external creative facilitators; 2 external contributing artists; and 3 Manchester Museum curators. There were also further people who came to the Residency as part of their wider visit to the Manchester Museum.

Co-research in creative practice took place in locations across Greater Manchester. There was a range of groups who participated and a range of locations involved. They included: Manchester Bangladeshi Women's Organisation; Ananna Backyard Garden, Longsight; Friends of Nutsford Vale; Gorton and Levenshulme, Close Neighbours Bowker Bank Woods, Crumpsall and Cheetham Hill; Salford Clarendon and Langworthy Parks and Langworthy Cornerstone, Salford; Crumpsall & Cheetham Hill Model Allotments, Crumpsall and Cheetham Hill; Upping It Backstreets and community gardens, Moss Side; Neighbourly Gardening Projects: Age Friendly Garden Improvements Brunswick Urban Village.

Who Cares? initiated the collection of stories about how and why older adults care for urban nature across Greater Manchester and has started to record an archive of 'living artefacts' that help embody values for health and wellbeing in older age. The research team used auto-ethnography and worked with older adult co-researchers associated with five local cases in or near to socially deprived neighbourhoods. All of these groups were actively working in green and blue spaces with an ethos of sharing and communing for local use.

61 Air Quality Expert Group (2018) *Effects of Vegetation on Urban Air Pollution* [Online] Access 12th July, 2019 https://uk-air.defra.gov.uk/assets/documents/reports/cat09/1807251306_180509_Effects_of_vegetation_on_urban_air_pollution_v12_final.pdf

Loneliness and social isolation is a challenging topic to be addressed directly, especially with vulnerable groups, so creative practice techniques were an important way to engage people about these topics. The creative practice enabled issues of loneliness and social isolation to come to the fore slowly, in a sensitive way within the group, through a collaborative process of making, discussing and reflecting. Creative practice goes beyond oral explanation. It enables visualisation and other mechanisms to materialise values connecting to emotion, memory, story-telling and embodied lived experiences of space.

Visual expression is especially important for people who speak English as a second language, and with experiences of trauma and exclusion. The value of some of the interventions considered by the research team was difficult for some participants to articulate in English. The lead facilitator frequently acted as translator. The psychological impact of predominantly being known in the world via translation has been explored elsewhere, for example within British Sign Language communities[62]. Visual arts practices enable expression beyond the English language. The creative practice research activity therefore provided a different way for people to be involved, to be heard, and to articulate what they find valuable about green and blue spaces for their health and wellbeing.

The co-research of local cases enabled a deeper understanding of barriers to engagement and how they can be overcome. Through lived experience of design activism and 'grassroots projects'[63] participants appeared to move past and beyond comments commonly stated such as '*there's too much litter'*, '*so much dog mess*' and '*little/no support from the council',* to very poignant, personal accounts of the healing power of nature and their emotional attachment to it. The mode of working encouraged people to pause and critically reflect on their own experiences of engagement and their responses to the barriers for engagement with green infrastructure. This has revealed personal accounts and, in some instances, emotional experiences of caring for and about green and blue spaces.

Life transitions presented both a driver of and an opportunity for change, for example a chance to take more time to notice nature and to engage with it. As one person comments, "*I became more aware of nature when I retired because I had more time*". Participants saw volunteering as a means of providing structure, stimulation, engagement and activity. Environmental volunteering was also associated with incentive and reward. However, volunteers might still experience loneliness outside of their volunteering activities, as one participant ruefully comments *"...when I get home, I'm an old woman in a chair"*. For some, the chance to "*Just get out into an open space and people watch*" is limited, either due to ill-health or a lack of appropriate infrastructure. In some areas there were tensions because benches – seen as essential for engagement for many – were also perceived by authorities to encourage anti-social behaviour and therefore not provided.

62 The Translated Deaf Self [Online] Accessed 12th Dec, 2019 https://sites.manchester.ac.uk/artviatds
63 Taylor, R. (2018) '*Experiencing participation: a phenomenological study of the transforming of a rooftop in Manchester, UK (2014-2016) and the methodological reframing of research through design'*, PhD, Lancaster University [Online] Accessed 12th Dec, 2019 https://doi.org/10.17635/lancaster/thesis/499

However, it seems that even a simple bench might be all the intervention which is needed to unlock the benefits from the spaces which already exists. For example, a bench in a private and enclosed outdoor space enabled members of the Bangladeshi Women's Organisation to gather together in the open air, as one participant remarked "*this little bench is preventing so much hardship, I'm telling you*". Other participants recounted how the Nutsford Vale supported recuperation following a hospital stay because of the availability of benches –literal benchmarks recording and supporting progress towards recovery.

Larger community-based interventions in green and blue spaces seem to require confident, physically active older people who act as 'champions' and catalysts for the involvement of others. Older adults performing these roles characterised themselves as being "*tenacious*", or even a "*nuisance*". However, creative practice can also catalyse new engagement through creative outputs like stories and poems.

Engagement can be promoted and enhanced through the involvement of a range of external individuals and organisations. For example, bringing ecology experts from Manchester Museum into spaces to work with communities has also inspired further curiosity and motivated some groups to do more to understand the spaces they care for. For example, the Bowker Bank Woods group developed inventories of woodland species to help them to enhance the value of the site, rather than solely focussing on the site's usability (e.g. clearing pathways). One important distinction is that notions of care and ownership of spaces should not be interpreted as a desire for spaces to be highly managed and manicured. Indeed, the research found evidence about how wilder, less manicured sites can support both healthy ageing and biodiversity.

the **Whitworth**

Partner Viewpoints – The Whitworth

The Whitworth, part of the University of Manchester, is an art institute and park made collectively by the activity of all its users, including those working, studying and volunteering here. Originally founded in 1889 in memory of the pioneering engineer Sir Joseph Whitworth, it was built for *"the perpetual gratification of the people of Manchester"*. We continue to use art and our collections for social change, connecting the University and the people of the city, providing a place to meet, learn and play.

The Whitworth provided a 'Cultural Coordinator' role for the project. The Cultural Coordinator acted as the main point of liaison for partners in the project The role also included helping the research team to identify opportunities for conducting parts of the research programme, including workshops, transect walks and natural experiments around interventions. As part of this, the Whitworth conducted interviews with participants and delivered an intervention called 'A Love Letter to Whitworth Park', which sought to explore the emotional connections and values older people feel towards their local green space. Using facilitated workshops, participants explored their responses to the outside environment/Park/Gallery building through various artistic mediums, such as photography, writing, printing, visual art. The theme 'A Love Letter to Whitworth Park' – encouraged personal stories, responses, memories, as well as immediate responses to the environment on the day of the workshop.

One of the main priorities of the cultural park programme was the commitment to develop a strand of programming dedicated not only to improving the health and wellbeing of participants, but also to encourage an interest in the natural world around us, and to discover and try to find solutions to overcome the challenges that participants may face in accessing such opportunities, which is why it felt like the natural thing to do in playing a part in this research.

In Spring 2019, the Whitworth launched 'The Natural and Cultural Health Service' programme. This is an innovative approach that aims to improve the health and wellbeing of the city's population, using the natural environment as a health asset and developing an accessible programme that promotes physical and mental wellbeing alongside partners that hold expertise in this area. Working together with local partners such as City of Trees and Greater Manchester Mental Health Trust Recovery Pathways team, we have devised a programme to deliver weekly nature-based activities, which include physical, mindful and artistic activities.

The results from the research have been really useful to understand the different ways in which the participants value green and blue spaces and the connections that they make with them. Whether it is for the personal and social memories that they embody, volunteering interventions, physical exercise, connecting to nature or forming new social connections – we as an organisation have the ability to facilitate these opportunities.

The research reiterates that the social prescribing of a service like the 'Natural and Cultural Health Service' programme can play a key role helping participants to achieve both social and physical wellbeing outcomes.

The results from this research will allow us to better shape the future of the 'Natural and Cultural Health Service' programme to age-friendly audiences. Our partnership with City of Trees is already looking at the development of an innovative project called 'Dementia Naturally Active' that aims to improve the physical health, mental wellbeing and social cohesion of people affected by dementia, living in the community. We will continue our work with the Friends of Whitworth Park and with Manchester City Council to support and increase access in developing an age-friendly green space.

We will carry out future investigations as part of our ongoing work, along with the findings to inform our park volunteering programme and will develop age-friendly park volunteering roles addressing the values highlighted within the report.

As a cultural institution we are already reaching out to engage communities and recording engagement within urban green spaces, it is part of the fabric of our nature. However, we can always learn more and how to do it better and this research evidences the important value of cross-sector collaboration.

8. What role can green infrastructure and environmental volunteering play in later life?

Environmental volunteering by older people in urban areas brings reciprocal benefits. The act of volunteering is itself well known to have positive benefits for wellbeing such as through providing a basis for social connection and sharing, for developing social relationships and by providing opportunities to care and contribute. Environmental volunteering has the potential to provide further opportunities for learning and sharing and providing a basis through which connections with nature can be forged, re-established or nurtured. In turn, older people play a key role in environmental stewardship and activism, in environmental education, in urban nature management, and in conservation for the benefit of present and future generations.

Older adults engaged in environmental volunteering may face mental and physical health challenges but this is not an automatic barrier to involvement. Mental and physical health challenges were apparent in the majority of participants across all case studies. However, this is not automatically a barrier for involvement in activities in green and blue space. Quite the opposite; as all participants identified as having personal health and wellbeing challenges.

Although engagement with urban green and blue spaces yields health and wellbeing benefits, health does not appear to be the primary motivator for older adults. A wide range of motivations have been identified which provide a basis through which others may be attracted to engage with urban green and blue spaces. They re-enforce the specific values for health and wellbeing revealed through the non-monetary participatory methodology (see section 5). These motivations, and the wider foundations for engagement, were found to include:

- Individual motivations, such as emotional and personal connections to particular places;

- Connection to someone already participating and the opportunity for further social interaction due to green and blue spaces acting as a meeting place;

- Similarity in cultural and racial backgrounds between the individual and wider participating community groups;

- The particular places themselves, such as particular plants or wildlife and particular colours, shapes, scent and movement;

- The opportunity to share environmental knowledge or knowledge of local history and heritage narratives;

- The chance to build a sense of pleasure, satisfaction, achievement and belonging through helping to establish and maintain particular green and blue spaces;

- Accessibility to and from residents' homes and the availability of nearby facilities for refreshment, toilets, medication, weather changes etc.; and

- The opportunity for variety and change and not always being rooted to a single location.

Health and wellbeing in later life can be enhanced through encouraging participation based on what motivates and de-motivates older adults to engage with urban nature. Some examples of what might be done better include:

- Consider supporting a range of opportunities through which people can connect with nature and natural areas, for example considering what older people have said that they value and what motivates them.

- Consider supporting a range of ways which offer different levels of contribution to activities and which provide stepping stones to greater engagement over time for people that want it.

- Consider ways to open up empty spaces in specific areas of high-density housing and high health, income and social deprivation while also managing expectations and providing a duty of care e.g. through removing the fear and threat of loss or developing social contracts for temporary use.

- Encourage and support the role of older 'place-makers' (i.e. older people who are already championing activities in their local areas) and tap into their skills and knowledge and their expertise in intergenerational learning and sharing.

- Evidence and document urban nature activism, care and use.

- Enhance the role of local cultural institutions and community organisations as hubs and sites of knowledge exchange and skills development for involvement in natural environments in towns and cities.

- Make available the learning from how people take action themselves and in what contexts.

- Use arts and creativity (and older 'creatives', i.e. older adults who are themselves already engaged in arts and creative practice) to respond to challenges and communicate solutions or how solutions might be achieved.

Health and wellbeing benefits of caring for green and blue spaces can be fostered through new interventions but equally the loss of green and blue spaces can have just as strong a negative impact. In areas with little or no green infrastructure and with high levels of poor health, the loss of valued green spaces can have particularly negative consequences.

Partner Viewpoints - Greater Manchester Centre for Voluntary Organisation (GMCVO)

Ambition for Ageing is a Greater Manchester wide cross-sector partnership, led by GMCVO and funded by the National Lottery Community Fund, aimed at creating more age friendly places by connecting communities and people through the creation of relationships, development of existing assets and putting older people at the heart of designing the places they live.

A representative from GMCVO sat on the Advisory Group for the project, providing brokerage of relationships between those involved as partners and Ambition for Ageing partners, connecting researchers up with the local mapping work and providing mechanisms for working with the cohort of older volunteers and community investigators.

The results from this research chime very closely to the findings of Ambition for Ageing over the past five years. In particular, the role green and blue spaces play as important social infrastructure within our communities.

Through Ambition for Ageing, we have provided low level interventions across a number of projects, including many in and across the multitude of green and blue space in Greater Manchester. We know that simple interventions in existing green and blue spaces, such as these, can encourage older adults' participation.

However, we are also aware that of lack of appropriate infrastructure is a major barrier and have seen first-hand how the closure of parks has had negative impacts on our local communities. Feedback from our programme also supports the report finding that green and blue spaces which appear uncared for tend to discourage participation. Feelings of safety and security rank highly on whether older people view their neighbourhood as age-friendly or not, and the look of a place has a big impact on people's perceptions of safety, whether accurate or not.

The report findings on the inequality of access to spaces for older people complements the equalities work of the Ambition for Ageing programme which focuses on the inequality of ageing that people from different communities might experience.

Working alongside colleagues within the GHIA project has strengthened our joint findings of the benefits of green and blue space on older people's wellbeing in addition to the social participation opportunities such spaces provide.

The quantitative findings of the group further strengthen our qualitative evidence for the importance of green and blue spaces within our communities and the opportunities they provide. In particular, that the local health status of people in Greater Manchester populations is linked to quantity, quality and proximity of elements of green infrastructure, even after income is disregarded.

9. "You just don't realise how important it is until it's taken away"

The research in this report has focussed on understanding benefits and values of urban green infrastructure elements and interventions for health and wellbeing in later life. Collaborative work with many individuals and groups across the Greater Manchester city-region has helped to reveal what is valued, how it is valued and why older adults care. There are many excellent examples of positive interventions and some bold visions for increasing and enhancing urban green infrastructure in the future. However, within the timeframe of our project there have been few opportunities to track interventions from initial conception to realisation.

Some of the 'wild places' valued by and cared for by communities represent land ear-marked for development or otherwise at risk of being lost to development and this can lead to negative health and wellbeing outcomes. Unfortunately, the losses to health and wellbeing can be caused even before any development occurs. There have been particular examples of large and locally important spaces threatened in this way, but participants have also recounted the shock and disappointment of losing gardens through being seen as being too old to look after them. Such negative experiences also reduce the desire and motivation to participate, to share learning and to experience and care for other spaces. The extent to which the specific health and wellbeing impacts of losses are fully appreciated in planning and development decisions is unclear, yet our evidence suggests that the consequences for older people may be particularly acute and long-lasting. Making better decisions today is important not only for the current generation of older adults but also for the older people of the future.

Further information

Project outputs

Publications

Ashton, J, (book publication in development) Creativity for Messy Heritage.

Ashton, J, Phillipson, C, Taylor, R. (paper in development). Environmental Volunteering in Later Life and Methods of Valuing Care.

Benton, J., Anderson, J., Cotterill, S., Dennis, M., Lindley, S. & French, D., (2018) Evaluating the impact of improvements in urban green space on older adults' physical activity and wellbeing: protocol for a natural experimental study *BMC Public Health*. 18 DOI: 10.1186/s12889-018-5812-z

Benton, J., Anderson, J., Cotterill, S., Dennis, M. & French, D. (2018) The impact of new walking infrastructure and changes to green space along an urban canal on physical activity and wellbeing: protocol for a natural experimental study *Open Science Framework* DOI: 10.17605/OSF.IO/ZCM7V

Benton J. S., Anderson J., Pulis, M., Cotterill, S., Hunter, R.F., French, D. P. (under review) Method for Observing pHysical Activity and Wellbeing (MOHAWk): development and validation of an observation tool to assess physical activity and other wellbeing behaviours in urban spaces. *Cities & Health.*

Dennis, M., Barlow, D., Cavan, G., Cook, P. A., Gilchrist, A., Handley, J., James, P., Thompson, J., Tzoulas, K., Wheater, P. & Lindley, S. (2018), 'Mapping urban green infrastructure: a novel landscape-based approach to incorporating land-use and land-cover in the mapping of human-dominated systems', *Land*. https://doi.org/10.3390/land7010017

Dennis, M., Barker, A., Lindley, S. J. *et al.* (in preparation) Integrating trans-disciplinary knowledge on green infrastructure, health and well-being in an ageing urban society: A brokerage approach.

Dennis, M., Cook, P.A, Wheater, C. P. James, P. and Lindley, S. J. (under review) Relationships between health outcomes in older populations and urban green infrastructure size, quality and proximity, *BMC Public Health*

Dennis, M. and Lindley, S. J. (in preparation) An integrated land-use-land-cover regression model for predicting ultra-fine particles in an urban city region.

Labib, S. M., Lindley, S. J. and Huck, J .J. (2020) Spatial dimensions of the influence of urban green-blue spaces on human health: A systematic review, *Environmental Research*, 180 doi.org/10.1016/j.envres.2019.108869

Macintyre, V. G., Cotterill, S., Anderson, J., Phillipson, C., Benton, J. S. & French, D.P. (2019). "I would never come here because I've got my own garden": Older adults' perceptions of small urban green spaces. *International Journal of Environmental Research and Public Health* 16; 1994.

O'Neill, J., Christian, R., J, Austin, A., Jeffares, S., Gilchrist, A. Wossink, A. & Lindley, S. (2019) How is green and blue space in Greater Manchester valuable to you? Exploring the value of green spaces for the well-being of older people. *GHIA Internal Report*.

Publications which are not yet in the public domain and new publications from the project will be linked from the project website www.ghia.org.uk

Other outputs

Output Type	Output title	Specific contact
Data	Green Infrastructure datasets for Greater Manchester (Published)	Matthew Dennis
Data	Evidence from the assessment of interventions (www.ceda.ac.uk) available after embargo period	Matthew Dennis
Data	Artists working or interested to work at the intersections of ageing and green infrastructure	Jenna Ashton
Exhibition	Who Cares? Residency at Manchester Museum (May-July, 2019)	Jenna Ashton
Manual	A manual for developing and using participatory and equitable forms of valuation in local government settings in the UK (in preparation)	John O'Neill
Online	Who Cares? A growing collection of stories about people caring for nature across Greater Manchester (https://whocares.uk/)	Jenna Ashton
Tool	MOHAWk: a validated tool for assessing physical activity (Sedentary, Walking, Vigorous) & two other wellbeing behaviours (Take Notice: awareness of the environment; Connect: social interaction) in urban spaces	David French
Tool	Online map tools developed in collaboration with Tellus Toolkit Ltd. (http://maps.humanities.manchester.ac.uk/ghia-web) • Extract tool (Find out information about the amount of green and blue space in different areas of Greater Manchester). • Value Tool (Contribute views about how green and blue spaces in Greater Manchester influence your health and wellbeing and see what others say) • Explore tool (Explore health and green space associations in Greater Manchester)	Sarah Lindley

Other documents and contributions

Ashton, J, Colton, R. (2017). A working Report on the Social Value of Nutsford Vale Country Park: Report submitted against planning application 117846/VO/2017, Nutsford Vale, Matthews Lane, Manchester.

Benton, J. S., Cotterill, S., Anderson, J., Macintyre, V. G., Gittins, M., Dennis, M., Lindley, S. J. and French, D. P. (2019) Impact of small changes in urban green space on older adults' physical activity and wellbeing: a controlled natural experimental study. Conference of the European Health Psychology Society, Dubrovnik, Croatia

GHIA Project Team and Partners - Nine Principles of Working – easy read document available at www. ghia.org.uk

Gilchrist, A. and Ashton, J. (2018) GHIA Communication and Impact Strategy. Internal document on our assessment of practitioner needs, core transferable elements and methods of engagement

Project Aims

The Green Infrastructure and the Health and wellbeing Influences on an Ageing population (GHIA) project ran from August 2016 to January 2020. It was a collaborative research project with a large academic and partner team.

Overall Aim - The overarching aim was to better understand the benefits and values of urban green infrastructure (GI) to older people and how GI attributes and interventions can best support healthy ageing in urban areas. This includes consideration of how GI can be best designed, enhanced, managed and promoted to support its use as part of preventative and restorative therapies and other health and wellbeing related activities. We included biodiversity as a specific attribute of interest. There were five sub-aims which correspond to 6 inter-connected work packages.

- **Aim 1:** to agree the multi-disciplinary foundation for the research (WP1).
- **Aim 2:** To develop knowledge and methods for older people to realise their potential for physical, social and mental wellbeing within green and blue spaces, whilst providing adequate protection, security and care (WP2).
- **Aim 3:** To understand, categorise and evidence the ways in which GI can influence the health and wellbeing of older people (WP3).
- **Aim 4:** To examine valuation procedures of the role of green spaces in improving the health and wellbeing of older populations (WP4).
- **Aim 5:** To develop and apply a new methodology for representing the needs, provision and value of GI for older people. (WP5).
- **Aim 6:** To co-develop a set of web-based tools, reference materials and design guide to support dissemination and wider adoption of research outputs (WP6).

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Advisory Group Coordination

- *Chair: Professor (Emeritus) John Handley*

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- *Cultural Coordinator Francine Hayfron*, Cultural Park Keeper, the Whitworth

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Advisory Group

Partners

- Ambition for Ageing, Greater Manchester Centre for Voluntary Organisation (GMCVO)
- Canal and River Trust
- City of Trees
- Greater Manchester Ageing Hub
- Manchester City Council
- Manchester Climate Change Agency
- Manchester Museum & Galleries

Other Organisations

- Greater Manchester Combined Authority
- RHS Garden Bridgewater
- Salford City Council
- Stockport Council
- Tellus Toolkit Ltd
- Valuing Nature Network

Academic Advisors

- Prof Raymond Agius, Emeritus Professor of Occupational and Environmental Medicine, University of Manchester
- Prof Andrew Stirling, University of Sussex
- Prof Phil Wheater, Manchester Metropolitan University

How we worked together

Our project brought together a range of academic disciplines with partners working in different areas of practice around green infrastructure, health and wellbeing, ageing and arts. Research at the science-policy interface requires an integrated approach. We therefore developed nine principles of working to underpin our activities and goals. The principles were the product of a collaborative process between academics, partner representatives and people involved in wider practice[64]. We continued our collaborative model with regular engagement with partners, other organisations and academic advisors through our project Advisory Group.

- **Principle 1:** We are involving older people and other people who are expected to benefit from the outputs of the research.
- **Principle 2:** Our research considers the role of life transitions for understanding links between green infrastructure and health and wellbeing.
- **Principle 3:** We seek to broaden participation in green and blue spaces and in decisions associated with green infrastructure, such as its valuation.
- **Principle 4:** Our work centres on and emphasises the importance of valuing the ways in which people relate to and are motivated to engage with the natural environment through urban green infrastructure.
- **Principle 5:** Our research is flexible and acknowledges the legitimacy of different perspectives and views.
- **Principle 6:** We consider spatial and temporal scales and how they influence research and practice.
- **Principle 7:** We are working in a range of locations in Greater Manchester and producing evidence relevant to a variety of social and environmental contexts.
- **Principle 8:** Our research emphasises pathways through which health and wellbeing is influenced by urban green infrastructure.
- **Principle 9:** Our work acknowledges that green infrastructure operates as a system involving both people and the natural environment.

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64 Dennis, M., Barker, A., Lindley, S J et al., (in preparation) Integrating trans-disciplinary knowledge on green infrastructure, health and well-being in an ageing urban society: A brokerage approach.