

**Finding Headspace: A Knowledge Synthesis of the Effects of Urban Green Space on
Mental Health**

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May 26th, 2017

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Summary

- Awareness of mental health as a critical component of overall well-being has grown in recent years
- One in five Canadians is diagnosed with a mental illness at some point in their lives, making mental health a priority for a productive and thriving population
- Our environment is linked to mental health outcomes, and contact with nature promotes greater mental well-being
- The number of Canadians living in urban centres is steadily increasing, with 81% of the Canadian population reporting living in an urban centre in 2011, an increase of 4% from 1991
- This migration towards urban centres means that the amount of contact Canadians have with nature is decreasing
- Urban green spaces, such as parks and community gardens, bring nature back into an urban environment
- Exposure to urban green spaces promotes various aspects of mental health and results in improved mental health outcomes
- Further research, including longitudinal studies, is needed to determine how urban green spaces can best be designed to promote mental health

Introduction

Mental health is a critical, yet an often neglected component of overall well-being (1). Mental illness affects a large proportion of the Canadian population, with one in five Canadians being diagnosed with a mental illness at some point throughout their lifetime (2). As a result of increased awareness and decreasing stigma surrounding these issues, mental health and promotion strategies are beginning to rise to the forefront of the public consciousness and demand policy intervention.

Interventions traditionally employed to improve mental health outcomes include counselling, pharmaceutical treatment, and seeking social support (2). Furthermore, our environment and physical surroundings also influence mental health (1). Nature and natural settings have been previously associated with improved mental health, and may present another strategy by which to protect and promote the mental health of populations (3).

Urban green space is defined as areas dedicated to nature found within communities. Green space may take the form of parks, community gardens, and cemeteries, as long as the area is at least partly covered by vegetation (4). Green space has been previously found to provide mental restoration benefits by decreasing mental fatigue, depression, anxiety, and stress (5). However, green space is traditionally lacking in cities, and urban centres continue to expand with previous green space allocated towards new developments.

Urban living is also on the rise, with 81% of Canadians now living in urban areas (6). As more Canadians dwell in urban environments it is important to understand the connection between urban green space and mental health. As such, this knowledge synthesis explores how green space within urban centres, or a lack thereof, affects the mental health status of Canadian urban residents.

Methods

The databases employed in this literature search were Google Scholar, Primo, and PsycINFO. To be included, only peer-reviewed literature that was published in English was chosen. Furthermore, articles must have been published in 2010 or later, to ascertain relevance of the information contained to the present day. The key search terms “green space”, “mental health”, “depression”, “anxiety”, “stress”, “well-being”, and “neighbourhood environment” were used in various combinations to search the above databases for appropriate articles. The abstracts of articles obtained were screened for relevance to this knowledge synthesis. Articles were included only if they reported at least one outcome measure pertaining to mental health, such as anxiety/mood disorder treatment counts. The references of all articles selected for review were also checked to determine if any of the studies cited would be of relevance to this search.

Results and Discussion

Mental Health Benefits of Green Space

The benefits of green space on mental health outcomes are many-fold. Access to urban green space has been significantly associated with decreased mental fatigue and reduced stress, as well as promoting greater self-reported mental health (7, 8, 9). Furthermore, even after controlling for multiple potential confounding factors that may influence mental health, such as age, gender, marital status, and socioeconomic status, living in areas with higher levels of neighbourhood green space remained associated with lower levels of depression, anxiety, and stress (7).

The presence of a high amount of green space around an individual’s home has also been found to moderate the potential negative effects of stressful life events (8). Green spaces were also found to help individuals manage stress in a study by Stigsdotter and colleagues (2010),

whose results showed that study participants living more than one kilometre away from the nearest green space were 1.42 times more likely to report experiencing stress than participants with the nearest green space located within 300 metres of their homes (10). Furthermore, residents of neighbourhoods with green spaces rated as medium or high quality were two times more likely to report good mental health as opposed to those living in neighbourhoods with low quality green spaces (11). As a whole, these findings indicate that the presence of urban green spaces heavily influenced mental health outcomes of individuals within these communities, and that green spaces exert protective effects on various aspects of mental health.

Results of a cohort study that took place over five years lends support to the idea that greater amounts of urban green space lead to improved mental health. Alcock and colleagues (2014) conducted a study in which participants' mental health baseline levels were recorded, then any changes tracked after a move to a neighbourhood with either increased or decreased amounts of green space. Participants who moved to neighbourhoods with higher proportions of green space saw their self-reported mental health steadily improve for the three years after their move (12). In contrast, participants who moved to neighbourhoods with lower proportions of green space self-reported decreased mental health the year after the move had occurred, with mental health returning to baseline pre-move levels by two years after their move (12). These findings point to the presence of neighbourhood green space as providing sustainable mental health benefits, while decreased neighbourhood green space has a temporary negative effect on mental health.

Physical Activity and Green Space

While physical activity on its own provides mental health benefits (13), physical activity performed in green space may result in a synergistic relationship and provide increased mental

health benefits compared with physical activity alone (14, 15). Using the Kessler Psychological Distress Scale as an outcome measure of mental health, those who participated in physical activity in green spaces saw improved mental health (14). This finding was further supported by another study, which found that the odds of poor mental health were 0.557 times lower among individuals who participated in physical activity in green space compared to individuals who performed physical activity in non-green spaces, such as a fitness centre (15).

Availability of green space in a neighbourhood was also found to increase the likelihood of residents being physically active on a regular basis (14). Resident levels of physical activity were found to increase when more green space was made available, thus indirectly promoting mental health (16). The link between physical and mental health is clear, and the above findings demonstrate how an individual's environment influences both of these health outcomes.

Presence vs. Use of Green Space

Does urban green space still benefit community residents if they do not actively use it? Nutsford and colleagues (2013) classified urban green space into two categories, one being "total green space" and the other being "useable green space". "Total green space" referred to the entirety of green space within a defined neighbourhood, whether public or private land, whereas "useable green space" referred to space that all community members would have access to, such as public parks and sports fields. The benefits of green space on mental health as measured by anxiety/mood disorder treatment counts were found to be present with both total and useable green space (19). Therefore, the simple presence of green space in an urban setting, regardless of whether neighbourhood residents actually participated in activities in the available green spaces or not, resulted in improved mental health outcomes (11, 19). Furthermore, regardless of any individual-level factors that contribute to mental health, neighbourhoods with the highest amount

of green space were the same neighbourhoods in which the lowest risk of poor mental health was found (16, 17, 18).

Proximity of Green Space

Another factor to consider in examining the relationship between mental health and urban green space is the location of said green space. If green space is located closer to one's home, community members are more likely to access it on a regular basis and reap greater benefits from it. Results from Nutsford and colleagues (2013) indicate that the greater proximity of green space to one's primary residence, the greater the impact on mental health. This study found a significant decrease of three percent in anxiety/mood disorder treatment counts for every 100 metre decrease in distance of participant's primary residence to the closest publically accessible green space (19). By conducting a cross-sectional study that mapped the percentages of green space in a one kilometre and three kilometre radius around study participant's homes, Van der Berg and colleagues (2010) found that participants with greater amounts of green space within a three kilometre radius of their home were found to be less impacted by negative life events than participants with lesser amounts of green space within the same radius of their homes (8).

Attributes of Green Spaces

When seeking urban green space, certain attributes of a space make it appear more or less desirable to potential users. A study conducted in Sweden surveyed participants about their preferences for green spaces by describing green spaces in eight different dimensions and seeing which dimensions participants most preferred. The qualities of "refuge" and "nature" were found to be the two most highly rated qualities as they best promoted a restorative environment (9). Another study conducted by Annerstedt and colleagues (2012) found that "serene" and "spacious" were selected by study participants as the most desirable aspects of green spaces from

the list of qualities given (20). A qualitative survey of green space users in the UK found that the primary motivations for accessing green spaces were relaxation, experiencing positive emotions, and spiritual well-being, lending support to the results of the above studies (21).

In light of this evidence, it is clear that green spaces must be designed with their target population in mind to meet their needs and provide a high quality environment exerting the greatest influence on mental health outcomes. Furthermore, individuals reporting the greatest levels of stress are also the most heavily influenced by their surroundings. These individuals may be a logical target for green space use, as highly stressed individuals are more likely to report poor mental health (9). The above evidence suggests that the primary reasons individuals access urban green space is to escape from busy urban settings and find a peaceful space in which to relax.

Limitations

Several limitations were encountered while compiling the information presented in this knowledge synthesis. One such limitation is that no consistent measure of green space exists. In some instances, the percentage of green space in a neighbourhood was calculated using Geographic Information System data, whereas in other cases information regarding green space was drawn from governmental databases. This limitation is also an issue in regards to green space quality. While multiple studies explored what users perceive as a high quality green space, no universal criteria currently exist to classify green spaces in terms of their quality. Also, the majority of studies conducted on this subject are cross-sectional in design. While cross-sectional studies are often more feasible both in terms of budget and time, they do not allow for the determination of causality due to the lack of a time component. Future research into the relationship between green space and mental health may wish to adopt a different study design in

order to be able to infer causality between these dimensions. Finally, there is a lack of evidence regarding green spaces and mental health implications in a Canadian context. None of the studies reported here were conducted in Canada, which may have implications for the validity of these studies to the Canadian context.

Conclusions

Numerous primary research studies have found a significant association to exist between urban green space and mental health outcomes. With increased amounts of green space in urban environments, mental health outcomes consistently improve. Users of green spaces report their primary motivations for seeking out these spaces to be relaxation and tranquility, making these spaces important for more than physical activity. As urban green space is accessible to all community members, this one intervention can have far reaching effects on the larger population and provide a broad range of benefits (12, 18). In light of the evidence presented in this knowledge synthesis, the implications of both the quality and quantity of urban green space on mental health outcomes must be considered. This information is of particular relevance to city planners, who may choose to incorporate greater amounts of higher quality green spaces into their planning, as well as policy makers, who may consider enacting policy changes that mandate a certain amount of area be allocated to green space. The creation of high quality urban green spaces is a novel way to improve mental health outcomes of the Canadian population, and should continue to be considered as both urban centres and mental health issues continue to grow.

References

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Appendix: Article Summaries

Reference	Methodology	Key Findings
<p>Beyer KMM, Kaltenbach A, Szabo A, Bogar S, Nieto FJ, Malecki KM. Exposure to Neighborhood Green Space and Mental Health: Evidence from the Survey of the Health of Wisconsin. <i>Int. J. Environ. Res. Public Health</i> 2014;11(3):3453-3472.</p>	<p><i>Study Type:</i> Cross-sectional</p> <p><i>Participants and Setting:</i> 2,479 individuals nested in 229 Census Block Groups of Wisconsin, USA</p> <p><i>Outcome Measures:</i> Three scales of the 42-item Depression Anxiety and Stress Scales (DASS) instrument</p> <p><i>Explanatory Variable:</i> Level of neighbourhood green space</p>	<p>-Green space has been found to be associated with decreased mental fatigue and reduced stress</p> <p>-After controlling for several confounding factors (age, gender, race/ethnicity, marital status, socioeconomic status), higher levels of neighbourhood green space were significantly associated with lower levels of depression, anxiety, and stress</p>
<p>Nutsford D, Pearson AL, Kingham, S. An Ecological Study Investigating the Association Between Access to Urban Green Space and Mental Health. <i>Public Health</i> 2013;127(11):1005–1011.</p>	<p><i>Study Type:</i> Cross-sectional</p> <p><i>Participants and Setting:</i> Residents aged 15 and over in 3149 small area units in Auckland City, New Zealand</p> <p><i>Outcome Measures:</i> Anxiety/mood disorder treatment counts</p> <p><i>Explanatory Variable(s):</i> Access to green space, classified into either “total green space” (including privately held land) or “useable green space” (such as parks and sports fields)</p>	<p>-In an urban environment, both decreased distance to green space and a larger proportion of neighbourhood green space were found to reduce anxiety/mood disorder treatment counts</p> <p>-Green space was classified as either total or useable, to look at the differences between actively using green space or simply observing its presence</p> <p>-The benefits of green space on mental health may be due to both use of green spaces and the mere presence and observability of green space in a neighbourhood</p> <p>-A significant decrease of 3% in anxiety/mood disorder treatment was found for every 100 m decrease in distance to the nearest useable green space</p>
<p>Van den Berg AE, Maas J, Verheijb RA, Groenewegen PP. Green space as a buffer between stressful life</p>	<p><i>Study Type:</i> Cross-sectional</p> <p><i>Participants and Setting:</i> 4529 Dutch respondents to the second Dutch National Survey of</p>	<p>-It was found that the amount of green space found in a 3-km radius of participant’s homes moderated the negative effect of stressful like events. Participants</p>

<p>events and health. Social Science & Medicine 2010; 70(8):1203–1210.</p>	<p>General Practice (DNSGP-2), conducted in 2000–2002</p> <p><i>Outcome Measures:</i> (1) the number of health complaints in the last 14 days; (2) perceived mental health (measured by the GHQ-12); and (3) a single item measure of perceived general health ranging from ‘excellent’ to ‘poor’.</p> <p><i>Explanatory Variables:</i> Percentages of green space in a 1-km and 3-km radius around the home</p>	<p>with a high amount of green space within a 3-km radius were less affected by a stressful life event than those who had a low amount of green space within a 3-km radius</p> <ul style="list-style-type: none"> -This same effect was observed for perceived mental health. -These results were not observed when researchers only looked at green spaces within a 1-km radius of participant’s homes -Larger areas of green space are more restorative environments than smaller areas of green space -Green space can provide a buffer against stressful and negative life events and promote greater perceived physical and mental health
<p>Astell-Burta T, Feng X, Kolt GS. Mental health benefits of neighbourhood green space are stronger among physically active adults in middle-to-older age: Evidence from 260,061 Australians. Preventive Medicine 2013; 57(5):601–606.</p>	<p><i>Study Type:</i> Cross-sectional</p> <p><i>Participants and Setting:</i> 260,061 Australians over 45 years old living in New South Wales</p> <p><i>Outcome Measures:</i> Kessler Psychological Distress Scale (K10)</p> <p><i>Explanatory Variables:</i> Physical activity (using responses from the Active Australia Survey) and mean percentage green space of neighbourhood</p>	<ul style="list-style-type: none"> -Residents of neighbourhoods with the greatest amounts of green space were less likely to report psychological distress and to live a sedentary lifestyle -Level of physical activity and amount of green space were found to interact -Among the physically active, a protective association between green space and mental health was found -For the age group studied, green space was found to promote physical activity, and those who were physically active in green spaces saw mental health benefits
<p>Thompson CW, Roe J, Aspinall P, Mitchell R, Clow A, Miller D. More green space is linked to less stress in deprived communities:</p>	<p><i>Study Type:</i> Cohort</p> <p><i>Participants and Setting:</i> 25 participants (exploratory study) aged 35-57 years old in Dundee, Scotland, all not in work</p>	<ul style="list-style-type: none"> -The relationships between salivary cortisol levels, well-being, and exposure to green space near place of residence were studied -Salivary cortisol level and

<p>Evidence from salivary cortisol patterns. Landscape and Urban Planning 2012; 105(3):221–229.</p>	<p><i>Outcome Measures:</i> Salivary cortisol (nmol/L) and self-reported stress given by the Perceived Stress Scale</p> <p><i>Explanatory Variables:</i> Self-reported mental wellbeing was measured using a shortened version of the Warwick and Edinburgh Mental Wellbeing Scale. Physical activity was measured by asking how many days in the past 4 weeks participants had been physically active for 30 minutes or more. Socio-economic deprivation was measured based on the Carstairs Index. Finally, the percentage of a participant's residential environment that was green space was also measured.</p>	<p>presence of green space were found to be positively correlated</p> <ul style="list-style-type: none"> -Self-reported stress and presence of green space were found to be negatively correlated -Living environment is a significant and independent predictor of salivary cortisol level -Preliminary findings show that presence of green space close to home have a protective effect on overall health outcomes
<p>Stigsdotter UK, Ekholm O, Schipperijn J, Toftager M, Kamper-Jørgensen F. Health promoting outdoor environments - Associations between green space, and health, health-related quality of life and stress based on a Danish national representative survey. Scandinavian Journal of Public Health 2010; 38: 411–417.</p>	<p><i>Study Type:</i> Cross-sectional</p> <p><i>Participants and Setting:</i> 11,238 Danish adults</p> <p><i>Outcome Measures:</i> Self-reported answers to two questionnaires: the SF-36, which measures eight dimensions of health and the Perceived Stress Scale, which measures self-reported stress</p> <p><i>Explanatory Variable:</i> Distance to green space</p>	<ul style="list-style-type: none"> -Aimed to investigate the relationships between green space, health, and stress -Participants living further than 1 km away from green space self-reported worse health outcomes - Respondents living more than 1 km away from a green space have 1.42 higher odds of experiencing stress than do respondents living less than 300 m from a green space -The study concludes that green spaces play an important role in developing environments which promote health and are also helpful in managing stress
<p>Richardson EA, Pearce J, Mitchell R, Kingham S. Role of physical activity in the</p>	<p><i>Study Type:</i> Cross-sectional</p> <p><i>Participants and Setting:</i> 8157 respondents to the New Zealand</p>	<ul style="list-style-type: none"> -The neighbourhoods with the highest amount of green space were also the neighbourhoods where participants had the

<p>relationship between urban green space and health. <i>Public Health</i> 2013; 127(4):318–324.</p>	<p>Health Survey 2006/07</p> <p><i>Outcome Measures:</i> physical activity; cardiovascular disease; overweight; poor general health; and poor mental health</p> <p><i>Explanatory Variable(s):</i> Neighbourhood-level green space availability</p>	<p>lowest risk of experiencing poor mental health. This finding held true regardless of any individual risk factors</p> <p>-In all neighbourhoods with at least 15% green space, cardiovascular disease risk decreased</p> <p>-Levels of physical activity were also found to be higher in neighbourhoods with higher percentages of green space</p>
<p>Alcock I, White MP, Wheeler BW, Fleming LE, Depledge MH. Longitudinal Effects on Mental Health of Moving to Greener and Less Green Urban Areas. <i>Environmental Science & Technology</i> 2014;48:1247–1255</p>	<p><i>Study Type:</i> Cohort</p> <p><i>Participants and Setting:</i> 1064 participants were identified from individuals who completed the British Household Panel Survey with mental health data (General Health Questionnaire scores) for five consecutive years, and who relocated to a different residential area between the second and third years</p> <p><i>Outcome Measures:</i> Mental health</p> <p><i>Explanatory Variable(s):</i> Post-move neighbourhood level of green space</p>	<p>-Participants who moved to greener neighbourhoods showed increased mental health scores for the following three years</p> <p>-Participants who moved to less green neighbourhoods showed decreased mental health score in the year following their move. However, after the initial year, their mental health scores returned to their baseline pre-move levels</p> <p>-Moving to greener neighbourhoods was found to be statistically significantly associated with improved mental health that is sustainable</p> <p>-Policies to increase urban green space may result in significant public mental health improvements</p>
<p>Richardson EA, Mitchell R. Gender differences in relationships between urban green space and health in the United Kingdom. <i>Social Science & Medicine</i> 2010; 71(3):568–575.</p>	<p><i>Study Type:</i> Cross-sectional</p> <p><i>Participants and Setting:</i> 6432 urban wards, with a total population of 28.6 million adults aged 16–64 years in 2001</p> <p><i>Outcome Measures:</i> Cardiovascular disease mortality, respiratory disease mortality, self-reported limiting</p>	<p>-Researchers looked if any gender differences existed in the relationship between health and urban green space</p> <p>-Cardiovascular disease and respiratory disease rates were found to decrease significantly with increasing green space in males</p> <p>-No such association was observed in females</p>

	<p>long-term illness, and lung cancer mortality</p> <p><i>Explanatory Variable:</i> Urban green space</p>	<p>-Authors conclude that it is important to not assume that all subgroups in a population benefit equally from an intervention or exposure</p>
<p>Mitchell R. Is physical activity in natural environments better for mental health than physical activity in other environments? <i>Social Science & Medicine</i> 2013; 91:130–134.</p>	<p><i>Study Type:</i> Cross-sectional</p> <p><i>Participants and Setting:</i> 1860 participants, with data from the Scottish Health Survey 2008</p> <p><i>Outcome Measures:</i> risk of poor mental health (measured by the General Health Questionnaire) and level of wellbeing (measured by the Warwick Edinburgh Mental health and Wellbeing Score)</p> <p><i>Explanatory Variable:</i> Use of a specific environment for physical activity</p>	<p>-Previous research suggests there may be a synergistic effect between physical activity and performing this activity in a natural environment, leading to a greater increase in mental health when physical activity is performed in green space compared with physical activity performed in other environments</p> <p>-Concludes that physical activity in natural environments is more beneficial to mental health than physical activity performed in other environments</p> <p>-Each additional use of a natural environment per week was found to be significantly associated with about a 6% lower risk of poor mental health</p> <p>-The odds of poor mental health among those who used natural environments as a setting to perform physical activity on a regular basis were 0.557 lower than those who did not use natural environments to perform physical activity</p>
<p>Francis J, Wood LJ, Knuiman M, Giles-Corti B. Quality or quantity? Exploring the relationship between Public Open Space attributes and mental health in Perth, Western Australia. <i>Social Science & Medicine</i> 2012; 74(10):1570–</p>	<p><i>Study Type:</i> Cross-sectional</p> <p><i>Participants and Setting:</i> 911 participants in Perth, Australia living in new housing developments</p> <p><i>Outcome Measures:</i> Mental health as measured by the Kessler 6 instrument</p>	<p>-Looked at the effects of both quality and quantity of Public Open Space (POS) on mental health</p> <p>-Participants living in neighbourhoods with high quality POS were more likely to report good mental health and less likely to experience psychological distress, whether they actually used the POS or</p>

1577.	<p><i>Explanatory Variable(s):</i> Quality and quantity of Public Open Space</p>	<p>not</p> <ul style="list-style-type: none"> -This same effect was not observed for quantity of POS in the neighbourhood -Those living in neighbourhoods with medium or high quality POS have 2 times the odds of better mental health than those living in neighbourhoods with low quality POS
<p>Grahn P, Stigsdotter UK. The relation between perceived sensory dimensions of urban green space and stress restoration. <i>Landscape and Urban Planning</i> 2010; 94(3-4):264–275.</p>	<p><i>Study Type:</i> Cross-sectional</p> <p><i>Participants and Setting:</i> 733 adults participants from 9 Swedish cities</p> <p><i>Outcome Measures:</i> Self-reported health status (including mental health)</p> <p><i>Explanatory Variable(s):</i> Preferences for certain qualities in urban green spaces</p>	<ul style="list-style-type: none"> -Concludes that urban green spaces are an important contributor to overall population mental health -Green spaces have certain qualities, and some may be more important in restoring people from stress -Qualities of urban green spaces need to be calculated to meet their user’s needs. Individuals with high levels of stress are most sensitive to their surroundings -The qualities of “Refuge” and “Nature” are the most highly sought after in urban green spaces by individuals experiencing high levels of stress and is seen as providing a more restorative environment
<p>Irvine KN, Warber SL, Devine-Wright P, Gaston KJ. Understanding Urban Green Space as a Health Resource: A Qualitative Comparison of Visit Motivation and Derived Effects among Park Users in Sheffield, UK. <i>Int. J. Environ. Res. Public Health</i> 2013;10(1):417-442.</p>	<p><i>Study Type:</i> Cross-sectional</p> <p><i>Participants and Setting:</i> 312 park user’s in 13 public green spaces in Sheffield, UK</p> <p><i>Outcome Measures:</i> Derived effects from the use of urban green space</p> <p><i>Explanatory Variable(s):</i> Reasons for visiting urban green space</p>	<ul style="list-style-type: none"> -Qualitative survey of urban public green space users -Public green space user’s motivations most often included walking, green space qualities, and children -Most commonly reported effects from utilizing public green space included relaxation, positive emotions, and spiritual well-being -Results show that participating in physical activity is only one

		<p>motivator for individuals visiting urban green spaces. There are many other motivating factors and benefits (such as relaxation, positive emotions, tranquility, revitalization, satisfaction) users report deriving from public green space</p>
<p>Annerstedt M, Östergren PO, Björk J, Grahn P, Skärbäck E, Währborg P. Green qualities in the neighbourhood and mental health – results from a longitudinal cohort study in Southern Sweden. BMC Public Health 2012;12:337.</p>	<p><i>Study Type:</i> Cohort</p> <p><i>Participants and Setting:</i> Data for 24945 individuals was from population health surveys conducted in the years 1999/2000 and 2005 in Southern Sweden</p> <p><i>Outcome Measures:</i> Mental health as self-reported in the General Health Questionnaire</p> <p><i>Explanatory Variables:</i> Defined green space qualities (Serene, Space, Wild, Culture, Lush) in the environment, person factors (financial stress, living conditions, physical activity)</p>	<p>-Lack of information about what kind of nature provides the greatest benefits to population health</p> <p>-Serene and/or Spacious nature qualities combined with physical activity resulted in improved mental health</p> <p>-Serene spaces are those in which users can experience peace, silence, and care. The sounds of nature are present, and there is a lack of pollution and disturbing people</p> <p>-Spacious spaces feel like “entering another world” and offer rest, such as a forest or beaches</p> <p>-While no direct connections were found between mental health and green space qualities, the authors state that this does not mean one does not exist, and that rather lack of significant findings may have been due to low landscape diversity in the area studied and lack of a validated landscape assessment tool</p>
<p>Roe JJ, Thompson CW, Aspinall PA, Brewer MJ, Duff EI, Miller D, Mitchell R, Clow A. Green Space and Stress: Evidence from Cortisol Measures in Deprived</p>	<p><i>Study Type:</i> Cross-sectional</p> <p><i>Participants and Setting:</i> 106 participants not in work aged 35-55 years in urban centres in Scotland</p>	<p>-Investigated the mechanism by which contact with green space is associated with mental health benefits</p> <p>-A significant and negative association was found between higher green space levels and</p>

<p>Urban Communities. Int. J. Environ. Res. Public Health 2013;10(9):4086-4103.</p>	<p><i>Outcome Measures:</i> Salivary cortisol concentration, perceived level of stress</p> <p><i>Explanatory Variable:</i> Quantity of urban green space in neighbourhood</p>	<p>stress levels</p> <p>-Also found that gender differences exist, with women showing higher levels of stress when living in areas with low levels of green space</p> <p>-Higher levels of urban green space were found to be associated with lower self-reported stress as well as healthier salivary cortisol concentrations in the population studied</p>
<p>White MP, Alcock I, Wheeler BW, Depledge MH. Would You Be Happier Living in a Greener Urban Area? A Fixed-Effects Analysis of Panel Data. Psychological Science 2013;24(6):920–928.</p>	<p><i>Study Type:</i> Cohort</p> <p><i>Participants and Setting:</i> 12,818 participants from the British Household Panel Survey from 1991 to 2008 for mental distress measure, and 10,168 participants from the same source for life satisfaction, all in England</p> <p><i>Outcome Measures:</i> Well-being (by ratings of life satisfaction) and mental distress (by General Health Questionnaires scores)</p> <p><i>Explanatory Variable(s):</i> Urban green space from the Generalised Land Use Database</p>	<p>-After controlling for individual and regional factors, the authors found that individuals have lower mental distress and higher well-being when they live in urban areas with more green space</p> <p>-These effects were still present after controlling for individual level factors such as income, employment status, marital status, health, housing type, and local-area-level variables</p> <p>-While individual level effects may be small, the potential cumulative benefit for the larger community of having green spaces must be considered when planning urban areas</p> <p>-Measure of green space was simplistic, and did not account for any changes in green space area over time</p>