NATURAL ENGLAND

Monitor of Engagement with the Natural Environment

A summary report on nature connectedness among adults and children in England

Analyses of relationships with wellbeing and pro-environmental behaviours.

March 2020

For further information see:
https://www.gov.uk/government/collections/monitor-of-engagement-with-the-natural-environment-survey-purpose-and-results

Foreword

Between 2009 and 2019, Natural England commissioned Kantar TNS to undertake the Monitor of Engagement with the Natural Environment survey (MENE). The MENE survey enabled Natural England and partners including the Department of Environment, Food and Rural Affairs to:

- Understand how people use, enjoy and are motivated to protect the natural environment
- Monitor changes in use of the natural environment over time, at a range of different spatial scales and for key groups within the population
- Inform delivery initiatives so that they link more closely to people's needs
- Evaluate the impact and effectiveness of related policy initiatives.

Other MENE outputs related to the results presented in the summary report include:

- A report detailing the development and testing of the new Nature Connection Index
- A Technical Report providing full details of the MENE survey methodology
- Raw data files of the adult and child datasets

Please see GOV.UK for these and other outputs from the survey: https://www.gov.uk/government/collections/monitor-of-engagement-with-the-natural-environment-survey-purpose-and-results

For more information on MENE or this publication contact the responsible officer, Rose O'Neill, by email: MENE@naturalengland.org.uk

This is a summary report collated by Natural England (Anne Hunt) and Kantar TNS (Duncan Stewart) on behalf of the project partners. The report summarises the key findings of a collaborative project whose results have been published in 2 peer reviewed journals:

A Measure of nature connectedness for Children and Adults: Validation, Performance, and Insights (1)

Nature contact, nature connectedness and associations with health, wellbeing and pro-environmental behaviours (2)

The MENE data used by the project was collected between May 2015 and February 2018 and was published in September 2019 and is available to download at: http://publications.naturalengland.org.uk/publication/6055858054365184?category=6663557926354944

All photographs in this report are from free to use sources.

For information on Natural England publications contact the Natural England Enquiry Service on 0845 600 3078 or e-mail MENE@naturalengland.org.uk.

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Background – developing a national measure of nature connectedness

In 2013, Natural England established a Nature Connection Working Group drawn from research and practice communities with expertise and interest in this area.

The Nature Connection Working Group reports to Natural England's Strategic Research Network for People and Environment and National Outdoors for All Working Group.

The Working Group identified the need for and then developed a measure for nature connectedness that was suitable for use in national surveys with both adults and children.

Detail on the rationale for and the development, testing and validation of the new 'Nature Connection Index' (NCI) in the Monitor of Engagement with the Natural Environment Survey (MENE) has already been published:

Monitor of Engagement with the Natural Environment Survey: developing a method to measure nature connection across the English population (3)

A Measure of nature connectedness for Children and Adults: Validation, Performance, and Insights (1)

Using the new national measure of nature connectedness

This report summarises the findings from a study that collected and analysed data to explore the relationships between nature contact, nature connectedness, wellbeing and pro-environmental behaviours.

This report summarises the key findings from the results of that study and that have already been published in 2 peer reviewed journals.

A Measure of nature connectedness for Children and Adults: Validation, Performance, and Insights (1)

Nature contact, nature connectedness and associations with health, wellbeing and pro-environmental behaviours (2)

This study extended previous work in this area by looking at nature contact, nature connectedness, wellbeing and pro-environmental behaviours in the same study, and by accounting for a wide range of individual and area level variables that are known to be important for wellbeing and pro-environmental outcomes. This approach also allowed the magnitude of the relationships between variables to be compared with those seen for key socio-demographic benchmarks.

The Nature Connection Working Group

Between 2013 and 2019, work on developing and testing the new Nature Connection Index was driven, funded and delivered by a wide collaboration of the following partners in the Nature Connection Working Group:

Historic England, Kantar, Leeds Beckett University, National Trust, Natural England, Plymouth University, RSPB, University of Derby, University of Edinburgh, University of Essex, University of Exeter, University of Greenwich, University of Surrey and the Wildlife Trusts.

The Nature Connection Working Group was convened and chaired by Natural England.

Executive summary – headline findings

Overall findings

Nature connectedness is a valuable measure of individual differences in people. Analysis of the Nature Connection Index from MENE revealed:

- Positive relationships between people's nature connectedness and their wellbeing and pro-environmental behaviours. These relationships remained after accounting for a wide range of socio-demographic and other variables, including people's general health and their contact with nature through visits to natural environments. In conclusion, nature connectedness is a significant factor in relation to wellbeing and pro-environmental behaviours.
- Reported pro-environmental behaviours and wellbeing were highest among people who also reported both high visit frequency to natural environments and high nature connectedness. The implication of this is that optimising pro-environmental and wellbeing outcomes is likely to rely on increasing both contact and connection with nature.
- Nature connectedness was also able to moderate or enhance some positive outcomes of contact with nature .

Specific findings

General health and wellbeing: results suggested that contact with nature was good for people's general health and nature connectedness is good for their eudaimonic wellbeing (the feeling that life is worthwhile). For example, people with high nature connectedness were 1.7 times more likely to report that their lives were worthwhile than those with low nature connectedness. People who visited nature at least once a week were 1.9 times more likely to also report good general health.

Household pro-environmental behaviours: individuals with high nature connectedness were 2.0 times more likely to report these behaviours than those with low nature connectedness; individuals with high visit frequency were 1.7 times more likely to report these behaviours.

Conservation pro-environmental behaviours: individuals with high nature connectedness were 1.8 times more likely to report conservation behaviours than those with low nature connectedness. Visit frequency did not show a significant relationship with these behaviours. (Pro-environmental behaviours that require a greater personal commitment, and which are currently reported by a relatively low percentage of the population, were associated with higher levels of nature connectedness.)

The results for both eudaimonic wellbeing and household pro-environmental behaviours were greater in magnitude than for the standard benchmarks tested.

Socio-demographics: nature connectedness did not show a marked relationship with any of the socio-demographic variables studied other than with age. Levels of nature connectedness dipped as children approached their early teenage years. The levels of nature connectedness among children was positively related to those of the adults in their household.

Limitations of the study are discussed in the report, for example MENE provides cross-sectional data to identify and compare relationships. Causality can be explored through different approaches.

Introduction and approach

What is nature connectedness?

Is nature connectedness different to nature contact?

Nature connectedness has relatively recently been defined as a measurable psychological construct that describes a person's relationship with the natural world. It includes aspects related to a person's affective (emotional) and cognitive relationship to nature and their sense of place in nature (4).

So, nature connectedness is very different to simply describing a person's exposure to or contact with nature. Contact with nature is typically reported through measures like visit frequency, length of visit and visit location.

A person's nature connectedness can change over time and in response to different experiences (rather like a person's wellbeing can change.) Five pathways to nature connectedness have been described (5) and are already being used to design activities that are effective in increasing people's nature connection.

Why is nature connectedness important?

Since publication of Natural England's evidence briefing on Connection to Nature in 2016 (6), research has continued to point to distinct and causal relationships between nature connectedness and people's wellbeing (7, 8) and to their pro-environmental attitudes and behaviours (9).

With crises in both human and environmental health, there is an increasingly urgent need to better understand people's connectedness to nature as well as their contact with nature if we are to be able to respond effectively to government ambitions to 'reconnect people with the natural environment', including the commitments set out in Government's 25 Year Environment Plan (10).

Measuring contact with nature through MENE

The MENE survey ran continuously for 10 years from March 2009 to February 2019. Data was collected across the whole of England and provided a nationally representative picture of the population's contact with nature as well as data on demographics, environmental attitudes and behaviours, and a number of other outcomes such as health and wellbeing.

Several different aspects of contact with nature were quantified through the MENE survey, including the frequency at which adults and children in England visit the natural environment.

The MENE survey, commissioned by Natural England and Defra, was run as part of a face-to-face in-home omnibus survey conducted by trained interviewers using computer-assisted personal interviewing.

The need to measure nature connectedness

The research and development work that led to the findings shared in this report has allowed MENE, for the first time, to also report on the levels of nature connectedness among adults and children in England.

Developing a simple way to report on nature connectedness

In 2013, Natural England's Strategic Research Network for People and Environment and National Outdoors for All Working Group established a Nature Connection Working Group drawn from research and practice communities with expertise and interest in this area.

The Group reviewed the literature and practice and concluded that none of the existing measures for nature connectedness were suitable for use in a national survey as they were either too long, too complex, or unsuitable for use with both adults and children. (Collecting data from both adults and children was desirable to allow comparison of levels of nature connectedness at different life stages.)

So, the Group developed, tested and validated a new short, simple 6 item scale for nature connectedness for use with both adults and children. The new 'Nature Connection Index' (NCI) is reported as a weighted points index, with scores from 0-100. The 6 scale questions are listed overleaf.

The weighted points index was developed following standard approaches to balance representation of all 6 items in the final score and to increase the spread of responses across the sample. This approach also brought the NCI in line with expectations for a national indicator.

For detail on the development, testing and validation of the NCI please see:

Monitor of Engagement with the Natural Environment Survey: developing a method to measure nature connection across the English population (3)

A Measure of nature connectedness for Children and Adults: Validation, Performance, and Insights (1)

The rest of this report provides a summary of the key findings from analyses of a second wave of data collected through MENE. The analyses began to explore relationships between nature contact, nature connectedness, wellbeing and pro-environmental behaviours.

The Nature Connection Working Group

Between 2013 and 2019, the work on developing and testing the new Nature Connection Index was driven, funded and delivered by a wide collaboration of the following partners in the Nature Connection Working Group:

Historic England, Kantar, Leeds Beckett University, National Trust, Natural England, Plymouth University, RSPB, University of Derby, University of Edinburgh, University of Essex, University of Exeter, University of Greenwich, University of Surrey and the Wildlife Trusts.

The Nature Connection Working Group was convened and chaired by Natural England.

The survey approach

To date, studies have rarely explored contact with and connectedness to nature simultaneously. This study set out to use the Nature Connection Index (NCI) within MENE to begin to compare relationships between nature contact, nature connectedness, and key outcomes such as self-reported health, wellbeing, pro-environmental attitudes and behaviours with demographics.

The new 6 statement NCI scale was included in eight quarterly waves of the MENE survey between May 2015 and February 2018.

The NCI statement results used for this study were gathered from a sample of 4,960 adults (aged between 16 and 95 years) and a sample of 461 children (aged between 7 and 15 years).

Within this overall sample of adults and children, a sub-sample of 211 was available to compare data from adults and children living in the same household.

The results presented in this report are statistically significant unless otherwise stated.

Full details of sampling procedures can be found in the annual MENE Technical Reports. Data and technical reports are available at: https://www.gov.uk/government/collections/monitor-of-engagement-with-the-natural-environment-survey-purpose-and-results

Survey participants were read the following definition of nature to help them respond to the questions '*By nature I mean all different types of natural environment and the things that live in them. It can be close to where you live or further away, and includes green spaces in towns and cities (such as your own and other people's gardens, parks, playing fields and allotments); the countryside (such as farmland, woodland, hills and mountains); and watery places (such as streams, canals, rivers, lakes, the coast and the sea).'*

The 6 Nature Connection Index scale items are:

- I always find beauty in nature
- I always treat nature with respect
- Being in nature makes me very happy
- Spending time in nature is very important to me
- I find being in nature really amazing
- I feel part of nature

Survey respondents rated their levels of agreement with each statement on a 7 point scale. The rationale for choosing these 6 statements, a 7 point response scale and a weighted points index score (0-100) are given in the publications listed below:

Monitor of Engagement with the Natural Environment Survey: developing a method to measure nature connection across the English population (3)

A Measure of nature connectedness for Children and Adults: Validation, Performance, and Insights (1)

The analyses

Data analysis for this report was led by project partners at Exeter, Plymouth and Derby Universities.

A collaboration between the Universities of Plymouth and Exeter used analyses that included a series of logistic and linear regressions, all models controlled for age, gender, ethnicity, working status, marital status, dog ownership, social grade, neighbourhood greenspace, area-deprivation, urbanicity and a number of outcome variables (2).

As shown on the right, their analyses included investigation of the relationships between the following key variables

- three types of nature contact
- connectedness to nature
- self-reported general health (as used in the UK Public Health Outcomes Framework)
- two types of subjective wellbeing (as used by the UK Office of National Statistics)
- two groups of pro-environmental behaviours.

The results table from the logistic regression models can be found on page 19.

Pages 12 and 13 also present some results from an additional set of analyses by The University of Derby (1)

Page 14 presents a simple descriptive statistic to illustrate the patterns seen when confounding variables were accounted for in the more sophisticated logistic regression modelling.

Full results that have informed this summary report can be found here:

A Measure of nature connectedness for Children and Adults: Validation, Performance, and Insights (1)

Nature contact, nature connectedness and associations with health, wellbeing and pro-environmental behaviours (2)

MENE provided cross-sectional data which is able to tell us about relationships between variables but not causality.

Key variables explored in the regression analyses

Nature contact

- **Intentional contact** – whether or not respondents normally visited natural places at least once a week (high frequency) or less than once a week (low frequency). Visits include all time outdoors in natural places including urban greenspaces, countryside or coast, for any duration of time.
- **Incidental contact** – whether or not there was availability of neighbourhood greenspace measured at the Lower Super Output Area (LSOA)
- **Indirect contact** – whether or not respondents reported watching or listening to nature programmes on TV or radio

Health and wellbeing

Respondent's ratings of their own health and wellbeing in the following areas, categorised as either high or low:

- **Good general health**
- **High evaluative wellbeing** ('Overall how satisfied are you with life nowadays?')
- **High eudaimonic wellbeing** ('*Overall, to what extent do you feel that the things you do in your life are worthwhile?')*

Nature connectedness

- **Whether or not respondents had high or low Nature Connection Index scores (around the median score of 59.)**

Pro-environmental behaviours

Respondent's reporting of their own pro-environmental behaviours loaded into 2 broad groups and were then categorised as either high or low:

Household pro-environmental behaviours

- I usually recycle items rather than throw them away
- I usually buy eco-friendly products and brands
- I usually buy seasonal or locally grown food
- I choose to walk or cycle instead of using my car when I can
- I encourage other people to protect the environment

Conservation pro-environmental behaviours

- I am a member of an environmental or conservation organisation
- I volunteer to help care for the environment
- I donate money at least once every three months to support an environmental or conservation organisation
- I donate my time at least once every three months to an environmental or conservation organisation

Note: All the variables shown here were collected through the MENE survey apart from incidental contact which used Lower Super Output Area data from the Office of National Statistics.

Headline findings

Nature connectedness, nature contact and demographics

Demographics

The most notable relationship seen in the analyses of the Nature Connection Index (NCI) against demographics with was with age. Please see Figure 1 to the right.

In general, levels of nature connectedness were relatively consistent across the different adult population groups studied. For example nature connectedness was only related to socio-economic group and gender to a limited extent; adults from lower socio-economic groups tended to have lower nature connectedness than adults from higher socio-economic groups and adult males tended to have lower nature connectedness than adult females. The findings suggested little or no relationship between a person's nature connectedness and their ethnicity as captured by the MENE survey.

Relationships within households

Reflecting the results of the pilot NCI study, results from this study found that there was a positive relationship between the level of nature connectedness among children and adults in the same household . In contrast, children's nature connectedness was not related to any other variables studied, including adult or child visit frequency.

Contact and connection

There was a positive relationship between nature connectedness and nature contact (people who visited nature frequently also tended to report higher levels of nature connectedness.) It is worth noting that a high level of nature connectedness was not always associated with a high visit frequency, for example, although men and women tend to report visiting natural environments at about the same frequency, women tended to report higher nature connectedness. In other words, nature connectedness does not simply mirror visit frequency and is clearly being influenced by other factors.

For more detail see: Nature contact, nature connectedness and associations with health, wellbeing and pro-environmental behaviours (2)

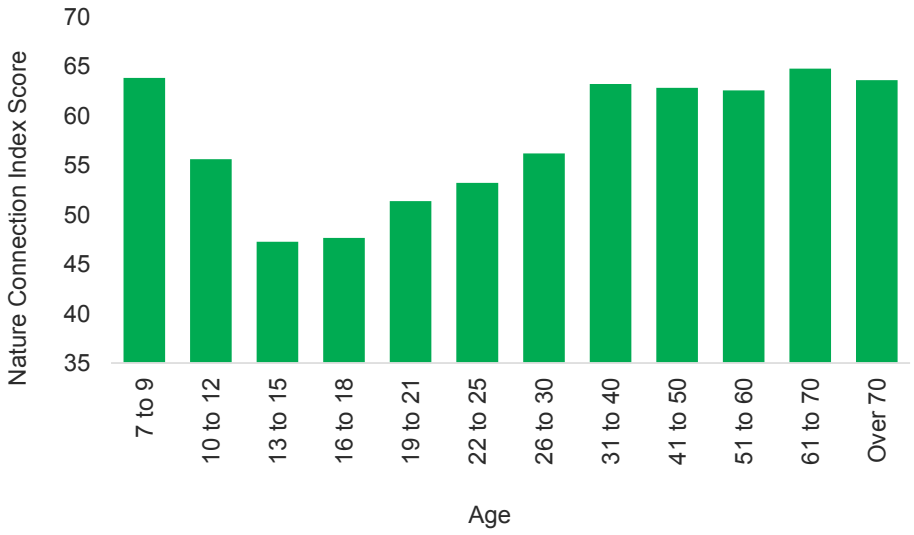
Age

Analysis showed a clear dip in levels of nature connectedness was seen around the early teenage years, with high nature connectedness being more likely among children aged 7-9, levels dipping at age 10-12 and being lowest among 13-15 and 16-18-year olds.

Detail and more discussion on the children's data can be found in A Measure of nature connectedness for Children and Adults: Validation, Performance, and Insights (1)

Although the sample sizes for children's age groups are relatively small, the pattern seen is consistent with other reports (3 & 11).

Figure 1 **NCI by age**



Levels of nature connectedness and self-reported participation in pro-environmental behaviors among adults

Analysis by the University of Derby of mean Nature Connection Index (NCI) scores among the adult population showed the levels of nature connectedness that are associated with different pro-environmental outcomes. For example, household recycling was associated with a mean NCI score of 63, just above the population mean of 61, whereas giving up time to volunteer to help the environment was associated with a mean NCI score of 76.

These results have been interpreted to suggest that pro-environmental behaviours requiring a greater personal commitment, and which are currently reported by a relatively low % of the population, are strongly associated with higher levels of nature connectedness.

More detail about the results presented on this page can be found here:

A Measure of nature connectedness for Children and Adults: Validation, Performance, and Insights (1)

Results from the related regression analysis by Plymouth and Exeter Universities are presented on the next page.

	Responded Yes		Responded No
Behaviours	**NCI – Mean Score**	**% of population who responded Yes**	**NCI – Mean Score**
Usually recycle	63.39	76.2	53.99
Walk or cycle instead of car	66.27	46.0	56.80
Buy seasonal or locally grown food	69.51	34.1	56.83
Usually buy eco-friendly products	71.09	24.4	57.95
Encourage others to protect environment	72.46	27.5	56.87
Signed a petition for conservation campaign	73.42	8.9	59.96
Donate money to environmental or conservation organization	74.11	8.7	59.93
Donate time to environmental or conservation organization	74.56	3.5	60.68
Member of conservation organization	76.12	7.0	60.04
Volunteer to help the environment	76.23	4.8	60.39
None of these	47.53	11.6	62.95

More detail on nature connectedness, contact and pro-environmental behaviours

The results from the Plymouth, Exeter & Derby University regression analysis are presented below. More detail on this (and additional results not covered in this report) can be found here: Nature contact, nature connectedness and associations with health, wellbeing and pro-environmental behaviours (2).

The analysis found that pro-environmental behaviours loaded into 2 distinct groups - called for this study the 'conservation pro-environmental behaviours' and the 'household pro-environmental behaviours' (see page 9.) Headline results from regression analyses on these groups were as follows (see page 20 for detail):

Conservation pro-environmental behaviours: nature connectedness was positively related to an individual's conservation pro-environmental behaviours. **Individuals with high nature connectedness were 1.8 times more likely to report these behaviours** than those with low nature connectedness. Visit frequency did not show a significant relationship with these behaviours.

Household pro-environmental behaviours: nature connectedness and visit frequency were both positively related to household pro-environmental behaviours. **Individuals with high nature connectedness were 2.0 times more likely to report these behaviours** than those with low nature connectedness**; individuals with high visit frequency were 1.7 times more likely to report these behaviours** than those with low visit frequency**.**

Contact and connectedness were independently related to household pro-environmental behaviours: nature connectedness and visit frequency were independently related to household pro-environmental behaviours. Nature connectedness was not simply meditating or moderating the effects of visiting nature on household pro-environmental outcomes. The relationship between nature connectedness and pro-environmental behaviours was stronger or as least as strong as visit frequency and the accepted benchmark of gender. Unlike many other studies this study is notable for finding a consistent positive relationship between nature visits and pro-environmental household behaviours.

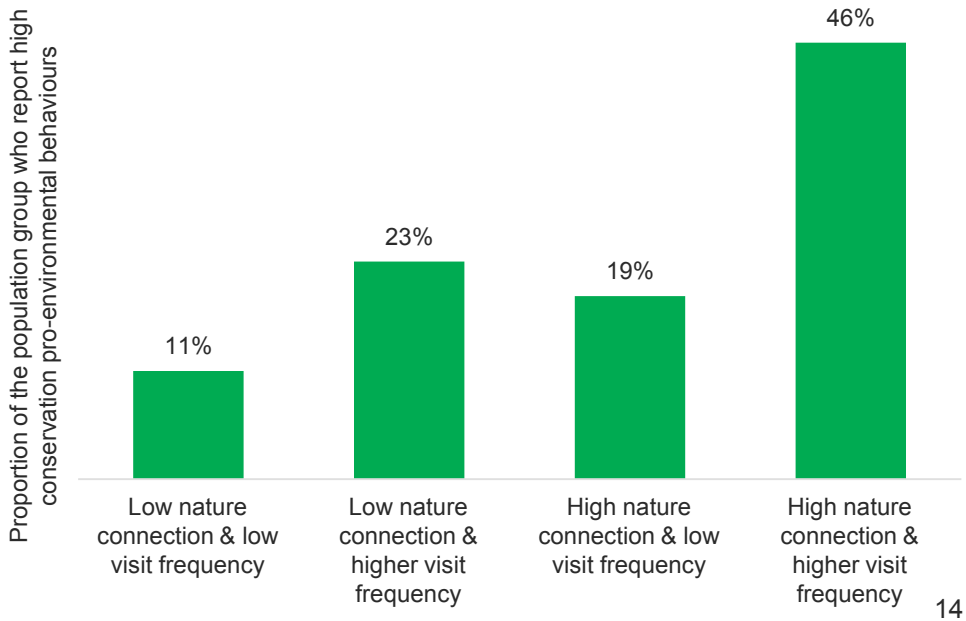
As MENE provided cross-sectional data, it is not possible to state causality. Mackay & Schmitt recently established a causal relationship between nature connection and pro environmental behaviours (9). Further work to identify how levels of nature connectedness relate to different stages or thresholds of behaviour change is being progressed.

The additive effect of high visit frequency and high nature connectedness

Reported pro-environmental behaviours were highest among people who also reported both high visit frequency and high nature connectedness. For example, there was a clear additive effect of high nature connectedness on conservation pro-environmental behaviours, regardless of whether people had either a high or a low visit frequency.

A simple descriptive example is given in Figure 2 to help illustrate this relationship. 46% of all the people who reported high levels of conservation pro-environmental behaviours also reported high nature connectedness and high visit frequency.

Figure 2 **Proportion of the population group who report high conservation pro-environmental behaviours shown by visit frequency and nature connection**



Nature connectedness and wellbeing

Eudaimonic wellbeing *('Overall, to what extent do you feel that the things you do in your life are worthwhile?')*

Nature connectedness was positively related to eudaimonic wellbeing. Visit frequency was not related to eudaimonic wellbeing.

People with high nature connectedness were 1.7 times more likely to report that their lives were more worthwhile than those with low nature connectedness.

The effect size was greater than that seen for the accepted socio-demographic benchmark of marital status.

Evaluative wellbeing *('Overall how satisfied are you with life nowadays?')*

Neither nature connectedness nor visit frequency had a significant relationship with evaluative wellbeing after controlling for eudaimonic wellbeing or general health.

However, analyses did reveal an interaction suggesting that nature connectedness may moderate the effect of visits on evaluative wellbeing. A possible explanation is that visiting nature frequently may not be enough in itself to raise evaluative wellbeing, rather it may also require a connectedness to nature.

Overall wellbeing: These results suggest that nature connectedness is important not only in its own right as a factor in people's psychological wellbeing, but also for its effects on moderating the wellbeing effects of visiting nature (nature contact.) The results are meaningful as effect size seen was greater in magnitude than standard benchmarks.

General health

Visit frequency (but not nature connectedness) had a positive relationship with self-reported general health. **People who visited nature at least once a week were 1.9 times more likely to also report good general health.**

Regression analyses found no significant effects of socio-economic group on general health or wellbeing, suggesting that nature contact is more important for general health than socio-economic group in this dataset.

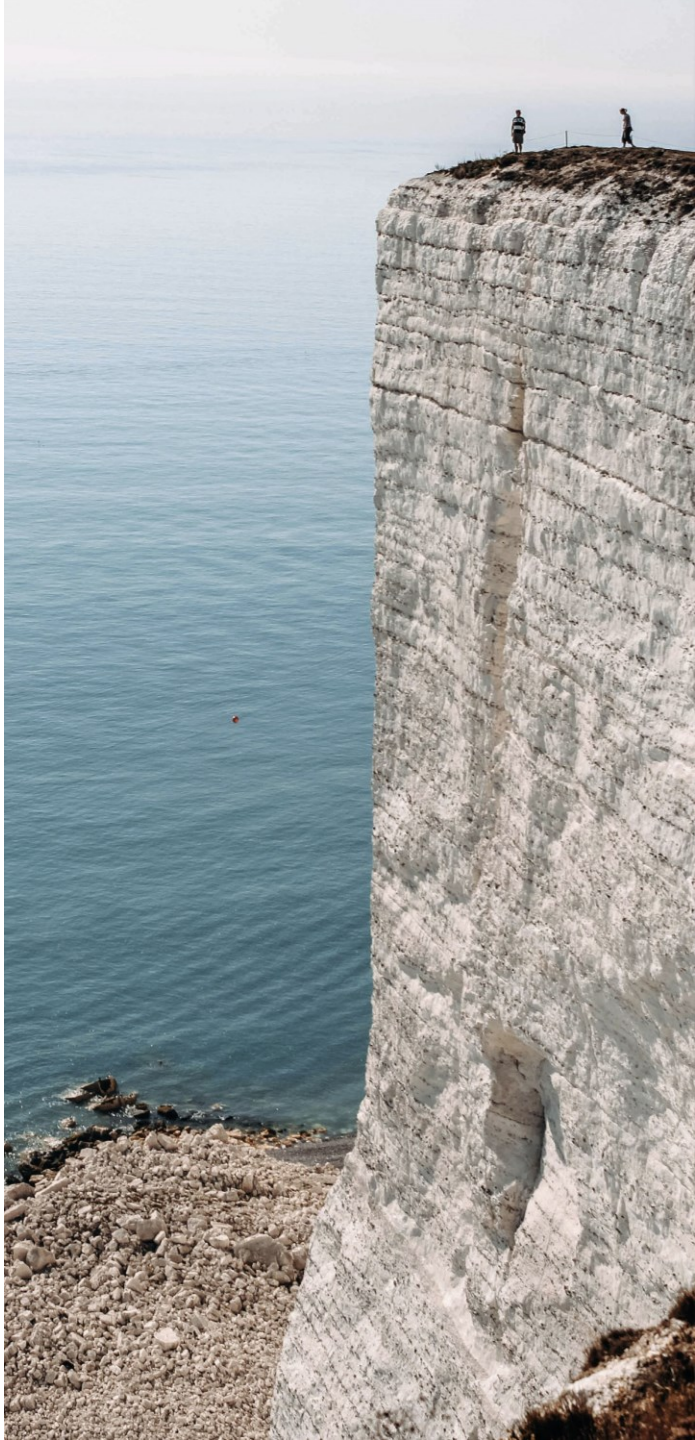
In summary, these results suggest that contact with nature is good for people's general health and nature connectedness is good for their wellbeing.

More detail on all the results presented here and results not covered in this report (including analysis of different types of contact with nature) can be found here: Nature contact, nature connectedness and associations with health, wellbeing and pro-environmental behaviours (2).

Limitations

The limitations of this study include:

1. MENE survey data was cross-sectional which limited inferences of causal direction. Causal relationships have been established elsewhere (8 & 9). It is likely that contact and connectedness processes are complex, self-reinforcing and bidirectional (for example see (10) for evidence of bi-directionality between nature connectedness and wellbeing). Gathering longitudinal data, not least to explore the dip in levels in the early teenage years is a clear recommendation for future research.
2. MENE survey uses self-reported data. There is good evidence that self-reported health and wellbeing correlate strongly with objective indices (13 &14), however more caution may be needed about self-reported pro-environmental behaviours.
3. We know little about the quality of people's contact with nature from this survey. This is important as recent research suggests higher subjective wellbeing is associated with visits to higher quality nature settings (12). Secondly, the quality of the interaction is also determined by the activity, for example interventions to notice the 'good things' in nature have been found to increase nature connectedness and deliver clinically significant increases in mental health, even in relatively 'mundane' urban environments (15). Further work is needed to explore this in more detail.
4. We recognise that these data are only representative of the current population of England and further work is needed to see whether similar effects are found in other countries and continents.
5. Analysis to better understand relationships between contact, connectedness and people's attitudes and values to the natural environment, as well as their behaviours, is being progressed but is not reported here.



Conclusions on contact and connectedness

Conclusions on contact and connectedness

Headlines

Nature connectedness can be used as a measure of individual differences in people, which when captured by the Nature Connection Index, revealed that:

- Nature connectedness has a positive relationship with people's eudaimonic wellbeing (the feeling that life is worthwhile) and their pro-environmental behaviours. These relationships remained after accounting for a wide range of socio-demographic and other variables, including people's general health and their contact with nature through visits to natural environments. So, nature connectedness emerged as a significant factor for these outcomes in its own right. The results seen for eudaimonic wellbeing and household pro-environmental behaviours were greater in magnitude than for the standard socio-demographic benchmarks tested.
- Nature connectedness also had the ability to moderate or enhance the positive outcomes of contact with nature.
- Reported pro-environmental behaviours and wellbeing were highest among people who also reported both high visit frequency to natural environments and high nature connectedness.
- Levels of nature connectedness dipped as children approached their early teenage years. The levels of nature connectedness among children was positively related to those of the adults in their household.

Implications:

- The Nature Connection Index is a validated population measure that could be used nationally and internationally to help understand and track improvements in nature connectedness to inform policy, research and practice.
- Integrated policies and practices for enabling both nature contact and nature connectedness will be needed to achieve synergistic improvements in public health and environmental goals.
- Policy, research and practice should consider delivery of interventions designed to increase both contact with nature (for example through increasing visit frequency) and nature connectedness (for example by adopting the 5 pathways to nature connection (5). In other words to consider both the 'quantity' and the 'quality' of people's experiences in nature, including where they happen, how they happen and who they happen with.

Next steps:

There is a need to build awareness and understanding of the relevance and importance of nature connectedness (why it matters, how to measure it, and how to enable it) among policy, practice and research communities with an interest in connecting people and nature.

Enabling nature connectedness is likely to require changes in nature-based intervention design and delivery, so that people's contact with nature (whether motivated by health, sport, learning, recreation or work) can also offer opportunities to build their connectedness to nature.

Doing this relies on better understanding our audiences and building our capacity to use simple, reliable tools to help target, shape and evaluate interventions designed specifically to increase both contact and connection.

Meanwhile there is a need to support ongoing research and evidence in this area – including gaining a better understanding of the relationships that exist between nature connection and key outcomes; what works to support nature connectedness among different groups of people in different contexts; and the factors that influence how nature connectedness changes across the lifespan. An immediate next step is identifying where inclusion of the Nature Connection Index in national and international surveys and in practical delivery contexts could improve our insight and understanding in these areas.

Appendices

Summary of fully-adjusted binary logistic regression models predicting favourable outcomes across health, wellbeing and pro-environmental domains

	General Health		Evaluative Wellbeing (life satisfaction)		Eudaimonic Wellbeing (worthwhile activities)		Household pro-environmental behaviours		Nature conservation pro-environmental behaviours	
	OR	**95% CI**	**ORs**	**95% CIs**	**OR**	**95% CIs**	**OR**	**95% CIs**	**OR**	**95% CIs**
Initial Models										
Neighbourhood greenspace (High)	.91	.78, 1.07	1.07	.90, 1.26	.97	.82, 1.14	1.06	.91, 1.24	.89	.73, 1.08
Nature visits (≥ once a week)	1.85***	1.60, 2.14	1.02	.88, 1.19	1.08	.93, 1.26	1.74***	1.51, 2.01	1.16	.97, 1.39
Nature programmes TV/radio (Yes)	.99	.85, 1.14	.83*	.71, .96	1.10	95, 1.28	2.85***	2.49, 3.28	1.57***	1.31, 1.89
Nature connectedness(High)	.96	.83, 1.11	1.03	.79, 1.06	1.72***	1.48, 2.01	2.05***	1.79,2.35	1.80***	1.51, 2.15
Moderation Models										
Neighbourhood greenspace (High)	.84	.68, 1.03	1.04	.84, 1.28	1.04	.84, 1.28	.91	.74, 1.11	.85	.64, 1.13
Nature visits (≥ once a week)	2.01***	1.66, 2.45	.89	.73, 1.09	1.16	.95, 1.42	1.58***	1.30, 1.93	1.32	1.00, 1.75
Nature programmes TV/radio (Yes)	1.01	.83, 1.23	.87	.71, 1.06	1.01	.83, 1.23	2.67***	2.20, 3.24	1.37*	1.04, 1.79
nature connectedness(High)	.99	.74, 1.32	.87	.65, 1.18	1.86***	1.37, 2.51	1.41*	1.04, 1.91	1.73**	1.16, 2.56
Greenspace x NC	1.21	.91, 1.60	1.07	.80, 1.43	.84	.63, 1.13	1.37*	1.05, 1.78	1.07	.76, 1.49
Visits x NC	.84	.63, 1.11	1.36*	1.01, 1.82	.85	.63, 1.15	1.22	.92, 1.61	.80	.56, 1.15
Nature progs. x NC	.95	.71, 1.26	.90	.67, 1.21	1.22	.91, 1.65	1.15	.88, 1.51	1.27	.89, 1.81

Note: OR = Odds Ratios; CIs = Confidence Intervals; NC= Nature Connectedness; *** $p<0.001$; ** $p<0.01$; * $p<0.05$. Controls included in these models: Area level –urbanicity, deprivation Individual level – age, gender, socioeconomic status, employment status, household composition, ethnicity, survey year; Related outcome variables (See Table S5-6 for details).

Table from: Nature contact, nature connectedness and associations with health, wellbeing and pro-environmental behaviours (8)

References

1. Richardson, M., Hunt, A., Hinds, J., Bragg, R., Fido, D., Petronzi, D., Barbett, L., Clitherow, T., & White, M. (2019). A measure of nature connectedness for children and adults: Validation, performance, and insights. *Sustainability, 11(12),* 3250.
2. Martin, L., White, M. P., Hunt, A., Richardson, M., Pahl, S., & Burt, J. (2020). Nature contact, nature connectedness and associations with health, wellbeing and pro-environmental behaviours. *Journal of Environmental Psychology*, 101389.
3. Hunt, A., Stewart, D., Richardson, M., Hinds J., Bragg, R., White, M. and Burt, J. (2017.) Monitor of Engagement with the Natural Environment: developing a method to measure nature connection across the English population (adults and children) Natural England Commissioned Reports, Number 233. York.
4. Mayer, F. S., & Frantz, C. M. (2004). The connectedness to nature scale: A measure of individuals' feeling in community with nature. *Journal of environmental psychology*, *24*(4), 503-515.
5. Lumber, R., Richardson, M., & Sheffield, D. (2017). Beyond knowing nature: Contact, emotion, compassion, meaning, and beauty are pathways to nature connection. *PloS one, 12(5),* e0177186
6. Natural England (2016). Connection to Nature: evidence briefing (EIN015). Available at: http://publications.naturalengland.org.uk/publication/4792791243161600
7. Pritchard, A., Richardson, M., Sheffield, D., & McEwan, K. (2019). The relationship between nature connectedness and eudaimonic well-being: A meta-analysis. *Journal of Happiness Studies, 1-23.*
8. McEwan, K., Richardson, M., Sheffield, D., Ferguson, F. J., & Brindley, P. (2019). A smartphone app for improving mental health through connecting with urban nature. *International journal of environmental research and public health*, *16*(18), 3373.
9. Mackay, C. M., & Schmitt, M. T. (2019). Do people who feel connected to nature do more to protect it? A meta-analysis. *Journal of Environmental Psychology, 65*, 101323.
10. UK Government (2018). 25 Year Environment Plan Available at: www.gov.uk/government/publications/25-year-environment-plan
11. Hughes, J., Rogerson, M., Barton, J., & Bragg, R. (2019). Age and connection to nature: when is engagement critical?. *Frontiers in Ecology and the Environment, 17(5),* 265-269.
12. Wyles, K. J., White, M. P., Hattam, C., Pahl, S., King, H., & Austen, M. (2019). Are some natural environments more psychologically beneficial than others? The importance of type and quality on connectedness to nature and psychological restoration. *Environment and Behavior, 51(2*), 111-143.
13. Diener, E., Suh, E. M., Lucas, R. E., & Smith, H. L. (1999). Subjective well-being: Three decades of progress. *Psychological bulletin, 125(*2), 276.
14. Kyffin, R. G., Goldacre, M. J., & Gill, M. (2004). Mortality rates and self reported health: database analysis by English local authority area. *Bmj, 329(7471*), 887-888.
15. Richardson, M., & Sheffield, D. (2017). Three good things in nature: Noticing nearby nature brings sustained increases in connection with nature. *Psyecology, 8(1),* 1-32.