Environment and Human Health

Green space quantity, stress and wellbeing

The James Hutton Institute, University of Edinburgh, University of Glasgow, Heriot Watt University, and Biomathematics and Statistics Scotland

This research was part of the Scottish Government's GreenHealth project. It investigated whether there is a link between the amount of green space in the residential environment (such as parks, woodlands, gardens and street trees) and the health and wellbeing of residents of deprived urban communities in Scotland. The study found evidence of a link between green space quantity and both perceived stress and mental wellbeing.

Main Findings

- Perceived stress and mental wellbeing were both linked with green space quantity. The strength and direction of relationships varied by gender and likely amount of time spent at home.
- In men, lower self-reported stress was associated with increasing amounts of residential green space, particularly for those likely to spend more time at home. There was no association between mental wellbeing and green space quantity for the total study sample of men; however, for a sub-group of men who were likely to spend more time around the home, higher mental wellbeing was associated with increasing amounts of green space.
- The relationships between green space quantity and stress and mental wellbeing were more complicated for women: only some showed the same patterns in self-reported stress and mental wellbeing as described for men.



Low levels of residential green space vs. high levels of green space, Dundee.



Background

The international evidence suggests that contact with nature and exposure to green or open spaces has a beneficial effect on health and wellbeing. Higher levels of residential green space have been associated with lower mortality rates, lower blood pressure and obesity levels, and better self-perceived health (e.g. Maas et al, 2006). Previous studies also suggest that increasing the availability of green space in the neighbourhood environment in areas of deprivation may help to reduce health inequalities (see Information Note no. 1). The GreenHealth 'Household Survey' study sought to investigate the links between stress and mental wellbeing and the amount of green space in the residential environment in deprived urban communities in Scotland. Two key self-reported measures of health were used: (i) perceived stress, and (ii) mental wellbeing.

Research undertaken

Four deprived communities were selected for the study, based on levels of deprivation and relative green space coverage: two in Edinburgh, and two in Dundee. Approximately 100 participants were recruited from each site; however, perceived stress scores were significantly higher in one of the Edinburgh communities compared to those reported at the other three sites, and mental wellbeing scores were significantly lower, suggesting that it was an unusual case. For this reason, one community was excluded from the pooled data analysis, giving a total sample of n = 305 for the results reported here.

Stress levels were measured using the Perceived Stress Scale (PSS) and mental wellbeing was measured using the shortened version of the Warwick-Edinburgh Mental Wellbeing Scale (SWEMWBS). Four measures of green space quantity around each participant's home, of differing resolution and composition, were used: (i) Ward (CAS Ward – parks, woodlands, scrub and other natural environments, but no private gardens included); (ii) Zone (Scottish Data Zone, as for Ward green space, but based on smaller area units and with private gardens included); (iii) Zone 300m Buffer (data as (ii) but for a 300m radius area around the home); and (iv) PAN 65 Zone (Scotland Green Space Map typologies: public open space, gardens, and roadside grass and trees). Relationships between variables were examined using multiple linear regression, and separately for men and women and key sub-groups such as those likely to spend more time at home (identified on the basis of 'work status', namely those (i) looking after the home/family; (ii) retired; or (iii) long term sick or disabled). The research also took into account factors other than green space that might influence stress and mental wellbeing, such as age, income, and deprivation. In all cases described below, these potential confounders have been controlled for in our analysis. Affluence was assessed using a four point 'Income Coping' measure, and deprivation using the Carstairs Index.

Stress

Lower perceived stress was associated with increased green space coverage for both men and women (Figure 1), but green space quantity was only a significant factor for men, accounting for about 5% of the variability in perceived stress levels. Men's stress scores were on average 1 point lower on the scale for every 4% increase in green space coverage.



Figure 1. Mean perceived stress and green space quantity for men (n = 101) and women (n = 130). Error bars are two standard errors (bars for highest and lowest mean perceived stress (PSS) do not overlap for men, indicating significance, but do for women).

The relationship between perceived stress and green space was much stronger for men considered likely to spend more time at home, however, with green space accounting for up to 34% of the variability in perceived stress (Figure 2), depending on the measure of green space quantity used. In addition to the Zone 300m Buffer green space measure (Figure 2), the PAN 65 Zone measure was also a significant predictor, accounting for 21% of the variance in perceived stress. The stress scores for these men



ranged from 2 to 18 (a higher score means greater stress). Green space coverage ranged from 26–69%. The regression coefficient for Figure 2 indicates a lower stress score by 1 point on the scale for every 1.6% increase in green space coverage.



Figure 2. The relationship between perceived stress and green space quantity for men estimated to spend more time at home (n = 22; Retired 77%, Disabled or long-term sick 23%), expressed as a partial regression plot. The y-axis shows PSS increasing from bottom to top, and the x-axis shows green space quantity (%) increasing left to right. Confidence intervals shown are 95%.

For women, the relationship between perceived stress and green space quantity was more complicated than for the men (Figure 3), with a greater range of stress scores, from 0 to 27. Whilst lower perceived stress appeared to be associated with higher green space for some individuals, as for the men (individuals inside the oval in Figure. 3), there was a number of women living in areas with high green space coverage who had some of the highest perceived stress levels recorded (individuals falling outside the oval, Figure 3). Based on visual inspection of



Figure 3. The relationship between stress and green space quantity (%) for women estimated to spend more time at home (n = 43; Looking after the home/family 41%, Retired 50%, Disabled or long-term sick 9%), expressed as a partial regression plot. The y-axis shows PSS increasing from bottom to top, and the x-axis shows green space quantity (%) increasing left to right. The oval identifies individuals for whom perceived stress appeared to be lower as green space increased, as for men.

Figure 3 and theoretical understandings, preliminary analysis of the two groups (those inside and outside the oval) suggests that stress experienced by women in the high green space/high stress group (those outside the oval) was more strongly influenced by significant recent life events and poorer reported life conditions compared to the other women in the study.

Mental Wellbeing

There was no association between green space quantity and mental wellbeing for the total sample of men in the study. However, for the sub-group who were likely to spend more time at home, higher mental wellbeing was associated with increased levels of green space (Figure 4). Only one green space measure,



Figure 4. The relationship between mental wellbeing and green space quantity for men estimated to spend more time at home (n = 22; Retired 77%, Disabled or long-term sick 23%), expressed as a partial regression plot. The y-axis shows mental wellbeing increasing from bottom to top, and the x-axis shows green space quantity (%) increasing left to right. Confidence intervals shown are 95%.

Zone 300m Buffer, was a significant predictor of mental wellbeing, accounting for 14% of the variability in such wellbeing scores (Figure. 4). Mental wellbeing scores for these men ranged from 19 to 35 (a higher score means greater mental wellbeing). Green space coverage ranged from 22–69%. In contrast to the observations for men, for the total sample of women in the study, lower mental wellbeing was associated with higher levels of green space, with green space accounting for about 8% of the variability in such wellbeing. Again, only the Zone 300m Buffer measure significantly predicted mental wellbeing. As with the analysis of stress in women described above, the relationship between mental wellbeing and green space quantity was complex. For some women, it appears that mental wellbeing



may be higher with increased levels of green space, as for men. However, there was a number of women living in areas with high green space coverage who had some of the lowest mental wellbeing values recorded (Figure 5). It is likely that the pattern observed in Figure 5 largely reflects that shown in Figure 3 (and thus for those individuals outside the oval, mental wellbeing is influenced more strongly by other factors). Mental wellbeing scores ranged from 17 to 35, and green space coverage 22–69%.



Figure 5. The relationship between mental wellbeing and green space quantity for women estimated to spend more time at home (n = 43; Looking after the home/family 41%, Retired 50%, Disabled or long-term sick 9%), expressed as a partial regression plot. The y-axis shows mental wellbeing increasing from bottom to top, and the x-axis shows green space quantity (%) increasing left to right. The oval identifies individuals for whom greater mental wellbeing appeared to be associated with increased green space, as for men.

Conclusions

This cross-sectional study cannot show a causal relationship between green space and health and wellbeing. Nonetheless, it suggests that the amount of green space in the residential environment is a factor contributing to the health and wellbeing of residents of deprived urban communities in Scotland, particularly those who are likely to spend more time in and around their home or neighbourhood. The study suggests that increasing green space coverage in deprived areas where there is little could contribute to reducing stress levels and increased wellbeing for some; however, other aspects of green space which impact on perceptions and use, such as quality and safety, must also be taken into account.

Policy relevance

This work has relevance for those involved in planning, designing and managing green spaces, and for those involved in protecting and improving population health in Scotland.

Increasing green space coverage in areas with low coverage in deprived urban communities may help lower stress and improve mental wellbeing for some residents, especially those who spend more time around the home.

For more information, contact: **Prof Catharine Ward Thompson** OPENspace Research Centre University of Edinburgh 74 Lauriston Place Edinburgh EH3 9DF

c.ward-thompson@ed.ac.uk

References

Maas et al. (2006) Green space, urbanity, and health: how strong is the relation? *Journal of Epidemiology and Community Health*, doi:10.1136/jech.2005.043125











