






Edge Hill University

NHS Greater Manchester

Economic Evaluation of the Greater Manchester Nature for Health Programme

Howarth, ML., Su, L., Relph, N., Foster, V., & Fletcher, K. (2025)

Contents

Contents

Executive summary

This report presents a comprehensive economic evaluation of Greater Manchester's Nature for Health (Green Social Prescribing) programme. The programme was commissioned and coordinated through NHS Greater Manchester as part of the national cross government Green Social Prescribing Programme. The Green Social Prescribing (GSP) delivery partners included Lancashire Wildlife Trust (LWT), Manchester Mind, Groundwork Greater Manchester, Northern Roots, START in Salford and Petrus in Rochdale. They offered therapeutic horticultural activities, including food cultivation, garden care, tree planting and bushcraft. Targeted outreach strategies were implemented by the delivery partners to ensure the inclusion of ethnic minority communities that have the lowest Health Index Scores in Greater Manchester. The programme was delivered in collaboration with Pennine Care's Early Intervention Teams (EITs) to support the implementation of a green social prescribing programme for patients with severe mental illnesses. The two delivery workstreams in Greater Manchester focused on severe mental health and sought to address health inequalities.

Key findings

Triangulated data revealed several key insights, drawing on the stakeholder engagement events, the scoping review and the wider GSP national evaluation which provided a comprehensive understanding of the effectiveness and value of GSP initiatives.

Stakeholder engagement

Two stakeholder events involving service commissioners and providers were held to understand the context and delivery of GSP. The discussions were recorded and analysed thematically. Three themes are presented in the report:

- Being brave: the need for greater ambition in collecting data.
- Collaboration: the need for more consistent communication across the sector and the potential benefits of collaborating on scale-up and future opportunities.
- Raising awareness: the need to communicate the wide-ranging benefits of GSP.

Initial scoping review

A systematic scoping review was carried out to understand the context in which economic evaluations took place and the economic evaluation methods used. This revealed:

- Significant variations in economic evaluations across different papers, with reported benefits ranging from £2 to £17 for every £1 invested.
- Published economic evaluations often lacked a standardised model and frequently pointed out insufficient data.
- SWEMWBS is recognised as a commonly used data collection tool for measuring mental health outcomes, which aligns with the focus of our economic review.
- Most nature-based interventions included in the review were deemed economically viable, supporting the findings for Nature for Health and contributing to existing research.
- There are common challenges in current evaluations, such as small sample sizes or incomplete data sets, with the latter being a specific issue for this review.

The economic evaluation

The economic evaluation of the GM Nature for Health programme used data from 136 patients with pre- and post-SWEMWBS outcomes. Specifically, a cost-benefit analysis was undertaken to ascertain overall costs of the individual programme delivery. This method compares the costs and benefits of an intervention, procedure, or programme in monetary terms. The findings indicate:

- The average overall SWEMWBS scores were 22.63 before the GSP intervention and 27.57 after the intervention. This represents an average increase in mental health outcomes of 4.94. This is statistically significant at the 1% level (p-value < 0.001).
- Based on data for 29 patients associated with LWT/Groundwork/Petrus, the average overall SWEMWBS scores were 21.59 before the GSP intervention and 23.79 after the intervention. This is an average increase in mental health outcomes of 2.21, which is statistically significant at the 1% level (p-value < 0.001).
- The model social values for overall SWEMWBS scores of 23-24 and 27-28 are £22,944 and £24,877, respectively. The cost-benefit analysis accounted for the deadweight, which refers to the changes in well being that would have happened regardless of whether a patient participates in the GSP programme.
- After accounting for 27% deadweight, the total social impact per patient is calculated as (£24,877 - £22,944) * (1 - 27%) = £1,411.09.
- The total costs for all delivery partners amount to £130,433, resulting in an average total cost of £959.07 per patient across all partners.
- The net social impact per patient is £1,411.09 - £959.07 = £452.02.
- Further calibration of social impact based on social value for individual patients reveals that the increase in average social value is £4,779.43 before accounting for deadweight.
- On average, the net social impact per patient after accounting for deadweight is £4,779.43*(1-27%) - £959.07 = £2,529.91 which highlights a positive net social benefit.
- The GSP programme is effective in improving mental health and wellbeing and offers £452.02-£2,529.91 per patient net economic benefit depending on how social value is calculated.
- There is evidence from correlation analysis that older patients, or patients living in post codes with lower Index of Multiple Deprivation, benefit more from the GSP programme.
- Regression analysis strongly suggests that attending more GSP sessions contributes to better mental health outcomes for patients, and that patients residing in northeast Greater Manchester have experienced significant improvements through participating in the GSP programme.
- The data underscored health inequalities and demonstrated that the cost-benefit analysis of the programs revealed positive financial outcomes. The scoping review acknowledged the challenges of comparing economic evaluations of GSP interventions due to the use of diverse methods and outcome measures.

Summary of findings

The Nature for Health GSP programme targeted populations from areas of high deprivation, and those with mental ill health. The aim was to improve mental health through the provision of a range of nature-based interventions across the delivery partners. Our findings suggest that the programme is reaching the right population, with 83% of the participants being in the highest areas of deprivation as defined by the Index of Multiple Deprivation (IMD). Findings suggest that those with the highest level of mental health need are benefitting the most from GSP. This also includes a positive impact on physical outcomes. Overall results report an average pre-SWEMWBS score of 22.6 which increases to 27.7 post intervention. This indicates a highly significant impact. There is a £452.02-£2,529.91 net economic benefit, depending on how social value is calculated. These findings resonate with the National Economic Evaluation which also highlighted the positive impact of GSP on mental health outcomes and the healthy SROI.

Conclusions

The findings suggest that the GSP programme reaches the right population with 83% in the highest deprivation areas, and those with the greatest mental health need benefit most. The SWEMWBS scores improved from 22.6 to 27.7 post-intervention, indicating significant impact. However, the evaluation also found that there is a need for more consistent and comprehensive data collection and evaluation methods to fully understand and optimise the impact of GSP interventions. Our own economic evaluation faced challenges due to incomplete data sets, missing information, and small sample sizes. Despite this, the evaluation findings highlight GSP's effectiveness and economic viability. We conclude that GM's Nature for Health GSP programme effectively supports populations in areas of high deprivation and those with mental ill health through structured nature-based interventions and demonstrates a net economic benefit.

Recommendations

We report here recommendations for future economic evaluations, data collection, future practice & policy.

Recommendations for future economic evaluation

- The development of a specific outcome tool for GSP may allow more sensitive economic evaluations, to be used alongside ONS4 and SWEMWBS.
- Economic evaluations should be built in at the design stage and green prescribing providers should be linked with project health evaluation teams or external economists where possible. The economic evaluation could also be underpinned by Theory of Change models.
- There is a need for agreed and consistent economic evaluation methods. Part of this is a need to agree a definition of "value".
- Establish a valid set of GSP costs. This is difficult as there are lots of assumptions to make and the commissioning practice is inconsistent. Funding is short term and hence so are projects. Therefore, there is a need for long term funding to support better economic evaluations.
- Linked to this is the need to include longer term non-health outcomes (e.g., increased confidence and hence benefits to society) and follow on care options in economic evaluations.
- There is a need for appropriate and long-term support, skills, knowledge and resources to substantiate the evidence for economic evaluations. Understanding and application of economic evaluations should be consistent within providers.
- Economic analysis needs to be careful not to just value individual therapies, e.g., walking groups or swimming, but instead to look at social prescribing as a whole ecosystem intervention.
- Collation of economic evaluation data could help secure top-down funding for nature-based interventions at a national level or grant funding at a local level.
- SROI involves key stakeholders, therefore researchers working with the same data may arrive at different SROI ratios depending on the outcome measure they chose to include. There is a need to agree a set of consistent outcome measures.
- Sensitivity analysis should include deadweight, displacement, attribution, duration, and drop off.

Recommendations for future data collection, consistency, and use

- Given that GSP is sited across multiple organisations, understanding the reasons for incomplete or patchy data collection and linkage in localities is important.
- There is a need for multiple cohorts / sites for data collection; consider combining data from multiple providers and set up data sharing agreements for pooled economic evaluations.
- Staff education and training in data collection with vulnerable groups is crucial.
- Qualitative feedback and the use of mixed methods is required to understand the context and variance about the delivery and impact of GSP. The data needs to 'tell a story' and, where possible, use longitudinal methods to support a holistic approach.

Recommendations for future practice

- Data systems need to be better integrated. There was difficulty accessing objective health outcomes for GSP users, yet there is also the risk of recall bias for self-reported health care use.
- There needs to be a consistent use of agreed outcomes that then uses a consistent measure of benefit, for example WELLBYs.
- Confounders need to be collected and controlled for (e.g., IMD measures).
- Possible bias including survivor bias (i.e., people who completed a whole course of nature-based activities); optimism bias and measurement error (i.e., data collected inaccurately); heterogeneity and multiplicity of intervention (i.e., type of nature-based activity, other types of support accessed) need to be considered and reduced when collecting outcomes.
- Training and education are necessary for delivery partner staff to collect data from vulnerable groups. Appropriate time should be built into programmes to ensure staff are able to develop the necessary relationships to collect data about impact.
- Collaboration across the sector is important to enable data sharing and learning.
- There is a need to agree standard outcome measures which also includes ONS4 to help leverage future funding opportunities.
- Research more broadly (36) has highlighted that outcomes aligned with the wider determinants, such as employability and work-related, are limited. However, our findings from the GM GSP evaluation and other research (36-40) have reported on how nature-based interventions can improve mental health. Equally, other research (36-40) has indicated that participation in health-promoting activities can work-related outcomes. This includes improved physical wellbeing, faster recovery leading to quicker return to work, improved nutritional outcomes, enhanced work productivity and reduced absenteeism due to physical health issues. There is a need to ensure that employability outcomes are captured alongside ONS4 and other wellbeing scores.

Policy

- Arrange a series of internal stakeholder meetings to discuss and agree dissemination strategy.
- At the same time of this evaluation, the national test and learn evaluation completed. It is recommended that the GM evaluation report be shared with the national GSP evaluation team to explore similarities and add to the evidence base supporting scale up of GSP nationally.
- Arrange a stakeholder face-to-face event to highlight results and identify scale-up opportunities and explore the opportunities for the programme to integrate with the Live Well programme.
- Support extended duration of GSP programmes to enable the capture of longitudinal data that will demonstrate impact.

Section 1: Introduction

Introduction

This report presents a comprehensive economic evaluation of Greater Manchester's Nature for Health (GSP) Delivery programme. The GM 'Nature for Health' programme worked in collaboration with Pennine Care's Early Intervention Teams (EITs) to support the implementation of a green social prescribing programme for patients with severe mental health issues. This programme provided therapeutic horticultural activities such as food cultivation, garden care, tree planting, and bushcraft and was delivered across two localities. In addition, the programme used targeted outreach to ethnic minority communities in Manchester, Salford, Oldham, and Tameside, which have the worst Health Index Scores in Greater Manchester. The Green Social Prescribing (GSP) interventions within Greater Manchester focused on both severe mental health and health inequalities workstreams.

The team at Edge Hill University used a mixed methods approach to investigate how, why and for whom GSP works and the economic benefit. This evaluation aimed to support policymakers and healthcare commissioners in making informed decisions regarding the adoption and scaling of GSP initiatives. We employed a Collaborative Inquiry Framework (CIF) to enable us to actively engage stakeholders, including service commissioners and service providers. This was combined with a systematic scoping review of the published economic evaluations which influenced a cost-benefit analysis of the Nature for Health programme.

Aims and objectives of the economic evaluation

To evaluate the impact and cost benefit of the Nature for Health Programme.

Objectives

- Undertake a desk-based systematic scoping review of economic evaluations of green social prescribing.
- Facilitate stakeholder analysis to understand the expected delivery outcomes for GSP.
- Undertake a cost-benefit analysis of direct and indirect costs and benefits using pre-existing materials.
- Feedback findings on the impact of GSP and the broader social and environmental outcomes of GSP that may be helpful in scaling up.

Context

In the UK, an estimated 1 in 6 adults suffer from a common mental health disorder (1). Health indices indicate a rise in chronic long-term conditions, particularly in deprived areas. Greater Manchester (GM) mirrors this trend, with significant health inequalities impacting standard health indices. GM local authorities report figures significantly worse than the national average. The environment positively influences human well-being (2). According to Manchester City Council's 2019 report on the Indices of Deprivation, GM ranks among the most deprived areas in the UK, with Manchester specifically ranked 6th on the Rank of Average Score and 2nd on the Rank of Average Rank and Rank of Extent. Approximately 43% of Manchester's Lower Super Output Areas (LSOAs) are in the most deprived 10% in England, indicating substantial socio-economic challenges.

The uptake of Green Social Prescribing (GSP) has increased, particularly in deprived areas. Findings from the National Evaluation of the Preventing and Tackling Mental Ill Health through Green Social Prescribing (GSP) reported that over 8,339 people were referred to green social prescribing activities within the Nature for Health programme, positively impacting mental health and well-being. These improvements are notable in communities with high levels of social inequalities. The final report published in January 2024 identified that 57% of participants accessing nature through GSP were from the most economically deprived areas, 21% were from ethnic minority groups, and the nature-based delivery programmes showed statistically significant improvements in happiness, life satisfaction, and anxiety (3). These and other findings indicate that social prescribing (SP) more broadly is cost effective with costs per QALY equalling less than £2000. Moreover, SROIs have reported a favourable return resulting in reduced inappropriate GP appointments.

Referral routes

Typically, GSP referrals can originate from a health or care practitioner to a link worker who would then refer to a GSP service in the local area. Haywood et al's (3) national report highlights the main referral routes and the key components. Figure 1 illustrates how Haywood et al's (3) report highlights the two 'key components' of the GSP pathway: referral and activity. This puts emphasis on how an individual may arrive at a nature-based service. Significantly, the referral routes are influenced by the need of the individual and may affect the outcomes of the GSP. For example, in the Nature for Health programme, one of the referral routes originated from a mental health trust. In this context, people referred may have experienced poorer mental health which may have influenced the initial mental health scores and subsequent progression.

Figure 1: A simplified GSP pathway with the two key components highlighted

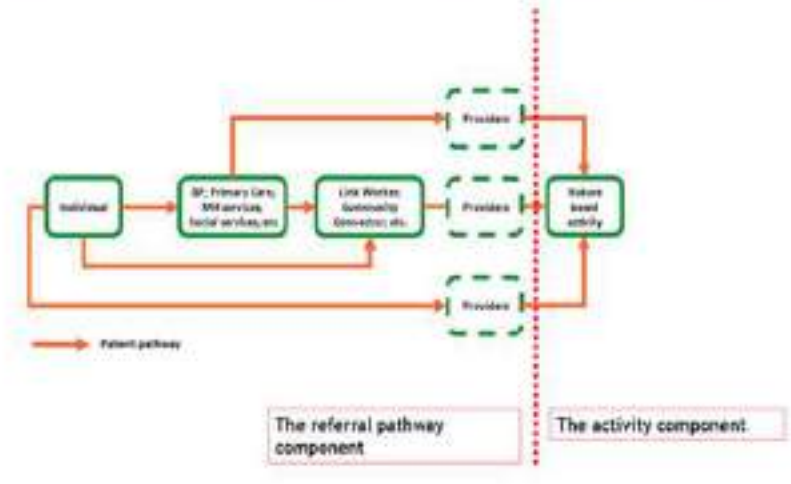

Figure 1: A simplified GSP pathway

Types of people who access the nature-based interventions

The Nature for Health programme aimed to target people in areas of high deprivation and those from ethnic minority groups. Similar to the National Evaluation (3), the evaluation team sought to capture demographics and geographical areas to identify whether the Nature for Health programme and GSP provision had supported this population. These findings are reported in section 4.

Types of nature-based activities

The NHS England (4) definition of Green Social Prescribing 'includes both what is known as green and blue activities. These could include local walking schemes, community gardening projects, conservation volunteering, green gyms, open water swimming or arts and cultural activities which take place outdoors'. However, for this evaluation, and to reflect the divergent approaches used in the case sites, we adopted the EU HORIZON GREENME 3 pillars of nature (see figure 2) which includes Nature in Everyday Life, Nature-Based Therapy and Nature-Based Health Promotion.

Nature in Everyday Life: This involves integrating natural elements into daily routines, such as spending time in parks, gardening, or simply enjoying a walk in nature. These activities can enhance well-being, reduce stress, and improve mood by providing a break from urban environments and fostering a connection with the natural world.

Nature-Based Therapy: This therapeutic approach uses nature to support mental and physical health. Activities like horticultural therapy, wilderness therapy, and animal-assisted therapy leverage the calming and restorative effects of nature to help individuals cope with stress, anxiety, depression, and other health issues.

Nature-Based Health Promotion: This focuses on encouraging healthy lifestyles through engagement with nature. Programmes and initiatives may include outdoor exercise classes, community gardening projects, and nature walks. These activities promote physical activity, social interaction, and mental well-being, contributing to overall health and preventing chronic diseases.

Figure 2: GREENME 3 pillars of nature activity https://greenme-project.eu/

The sites included in the economic evaluation used a range of approaches, and whilst nature-based therapy was provided, participants may have also been previously exposed to nature-based health promotion and nature in everyday life.

Section 2: Methodology

A mixed methods approach was taken to investigate the impact of the GM Nature For Health programme on mental wellbeing and economic benefit. We employed a Collaborative Inquiry Framework (CIF) which involved actively engaging stakeholders to understand their views on the impact of the Nature for Health programme. Stakeholders included delivery partners, commissioners and policy managers and we aimed to gain insight into the expected benefits of GSP and associated challenges. The research team also visited the delivery partner sites to understand the context of the Nature for Health programme, and the business case models used. Following this, team members undertook a comprehensive systematic review of previously published economic evaluations. The aim was to explore the different types of models used to evaluate economic impact and inform the economic evaluation methodology. We triangulated the data from the review and stakeholder engagement to inform the economic evaluation methodology to ensure that the methods used were meaningful and captured the relevant data required for the programme.

Stakeholder engagement

Two stakeholder events were held during the project to engage, inform and listen to a range of people involved in green social prescribing across the region. The first, which took place online in September 2024, involved a range of commissioners of services who were invited to attend by the Nature for Health Programme Manager. The second took place at Edge Hill University's Manchester campus and was aimed at service providers. Attendance was good and included some of the providers involved in the Greater Manchester project but was not limited to them. Both events began with a summary of the evaluation, its aims and objectives. This was followed by three rounds of discussions in small groups. After each of these, a spokesperson from each small group provided feedback to the whole room. Detailed notes were taken at both meetings, and a recording was made during the online meeting. Notes and transcript were analysed thematically, and key findings are reported later in section 4 of this report.

Sample for economic evaluation

For the economic analysis, we collected 'pre-existing materials' derived from data obtained from people who have accessed GSP services that reflect the challenges identified through health index data.

Data collection for cost benefit analysis

We collected anonymised data from all delivery partners. Data were controlled by the Nature for Health Programme team and shared via encrypted files. Existing SWEMWBS questionnaires that were completed by GSP participants were leveraged to generate important insights into the types of nature-based activities the participants engaged in, the length of their participation in the GSP programme, and the number of sessions they attended. This data was used to assess the value for money invested in the GSP programme, despite the lack of pre-intervention baseline measurements. By utilising the existing participant-level data, we were able to conduct robust quantitative analyses that overcame the limitations of the lack of pre-intervention baseline measurements.

Our methodological approach, anchored in Tobit models, generated valuable insights to guide the optimisation and expansion of the GSP programme, even in the absence of a comprehensive before-and-after dataset. Data collected included the SWEMWBS scores, demographic data, post code data and referral route.

Data analysis

We used a range of data analytic methods to analyse the data sets. For example, to understand the programme's reach and engagement, we used descriptive statistics to summarise characteristics of the participants, the types of nature-based activities, the length of their programme attendance, and number of sessions attended. We then used comparative analysis methods to analyse post-GSP outcomes of participants who engaged in different types of nature-based activities, different lengths of programme participation or different numbers of sessions. We conducted a heterogeneity analysis to examine the variations in outcomes across the four delivery localities and explored heterogeneity based on demographic factors such as age group, gender, and ethnicity, to determine if the GSP programme had differential impacts on certain population subgroups. For the cost- benefit analysis, we assessed the costs of the programme and compared them to the observed outcomes using cross-section multivariate regression techniques. For example, we used multiple linear regression models and Tobit models to examine the relationship between various outcome measures (e.g., mental health, and work and social adjustment) and the following programme inputs: (1) type of nature-based activities, (2) length of participation, (3) number of sessions attended, and (4) locality of GSP intervention. By employing the Tobit regression models, we were able to generate robust estimates of the cost-effectiveness of the GSP programme while accounting for the censored or bounded nature of the dependent variables. The results of our cost-benefit analysis have provided valuable insights for policymakers and programme administrators, including (1) identifying the most cost-effective types of nature-based activities and the optimal length and dosage (number of sessions) of the GSP interventions; (2) determining whether certain delivery localities are more efficient in generating positive outcomes per unit of cost; and (3) informing decisions on resource allocation and the scaling of the GSP programme to achieve maximum impact and value for money. We used multivariate regression techniques to identify the nature-based activities, program dosages (length and number of sessions), and delivery localities that are most strongly associated with positive outcomes, such as improved mental health, social connectedness, and well-being. Assuming programme costs are proportional to length of sessions, this analysis can provide evidence on the cost-effectiveness of different intervention approaches. This would allow us to pinpoint the most efficient and impactful GSP interventions, informing resource allocation and program scaling to maximize value for money.

Ethical approval and data management

We obtained full ethical approval from Edge Hill University (ref ETH2324-0281). We included a full data management plan and worked with the GM team to support a full DPIA.

The notes and transcripts from the two stakeholder events were analysed thematically and three of the themes are presented here: Being brave; Collaboration; and Raising awareness.

Being brave

Participants in the stakeholder events frequently mentioned the 'ripple effects' or 'domino effects' of nature-based interventions:

'*The impact and the value is not just for individuals, but it's for communities and for the wider systems as well. And that kind of ripple and knock on effects if you're working with an individual and you've seen that impact, the impact is then wider within that like close family unit or wider community.'*
(Online stakeholder event participant)

This led to discussion over the challenges of capturing, and quantifying, some of this diffuse impact. There is a need to evaluate the aims of what the programme 'should' be doing, but the kind of 'domino effect' of 'unintended consequences' – such as impacts on friends and family or employment – are more difficult to measure. It becomes still more challenging when nature and environmental benefit is acknowledged (which indeed it was by many participants). During these discussions, there were several references to the need to be 'bold' or 'brave' with approaches. For instance, there was focus given to the need to be more ambitious when it comes to understanding complexity and scope of initiatives:

'*Maybe we need to be bold and brave and think about collecting a range of different types of data and saying what's important to everybody, not just commissioners, but the delivery partners as well, because they're the ones that are on the ground.'*
(Online stakeholder event participant)

'*Maybe we need to be braver to show the inter-connectivity across different sectors, and we are being asked nationally to demonstrate how we can compare activity in an area to boost employment and transferable skills. [We need to] understand what the appetite is for the day, what interventions are best for which populations, and understand the complexity. As we need to recognise that some data may conflict across the data sets – maybe we need to be bolder about evidencing the complexity of the data sets.'*
(Online stakeholder event participant)

There might be lessons to be learned from outside of the UK. Several international examples were given including one of preventative care in Germany. Individuals are given a certain amount of money each year to spend on preventative health, and there is evidence that this has led to improved general population level health. Participants also gave examples of good practice they had witnessed closer to home. For instance, one participant was involved in analysing large numbers of care records, mapping likely health costs over the next five years, and suggesting what savings might be garnered through successful preventative work. Longitudinal research was mooted as an ambitious, 'bold and brave' solution to data collection and analysis. This would enable tracking of the wider impacts of programmes.

'The short-term nature of the intervention is often not captured 3-5 years down the line… there seems to be a pressure to get funding into those services to deliver services now….. We need to create generational shifts in health care – but trying to analyse the impact of this in such a short space of time.'
(Online stakeholder event participant).

A long-term focus might also consider 'nature recovery' and the impact of this on health and wellbeing. It was pointed out that funding issues can stymie this sort of research. It is also hampered by the fact that outcomes are not standardised. If funders are supporting different types of data collection over different lengths of time, 'it's really then hard to consolidate that and learn from that' (online stakeholder event participant).

Collaboration

As discussed above, there are practical reasons for collaborating on data collection and analysis. For instance, this will help ensure consistency which in turn will enable longitudinal research. It will also help to show the inter-connectivity between different sectors. Commissioners were keen to involve service providers in these discussions. Collaborative working is also good for morale,

'Because I think you know there's a risk of people being feeling on their own with this and trying to sort of reinvent the wheel when it comes to, you know, what data should be being collected.'
(Online stakeholder event participant)

Participants expressed a sense that the NHS increasingly values GSP and sees the value in communities finding their own solutions. Examples were shared of good practice regarding co-design of spaces. One involved working with communities to co-design ways of managing heavy rainfall, brought about by climate change, as opposed to bringing in an external contractor. As well as supporting climate resilience, this aimed to improve connectedness and wellbeing. Another participant described the rich benefits a local green space provided, and the multitude of schemes linked to this community centred asset. This led to discussion of how issues of environment, health and crime can intersect, and a place-based approach can be useful to mitigate all these concerns. If this is streamlined, and there is a single referral pathway, 'like a one stop shop approach' (Manchester stakeholder event participant) this can remove the complexity of navigating a disparate system.

Participants noted that GSP should encourage empowerment rather than dependency; indeed 'they have that potential to be more empowering than a lot of sorts of health-based interventions and enabling people to take more control of their lives' (online stakeholder event participant). There were suggestions made for how people could be encouraged to create their own green spaces, tailored to local communities. Activities could be planned with service users too. Given the lack of resources for GSP, collaboration could lead to a sharing of assets and skills, adding value 'through being very creative' (Manchester stakeholder event participant).

Raising awareness

This discussion revolved around the need for greater awareness of GSP among practitioners and communities. This would help strengthen referral pathways and enable resources to go further. Participants discussed how the use of green spaces should be integrated with health and social care agendas as well as with education. Participants reported that currently, the financial systems in the NHS are not set up for GSP and this leads to inconsistency of services and delivery. It was generally agreed that consistency in referrals would equate to consistency in delivery. Participants believed that services should be core rather than sporadic. The stopping and starting of services affect quality, and some participants in the Manchester event felt that services across GM are patchy. Referral routes also vary across GM. A simpler and more consistent referral system would be welcomed by many of the workshop participants. The referral relationship is core to the delivery and ensuring that the service is meeting those who are most in need. Ideally, this relationship would enable participants to be followed up. Participants noted that currently it can be difficult to follow up what happens with service users once they have completed a service. Resources permitting, they believed that follow-ups at 3, 6 and 12 months could be useful.

It was suggested by participants that other professionals could be taught about the potential of GSP, for example teachers, pharmacists and local welfare agencies. They could potentially refer to GSP programmes or at least raise awareness of them. Participants also suggested that more use be made of social media to raise awareness. Putting clear information in this format could help to change attitudes and reduce barriers.

Section 4: Systematic scoping review

We wanted to understand the context in which economic evaluations took place – and the economic evaluation methods used. To achieve this, we undertook a systematic scoping review to synthesise all literature that meets a pre-set list of criteria using systematic search methods (5). Often, a systematic review involves answering a very focussed research question, for example, is GSP more effective at improving wellbeing scores than CBT? As the question for this report was less specific and aimed to synthesise both current methods used for and results of economic evaluations in GSP, we conducted a scoping review with systematic search methods. A scoping review enabled us to search more broadly and include grey literature whilst still be confident we have included all relevant information (6). It is important to provide a transparent method when using systematic search methods (6), these are provided below.

Search methods

We searched 15 databases and relevant organisation websites. We included any type of economic evaluation of UK based nature / outdoor based interventions. We excluded papers that evaluated social prescribing interventions without a nature-based or outdoor focus. However, a summary of these studies can be found in the Appendices.

Searching details

All searches were performed between 14th and 29th October 2024. Searches were conducted using a search string that encompassed terms synonymous with or variations of “green” (such as “natural”, “land”, “outdoor”, “forest”, “wildlife”, “horticulture”) and economic evaluation (e.g., “cost-effectiveness”, “cost-benefit”) limited to UK-based studies. An example of a search string is provided in the Appendices.

Where a search string could not be applied to a database or registry, results were generated by applying a series of key words or phrases (e.g., “nature AND evaluation”, “social prescribing AND green”) based on a pre-agreed search strategy. Grey literature was searched using the same key word and phrase strategy.

Systematic review results

The searches performed during this period yielded a total return of 2679 results. In addition, articles that were recommended to the research team (n=9) were added to these results for screening (see Figure 3).

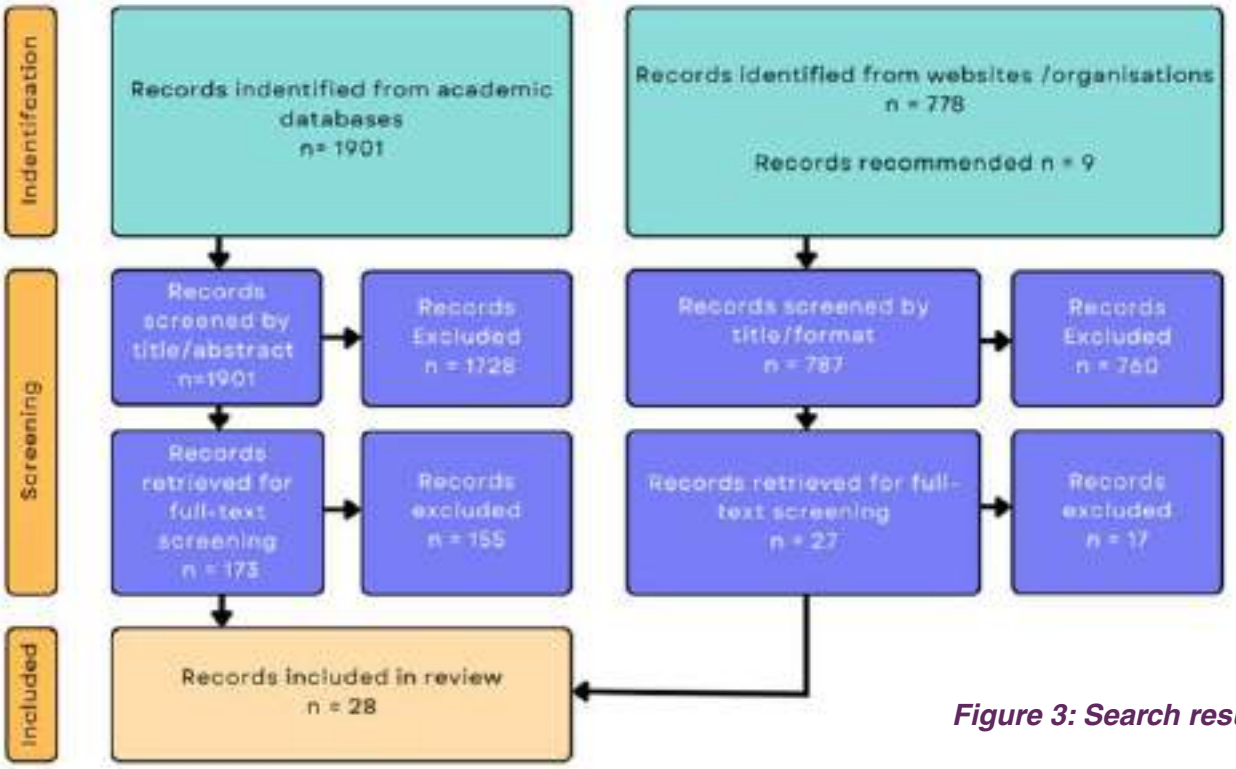

Figure 3: Search results

Characteristics of included studies

A total of 28 economic evaluations of UK based, nature-based / outdoor-based interventions were included in the current review (3, 7-33). Sixteen of the included studies were grey literature reports which had not been peer reviewed (five review/evidence synthesis studies, one randomised controlled trial, one toolkit and nine evaluations) (3, 7-9, 14, 18-21, 24-30). Three peer-reviewed evaluations were included (15, 22, 33). Two peer-reviewed evidence synthesises were also included (16, 17). Four were study protocols, including one for a randomised controlled trial (11, 12, 23, 31). There was also one pilot study (10), one longitudinal cohort study (13) and one quasi-experimental study included in the review (32).

Populations

It was difficult to extract specific demographics of populations included in the studies as most focussed on economic evaluations rather than presenting participant characteristics. However, the following key findings can be reported:

1.Participants were mainly adults.
2.Specific target populations included offenders on probation, disadvantaged / deprived communities, sedentary older adults, and families.
3.Clinical groups included people with existing mental health problems, dementia patients, weight management groups and GP exercise referral groups.

Intervention details

The most common type of intervention was a mixed offer, incorporating different types of provision, often from one organisation, for example the Wildlife Trust. There were ten studies of this types from Natural England (n=3, (8, 28, 29)), the Wildlife Trust (n=2, (7, 30)), NASP (n=2), (24, 25)), DEFRA (n=1, (3)), 1 by a small charity in Wales namely Coed Lleol—Small Woods Wales (15) and one economic synthesis of six projects including a city farm, Mind, the Wildlife Trust, a community woodlands project and Branching Out a program developed by The Forestry Commission Scotland and The National Health Service (16). See Table X in the appendices for more information.

The second most common approach (eight studies (9, 12, 13, 20, 22, 23, 26, 27)) was the use of exercise in the outdoors considering walking, football, outdoor swimming and climbing. Five studies completed economic evaluations on embedded nature-based infrastructure in communities such as nature trails, cycle paths, walking paths and woodlands (14, 17, 31-33). Three studies considered the economic value of gardening specific programmes (18, 19, 21). Finally, one study (with two reports, the final report plus the protocol) evaluated the use of Care Farms (10, 11) (see figure 4).

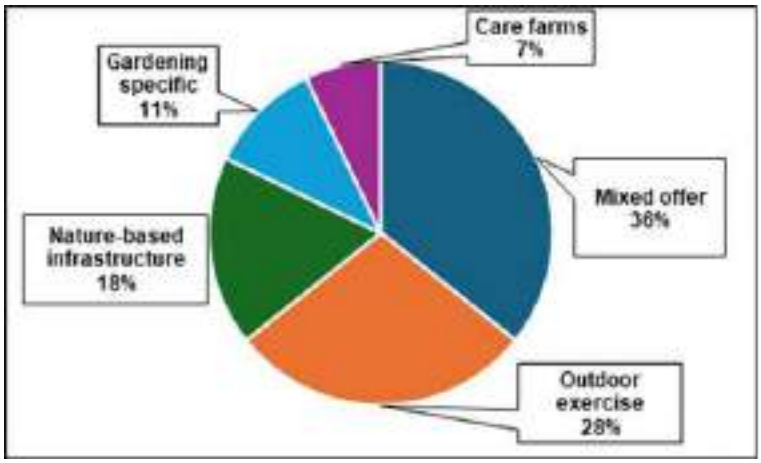

Figure 4: Nature-based interventions

We mapped the nature-based interventions with the GREENME three pillars. The majority (62%) were described as nature-based therapy, whilst 28% were described as nature in everyday life, and 10% equated to nature-based health promotion (see figure 5).

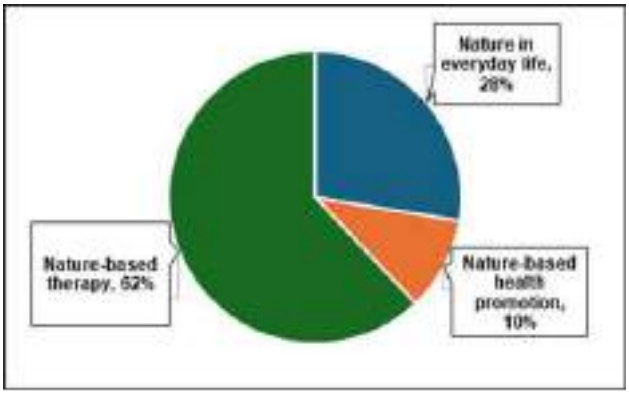

Figure 5. Intervention types mapped to the GREENME model.

Outcomes

In this section primary studies and review papers are presented separately for clarity.

Primary Studies (n=21)

Mental health outcomes were collected in the majority of evaluations. The two most common tools were the WEMWBS/ SWEMWBS (five studies (7, 15, 21, 22, 31)) and the EQ-5D-5L / 3L and QALYS (five studies (12, 23, 31-33)). Three studies used SF-8 / SF-12 / SF-36 and QALYS for economic evaluations (13, 20, 31). Two studies for each measure used nature relatedness / connectedness to nature (7, 32), the NEF social trust measure (15, 22), social activity / cohesion (19, 32) and the perceived stress scale (32, 33). Twelve papers used outcomes not used in any other study (see Table X in the Appendices).

Physical activity measures were taken in eleven studies (7, 15, 17, 19-22, 26, 31-33). Anthropology, physiology and biochemistry outcome were reported in two studies (13, 20) as were healthy eating measures (19, 21). Sleep and self-efficacy for management of chronic disease was taken in single studies (21).

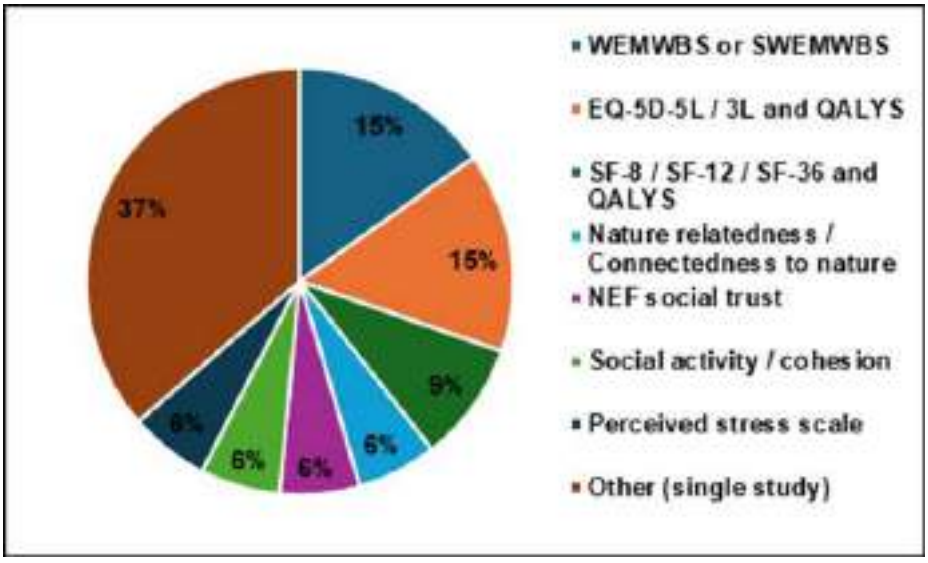

Figure 6. Outcomes

Qualifications and employment status were reported in a single study (19). One study used a self-designed survey on health and wellbeing to conduct their economic evaluation (18). One study did not report health outcomes as the primary aim was to present the costs of setting up a walking programme, rather than evaluating its benefits (27).

Health service costs including inpatient stays, consultations, medications, outpatient visits, respite care, crisis intervention, support worker and care packages were calculated in six studies (10, 13, 19, 20, 24, 26). The costs of the intervention were included in five economic evaluations (3, 10, 13, 19, 20)

Review papers (n=7)

We have not extracted individual study outcomes included in the seven review papers (8, 9, 14, 16, 28-30) but rather provide an overview of the outcomes presented in the review papers themselves.

Four reviews included mental health outcomes including wellbeing, anxiety, depression, stress, loneliness, social isolation and quality of life (8, 16, 17, 30). Like the primary studies, measurement tools included EQ-5D and QALYs, ONS4 and SWEMWBS. The same four reviews included measures of physical health such as dementia symptoms and walking behaviours and general physical activity levels using IPAQ and short questionnaire to assess health-enhancing physical activity (SQUASH) (8, 16, 17, 30).

In addition, Hunter (17) reported community measures such as the system for observing play and recreation in communities (SOPARC), perceptions of neighbourhood, perceived greenery, police reported crime and environmental measures such as water management and urban cooling, fauna and flora.

It was difficult to extract outcomes from three review papers as details were not provided (24, 28, 29). However, most review papers referred to some form of NHS cost saving such as reduced GP appointments, A&E attendances, hospital appointments, prescription usage, mental and social support services.

Economic evaluation methods

The most common (15 studies) approach to economic evaluation was a cost-effectiveness or cost-benefit analysis (10-13, 16, 17, 20, 21, 23, 26, 27, 30-33). A social return on investment analysis was completed in eight of the included studies (3, 7, 9, 14, 15, 18, 19, 22). Four economic evaluations used a mix of analysis techniques (8, 24, 28, 29). One study was a tool kit offering general advice on economic evaluation rather than specific methods (25) (see figure 7).

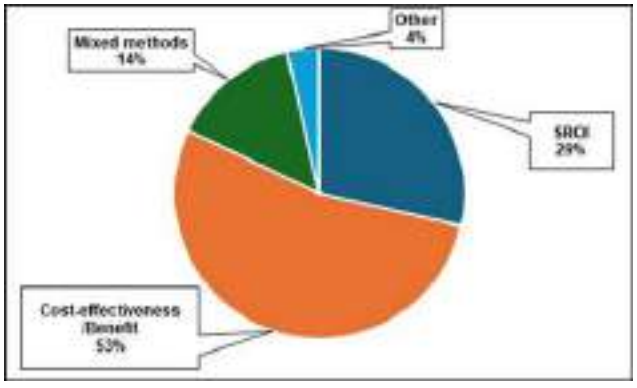

Figure 7. Economic evaluation types

Figure 7 details the methods and results of the economic evaluations in the included papers.

Synthesis of SROIs

The highest return on investment was £17 for every £1 invested from the Bridgend growing communities programme in Edinburgh (14). The lowest return on investment was £0.82 for every £1 invested from the Gardening in Mind programme (19). However, there was large variation in SROI methods and variables included in the calculations. This makes it difficult to compare the economic value between programmes. All evaluations included a measure of wellbeing / mental health and a version of NHS cost savings. Some also included a measure of physical health.

Synthesis of other approaches

Costs per participant were reported from £17.20 (walking programme (27) and £33 (care farms (10)) per person up to £2450 per person (football weight management programme (13). Savings to the NHS were reported in two studies from £7002 to £7635 per person per annum (care farms (10) and Ecominds programme (28)). Costs per QALY were reported in six studies and ranged from £165 (Woods in and around Town project (32)) to £8600.54 (Branching Out (28)). One study presented the cost per one increase of MET-hours to be $0.14 to $2.40 (Green infrastructure (17)), and one study reported a cost of £8750 per one unit increase in the SF-36 scale (walking intervention (20). Cost-benefit results ranged from £1: £0.34 benefit in terms of reduced costs to the NHS (30) to £1: £7.18 from a walking the way programme (26).

Summary of the systematic scoping review

The scoping review revealed significant variations in economic evaluations across different papers, with reported costs ranging from £2 to £17. Researchers did not use a standardised model, and most papers highlighted a lack of data. Consequently, the findings suggest that due to the inconsistency in economic evaluation methods in nature-based research, it is challenging to draw specific conclusions about cost-effectiveness. Nonetheless, all but one of the included studies presented a positive economic analysis, demonstrating that the programs were cost-effective and yielded higher returns than the investments.

Section 5: Cost-benefit analysis

This section provides the findings from the cost benefit analysis and reports on the programme reach, frequency of attendance, types of nature-based interventions, impact on mental health (based on SWENWBS scores) and cost benefit. After removing data without pre-SWEMWBS record, there are a total of 197 observations. However, only 136 observations have pre- and post- SWEMWBS records that could be used for cost-benefit analysis (CBA).

Programme reach

The Nature for Health programme used targeted outreach to ethnic minority communities in areas which have the worst Health Index Scores in Greater Manchester. The Green Social Prescribing (GSP) interventions within Greater Manchester focused on both severe mental health and health inequalities workstreams. The data indicates that the participants were predominantly ethnic minority females, suggesting that the programme was able to reach the intended cohorts (see table 1).

Ethnicity	Freq.	Percent	Cum.
Asian/Asian British	93	48.19	48.19
Black/Black British	20	10.36	58.55
Other	34	17.62	76.17
White/Any other White background	46	23.83	100.00
Total	193	100.00	

Table 1: Programme reach

Frequency of provision

We analysed the frequency of provision across the delivery partners. Figure 8 illustrates the distribution of services among four different providers. Here are the key findings:

- Northern Roots is the largest provider, accounting for 29.95% of the services.
- Manchester Mind/EHF/S4S follows closely, providing 26.9% of the services.
- START contributes 22.84%.
- Groundwork/LWT/Petrus is the smallest provider, with 20.3%.

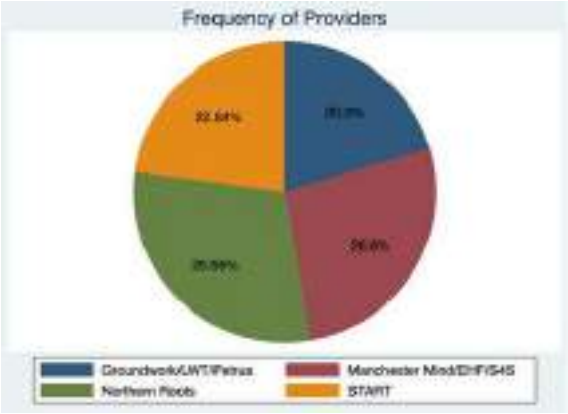

Figure 8: Frequency of provision

As shown in Figure 8, the number of patients for the four delivery partners is 40 for LWT/Groundwork/Petrus (20.3%), 53 for Manchester Mind (26.9%), 59 for Northern Roots (29.95%), and 45 for START (22.84%). As shown in Tables 2 and 3, more than 79% of participants are female and more than 76% are from ethnic minorities.

Sex	Freq.	Percent	Cum.
Female	153	79.27	79.27
Male	40	20.73	100.00
Total	193	100.00	

Table 2: Number of participants M/F

Ethnicity	Freq.	Percent	Cum.
Asian/Asian British	93	48.19	48.19
Black/Black British	20	10.36	58.55
Other	34	17.62	76.17
White/Any other White background	46	23.83	100.00
Total	193	100.00	

Table 3: Ethnicity of participants

Types of nature based activities

We captured the type of nature-based activities that were used as an intervention for the GSP. Table 6 highlights that the type of Green Social Prescribing (GSP) activity is predominantly horticultural (as aligned to Nature-based therapies) (see table 4).

GrAct	Freq.	Percent	Cum.
Horticultural	126	64.29	64.29
Nature connection activity i.e. fores..	57	29.08	93.37
Other:	13	6.63	100.00
Total	196	100.00	

Table 4: Types of nature-based activities

These types of 'horticultural activities' typically involve the use of gardening activities to promote physical, mental, and emotional well-being. This therapeutic practice leverages the healing power of nature and plants to help individuals improve their overall health. These activities are understood to help reduce stress, depression and anxiety (34) and reflect the nature-based therapy as described in the three GREENME pillars.

Impact on mental and physical health

As shown in Table 5, out of 185 patients who shared data, 21.62% report they have high level of mental health need prior to joining in the GSP programme, 60.54% report medium level of mental health need, and only 17.84% report low mental health need.

LoPHN	Freq.	Percent	Cum.
High	31	17.03	17.03
Low	62	34.07	51.10
Medium	89	48.90	100.00
Total	182	100.00	

Table 5: Level of mental health need

Similarly, as shown in Table 6, out of 182 patients, 17.03% report they have a high level of physical health need prior to joining the GSP programme, 48.90% report a medium level of physical health need, and 34.07% report low physical health need.

LoPHN	Freq.	Percent	Cum.
High	31	17.03	17.03
Low	62	34.07	51.10
Medium	89	48.90	100.00
Total	182	100.00	

Table 6: Level of physical health need

Cost benefit analysis

Using the data, a cost benefit analysis was undertaken. There were gaps in the data, but overall, the SWEMWBS scores were significantly improved pre-post intervention. The SROI is small as an average calibration as organisations differ, and sample sizes vary. However, when calibrated at an individual level, there is a positive improvement which indicates that the average SROI is almost £2,945 with NET of nearly £2000. The number of sessions attended influences the positive improvement of SWEMWBS. Based on data from 136 patients with pre- and post-SWEMWBS outcomes, the average overall SWEMWBS scores are 22.63 before the GSP intervention and 27.57 after the intervention (see Table 7 first row). This represents an average increase in mental health outcomes of 4.94, which is statistically significant at the 1% level (p-value = 0.00) (table 9). According to Trotter and Railings Adams (35), the model social values for overall SWEMWBS scores of 23-24 and 27-28 are £22,944 and £24,877, respectively. After accounting for 27% deadweight—reflecting changes in wellbeing that would occur regardless of any intervention—the total social impact per patient is calculated as (£24,877 - £22,944) * (1 - 27%) = £1,411.09.

Delivery partner	No. of obs	Pre-SWEMWBS	Post-SWEMWBS	Difference	*t*-statistic	*p-value*
All	136	22.63	27,57	-4.94	-9.4482	0.0000
LWT/ Groundwork /Petrus	29	21.59	23.79	-2.20	-3.7802	0.0004
Manchester Mind	32	23.63	26.75	-3.12	-3.7758	0.0003
Northern Roots	53	20.92	29.07	-8.15	-8.0740	0.0000
START	22	26.68	30.13	-3.45	-4.0301	0.0003

Table 7: Paired t-test of SWEMWBS scores pre- and post-GSP intervention

The self-reported total costs for LWT/Groundwork, Manchester Mind, Northern Roots, and START are £39,504 (£25,473 + £14,031), £30,000, £42,630, and £18,299, respectively. The total costs for all delivery partners amount to £130,433, resulting in an average total cost of £959.07 per patient across all partners. Consequently, the net social impact per patient is £1,411.09 - £959.07 = £452.02.

Rows 2-5 in Table 7 report average SWEMWBS scores pre- and post-GSP intervention for four delivery partners. Based on data for 29 patients associated with LWT/Groundwork/ Petrus, the average overall SWEMWBS scores are 21.59 before the GSP intervention and 23.79 after the intervention. This represents an average increase in mental health outcomes of 2.20, which is statistically significant at the 1% level (p-value = 0.0004). The model social values for overall SWEMWBS scores of 21-22 and 23-24 are £21,049 and £22,944, respectively. After accounting for deadweight, the total social impact per patient is (£22,944 - £21,049) * (1 - 27%) = £1,383.35. The self-reported total costs are £39,504, resulting in an average total cost of £1,362.21 per patient. Hence, the net social impact per patient is £1,383.35 - £1,362.21 = £21.14 for LWT/Groundwork/Petrus.

Based on data for 32 patients associated with Manchester Mind, the average overall SWEMWBS scores are 23.63 before the GSP intervention and 26.75 after the intervention. This represents an average increase in mental health outcomes of 3.12, which is statistically significant at the 1% level (p-value = 0.0003). The model social values for overall SWEMWBS scores of 23-24 and 27-28 are £22,944 and £24,877, respectively. After accounting for deadweight, the total social impact per patient is (£24,877 - £22,944) * (1 - 27%) = £1,411.09. The self-reported total costs are £30,000, resulting in an average total cost of £937.50 per patient. Hence, the net social impact per patient is £1,411.09 - £937.50 = £473.59 for Manchester Mind.

Based on data for 53 patients associated with Northern Roots, the average overall SWEMWBS scores are 20.92 before the GSP intervention and 29.08 after the intervention. This represents an average increase in mental health outcomes of 8.15, which is statistically significant at the 1% level (p-value = 0.0000) (see table 13). The model social values for overall SWEMWBS scores of 21-22 and 29-30 are £21,049 and £25,480, respectively. After accounting for deadweight, the total social impact per patient is (£25,480 - £21,049) * (1 - 27%) = £3,234.63. The self-reported total costs are £39,504, resulting in an average total cost of £745.36 per patient. Hence, the net social impact per patient is £3,234.63 - £745.36 = £2,489.27 for Northern Roots.

Based on data for 22 patients associated with START, the average overall SWEMWBS scores are 26.68 before the GSP intervention and 30.13 after the intervention. This represents an average increase in mental health outcomes of 3.45, which is statistically significant at the 1% level (p-value = 0.0003) (see table 14). The model social values for overall SWEMWBS scores of 27-28 and 29-30 are £24,877 and £25,480, respectively. After accounting for deadweight, the total social impact per patient is (£25,480 - £24,877) * (1 - 27%) = £440.19. The self-reported total costs are £39,504, resulting in an average total cost of £1,795.64 per patient. Hence, the net social impact per patient is £440.19 - £1,795.64 = -£1,355.45 for START.

Therefore, the GSP programme administered by Northern Roots is the most effective in improving mental health for patients, as measured by average SWEMWBS scores. This is followed by the Manchester Mind programme, and then by the LWT/Groundwork. In contrast, START programme is the least effective.

Since the social impact is based on the average SWEMWBS score for all 136 patients, the overall social benefit could be significantly higher if individual social impacts are assessed on a patient-by-patient basis. This is because changes in social value are bigger at lower SWEMWBS scores than at higher scores for the same incremental change.

For instance, if the average SWEMWBS score rises from 14 to 15, the increase in social value is £9,639. In contrast, an increase from 24 to 25 yields only £1,281 in social value. Similarly, if the score increases from 34 to 35, the corresponding increase in social value is just £618, prior to accounting for deadweight. This illustrates how assessing individual social impacts could reveal a more accurate and potentially greater overall benefit, especially if a large number of patients have relatively low SWEMWBS scores before the GSP intervention.

Table 8 presents the average social values for individual patients both before and after the GSP intervention. We have assigned the corresponding social values for SWEMWBS scores for each patient prior to and following GSP treatment and subsequently calculated the average social values. As indicated in the first row, the increase in average social value from pre- to post-GSP intervention is £4,779.43, which is statistically significant at the 1% level (p-value = 0.00). On average, the net social impact per patient, after accounting for deadweight, is calculated as £4,779.43 * (1 - 27%) - £959.07, resulting in a net value of £2,529.91. This figure is significantly higher than the £452.02 obtained based on the average difference in SWEMWBS scores in Table 7.

Further analysis of social impact based on each of the four delivery partners reveals that the net social impact per person is £3,233.79*(1-27%) - £1,362.21 = £998.46 for LWT/Groundwork/Petrus, £2,338.44* (1-27%) - £937.50 = £769.56 for Manchester, £7,778.11*(1-27%) - £745.36 = £4,932.66 for Northern Roots, and £3,143.32*(1-27%) - £1,795.64 = £498.98 for START, respectively. These results align broadly with previous analyses based on improvements in SWEMWBS scores, showing that Northern Roots is the most effective in enhancing mental health outcomes.

Delivery partner	No. of obs	Pre-social value	Post-social Value	Difference	*t*-statistic	*p-value*
All	136	18893.65	23673.09	-4779.44	-7.6571	0.0000
LWT/ Groundwork /Petrus	29	18452.07	21685.86	-3223.79	-3.8106	0.0003
Manchester Mind	32	21428.88	23767.31	-2338.43	-2.9624	0.0029
Northern Roots	53	16192.91	23971.02	-7778.11	-6.0950	0.0000
START	22	22294.50	25437.82	-3143.32	-2.6169	0.0081

Table 8: Paired t-test of Individual Social Values Pre- and Post-GSP Intervention

Impact on populations from areas of deprivation

To investigate whether demographic characteristics affect the outcome of GSP programme, we conducted pairwise correlation analysis between changes in mental health well-being and age, ethnicity, number of sessions, frequency, level of mental health need, level of physical health need, and Index of Multiple Deprivations (IMD). IMD is obtained by matching the post code of each patient with English indices of deprivation 2019 provided by Ministry of Housing, Communities & Local Government.

	Differ~e	Social~t	Age	Sessions	Freque~y	LoMHN_~t	LoPHN_~t
Difference	1.0000						
SocialImpact	0.8604 0.0000	1.0000					
Age	0.1503 0.0829	0.0643 0.4603	1.0000				
Sessions	0.0602 0.4877	0.0646 0.4567	0.0368 0.6194	1.0000			
Frequency	0.0958 0.2880	0.0467 0.6049	-0.0356 0.6474	-0.0469 0.5386	1.0000		
LoMHN_int	0.0771 0.3816	0.0043 0.9611	0.0144 0.8487	0.0539 0.4701	0.0085 0.9141	1.0000	
LoPHN_int	0.0128 0.8848	0.0504 0.5693	-0.2776 0.0002	0.1593 0.0332	-0.0130 0.8706	0.4553 0.0000	1.0000
IndexofMul~e	-0.1819 0.0383	-0.1261 0.1529	-0.3253 0.0000	-0.0347 0.6437	-0.0736 0.3501	-0.0797 0.2986	0.1692 0.0279
IndexofMul~a	-0.1681 0.0559	-0.1215 0.1686	-0.3509 0.0000	-0.0319 0.6709	-0.0672 0.3943	-0.0848 0.2686	0.1758 0.0222

	Indexo~e	Indexo~a
IndexofMul~e	1.0000	
IndexofMul~a	0.9875 0.0000	1.0000

Table 9: Pairwise correlation coefficients for key variables. The top value represents the correlation value, and the bottom value represents the p-value for each comparison *.

*Difference is the difference in SWEMWBS scores pre- and post-treatment. SocialImpact is the difference in social values pre- and post-treatment. Age is the age of the patient. Sessions is the number of GSP sessions attended. Frequency is the number of sessions divided by the number of days of treatment. LoMHN_int is the level of mental health needs of the patient. LoPHN_int is the level of physical health needs of the patient. IndexofMul~e is the decile of the Index of Multiple Deprivation (1-10). IndexofMul~a is the ranking of the Index of Multiple Deprivation.

Based on table 9, the difference between pre- and post-SWEMWBS scores is positively related to age (p=0.000), while negatively related to the Index of Multiple Deprivations (p=0.0383) (see column 1). However, the improvement in individual social values is unrelated to any demographic variables (see column 2).

To identify the factors influencing improvements in mental health well-being, we performed a multiple linear regression analysis. In the analysis below, the difference between pre- and post-SWEMWBS scores serves as the dependent variable, while the explanatory variables include age, gender, ethnicity, number of sessions, frequency, provider dummies, level of mental health need, level of physical health need, IMD, and post code dummies.

Source	SS	df	MS	Number of obs	=	129
				F(3, 125)	=	8.38
Model	819.514641	3	273.171547	Prob > F	=	0.0000
Residual	4076.45435	125	32.6116348	R-squared	=	0.1674
				Adj R-squared	=	0.1474
Total	4895.96899	128	38.2497578	Root MSE	=	5.7107

Difference	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Sessions	.2337898	.1288612	1.81	0.072	-.0213225	.4889021
PostCode_dummy3	4.957394	1.109336	4.47	0.000	2.761881	7.152908
IndexofMultipleDeprivationDe	-.1988695	.3060389	-0.65	0.517	-.8045584	.4068194
_cons	1.731908	1.562741	1.11	0.270	-1.360951	4.824766

Table 10: Regression results of changes in SWEMWBS scores pre- and post-GSP intervention

Source	SS	df	MS	Number of obs	=	129
				F(3, 125)	=	8.32
Model	814.879423	3	271.626474	Prob > F	=	0.0000
Residual	4081.08957	125	32.6487166	R-squared	=	0.1664
				Adj R-squared	=	0.1464
Total	4895.96899	128	38.2497578	Root MSE	=	5.7139

Difference	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Sessions	.2347749	.1290675	1.82	0.071	-.0206657	.4902154
PostCode_dummy3	5.00666	1.105478	4.53	0.000	2.818782	7.194537
IndexofMultipleDeprivationRa	-.0000484	.0000915	-0.53	0.598	-.0002295	.0001327
_cons	1.538292	1.477509	1.04	0.300	-1.385882	4.462466

Table 11: Regression results of changes in SWEMWBS scores pre- and post-GSP intervention

As shown in Tables 10-11 above, multiple linear regression models indicate number of sessions has a significant positive effect at the 10% significance level, while the postcode starting with OL shows a significant positive effect at the 1% significance level. This suggests that attending more GSP sessions contributes to better mental health outcomes for patients. Additionally, patients residing in northeast Greater Manchester (including Oldham, Rochdale, Ashton-under-Lyne, Heywood, and Littleborough), as well as in small areas of east Lancashire (Bacup) and West Yorkshire (Todmorden), experienced significantly greater improvements after participating in the GSP programme compared to those living in postcodes starting with BL (Bolton), M (Manchester and Salford), SK (Stockport), and WN (Wigan). Other variables are statistically non-significant.

Given that the dependent variable is truncated and takes discrete values ranging from 7 to 35, we employed a Tobit regression to re-estimate and confirm the relationship between improvements in mental health well-being and the explanatory variables (not presented here). The results we obtain are consistent with those mentioned above.

The Nature for Health GSP programme targeted populations from areas of high deprivation, and those with mental ill health. The aim was to improve mental health through the provision of a range of nature-based interventions across the delivery partners. Our findings suggest that the programme is reaching the right population, with 83% of the participants being in the highest areas of deprivation as defined by the IMD. Findings suggest that those with the highest level of mental health need are benefitting the most from GSP. This also includes a positive impact on physical outcomes. Overall results report an average pre-SWEMWBS score of 22.6 which increases to 27.7 post intervention. This indicates a highly significant impact. There is a £452.02-£2,529.91 net economic benefit, depending on how social value is calculated. These findings resonate with the National Economic Evaluation which also highlighted the positive impact of GSP on mental health outcomes and the healthy SROI.

Triangulated data revealed several key insights, drawing on both the scoping review and the wider GSP national evaluation which provided a comprehensive understanding of the effectiveness and value of GSP initiatives. The main findings highlighted the impact on mental health, as measured by the SWEMWBS, and the effects that the frequency and duration of attendance had on mental health outcomes. Additionally, the data underscored health inequalities and demonstrated that the cost-benefit analysis of the programs revealed positive financial outcomes. The scoping review acknowledged the challenges of comparing economic evaluations of GSP interventions due to the use of diverse methods and outcome measures. However, the review identified SWEMWBS as one of the most frequently adopted ways for measuring mental health outcomes, aligning with the design of this economic review. Further, the majority of included interventions were reported to be economically viable, which supports the evaluation findings for Nature for Health and adds to the existing body of research. The review also identified common challenges amongst existing evaluations, notably low sample sizes or incomplete data sets, the latter being a reported issue for this review.

Conclusions

The findings suggest that the GSP programme reaches the right population with 83% in the highest deprivation areas, and those with the greatest mental health need benefit most. The SWEMWBS scores improved from 22.6 to 27.7 post-intervention, indicating significant impact. However, the evaluation also found that there is a need for more consistent and comprehensive data collection and evaluation methods to fully understand and optimise the impact of GSP interventions. Our own economic evaluation faced challenges due to incomplete data sets, missing information, and small sample sizes. Despite this, the evaluation findings highlight GSP's effectiveness and economic viability. We conclude that GM's Nature for Health GSP programme effectively supports populations in areas of high deprivation and those with mental ill health through structured nature-based interventions and demonstrates a net economic benefit.

Section 7: Recommendations

This section reports on the key recommendations for future research, practice and policy makers. When taken together, the findings from the cost benefit analysis (CBA), stakeholder engagement and the scoping review suggest that nature-based interventions are effective and cost effective for people in deprived areas who have mental ill-health. However, there are challenges associated with CBA more broadly. For example, our scoping review highlighted the lack of data, diverse range of results and lack of standard economic models. These challenges, coupled with missing data from the CBA can affect the ability to scale up GSP programmes. A number of common themes that emerged from the review and stakeholder engagement were also reflected in the cost-benefit analysis. These related to consistent use and collection of data, future research and the need to develop a homogenous economic evaluation model.

Recommendations for future economic evaluation

The lack of complex study designs, such as RCTs, prevent NICE and hence NHS cost-effectiveness processes that traditional health care providers recognise. None of the included studies in the review included a control group, but appropriate comparator groups should be identified in future work (for example one study modelled hypothetical control groups (13)).

- The development of a specific outcome tool for GSP may allow more sensitive economic evaluations.
- Economic evaluations should be built in at the design stage and green prescribing providers should be linked with project health evaluation teams or external economists where possible. The economic evaluation could also be underpinned by Theory of Change models.
- There is a need for agreed and consistent economic evaluation methods. Part of this is a need to agree a definition of “value”.
- Establish a valid set of GSP costs. This is difficult as there are lots of assumptions to make and the commissioning practice is inconsistent. Funding is short term and hence so are projects. Therefore, there is a need for long term funding to support better economic evaluations.
- Linked to this is the need to include longer term non-health outcomes (e.g., increased confidence and hence benefits to society) and follow on care options in economic evaluations.
- There is a need for appropriate and long-term support, skills, knowledge and resources to substantiate the evidence for economic evaluations. Understanding and application of economic evaluations should be consistent within providers.
- Economic analysis needs to be careful not to just value individual therapies, e.g., walking groups or swimming, but instead to look at social prescribing as a whole ecosystem intervention.
- Collation of economic evaluation data could help secure top-down funding for nature-based interventions at a national level or grant funding at a local level.
- SROI involves key stakeholders, therefore researchers working with the same data may arrive at different SROI ratios depending on the outcome measure they choose to include. There is a need to agree a set of consistent outcome measures.
- Sensitivity analysis should include deadweight, displacement, attribution, duration and drop off.

Recommendations for future data collection, consistency, and use

Our economic evaluation faced challenges due to incomplete data sets, missing information, and small sample sizes. Similar to other ongoing research in this field, there is a need to support staff who collect data from vulnerable groups, such as individuals with mental health issues. The stigma associated with mental ill health means that quality data depends heavily on the relationship between the researcher and the participant. Often, data were collected by delivery partners who had already established relationships with the participants, which is significant and represents good practice. It is crucial to train those collecting data from vulnerable groups so they are equipped to handle sensitive conversations about mental wellbeing. These challenges are well-documented in the literature and are major limitations in GSP evaluation.

- Given that GSP is sited across multiple organisations, understanding the reasons for incomplete or patchy data collection and linkage in localities is important.
- There is a need for multiple cohorts / sites for data collection; consider combining data from multiple providers and set up data sharing agreements for pooled economic evaluations.
- Staff education and training in data collection with vulnerable groups is crucial.
- Qualitative feedback and the use of mixed methods is required to understand the context and variance about the delivery and impact of GSP. The data needs to 'tell a story' and, where possible, use longitudinal methods to support a holistic approach.

Recommendations for future practice

Our findings indicate that the future of practice in GSP looks promising but depends on collaboration across GSP to help foster a unified approach to embedding nature-based services within the existing social prescribing ecosystem and across sectors. Equally significant is the need to use a combination of standardised data collection tools such as SWEMWBS and the ONS4, to help ensure consistency and reliability in measuring outcomes. We also identified commonalities among the delivery partners that are crucial for future practice and delivery. This includes training and education of staff to equip them with the skills and knowledge needed to collect high-quality data and support those most vulnerable.Together, these efforts could support the ongoing growth of more impactful and sustainable GSP programmes. There is need for more effective systems for monitoring and evaluation.

- Data systems need to be better integrated. There was difficulty accessing objective health outcomes for GSP users, yet there is also the risk of recall bias for self-reported health care use.
- There needs to be a consistent use of agreed outcomes that then uses a consistent measure of benefit, for example WELLBYs.
- Confounders need to be collected and controlled for (e.g., IMD measures).
- Possible bias including survivor bias (i.e., people who completed a whole course of nature-based activities); optimism bias and measurement error (i.e. data collected inaccurately); heterogeneity and multiplicity of intervention (i.e., type of nature-based activity, other types of support accessed) need to be considered and reduced when collecting outcomes.
- Training and education are necessary for delivery partner staff to collect data from vulnerable groups.
- Appropriate time should be built into programmes to ensure staff are able to develop the necessary relationships to collect data about impact.
- Collaboration across the sector is important to enable data sharing and learning.
- There is a need to agree standard outcome measures which also includes ONS4 to help leverage future funding opportunities.

- Research more broadly (36) has highlighted that outcomes aligned with the wider determinants, such as employability and work-related, are limited. However, our findings from the GM GSP evaluation and other research (36-40) have reported on how nature-based interventions can improve mental health. Equally, other research (36-40) has indicated that participation in health-promoting activities can work-related outcomes. This includes improved physical wellbeing, faster recovery leading to quicker return to work, improved nutritional outcomes, enhanced work productivity and reduced absenteeism due to physical health issues. There is a need to ensure that employability outcomes are captured alongside ONS4 and other wellbeing scores.

Policy

Our evaluation demonstrates that the GSP Nature for Health Programme has been effective in improving mental health outcomes for individuals in deprived areas. These findings are statistically significant and highlight a clear cost benefit. This evidence is essential for policymakers to ensure that future GSP initiatives remain well-supported, evidence-based, and responsive to population needs. The evaluation also provides valuable insight into both the successes and challenges of the programme, offering evidence for commissioners and decision-makers to refine strategies for efficient resource allocation and future scale up. Additionally, four key recommended actions have been identified to facilitate the dissemination of findings and support the future expansion of GSP in Greater Manchester.

- Arrange a series of internal stakeholder meeting to discuss and agree dissemination strategy. At the same time of this evaluation, the national test and learn evaluation completed. It is recommended that the GM evaluation report be shared report with national GSP evaluation team to explore for similarities and add to the evidence base supporting scale up of GSP nationally.
- Arrange a stakeholder face-to-face event to highlight results and identify scale-up opportunities and explore the opportunities for the programme to integrate with the Live Well programme.
- Support extended duration of GSP programmes to enable the capture of longitudinal data that will demonstrate impact.

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Appendices

Economic Evaluation Results: SROIs

Study	Type of nature activity	Variables used in SROI	Results
Bagnall (7)	Wildlife Trust Programmes	• WEMWBS: • Four monetary values: • Relief from Depression & Anxiety • Feelings of health: • One value • Good overall health • Nature-relatedness: • One value • Gardening • Physical Activity: • One value • Frequent moderate exercise • Volunteers: One value • Wages / Hours	• £1: £6.88 for targeted groups with low wellbeing at baseline • £1: £8.50 for volunteers with average to high wellbeing at baseline.
Bragg & Leck (8)	Natural England Programmes	Master Gardener: • Physical health, mental health, Wellbeing, Community participation and life satisfaction.	Master Gardener £1: £10.70

		• Master Gardener: • Physical health, mental health, Wellbeing, Community participation and life satisfaction. • The Conservation Volunteers (TCV): Inactivity. • Green Gyms: physical health, social isolation, personal wellbeing. • City Farm: Unclear • Woodland HP: QALY • Ecominds; EA on 5 people. • Community gardening total NHS savings • Care Farms: SROI; service users, families, NHS savings. • Gardens: Unclear Other • Rotherham SP • Well spring health living centre	• TCV £1: £2.55 • Green Gyms £1: £4.02 • City Farm £1: £2.35 • Woodland HP £6800 per QALY "highly cost effective". • Ecominds "value of approx. £7000 per person". • Community gardening NHS savings over £113,000 per year per participant • Care Farms: £1: £3.59 / £3.39 • Gardens: £1: £9.42 "economic pay-off to the NHS". • £1: £1.41/ £3.38 • 33% return per £1 annual return • 3 years 78p and 85p per pound invested • £1: £2.90

Carrick (9)	Glasgow Health Walks	• NHS cost savings · Volunteering benefits · Physical health improvements* · Mental health improvements* *self-designed questionnaires	• £1: £8 • £1: £6.75 to £9.39 from sensitivity analysis
Greenspace (14)	Greenspace Scotland Programmes	A range of 17 SROIs	• Highest SROI £1: £17 Bridgend Growing Communities (Edinburgh) • Lowest SROI £1: £2 Craigshill Greenspace Group (West Lothian) Day event.
Hartfiel (15)	Nature-based activities for example bushcraft, campfire cooking, woodland walks, conservation, foraging, woodland gym and mindfulness	• Logic model using SWEMWBS, 7-day PA, GSES and Social trust. Outcomes were monetised using Social Value Calculator and Mental Health SVC.	• Minimum cost scenario: SVC base £1: £4.02 Conservative case £1: £1.74. MHSVC £1: £4.67 • Maximum cost scenario: SVC base £1: £2.57. Conservative £1: £1.11 MHSVC £1: £2.99
Haywood (3)	National green social prescribing offer	• ONS4 • Cost per participant • Costs and Input • WELLBYs	• £1: £2.42 If resources leveraged by the Test and Learn sites £1: £1.88 in the project overall.

Ireland (19)	Gardening in Mind	• Number of people increasing: confidence, social activity, physical activity, healthy eating, qualifications, volunteering, employment, respite care, care, medication, GP, hospital, crisis intervention, support worker, care packages.	• £117,961on an investment of £57,906, giving a return on investment of £1: £2.04. • Sensitivity analysis £1: £1.25 • The value of social returns to Mind were £ 7,258 compared to an investment of £8,885 giving a return of £1: £0.82
Makanjuola (22)	Outdoor walking or climbing	• SWEMWBS • Overall Health • Social Trust • IPAQ-Short	. Ranged from £1: £4.37 to £5.36
RM Insight (18)	ESCAPE is an allotment project working with adults with mental health problems and children at risk of social exclusion	• Anxiety and stress • Social confidence • Social networks • Physical health • Self-confidence and aptitude • Improved employability • Reduced NHS costs • Improved academic performance	• £1: £1.94. • The improved achievement experienced by the child participants was forecast to lead to £17,000 worth of benefits to the children themselves and achieved £11,000 worth of benefits to their school as a result of savings in remedial support.

Economic Evaluation Results: One method of Cost Effectiveness / Benefit Analysis

Study	Type of Nature Activity	Method and variables used in economic calculation	Results
Elsey (10)	Care Farms (CF)	• Improving health and wellbeing CORE-6D. QALYs Costs of the service (unit cost) including inpatient stay, outpatient visit, consultations, medications and intervention costs.	• £93 in comparator, £33.50 in CF ($p<0.05$) • Medication CF £5.50 vs comparator £3.00 ($p>0.05$) last month • Health Service Cost £92.96 vs CF £33.47 ($p<0.05$) last month Costs over last month comparator £95.70 vs CF £67.20 ($p>0.05$)
Gray (13)	Weight-management through football	• Hypothetical control group (extrapolating) • Cost of intervention per person • No. and type of NHS service used in preceeding12 weeks at baseline, 12 weeks, 12 months and3.5 years) and costs applied. • Medication costed • SF-12 scores into health utility scores using the SF06D algorithm. • Blood Pressure for QALYs	• £2450 per participant at 3.5 years • Costs for hypothetical controls were from £521,000 to £697,000, mean costs £1640 to £1870 per participant. • Increase in QALYs of 0.046 to 0.051 in hypothetical settings. Cost effectiveness of £10,700 to £15,300 per QALY gained. • Lifetime analysis increase in QALY from 0.679 to 0.821, £1790-£2200 per QALY gained within lifetime. • Intervention was cost effective when decision maker pays around £2000 per QALY.

Hinde (16)	Ecotherapy programmes	· Value of information methodology QALYs	• ·Ecominds project: NHS saving of £7635 for the year the intervention is active for a single participant. • City Farms and Community Gardens: 16 volunteers 311 fewer visits to doctors / year and 572 fewer visits to support workers / year.
Hunter (17)	1) Park-based 2) Greenways/trails 3) Greening 4) Green built features.	• Cost Benefit Analysis • Physical activity benefits (MET hours / years). • 1 MET-hour gained is equivalent to a person engaging in moderate-vigorous physical activity for approximately 15 min, with cost effectiveness judged at whether the cost was less than between $0.50 and $1.00 per MET-hour.	• Interventions costs from $45,000 to $3.5 million per park to a total area-wide intervention cost of $6.1 million based cost-effectiveness on increased physical activity, measured in Metabolic Equivalent of Task (MET)-hours/year. • $0.14 to $2.40 per MET-hour.
Issacs (20)	Walking intervention option	• Comparison of cost and effects. • Cost-effectiveness ratio using SF-36 for health outcomes.	• At 6 months: Walking:control - £47,500 per unit increase in SF-36. Walking:leisure - a cost saving from the walking intervention of approximately £10,333 per unit decrease in SF-36. • At 12 months: Walking:leisure cost saving of approximately £8750 per unit improvement in SF-36.

Jones & Lynch (21)	Grow Cardiff	Pre-post estimated cost variance using SWEMWBS	• Total GP appointments before intervention were 96 (average 8 per person), during the intervention 60 (average 5.16 per person). • Due to added cost of intervention and still GP visits, increase in cost by £399.17 per person per annum. • Only 9 participants.
Natural England (26)	Walking the Way to Health regular walking programme.	QALY modelling.	• 2817 QALYs delivered at a cost of £4008.98 per QALY. • Savings to the health service of £81,167,864 (based on life-cost averted). • Cost-benefit ratio of £1: £7.18
Natural England (27)	Walking for Health schemes - led walking interventions.	Recurring cost analysis. Sensitivity analysis.	Different estimates for the unit costs: • by walk register (costs ranged from £231 to £368), • by walk hour (costs ranged from £14.4 to £22.8) • by attendee (costs ranged from £17.2 to £27.3)

Sendall (30)	Wildlife Trust	Benefit cost ratio	• Wild at Heart Clifton Park in Rotherham session £1: £1.19 benefit in terms of reduced costs to the NHS. • Assuming one year each in the scheme, £1: £0.34 benefit in terms of reduced costs to the NHS. • Where assumed to have participated for longer, £1: £0.86. • £1: £2.16 of benefit in terms of reduced costs of treating mental health related conditions. • Including NHS members of staff and double the costs the BCR £1: £1.08 benefit in terms of reduced costs of treating mental health related conditions. • Nature for Health project £1: £0.18-£0.93 in benefit in terms of reduced costs to the NHS • Wild Health project £1: £0.58- £1.10 in benefit in terms of reduced costs to the NHS.

Ward Thompson (33)	Woods in and Around Towns programme.	• Cost-consequences analysis • Exploratory cost-utility analysis using EQ-5D	• CCA shows that the WIAT interventions are of low cost • Cost per QALY was £935 for physical interventions. • Cost per QALYs was £662 for both social and physical interventions. • Exploratory cost-per-QALY analysis showed that a wide range of cost-per-QALY figures would be consistent with the WIAT interventions. • At an average cost per subject of £12 for the interventions, and assuming a societal willingness to pay of at least £10,000 per QALY, then the interventions would only have to generate lifetime QALYs of 0.0012 on average for the interventions to be cost-effective
Ward Thompson (32)	Woods in and Around Towns programme.	• Indicative cost per QALY in a Cost Utility Analysis	• Incremental ICER of £935 (95% CI £399 per QALY to dominated) in wave 2 for the physical intervention (thus higher cost and lower QALY than in the control) • ICER of £662 (95% CI £206 per QALY to dominated) in wave 3 for both social and physical interventions. • The cost per QALY after the physical intervention was £361 (95% CI £160 per QALY to dominated) • The cost per DALY after both social and physical interventions was £165 (95% CI £71 per QALY to dominated).

Economic evaluation results: Multiple methods of cost effectiveness / benefit analysis

Study	Type of nature activity	Method and variables used in economic calculation	Results
NASP (24)	Various	Various including: SRoI, cost description analysis, cost-benefit analysis, regression modelling, cost-effectiveness analysis.	£1: £2.14 and £8.56 in social and economic value.
Natural England (28)	• Various • Wildlife Trust • Natural England • Ecominds - nature-based health interventions to support mental health • Scottish 'Branching Out' programme (where patients with mental health issues are prescribed a series of formally led, woodland activities)	• Wildlife Trust SRoI • Natural England – SRoI • Ecominds – Cost-Benefit • Branching Out - QALY	• Wildlife Trust - £1: £4.20 and £11.94 • Natural England £1: £2.35 to £10.70 per £1 • Ecominds - was estimated to have savings (through reduced NHS costs, benefits reductions, and increased tax contributions) of around £7,082 per participant. It was estimated the programme would result in savings of £1.46m for 246 people who found full-time work following participation. • Branching Out - the cost per Quality Adjusted Life Year gained (QALY) was £8,600.54 In comparison to the NICE threshold of £20-30,000 per QALY.

Study	Type of nature activity	Method and variables used in economic calculation	Results
Natural England (29)	• Welsh Coast walking • Walking for Health • Woods In and Around Towns Challenge Fund • Greenspace Scotland	• Walking for Health – QALY • Woods In and Around Towns Challenge Fund – economic estimate • Greenspace Scotland - SRoI	• Welsh Coast Path - estimated health benefits approximately £18.3 million per year. • Walking for Health - 2817 Quality Adjusted Life Years (QALY) delivered at a cost of £4,008.98 per QALY. Estimated to be a potential saving to the health service of £81,167,864 (based on life-cost averted) at a cost-benefit ratio of £1: £7. • Woods In and Around Towns Challenge Fund - approximately £0.36m per year. • Greenspace Scotland - found a range of favorable cost-benefit ratios of health-related natural environment interventions, £1: £5 of benefit.

Excluded social prescribing studies (no green or nature aspect or not possible to extract this individually)

Study	*Year*	*Study design / format*	*GSP description*	*Economic evaluation method*	*Results of EE*
Social prescribing in Wessex : : understanding its impact and supporting spread, Southampton, Wessex Academic Health Science Network.	2017	Briefing	Eight Social Prescribing Services in Wessex	• Reduction in emergency hospital admissions (number of A&E attendances and emergency admissions to hospital)– • - Analysis of health records of service users • 120 before and 120 after SP	• Range of 20%-50% reduction in A&E and 32%-35% reduction in emergency • Admissions. • Potential annual tariff savings £627,000 to £2,715,000. • Potential return on investment 222% to 225%.

Study	*Year*	*Study design / format*	*GSP description*	*Economic evaluation method*	*Results of EE*
Macmillan Social Prescribing Service : : summary evaluation report : July 2017 - April 2019, London :, Bromley by Bow Centre	2019	Summary Evaluation Report		(Appendix 4 provides details) <u>SROI</u> - ONS4 and MyCAW - Housing Associations Charitable Trust HACT calculator Looked at three aspects – direct benefit from intervention, external benefits (e.g. use of food banks) and benefits to anxiety and depression.	• Present Value: £691,555 • Net Present Value (total of Present Value – inputs): £386,803 • SROI (Present Value / inputs): £2.27 • Autonomy and knowledge: • PV: £1,020,420 • NPV: £715,668.53 • SROI of £3.35 • Suicide prevention: • PV: £602,053 • NPV: £297,301.53 • SROI of £1.98 • PA: • PV: £739,471.35 • NPV: £434,720.02 • SROI of £2.43 • Wellbeing: • Lowest value: £889,075. • NPV: £305,008.63 • SROI of £2.00 • Highest value: • £3,591,863. • NPV: £575,287.43 • SROI of £2.89 • Referrals/signposts: • £1,386,957. • NPV: £354,796.83 • SROI of £2.16 • Other SROIs are available.

Study	*Year*	*Study design / Format*	*GSP description*	*Economic evaluation method*	*Results of EE*
Dayson, C. & Bennett, E. 2017. Evaluation of the Rotherham Mental Health Social Prescribing Service 2015/16-2016/17, Sheffield :, Sheffield Hallam University.	2017	Evaluation	Rotherham Mental Health Social Prescribing Service	<u>SROI:</u> QALYs – using wellbeing scores (Equating well-being with mental health therefore provides an overall well-being valuation of £10,560 per year (0.352 x £30,000). One point change = £264 Low to high = £1,320 Outcomes included family and friends, feeling positive, lifestyle, looking after yourself, managing symptoms, money, where you live, Work, volunteering and social groups.	Well-being benefits for the pilot was between £0.79 and £1.84 (between seventy nine pence and one pound and eight four pence for each pound invested)

Study	***Year***	***Study design / format***	***GSP description***	***Economic evaluation method***	***Results of EE***
Ferguson, K. & Hogarth, S. 2018. Social prescribing in Tower Hamlets : : evaluation of borough-wide roll-out : 1 December 2016 – 31 July 2017, London :, Tower Hamlets Together	2018	Evaluation	Social Prescribing in Tower Hamlets	GP appointments	12.3% reduction in GP appointments between the 6 months before and 6 months after patients' appointments with a Social Prescriber (418 fewer appointments in a cohort of 890 patients who had seen a Social Prescriber)

Study	*Year*	*Study design / format*	*GSP description*	*Economic evaluation method*	*Results of EE*
Fitzsimons, C. F., Baker, G., Wright, A., Nimmo, M. A., Ward Thompson, C., Lowry, R., Millington, C., Shaw, R., Fenwick, E., Ogilvie, D., Inchley, J., Foster, C. E. & Mutrie, N. 2008. The 'Walking for Wellbeing in the West' randomised controlled trial of a pedometer-based walking programme in combination with physical activity consultation with 12 month follow-up: rationale and study design. BMC public health, 8, 259.	2008	RCT Protocol	Walking for Wellbeing in the West	QALYs EQ-5D, administered to Group 1 at baseline, 12 weeks, 24 weeks and 48 weeks and baseline, 12 weeks, 24 weeks, 36 weeks and 60 weeks in Group 2 was used to determine the quality of life for the intervention and control groups. Incremental cost-effectiveness ratios (ICERs)	Results in https://doi.org/10.1186/1471-2458-11-200 Shaw et al. 2011 The incremental cost effectiveness associated with the interventions was estimated as £92 and £591 per person achieving the target for the minimal and maximal interventions respectively. The ICER associated with the maximal intervention, compared to the minimal intervention, is £591per additional target achiever (£591/1).

Study	*Year*	*Study design / format*	*GSP description*	*Economic evaluation method*	*Results of EE*
					If achieving and maintaining the target over 12 months increased each person's lifetime QALYs by more than 0.02 (= 591/30000), then the maximal intervention would be considered cost-effective against this standard threshold. This level of increase in QALYs equates to an increase in survival (in full health), as a result of the maximal intervention, of 7.3 days over a lifetime (= 0.02*365), or 1.1 day over a lifetime for the minimal intervention (= 0.0031*365).

Study	*Year*	*Study design / format*	*GSP description*	*Economic evaluation method*	*Results of EE*
Foster, A., Thompson, J., Haywood, A., Akparido, R., Jacques, R., Mukuria, C., Ariss, S. & Holding, E. 2021. Impact of social prescribing to address loneliness : : a mixed methods evaluation of a national social prescribing programme.	2021	Evaluation	British Red Cross national SP programme to address loneliness	SROI SWEMWBS Avoidance of missed healthcare appointments Improved wellbeing of volunteers	• Social Return • Base case £3.42 • Lower 95CI £2.40 • Upper 95CI £4.45 • 50% SWEMWBS £1.79

Study	***Year***	***Study design / format***	***GSP description***	***Economic evaluation method***	***Results of EE***
Grant, C. A randomised controlled trial and economic evaluation of a referrals facilitator between primary care and the voluntary sector.	2000	RCT	Avon GP surgeries referred to the voluntary sector	We compared the NHS resource utilisation of patients in the two groups by economic analysis. Resources measured were primary care time and Amalthea time, prescribing in primary care (all drugs and mental health drugs), and referrals to other agencies (excluding voluntary agencies).	Intervention costs £153 (33413) Control costs £133 (10452)

Study	*Year*	*Study design / format*	*GSP description*	*Economic evaluation method*	*Results of EE*
Hou, B., Moss, R., Hammad, M., Sheldon, T., Wright, J. & Dickerson, J. 2023. Findings of the effectiveness evaluation of the Bradford Central Locality Integrated Care Services (CLICS) intervention (which integrates social prescribing and general practice) : : summary report for the Reducing Inequalities in Communities (RIC) programme, Bradford :, Born in Bradford.	2023	Evaluation	Bradford SP	Unplanned hospital admissions	Cannot access full report

Study	*Year*	*Study design / format*	*GSP description*	*Economic evaluation method*	*Results of EE*
Jones, C., Hartfiel, N., Brocklehurst, P., Lynch, M. & Edwards, R. T. 2020. Social Return on Investment Analysis of the Health Precinct Community Hub for Chronic Conditions. International journal of environmental research and public health, 17.	2020	SROI	Health Precinct Community Hub for Chronic Conditions	<u>SROI</u> QALYs using HACT Social Value Calculator version 4. **Costs:** Attendance fees paid by participants, sta ff costs (covering Health Precinct staff and a proportion of general staff for the leisure centre e.g., receptionists), leisure centre overheads, and exercise equipment annuitized over 12 years at a discount rate of 3.5%. **Outcomes:** PA levels, EQ-5D-5L, Rosenberg self-esteem, Campaign to end loneliness, self-reported health status, GP appointments, annual memberships	Dividing the social value of benefits experienced by stakeholders (£281,010) by the value of inputs required to deliver the Health Precinct (£55,389) yielded a base case SROI ratio of £5.07 of social value generated for every £1 spent.

Study	*Year*	*Study design / format*	*GSP description*	*Economic evaluation method*	*Results of EE*
Makanjuola, A., Lynch, M., Hartfiel, N., Cuthbert, A., Wheeler, H. T. & Edwards, R. T. 2022. A Social Return on Investment Evaluation of the Pilot Social Prescribing Emotion Mind Dynamic Coaching Programme to Improve Mental Wellbeing and Self-Confidence. International journal of environmental research and public health, 19.	2022	SROI	Social Prescribing Emotion Mind Dynamic Coaching Programme	<u>SROI:</u> Mental wellbeing SWEMWBS Mental health social value calculator v.1.0 Self-efficacy GSES Social value calculator v.4.0 Costs The total costs for the EMD programmes included product development costs, consultancy costs, website costs, equipment and software costs, overhead costs, and staff costs.	• Face to face: the total social value for high confidence among face-to-face clients was GBP 196,200 per year. • Online: the tot social value among online clients was GBP 130,800 per year. • SWEMWBS: The social value was GBP 15,640 per client per year for face-to-face clients (Table 7) and GBP 4758 for online clients (Table 8).

Study	*Year*	*Study design / format*	*GSP description*	*Economic evaluation method*	*Results of EE*
					CRSI: • The total annual cost saving was GBP 272 per face-to-face client and GBP 27 per online client • Total financial value per client was compared with the total cost per client, the SROI ratios ranged from GBP 4.12 to GBP 7.08 for every GBP 1 invested for face-to-face clients and from GBP 2.36 to GBP 3.34 for every GBP 1 invested for online clients (Table 10).

Study	*Year*	*Study design / format*	*GSP description*	*Economic evaluation method*	*Results of EE*
Palmer, D., Wheeler, J., Hendrix, E., Sango, P. N. & Hatzidimitriadou, E. 2017. “When I am out with her (befriender) I feel so good mentally and all my physical pains go unnoticed” : : social prescribing in Bexley : pilot evaluation report, Canterbury :, Canterbury Christ Church University.	2017	Mixed methods evaluation	Bexley pilot programme - referral through 9 GP surgeries to SP co-ordinator based at Mind. Participants with long-term health conditions meeting criteria: socially isolated / frequent user of primary care or A&E/struggling with life change/struggling to manage health/or a carer for someone with long-term health conditions.	WEMWBS was used at baseline and at six months to measure clients’ mental wellbeing. Quantitative measures also included data on GP surgery appointments, hospital data, A&E admissions and data from the London Ambulance Service. EE achieved through comparison of service usage.	Emergency admissions - Total cost of A&E attendances reduced by £1,118 6 months after social prescribing. The average cost of an A&E attendance reduced by £30.35 per client, from £331 to £301.2 Non-elective - the total cost of admissions also reduced after social prescribing, from £39,576 to £16,968.

Study	*Year*	*Study design / format*	*GSP description*	*Economic evaluation method*	*Results of EE*
Polley, M., Bertotti, M., Kimberlee, R., Pilkington, K., Refsum, C. & Carpenter, A. 2017. A review of the evidence assessing impact of social prescribing on healthcare demand and cost implications, London :, University of Westminster.	2017	Systematic review	Various UK-based programmes / interventions reviewed.	CBA, ROI SROI	Eight studies calculated value for money assessments such as cost benefit analysis (Burgess, 2014; Windle et al., 2016). None of the studies used the traditional cost-effectiveness or full cost-utility analysis. Estimates varied widely from an annual Return on Investment (ROI) of 0.11 (in the first year of operations) (Dayson and Bashir, 2014) to 0.43 (Kimberlee, 2016). The RCT reported higher cost of care per patient in the intervention group than the control, though no value for money assessments were calculated (Grant et al, 2000)

Study	*Year*	*Study design / format*	*GSP description*	*Economic evaluation method*	*Results of EE*
					Four studies carried out broader SROI calculations. Improved mental wellbeing outcomes and higher rates of employment were examples of positive externalities considered in SROI but excluded from ROI analysis. The mean SROI (Weld et al, 2015) was £2.3 per £1 invested in the first year (Kimberlee, 2016).

Study	*Year*	*Study design / format*	*GSP description*	*Economic evaluation method*	*Results of EE*
Polley, M., Seers, H., Toye, O., Henkin, T., Waterson, H., Bertotti, M. & Chatterjee, H. 2023. Building the economic evidence case for social prescribing, London :, NASP.	2023	Rapid scoping review.	Various UK-based programmes / interventions (post 2018) reviewed.	Cost-description analysis (CDA)	Lynch and Jones (2022) costs assigned to the GP consultation reduction of 4.74 appointments per participant, extrapolated over a 12-month period indicate a likely cost saving of £78.37 per participant. Bertotti et al (2020) reduction in GP usage equated to £24.4 per person (n=102), but there was a small rise in cost of A&E £6.27 per person (n=102). Envoy Partnership - Values assigned to the reductions in health services usage equated to £102,000 for GP practice staff time in the first year, forecast to rise to £150,000 in year 2. Resource savings for the hospital usage were calculated at £106,000 year 1 and forecast at £154,000 year 2.

Study	*Year*	*Study design / format*	*GSP description*	*Economic evaluation method*	*Results of EE*
				Regression modelling	Lynch and Jones (2022) costs assigned to the GP consultation reduction of 4.74 appointments per participant, extrapolated over a 12-month period indicate a likely cost saving of £78.37 per participant. Bertotti et al (2020) reduction in GP usage equated to £24.4 per person (n=102), but there was a small rise in cost of A&E £6.27 per person (n=102). Envoy Partnership - Values assigned to the reductions in health services usage equated to £102,000 for GP practice staff time in the first year, forecast to rise to £150,000 in year 2. Resource savings for the hospital usage were calculated at £106,000 year 1 and forecast at £154,000 year 2.

Study	*Year*	*Study design / format*	*GSP description*	*Economic evaluation method*	*Results of EE*
				Regression modelling	Case et al. (2021) - annual secondary care cost reduction of £1.56 million for the 2019/2020 financial year.
				CBA	Jones and Lynch (2020) - GSP programme found negative cost saving, but on a small sample (n=9).

Study	*Year*	*Study design / format*	*GSP description*	*Economic evaluation method*	*Results of EE*
				SRoI	Elston et al. (2019) - 56% had increased costs, the increases were only statistically significant for inpatient, community based and social care usage. Wildman and Wildman (2023) - Patients who had high engagement with the social prescribing scheme generated the greatest reductions in care costs of £77.57 [95% CI: -152.30, -2.84] per patient, per year. Ferry et al (2020) - feasibility study showed average health and social care cost increased between baseline and the three month follow-up time point. Foster et al. (2021) - SROI range of £3.42 per £1 invested. Mankanjuola et al. (2022) - pilot data reported an SROI of £2.14-7.08 per £1 for face-to-face participants and £2.37-3.35 per £1 for online participants.

Study	*Year*	*Study design / format*	*GSP description*	*Economic evaluation method*	*Results of EE*
				Cost-effectiveness analysis (CEA)	Bosco et al. (2019) - SROI range between £1.02-£1.20 per £1 invested. Hartfield et al (2022) - n SROI range of £3.46-£5.94 £1 invested. Jones et al. (2020) - SROI range of £2.60–£5.16 per £1 invested. Jones et al. (2018) - range of SROI reported was £3.20-£6.62 per £1 invested. Ubido and Thompson (2018) - highlighted a particular scheme that generated savings to the public finance of £13.14 per pound invested. Jones et al. (2019) - highlighted a social prescribing scheme that returned £2.50 for every pound invested. Wilson (2022) - three different museum and health programmes ranging from £8.66-£17.73 per pound invested.

Study	*Year*	*Study design / format*	*GSP description*	*Economic evaluation method*	*Results of EE*
				Cost-effectiveness analysis (CEA)	Envoy partnership (2018) SROI of £2.80 per £1 invested. Bertotti et al. (2020) - SROI analysis for only one site was reported, as £5.04 per £1 invested. Bertotti and Temirov (2020) - SROI was conservatively estimated at £3.51 per £1 invested for the people that provided baseline and follow-up WEMWBS data (n=41 at 3 months) and estimated an upper limit of £8.56 per £1 invested for the overall population of 2000 service users. Bertotti et al (2020) - SROI range of £2.86-£6.42 per £1 invested.

Study	*Year*	*Study design / format*	*GSP description*	*Economic evaluation method*	*Results of EE*
				Cost-effectiveness analysis (CEA)	Bertotti and Temirov (2020) - e initial QALY gained at 3 and 6 months was negative. Three negative respondents were carried across as no change, to understand potential cost effectiveness which resulted in QALY of £20100 n=59 at 3 months, which falls within the NICE guidelines for a cost-effective intervention thresholds (£20,000-£30,000/QALY).

Study	*Year*	*Study design / format*	*GSP description*	*Economic evaluation method*	*Results of EE*
Skinner, A., Hartfiel, N., Lynch, M., Jones, A. W. & Edwards, R. T. 2023. Social Return on Investment of Social Prescribing via a Diabetes Technician for Preventing Type 2 Diabetes Progression. International journal of environmental research and public health, 20.	2023	SRoI	MyLife - aimed to prevent T2DM by referring to a diabetes technician (DT), who then signposted patients to community-based SP programmes, such as the National Exercise Referral Scheme (NERS), KindEating, and Slimming World.	SRoI analysis compared the cost of implementing the programme with the social value generated: SWEMWBS EuroQol EQ5D-5L Outcomes monetised using the HACT Social Value Bank (SVB), which uses wellbeing valuation to estimate social value.	Social value for every GBP 1 invested for participants who engaged with the 'DT (Diabetes Technician) only' ranged from GBP 4.67 to 4.70. Social value for participants who engaged with the 'DT plus SP (social prescribing) programme' ranged from GBP 4.23 to 5.07

Study	*Year*	*Study design / format*	*GSP description*	*Economic evaluation method*	*Results of EE*
White, C., Bell, J., Reid, M. & Dyson, J. 2020. An evaluation of Connect Well and Social Prescribing in Hull : : final evaluation report January 2019 - December 2020, Hull :, University of Hull.	2020	Mixed methods programme evaluation	Connect Well - provides both Welfare Advice and Social Prescribing.	Economic analysis using GP attendance rates.	There was insufficient data to conduct the planned economic analysis.

Example of a search string

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Search: (((environment* OR natur* OR green* OR green space OR natural environment OR open space OR land OR terrestrial OR tree* OR outdoor* OR outside OR park OR forest* OR wildlife* OR wilderness OR wood* OR plant* OR garden* OR vegetation OR land* OR playground* OR mountain* OR horticultur* OR nature connect* OR exercise OR nature art OR nature craft OR alternative therap* OR wilderness OR sport OR conservation OR photo walks OR care farming OR talking therap*) AND ("cost-effectiveness analysis" OR "cost-benefit analysis" OR "cost effectiveness" OR "economic evaluation" OR "cost description analysis" OR "cost-utility analysis" OR "value for money" OR "benefit-cost ratio" OR "SROI" OR "Social Return on Investment")) AND (social prescri* OR community referral OR community connector OR nature intervention OR community prescri* OR social referral OR non-medical referral OR link worker OR care navigator OR asset-based OR strengths-based)) AND (united kingdom OR UK OR Great Britain OR England OR Scotland OR Wales OR Ireland OR Northern Ireland).

Examples of the interventions in the mixed offer studies

Organisation	**Examples of offer**
Wildlife Trust	Volunteering, recovery work, wellbeing through nature, life skills and wildlife habitat.
Wildlife Trust	Wild at Heart – exploring green spaces. Feed the Birds – home visits to feed the bird. Early MH Intervention in Bury - group outdoor activities such as pond dipping, willow weaving, gardening, bird box building.
Natural England	Health promotion, green care including care farms, gardening, conservation work and green gyms.
Natural England	Nature-based initiatives, Ecominds, Branching Out (prescription of a series of formally led, woodland activities).
Natural England	Walking on the Welsh Coast path, Woodlands in and around town, health walks.

NASP	Green social prescribing
NASP	Toolkit – no specific examples provided.
Coed Lleol—Small Woods Wales	Nature-based activities bushcraft, campfire cooking, woodland walks, conservation, foraging, woodland gym and mindfulness.
Ecotherapy	City farm, MIND projects, Wildlife Trust, and community woodlands project
DEFRA	Gardening, green exercise, other, bushcraft, crafting, yoga, conservation and food growing

Single study outcomes

Study	Outcome
Haywood (3)	ONS4 and WELLBYs
Bagnall (7)	Feelings of Heath
Elsey (10)	CORE-6D and QALYs
Giné-Garriga (12)	ICECAP-O
Hartfiel (15)	Generalised self-efficacy
Ireland (19)	Confidence
Issacs (20)	HADS
Issacs (20)	Behaviour Change
Jones and Lynch (21)	UCL Loneliness Scale
Makanjuola (22)	Overall Health Question

Massey (23)	ReQOL and QALYs
Ward Thompson (33)	Health related QoL

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