

Environment and Human Health

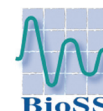
The contribution of green and open space in public health and wellbeing

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This summary reports on the findings of the GREENHEALTH project which explored the relationship between green spaces in urban areas and human health using a range of methods and approaches. Some of the findings are based on analysis of representative data sources such as the Scottish Health Survey. Findings show that urban green and open spaces contribute to public health and wellbeing, particularly mental health and wellbeing.

Main Findings

- There was no evidence of a relationship between the amount of green space in urban neighbourhoods and mortality and various measures of morbidity. The exception is men living in deprived urban areas where higher amounts of local green space were associated with a lower risk of mortality (GreenHealth Briefing 1).
- For those who did use green spaces for physical activity, no relationship was found between obesity and self-reported cardiovascular or respiratory health. However, levels of c-reactive protein (a marker of inflammatory response in the body) were lower in men living in urban areas who regularly used green space for physical activity than those who did not (GreenHealth Briefing 1).
- There was no relationship between the amount of green space in urban neighbourhoods and mental health and wellbeing. However, urban dwellers who used green space such as woods and forests for physical activity had a lower risk of poor mental health than non-users of these types of green spaces. Regular use of woods and forests appeared to be more protective of mental health than exercising in the gym or streets (GreenHealth Briefing 1).
- In three deprived urban areas in Edinburgh and Dundee (total sample 300), analysis of self-perceived stress levels were found to be associated with the amount of green space within deprived urban neighbourhoods. However, the strength and direction of relationships varied by gender (GreenHealth Briefing 2).
- In the deprived urban communities, more green space was associated with lower levels of stress as evidenced by salivary cortisol patterns for a sample of middle-aged men and women not in work. More green space has a greater effect on cortisol concentrations in women than in men in these groups (GreenHealth Briefing 3).
- Individuals and social groups attach different meanings to green space, and experience differing wellbeing benefits. For most people social interaction is significant in using local green space (GreenHealth Briefing 4).
- Larger urban green spaces provide multiple functions for communities of place, and communities of interest; smaller areas of green space provide important spaces for short periods outdoors. There is significant community interest in involvement in decision-making about local green spaces (GreenHealth Briefing 5).
- Ensuring the visibility of green space can make a significant difference to the interpretation of accessibility (GreenHealth Briefing 6).



Background

Urban green space is thought to protect or enhance people's health via three main mechanisms: providing a venue for physical activity; promoting social contact; and direct impacts of green spaces on psychological and physical health through stress reduction and attention restoration (via psycho-neuro-endocrine pathways). Various international studies have found that green space levels and use are associated with physical and/or mental health benefits.

The GreenHealth project investigated these relationships in Scotland, as well as people's perceptions of, and reasons for visiting, green space, and their activities in green space including uses for social purposes. Drawing on national-level data analysis from other parts of the UK, Europe and North America that suggested links between experience of natural environments and stress or mental health were strongest for lower income-level populations, the GreenHealth research focused on comparatively deprived urban populations in Scotland.



Mortality and morbidity

At a Scottish level, for most age, gender and income sub-groups, the research found that amounts of green and open space in urban areas were not related to reduced risks of mortality, nor associated with lower levels of obesity or poor cardiovascular or respiratory health. However, more green space in urban neighbourhoods was associated with a lower risk of mortality for working-age men in the poorest two income deprivation quartiles; those resident in the greenest urban areas were 16% less likely to die than those in the least green urban areas.

This contrasts with England and Wales where, for working age men of all income groups, the risk of mortality falls as the amount of green space in urban areas increases. Such an association is absent for women of all income groups across all three countries, and is likely linked to lower green space use.

Analysis of Scottish Health Survey data found that use of green space for physical activity (e.g. for walking) was not strongly related to the amount of green space in the neighbourhood (Mitchell, 2013). This was particularly the case for those on lower incomes where green space usage hardly varied across neighbourhoods with different levels of green space.

For those who did use green space for physical activity, there was no association with various measures of physical health including body mass index (BMI), self-reported measures of cardiovascular and respiratory health problems, blood pressure and c-reactive protein (a marker of inflammatory response in the body, with lower levels being healthier) at population level, nor for different age, gender or income groups. The exception was men who regularly visited green space for physical activity, who had lower levels of c-reactive protein than those who did not.

Inequalities

In contrast to England and Wales, socio-economic health inequalities, as measured by mortality rates, were not significantly narrower in Scotland's greenest urban areas. A study of the English urban population found that socio-economic inequalities in cardiovascular and respiratory mortality were narrower in urban areas with relatively more green space than in those with relatively less (Mitchell and Popham, 2008). When this analysis was repeated for Scotland, it found results in the same direction (i.e. that inequalities in health were narrower in greener areas), but associations that were not statistically significant. This might be explained by the finding that use of green space for physical activity is not strongly related to the amount of green space locally, particularly for those on lower incomes.

Mental health – stress and wellbeing

Analysis of Scottish Health Survey data found no relationship between the amount of green space in urban neighbourhoods and mental health and wellbeing (GHQ, WEMWBS measures) at population level or for different age, gender or income



subgroups. However, it did show that those who used woods and forests for physical activity enjoyed some mental health benefits. In particular, they had a lower risk of poor mental health than non-users of these types of green spaces, whilst regular use of woods and forests appeared to be more protective of mental health than exercising in the gym or streets.

Fieldwork in three deprived urban areas in Edinburgh and Dundee (total sample 300) found a relationship between amounts of green space and stress. Self-perceived stress levels were lower for men living in areas with higher green space, but the relationship was not so clear for women.

The link between self-perceived stress, together with a separate assessment of wellbeing and the amount of green space in a neighbourhood, was strongest for those who stayed at home (in this sample, mostly retired people, those looking after the home/family, disabled people and those with long-term illness).

Using the sample we looked at the relationship between an objective measure of stress (salivary cortisol) and levels of green space. We found that higher green-space levels in these deprived urban neighbourhoods were associated with lower stress levels amongst men and women. Furthermore, higher levels of green space had a more positive effect on stress regulation in women than in men.

Meanings and engagement

Meanings of green space, and hence any wellbeing benefits derived from engagement with green space, vary between different people and social groups. For most people, social contact is a key dimension of wellbeing gained from using urban green and open space. For others, notions of escape and 'getting away from it all' are important.

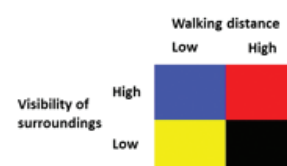
For some people engagement with green space is as part of a group giving their activity meaning and purpose. However, the activities of different groups can affect the experience of others, positively and negatively. We found that local people were interested in participating in decisions about their local green spaces, with some keen to be involved in ongoing maintenance of these places, e.g. joining an environmental group.

Research Undertaken

The study used a wide range of research methods: health surveys; geographic modelling; policy analysis; focus groups;



Figure 1. Combined physical and visual accessibility of greenspaces to properties in Pilton, Edinburgh: 200 m walking distance.

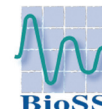


neighbourhood surveys; cortisol testing; mobile and visual ethnography; community engagement case study; and green-space mapping. Fieldwork was undertaken in case study areas in Edinburgh and Dundee.

Our research validated a method for measuring diurnal patterns of salivary cortisol. This is an ecologically valid method (i.e. observing people in their real-life contexts) to provide evidence and further understanding of the salutogenic (i.e. health promoting) effects of green space. Levels of green space in the residential environment of deprived urban communities can significantly predict levels of self-reported stress using this biomarker. We also developed a method to enable spatial assessments of physical and visual access to green spaces at the level of individual properties.

Conclusions

Except for reduced risk of mortality for men living in deprived areas, the general absence of a relationship between levels of green space within urban neighbourhoods and various measures of physical health is perhaps a surprising one. Nevertheless, the protective relationship between regular use of green space for physical exercise and risk of poor mental health is an important finding. Our research cannot prove that green space *per se* protects mental health; however, it echoes findings from small-scale laboratory and field experiments, providing



more confidence in our results. While the research does not show a causal relationship between green space and health and wellbeing, it suggests that the amount of green space in residential environments can contribute to people's health and wellbeing, particularly residents of deprived urban communities in Scotland.

The research investigated why some relationships between green space and health were absent in Scotland, but was not able to explain it. Possible explanations include that the study could not allow for any differences in the quality or types of urban green spaces, compared to the rest of the UK and other countries, or that a higher level of underlying poor health and risky behaviours in Scotland such as smoking and drinking is negating positive impacts of urban green spaces. In Scotland it may be use of urban green space, rather than how much is available in the neighbourhood, that is important to its benefits.

Policy Implications

Simply increasing the amount of green space available in urban areas is unlikely to have positive impacts on population mortality or morbidity rates or socio-economic health inequalities.

The findings suggest that increasing green space in deprived areas where little is present could contribute to reducing stress levels and increased wellbeing for some residents, especially those who spend more time around the home. However, other aspects of green space that impact on perceptions and use, such as quality and safety, how power and knowledge affect meaning, and how different groups are positioned in relation to these resources, are also important.

A key predictor of whether someone uses green space in adulthood is whether they did so in childhood. It is understood that there are socio-economic inequalities in children's use of green space, but also that, when children are introduced to such places, it kindles a lasting desire to re-visit (Ward Thompson et al., 2008). Therefore, there is an opportunity for an enduring, inter-generational effect. In other words, helping people to become and stay regular users could be a useful additional means of protecting and enhancing mental health. From GreenHealth and other recent research, implications for policy makers include:

- Policy makers, planners and green-space managers should ensure that communities have access to a range of different

kinds of green space, to allow all to enjoy the wellbeing benefits of using these spaces.

- Schemes proven to be effective in introducing and encouraging children to use green spaces should be expanded (Asah et al., 2012; Ward Thompson et al., 2008). This may produce a lasting, multi-generational impact.
- Evaluations of local walking groups have found them to be effective at introducing adults to, and maintaining their use of, green spaces for physical activity (C3 Collaborating for Health, 2012). These should be promoted as a resource for mental as well as physical health.
- Identification of sub-areas of green spaces which support compatible functions could increase the overall effectiveness of such spaces in delivering multiple benefits, and safeguard its value for relaxation and escape.
- There is community interest in having greater responsibility for managing of areas of green spaces for local benefit; increased social well-being may be promoted through facilitating mechanisms of community engagement. The use of newly-available mapping and visualisation tools stimulates interest.

More details are given in separate GreenHealth Briefings:

- 1 Urban green space, mortality & morbidity
- 2 Green space quantity, stress and wellbeing
- 3 Urban green space and stress
- 4 Urban green space and wellbeing
- 5 Green space services: community engagement case study
- 6 Mapping physical and visual access to green spaces

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References

- Asah S., Bengtson D.N., Westphal L.M. (2012) The influence of childhood: Operational pathways to adulthood participation in nature-based activities. *Environment and Behavior* 44(4): 545-569.
- C3 Collaborating for Health (2012) The benefits of regular walking for health, well-being and the environment. <http://www.c3health.org/wp-content/uploads/2009/09/C3-report-on-walking-v-1-20120911.pdf>
- Mitchell R. (2013) Is physical activity in natural environments better for mental health than physical activity in other environments? *Social Science & Medicine* 91: 130-134.
- Mitchell R., Popham F. (2008) Effect of exposure to natural environment on health inequalities: an observational population study. *The Lancet* 72(9650): 1655-1660.
- Ward Thompson C., Aspinall P., Montarzino A. (2008) The childhood factor: adult visits to green places and the significance of childhood experience. *Environment and Behavior* 40(1): 111-143.

