Forest Research

Valuing Mental Health Benefits of Forests

Vadim Saraev, Liz O'Brien, Gregory Valatin, and Matthew Bursnell

October 2022

For TDAG

Presentation Outline

- Why to estimate & value ecosystems
- Natural capital: carbon and beyond
- Background to the study
- Aims and Objectives
- Methods
- Results
- Research gaps

Why we need to value ecosystem services?

- "…in the absence of economic valuation, implicitly economic-based business political decision making will assign ecosystems a default value of **zero**."
- "…economic valuation could be a useful instrument in **communicating the case for ecosystem service protection** and **accounting for 'market failures'** by making evident the **true costs of activities which degrade them**".
- "**provide a single common unit** which can be used to condense a complex system and to compare the impacts of alternative policy measures…"

- To justify and decide how to allocate public spending on conservation, preservation, or restoration initiatives.
- To prioritise conservation or restoration projects.
- To maximise the environmental benefits per pound spent.

Annual values woodland ecosystem services, £ million (2018 prices), UK, 2017

Ecosystem services	England	Wales	Scotland	Northern Ireland	UK Total, UK	% of
Timber	51	30	135	7	**224**	6.9%
Wood fuel	12	7	31	2	**51**	1.6%
Carbon Sequestration	553	78	531	42	**1,204**	37.0%
Pollution removal	390	100	411	37	**938**	28.8%
Flood prevention (GB only)	146	23	49		**219**	6.7%
Urban woodland cooling (GB only)	86	2	0		**88**	2.7%
Noise reduction	13	1	1	1	**15**	0.5%
Recreation	362	79	62	12	**516**	15.9%
Total	**1,614**	**320**	**1,220**	**100**	**3,254**	

What is Natural Capital?

- **NC** can be thought of as the stock of our physical natural resources and the ecosystem services that they provide. The Natural Capital Committee's State of Natural Capital Report (2013) defines **NC** as: "the elements of nature that directly or indirectly produce value to people, including ecosystems, species, freshwater, land minerals, the air and oceans, as well as natural processes and functions".
- The above definition includes **ecosystems**, which are defined as a dynamic complex of plant, animal and micro-organism communities, and their non-living environment interacting as a functional unit (Source: Millennium Ecosystem Assessment).

Natural Capital beyond Carbon

What we can do with this number of **£202m across the UK**?

What practical difference might this research make in policy or decision making?

- Further advancing NCA for Woodlands, more complete accounts
- More on NCA: Enabling a Natural Capital Approach (ENCA) - GOV.UK (www.gov.uk)
- Avoid double-counting, e.g. well-being overlaps with recreation and amenity benefits
- Woodland Carbon Code (WCC)
- Biodiversity Net Gains (BNG)
- Woodland Water Code (high interest in developing this)
- Direction of travel:
  - Hope to attract further interest from health sector, incl., private
  - Start focusing on specific elements, e.g. street trees
- What is **TDAG** interest in further research in this area?

Valuing Mental Health - Context

- Growing evidence supporting associations between the natural environment and improved mental health ('Green social prescribing' – NHS England)
- Increasing awareness of the benefits that forests provide in improving peoples' mental health
- Media and general public interest in 'forest bathing' ('shinrin-yoku')
- However, a significant evidence gap in estimating associated economic values remains (Faccioli and Bateman, 2018)
- Multitude of approaches used in valuation studies need to be assessed
- Natural Capital & project/policy appraisals

Valuing Mental Health – Aims & Objectives

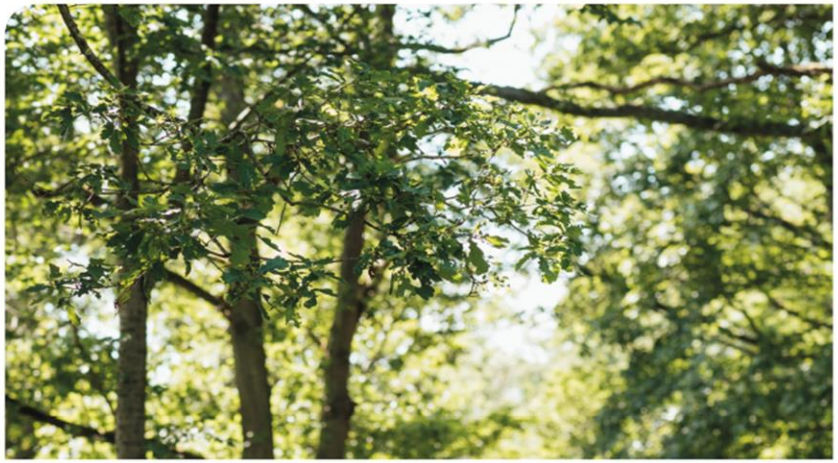
Overall goals for the study:

- Examine existing evidence (Phase 1)
  - relevant impact pathways/logic chains which focus upon monetary valuation of identified relationships
  - identify what metrics are available to measure and monetise mental health benefits of forests and list the pros and cons;
  - interview key stakeholders and experts

- Propose next steps for monetary valuation (Phase 1)
  - methodologies, for how to monetise mental health benefits of forests; potential for their incorporation into natural capital accounting and for project and policy appraisals

- Provide indicative experimental monetary estimates of mental health benefits of woodlands (Phase 2)

Forest Research



Valuing the mental health benefits of woodlands

Research Report

Forest Research In Brief

Valuing the mental health benefits of woodlands

During the COVID-19 pandemic, the prevalence of mental illness has increased. Access to trees, woods, forests and other natural environments, including urban parks and green spaces, has become even more important for individuals to support and maintain their well being. This new research is the first of its kind to value the mental health benefits associated with the UK's woodlands. The values are based on the role of woodland in alleviating mental illnesses, resulting in reduced costs to the NHS and employers. The annual mental health benefits associated with visits to the UK's woodlands are estimated to be £185 million. Country-level values, based on population size, are provided in the table below. This research is expected to be of use to policymakers in making the case for continued investment in and expansion of the UK's woodlands and treescapes, and the provision of public access to ensure people reap the benefits of those woodlands.

An 'avoided costs' approach, and what this means

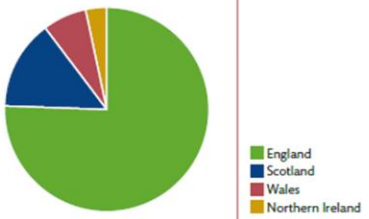
- The research is the first attempt to estimate the mental health benefits associated with the UK's woodlands using an avoided costs approach, by valuing woodland through the reduced prevalence of mental illness.
- The values are based on evidence of the reduced incidence of depression and anxiety resulting from regular visits to woodland.
- The avoided costs are based upon the average annual costs to society of living with depression or anxiety.
- These comprise costs associated with treatment, including visits to GPs, drug prescriptions, inpatient care and social services.
- They also include employment-related costs based on estimates of the number of working days lost due to mental health issues.
- The use of an avoided costs approach avoids 'double counting' with values for the other benefits of woodlands e.g. recreation or physical health benefits.

There has been a lack of evidence on the economic value of woodlands in improving mental health. This ground-breaking research is the first of its kind to value the mental health benefits associated with the UK's woodlands

Values for each of the four countries of the UK, based on population size

England	£141 million
Scotland	£26 million
Wales	£13 million
Northern Ireland	£6 million
United Kingdom	£185 million

Country figures are individually rounded so do not sum to the UK total



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Trees and forests

This article is more than 1 month old

Woodland walks save UK £185m a year in mental health costs, report finds

Researchers say conservative estimate shows importance of wooded areas to wellbeing, with street trees also beneficial

Damian Carrington
Environment editor
@dpcarrington
Sat 4 Dec 2021 08.00 GMT

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More physical exercise and 'forest bathing' contribute to boost in wellbeing of the population

Kate Ng

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Living on a leafy street can keep you from going out of your tree

People are less likely to be on antidepressants if they live on a tree-lined street – meaning the NHS saves millions, research finds

By Olivia Rudgard, ENVIRONMENT CORRESPONDENT
4 December 2021 • 6:00am

Related Topics
London, Scientific research, Depression, Trees and forests

The Forestry Commission report claims the UK saves £185 million each year because of woodlands

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Press release

Mental health benefits of visiting UK Woodland's estimated at £185 millior

New research proves immense benefits of trees and woodlands for people's wellbeing.

From: Forest Research
Published 4 December 2021

Visits to the UK's woodlands boosts mental health and is estimated to sav £185 million in treatment costs annually, a landmark report published by Forest Research finds today (4 December).

i News Politics Opinion Culture Money Sport Lifestyle Features
Health

A walk in the woods boosts mental health and saves the NHS millions of pounds

'Forest bathing', the practice of mindfulness in woodlands, can boost wellbeing along with increased physical exercise

Spending time in Britain's woodlands can boost mental health and save the NHS millions of pounds every year (Photo: Dougal Waters/Getty Images/Stone RF)

By Georgina Littlejohn
December 4, 2021 12:48 pm

A walk in the woods can save the NHS around £185 million every year due to the boost it gives to people's mental health, new research has found.

Defining Mental Health

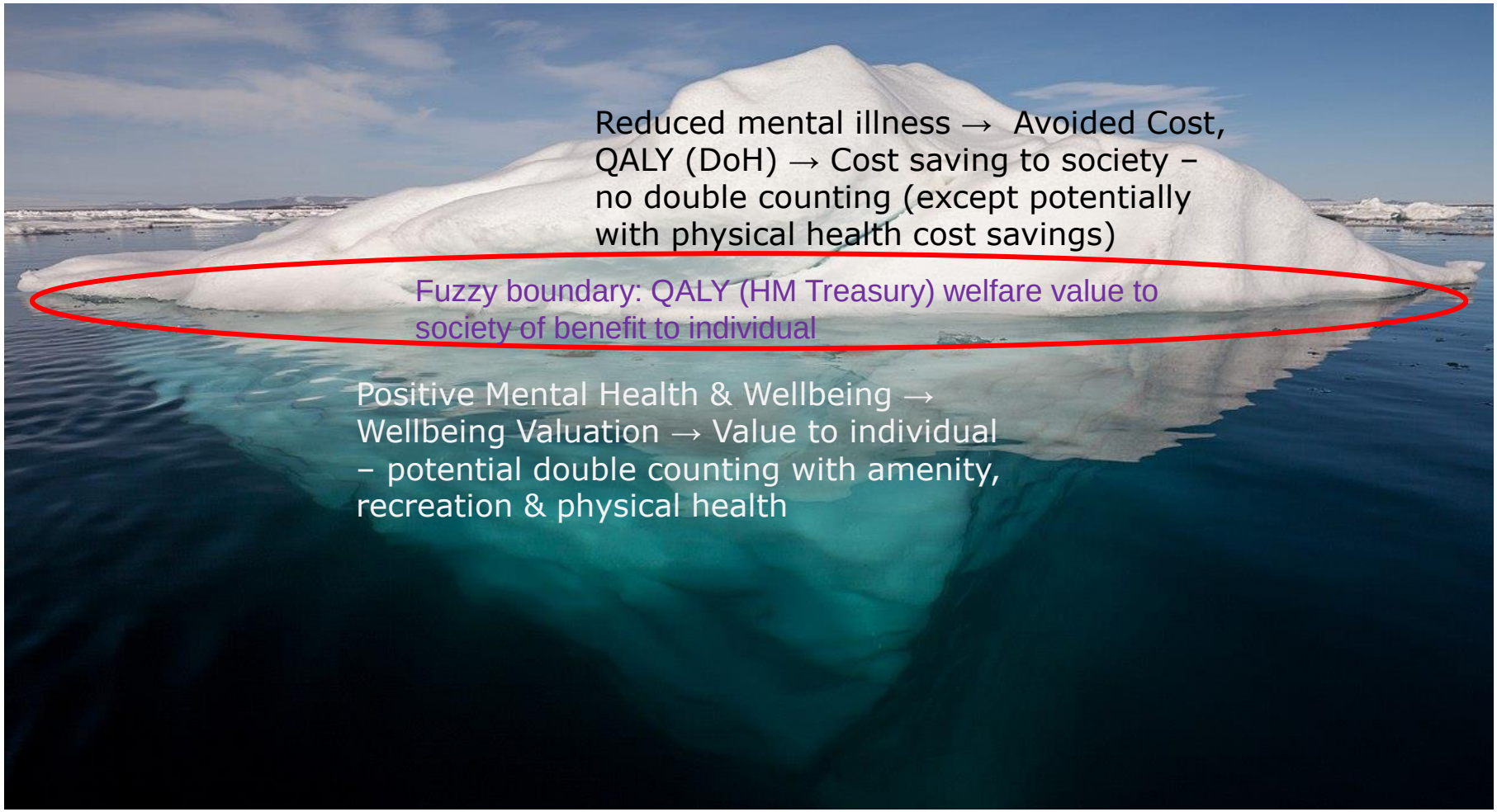
- The **World Health Organisation** (WHO, 2004) currently defines mental health as:

"a state of well-being in which the individual realises his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community"

Mental health encompasses both **positive mental wellbeing** as well as **mental illness**

- Mental illness reflects types of psychological distress
- Wellbeing reflects sense of welfare or satisfaction
- Physical health is intrinsically linked to mental health but disentangling this relationship for valuation can be difficult

Different type of mental health benefits



- Just as only a small part of an iceberg's volume is above water, benefits of avoided mental illness may represent only a small fraction of the total benefits
- Aggregate Economic Value includes both societal benefits (avoided costs) & individual benefits (mental health and wellbeing value)

Valuation Methodologies - Summary

Methodology	Summary	Suitability
QALY	A popular, widely accepted metric for valuing health. Its ability to capture health value holistically can be a useful attribute, if desired.	More suitable for comparing healthcare interventions, with its value reflecting cost-effectiveness. Other pathways may be more adapted to addressing mental health.
Wellbeing Valuation	Valuation is based on real, observable experiences. It has a broad applicability with any dataset using life satisfaction or SWEMWBS data.	Positive mental health and wellbeing is relevant to every individual, making these approaches widely applicable for exploring welfare values associated with mental health.
✓ Avoided cost	Can provide a conservative, lower-bounded estimate for the costs associated with poor mental health.	Avoided cost approaches can address the societal costs of mental illnesses where wellbeing valuation may fall short. In practice, data limitations can hinder their applicability.

Summary of Pathways - Overview

Summary of Mental Health research used within the four pathways explored

Pathway	Description
Visits to Nature ✓	Shanahan et al. (2016) reported that visits to outdoor greenspace of 30 minutes or more per week is associated with a reduction in the prevalence of depression in the population by 7%.
Physical Exercise	Findings from the MOVES tool developed by Sport England (2016) suggest that on average, adults in the UK can reduce their incidence of depression by 0.67% by walking two hours a week.
Antidepressants and Street Trees	Taylor et al. (2015) reported an association suggesting a decrease of 1.18 prescriptions per thousand population per unit increase in trees per km of street in London.
Proportion of Greenspace	(White et al., 2013) found improvements in mental health from greater greenspace in an area with a greater proportion of greenspace. Vivid economics, (2017) adopted these findings, applied estimates of avoided mental health spending in London, to estimate a mental health value of greenspace in London of £370 million.

Exposure – Response relationships

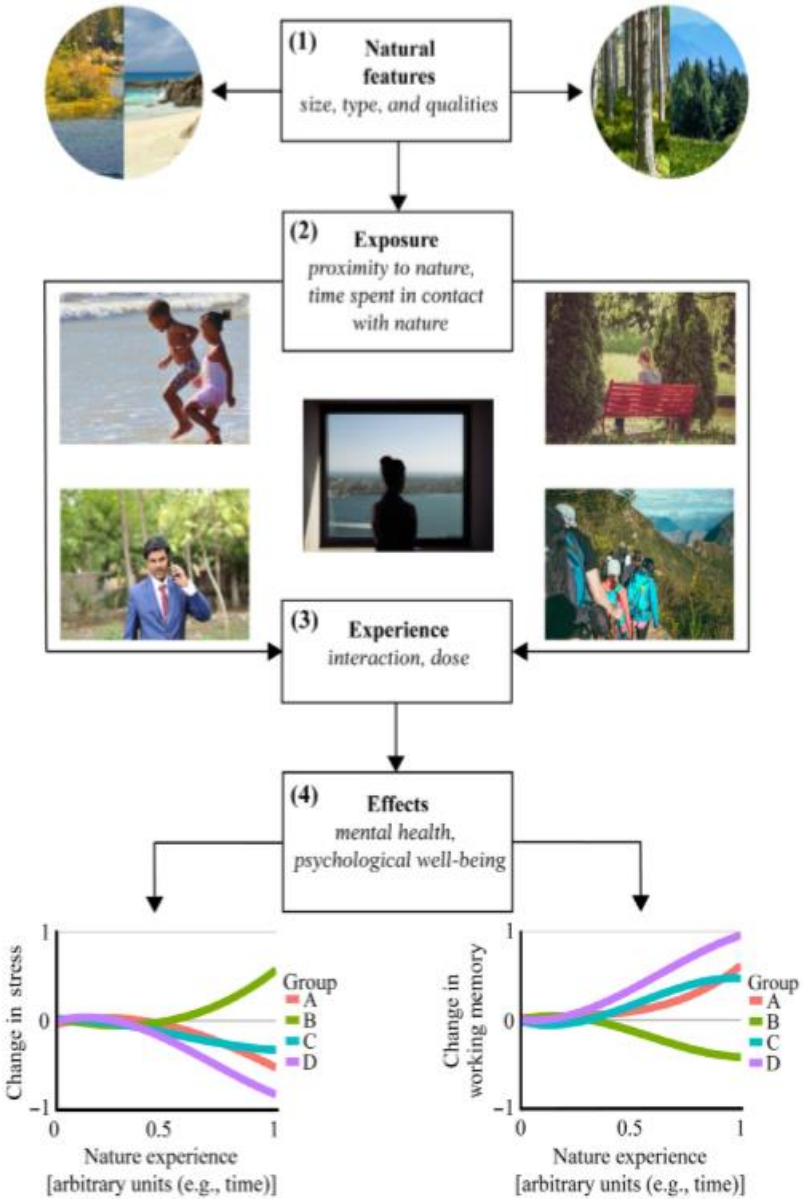


Diagram from Bratman et al. (2019)

- The **characteristics** of the forest or other natural environment (its 'natural features') and the kind of **exposure** and **experience** that occurs on-site are important determinants of the mental health and wellbeing benefits derived.
- The effects can be measured through any desired mental health metric for a particular valuation approach.

Avoided costs methodology - major steps

1. **Start**: visits to nature 30+ mins a week reduce MHC prevalence by 7%
2. Public Opinion of Forestry (POF) data on population numbers regularly (several times a month) visiting woodlands
3. ONS population data and Adult Psychiatric Morbidity Survey (2016) on MHCs
4. Intermediate result: number of people with reduced prevalence of MHCs due to visits
5. Avoided costs data: for NHC (treatments) and employment (working days lost)
6. **End** results: estimates of avoided costs

Avoided costs methodology – some data

1. UK is ranked among lowest countries for typical greenspace visit frequency (White et al, 2021)
2. Public Opinion of Forestry (POF) data on population numbers regularly (several times a month) visiting woodlands:
   - England & NI – 37%
   - Scotland – 51%
   - Wales – 44%
3. Annual working days lost due to MHC: 17.2
4. Adult Psychiatric Morbidity Survey (APMS) in 2014:
   - Depression – 3.3%,
   - Anxiety – 5.9%,
   - CMD – 7.8%

Cost Profiles used in estimates

Summary of cost estimates for **individual** MHCs, used in visit-based pathways. Sources: (Viavattene and Priest, 2020), (McCrone et al., 2008).

Type of MHC	Annual Treatment-related costs	Annual Employment-related Costs
Depression	£1,503	£1,259
Anxiety	£646	£596
CMD-NOS	£526	£464

Summary of cost estimates for **mixed** MHCs, used in proximity-based pathways. Sources: (Viavattene and Priest, 2020), (Vivid economics, 2017).

Cost Description	Annual Cost Estimate
Avg. annual price of antidepressant drugs	£23
Avoided mental health costs due to greenspace in London	£370 million

Results - Economic values (Annual)

- **Visits to nature**
  - Annual mental health value of UK woodlands via avoided anxiety, depression and CMD-NOS related costs is **£185 million** at 2020 prices.
  - By country: England: £141 million, Scotland: £25.9 million, Wales: £12.5 million, Northern Ireland: £5.7 million.
- **Antidepressants and Street Trees**
  - This gives a final value of **£16.3 million**, as the value of UK urban street trees through avoided antidepressant costs.
  - By country: England: £14.1 million, Scotland: £1.2 million, Wales: £580,000 and Northern Ireland: £365,000.
- **Aggregation** is possible for values from proximity-based pathways and visit-based approaches.

Results - Economic values (Natural Capital Assets)

- **Natural Capital** asset value is the net present value of annual benefits flow over a 100 years

- **Visits to nature**
  - Natural capital values for this pathway, adjusted for population projections, are estimated at just over **£11 billion** for UK for the mental health benefits of visits to woodlands (100 years, from 2020).
  - **£1.4 billion** for Scotland

- **Antidepressants and Street Trees**
  - **£982 million**, NC value of UK urban street trees through avoided antidepressant costs.
  - **£65 million** for Scotland

Results - Economic values (Physical)

- **Physical exercise**
  - Using the MOVES tool developed by Sport England
  - Average reduction in incidence of depression for UK adults from walking two hours a week is 0.67%

  - Annual mental health benefits of UK woodlands for reduction of anxiety, depression and CMD-NOS related costs due to increased exercise is **£18 million** at 2020 prices.
  - By country: England £13.5 million, Scotland £2.5 million, Wales £1.2 million and Northern Ireland £550,000.

Recommendations

- The **Visits to Nature** pathway gives the most reliable figure for a rough, initial estimate, at **£185 million** for an annual value of UK forests and woodlands through reduced mental health related costs.

- There **may** be scope to consider an aggregate value, of the combined **visits to nature** pathway and **antidepressants and street trees** pathway, assuming that there would be no overlap between these types of environmental interactions.

- This value would be **£202 million** (at 2020 prices), and could be adopted dependant on the question posed and required confidence in the value

Limitations

- Number of people seeking treatment for MHCs privately?
- Public Opinion of Forestry (POF) sample size is small and need boosting.
- Longitudinal studies are needed to confirm causality and duration of impact.

Areas to Consider for Improvements

1. To build on the **Visits to Nature** pathway with UK-centred research, the association between visits to nature and prevalence of anxiety could be explored using data from the MENE surveys. Similar approaches have been performed on this looking at life satisfaction (White *et al.*, 2019).

2. The research underpinning the **Antidepressant and Street Trees** pathway (Taylor *et al.*, 2015) could be repeated across multiple UK cities and towns to explore how this association varies nationally.

3. Potentially **Forest Bathing** therapy could be a very powerful pathway to depression, anxiety and stress reduction. Economic valuation will become possible as the required data is accumulated.

General Research Gaps

1. **Forests and Woodland-specific research**. There are fewer studies in the review and in wider literature focused solely on forests or woodlands. The specific influence of woodlands requires further research, where high levels of biodiversity and presence of trees may prove to be an important mediator for additional benefits.

2. **Understanding scale, duration and consistency of effects**. The overall evidence base has struggled to establish causal relationships between components of the environment and health. There is a need for longitudinal study.

3. **Understanding best-practice health indicators**. There are a broad range of health metrics commonly used in environmental research but there has been relatively little work on appraising the relative effectiveness of different kinds of nature-relevant health metrics. Standardising indicators set will allow long-term comparisons between different approaches to monitoring health and well-being benefits.

Research Gaps - Other

Robust mental health impact estimates:

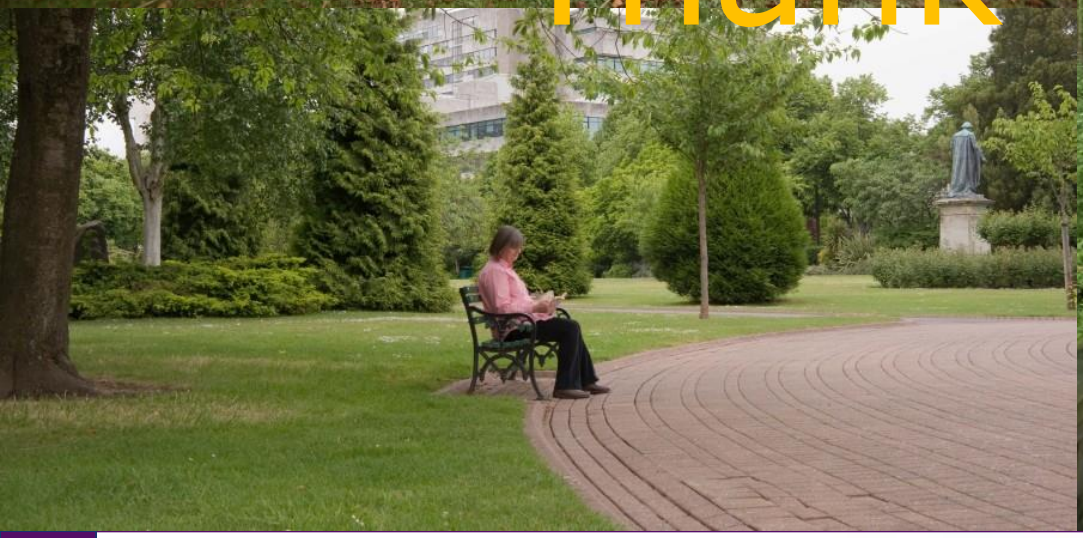
- many factors must be considered & controlled for to derive a robust causal relationship between an intervention or interaction and mental health (White *et al.*, 2019). Many studies are too small-scale to be able to robustly explore impacts on mental health. There is need for longitudinal experiments and cohort studies to better explore the relationship of natural environment interventions or interactions on mental health, with consideration for these factors.

Valuing mental health benefits separately:

- Few studies have attempted a monetary valuation approach solely of mental health benefits. Existing studies often including mental health as a component of wider benefits, such as cultural ecosystem services or overall health.

Developing more comprehensive mental health benefit valuation:

- Inclusion of societal & individual benefits (a 'whole iceberg' approach)



the END.

Thank you!

Extra slides

A few additional slides below

- Ignore if short on time.

Qs & Plan from Woodland Trust Scotland

Why is it useful to be able to value this benefit financially? 10 mins

- a) the general benefits of valuing natural capital. People will be very aware of the Carbon money now flowing into woodland creation and peatland restoration – but it would be good if you could give other examples of how natural capital is delivering funding for nature projects and
- b) what you think we can do with this number of £202m across the UK? i.e. what practical difference might this research make in policy or decision making?

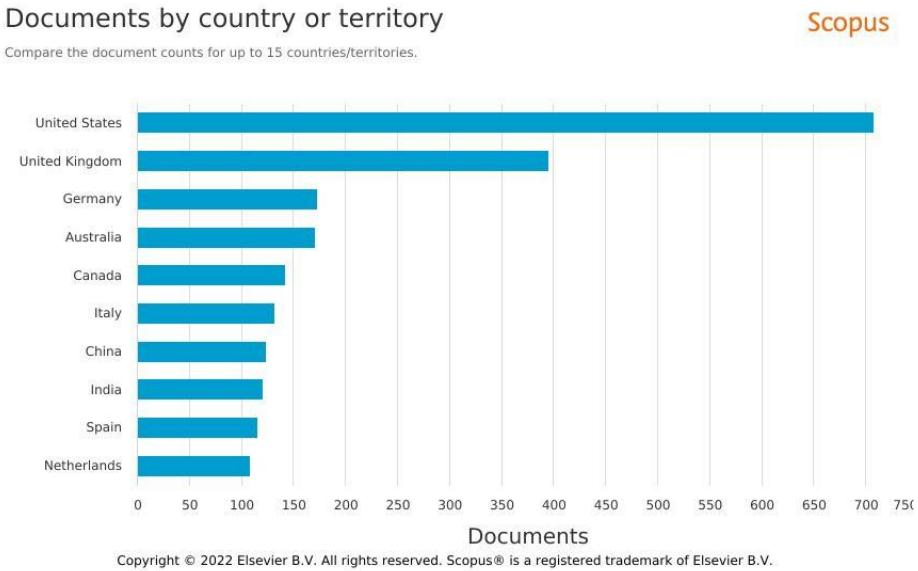
What is the research evidence that trees and woods are good for mental health? 15 mins

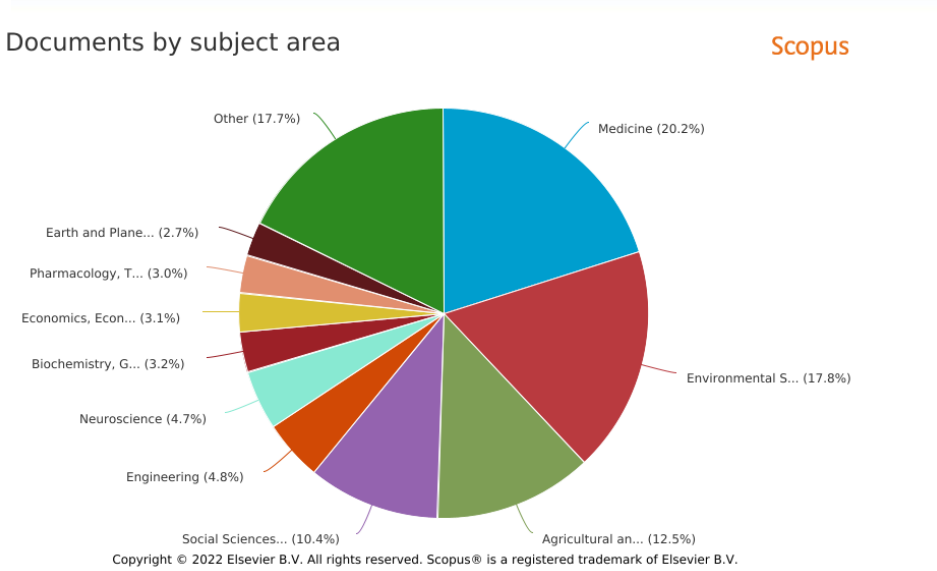
- It would be good if you could look at the 5 pathways and briefly present the research / evidence for each of these

How do we go about allocating a financial value to mental health benefits? 10 mins

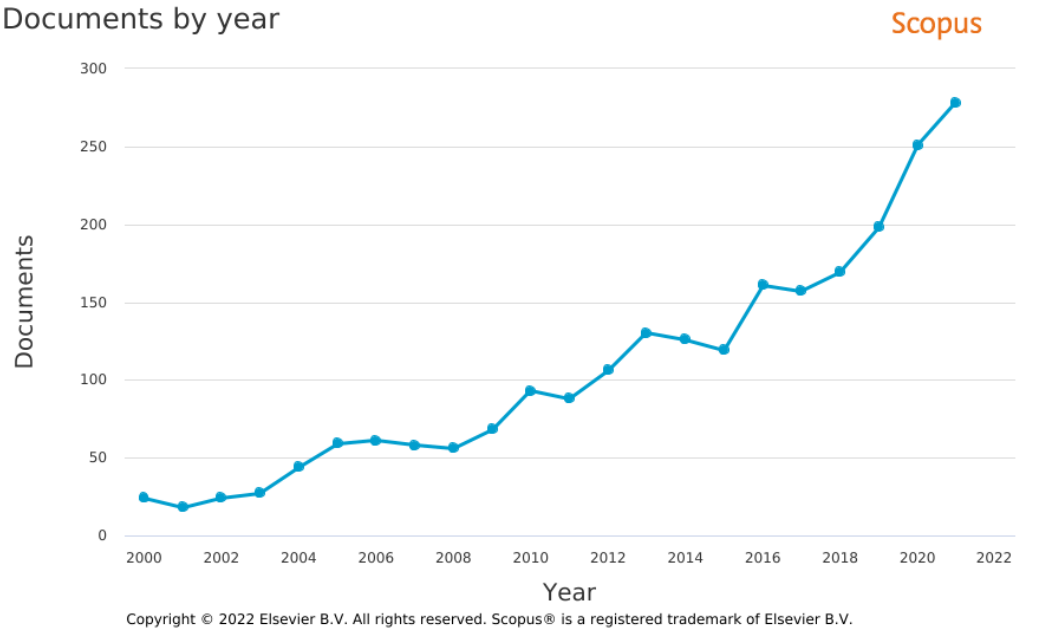
- A bit about the models / economics / assumptions that you used to get the number.

Valuing Mental Health - Literature





- More than 11-fold increase (24 in 2000, 278 in 2021) in publications
- Countries: US, UK, Germany and Australia
- But only 3% Economics



Valuing Mental Health - Methods

1) Literature review (Phase 1)

- Two expert 'critical friends'
- The project steering group
- Databases searched: Scopus (including coverage of over 95% of Medline publications)
- from 2010 to present
- 1,408 search results examined

2) Expert interviews (Phase 1)

- 12 experts: academics and practitioners, public and private sectors

3) Avoided costs valuation (Phase 2)

Expert interviewees recommendations according to monetary valuation methodology

	Policy and decision -making applications	Future research directions and data requirements
Wellbeing valuation	Valuations of forestry and greenspace assets Comparisons with other valued social impacts (e.g. heritage and culture)	Experimental data to determine direction and strength of effects Time-course and longitudinal datasets
QALY	Comparisons with other healthcare interventions Biomarkers linked to QALYs impactful among medical / health service stakeholders (but are indirect methods)	Inclusion of appropriate instruments and biophysical data in surveys of natural environments or linking these data elsewhere with small area geographies.
Avoided cost	Wider economic impacts in society e.g. in labour force	Linked administrative data Large scale studies to determine impact of exposure and engagement with forest and greenspaces on biomarkers
All methods		Environmental data including biodiversity / recreational facilities. Objective measures and perceptions of environments Experimental research assigning people to environments / activities / visit conditions to control for self-selection bias and endogeneity

Results – Valuation Pathways: QALY

Overview	Issues
The QALY framework was developed to compare health interventions and compare their cost-effectiveness. A QALY represents a unique health state profile between 0-1, relative to 1 QALY as perfect score. The approach quantifies health benefits in terms of reductions in ill-health of individuals. In principle, the approach can be applied in valuing mental health benefits of any forest intervention that reduces ill-health. The current monetary WTP value for a QALY is £60,000 (HM Treasury, 2018). QALY is used through scales such as EQ-5D, SF-6D or any validated QALY metric.	QALY metrics have been found to be less sensitive to detecting changes in mental health, compared to dedicated mental health scales (Brazier, 2010; Johnson *et al.*, 2016). In generating health state profiles, QALY ranks different health outcomes relative to each other. These rankings may underestimate the impact of mental health issues (Powdthavee and van den Berg, 2011; Dolan and Metcalfe, 2012; Fujiwara and Dolan, 2014). QALY captures changes in both physical and mental health, which could give rise to double-counting issues. Back...

Results – Valuation Pathways: Wellbeing

Overview	Issues
The approach quantifies health benefits in terms of improvements in the self-reported wellbeing or life satisfaction of individuals. Direct monetisation exists for changes in life satisfaction, using a model developed by leading contributors to the Green Book's non-market valuation guidance (HM Treasury, 2018). A statistical relationship between life satisfaction and the short Warwick Edinburgh Mental Wellbeing Scale (SWEMWBS) has also been investigated (Fujiwara *et al.*, 2017). This has produced a methodology to allow valuation of changes in SWEMWBS scores. Wellbeing Valuation approaches can use Life Satisfaction data or the SWEMWBS as metrics.	The SWEMWBS valuation model is simplistic and may be less suitable for usage with large-scale datasets without further development. Life satisfaction is an encompassing term for subjective wellbeing that arguably captures feelings broader than just mental health, potentially inflating value. To the extent that woodland visits are motivated through good mental health, double-counting issues could arise with recreational benefits. With a focus on individual positive wellbeing, the societal costs associated with very poor mental health may be missed. Back...

Results – Valuation Pathways: Avoided costs

Overview	Issues
The approach quantifies health benefits in terms of reductions in expenditure by the public sector (e.g. NHS) and/or ill-health-related costs (e.g. productivity losses) by the private sector rather than costs avoided by individuals or households. They can use a variety of metrics, including but not limited to: reduced GP visit frequency; reduced anti-depressant prescription rates or mitigated productivity losses due to mental health issues. Any self-reported mental health metric could also be used for a very basic transfer (e.g. assuming % change in metric = % change in mental health spending).	Reliant on the availability of specific data, which can be scarce if not unavailable, and is often simplistic. Often due to data limitations, avoided cost examples have adopted to use self-reported mental health metrics with broad costs of mental health (Vivid Economics, 2017; Dickie *et al.*, 2018). Observable costs are associated with the characteristics of mental illnesses and poor mental health. Cannot capture improvements with moderate and good mental health. Back...

'Exposure – Response' key to valuation

- Valuation of the mental health benefits of a forest intervention or interaction involves two fundamental elements:

1. Quantifying the mental health impact using a metric, such as a self-reported mental health scale or based upon a directly observable characteristic (e.g. a biomarker such as cortisol level) or intervention (e.g. anti-depressant prescription rates), compared to an appropriate baseline. (This could either be a standardised baseline, or based upon a pre-intervention survey)

2. Monetising this mental health impact through a valuation approach

- **Monetisation relies on a robust estimate of the change in mental health associated with the forest intervention or interaction**

'Mediators' influence mental health

Influence	Description	Mediator Examples
Physical Characteristics	Size	Air pollutant removal
	Biodiversity/species composition	Noise pollution reduction & natural sounds
	Location	Biodiversity
Exposure	Length of time spent	Social cohesion
	Frequency of visits	Physical Activity
	Type of Activity	Mindfulness
External Factors	Individual attributes that affect the kind of benefit that can be received	Cultural values and upbringing
		Mental wellbeing status
		Socio-economic status

Summary logic chain on monetisation of mental health benefits

Influences

Physical Characteristics (*Size, Location, Species composition*)
+
Exposure (*Length of visit, Frequency of visit, Type of activity*)

Change in response to a policy intervention

Mediators (Non-exhaustive)

Physical Mediators (*Air pollutant removal, noise pollution reduction, Biodiversity*)
+
Exposure Mediators (*Physical Activity, Social cohesion, Mindfulness*)
+
Individual Mediators (*Socioeconomic status, mental wellbeing status, cultural values*)

Working through the mediators

Mental Health Metrics

EQ-5D, SF-6D (QALY metrics)

WEMWBS
Life Satisfaction

GP visits, Anti-depressant prescriptions, Workplace productivity losses, Self-reported mental health scale

Lead to changes in metrics

Mental Health Valuation Pathway

QALY

Wellbeing Valuation

Avoided Costs

Changes in health metrics can be valued