Nature-based interventions to support mental health and well-being of young women in pregnancy: exploratory work for future feasibility RCT

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Abstract

Nature-based interventions to support mental health and well-being of young women in pregnancy: exploratory work for future feasibility RCT

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Background: The prevalence of mental health and well-being issues among young women is increasing. Pregnancy is a time when new mental health challenges may arise, or existing conditions can be exacerbated. This project presents preparatory work on how nature-based interventions may help to support the mental health and well-being of young pregnant women (aged 16–24 years) in a future study.

Methods: This project was formed of three main phases conducted from March to August 2022: (1) mapping nature activities available across the East Midlands region and two focus groups with providers of nature activities (n = 6); (2) public participation and involvement work to inform future research. This included four focus groups with young women (n = 11), leading to the formation of a new young women's panel (Research Influencers Group). Networking and stakeholder engagement to support future research.

Results: The mapping survey identified 68 nature-based organisations/projects operating in the region, many of whom expressed interest in being involved in future research. The young women's focus groups confirmed the importance of the topic and generated a wealth of information to support the intervention design. A Research Influencer Group of five young women was established from the focus group participants. The Research Influencer Group chose the nature-based intervention and had input into all aspects of the study design. This group will continue into future projects. Focus groups with providers of nature activities have further advanced the study design. The project team have developed relationships with relevant stakeholders and networks that will inform the future trial.

Conclusion: This preparatory co-design work suggested that a nature-based intervention may be acceptable to young women, and providers of such interventions felt it was feasible to offer these activities to young pregnant women. This preparatory work has led to an outline research plan which has been co-produced with public contributors and stakeholders throughout.

Limitations: This preparatory work is limited by small focus group samples, and the possibility that not all providers were reached through the snowballing approach to the mapping survey.

Future work: Future research is needed to test the nature-based intervention; this would be in the form of a feasibility randomised controlled trial of nature-based interventions to promote the mental health and well-being of young pregnant women.

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List of supplementary materials

Report Supplementary Material 1 Survey instrument

Report Supplementary Material 2 Focus group topic guides

Supplementary material can be found on the NIHR Journals Library report page (https://doi.org/10.3310/NPGR3411).

Supplementary material has been provided by the authors to support the report and any files provided at submission will have been seen by peer reviewers, but not extensively reviewed. Any supplementary material provided at a later stage in the process may not have been peer reviewed.

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Plain language summary

What is the project about and why is it important?

The mental health and well-being of young women has been getting worse since the 1990s. In particular, young women are more likely to experience depression or anxiety when pregnant or after giving birth. This can have long-term effects for them and their children. This also results in high costs for the National Health Service and social services. We know that social support can help to protect people against poor mental health and well-being. Research has also shown that access to nature may be linked to better mental health and well-being.

This project aimed to find out what types of group nature activities were offered in the community and whether young women (aged 16–24) felt doing these activities might help their mental health during and after pregnancy.

What have we done?

Our first step was to map the nature-based activities that are available in the East Midlands region of the United Kingdom by sending a short survey to organisations to find out more. These may include activities such as walking, music or dance, or arts and crafts sessions held in natural settings such as forests or community gardens.

We also held focus groups with young women to discuss the idea of nature activities to promote mental health and well-being. We invited some women to work with us as part of our 'Research Influencer Group'. They were involved in co-designing the future research, including choosing the nature activity to be tested. We have also linked up with the right people to support this and future projects.

What did we find out?

In this small preparatory study, young women we spoke to were very enthusiastic about spending time in nature and they felt it could benefit young pregnant women and their babies in many ways. There are currently a wide range of nature activities available in the East Midlands. Providers of these activities have recommended ways to make sure a future study works well. An outline research plan has been co-developed with the Research Influencer Group to move forward with the next stages of this research.

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Background

More women in the United Kingdom (UK) are presenting with mental ill-health than ever before.[1] A quarter of young women now report symptoms of mental ill-health[1] and rates in women continue to rise, while rates in men have remained stable from 2000 onwards.[2] Pregnant and postnatal women are particularly at risk, as perinatal and postnatal mental health disorders are some of the most common comorbidities of pregnancy.[3] Recent systematic reviews report the prevalence of antenatal and postnatal anxiety at 15–20% and 10% respectively,[4–6] with 17% of mothers experiencing postnatal depression.[7] This can have a devastating impact on women's quality of life, their relationships and attachment with their child.[8] Maternal mental health problems can also impact child health such as adverse birth outcomes,[8,9] and emotional, behavioural and developmental issues in childhood.[8,10,11] There is a substantial cost associated with this to the public sector, particularly to National Health Service (NHS) and social care. The combined costs of perinatal anxiety and depression are estimated to be £8500 per woman giving birth; 60% of these costs relate to the adverse impact on children.[10]

Young pregnant women are particularly vulnerable to poor mental health and well-being.[4,12] Antenatal anxiety is significantly associated with young age,[4] and adolescents have an increased risk of becoming depressed during[4,12] and after[12] pregnancy. Other risk factors include a history of mental ill-health,[13] low educational achievement and unemployment, insecure relationships and current/past pregnancy problems.[4] Lack of social support may also increase anxiety and depression during pregnancy.[4] However, good-quality social support can mitigate symptoms and is important for well-being throughout the maternity period.[4,12] Indeed, increasing social networks and support is well established as a means to promote mental health and well-being.[14–17] In pregnancy, greater social support networks have been found to have protective effects against health outcomes as diverse as postnatal depression,[18] pregnancy complication in women with additional risk factors,[17,19] and cortisol secretion, which can be harmful to the fetus.[20] Additional social support in pregnancy has long-term benefits on the psychosocial health of mothers and children's health and development.[21] Group approaches to pregnancy care are also well received by young women and offer opportunities for learning and socialising amongst peers.[22,23]

Alongside social support there is increasing evidence that access to nature (green and blue space) is beneficial to mental health and general well-being,[24–28] and reduces socioeconomic health inequalities.[29] Regular visits to nature can improve well-being, help people feel their lives are more worthwhile and increase happiness.[25] A recent review found that 23 of 25 studies showed positive associations between access to urban green space and mental health in the general population but called for more evaluative studies going beyond cross-sectional surveys.[24] There are also particular benefits to pregnant women as proximity to nature may have stronger protective effects on mental health for females, as well as lower-income and lower-educated groups.[30] Pregnant women living in greener environments were around 20% less likely to report symptoms of depression, and improving access to green space was suggested as a promising intervention for reducing risk of depression, particularly in disadvantaged groups.[31] These encouraging findings have generally not been derived from samples of young pregnant women; therefore, there is an urgent need for robust evaluative studies to add to this evidence. No published interventions for green prescribing with young pregnant women were found.

One approach to improve mental health and well-being is through social and green prescribing. This practice is increasing in the UK as healthcare commissioners and public health bodies acknowledge the associated health[32,33] and economic benefits.[34–36] Green space has also been recognised as vital during the COVID-19 pandemic.[37] A cross-government initiative was launched late 2020 with a £5.77m investment to embed green prescribing into communities.[38] This initiative aims to improve mental health outcomes and develop best practice for green social activities, in terms of resilience and accessibility.[38] The East Midlands region secured funding for two of the seven *test and learn* sites nationally: 'Nottingham and Nottinghamshire Integrated Care System' and 'Joined Up Care Derbyshire Sustainability

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and Transformation Partnership'.[38] However, this is yet to be evaluated and there is a lack of high-quality studies to test the effectiveness of green prescribing on mental health and well-being.

The overarching aim of this project was to underpin an application to the future National Institute for Health and Care Research (NIHR) Public Health Research (PHR) commissioned call. This focused on social, nature-based activities to promote mental health and well-being amongst young pregnant women. This includes any group activities taking place in a natural setting or actively connecting with nature, for example, gardening, walking, exercise, forest schools and mindfulness, among others. This project took place in the East Midlands region (Notts, Derbys, Leics, Lincs, Northants, Rutland) as it encompasses diverse populations in a mix of rural, semi-rural, urban and coastal environments. The East Midlands has similar deprivation scores to the England average.[39] This region also has slightly higher than average adult depression rates and number of births to women aged under 20 compared to the rest of England.[40] Therefore, there is a need to promote mental health among young mothers in this region and the range of environments ensures findings are generalisable. To our knowledge, this will be the first study to investigate the effects of social, nature-based, community activities on mental health and well-being among young pregnant women.

Study aim, objectives and research questions

Aim

To complete development work to underpin and support an application to the NIHR PHR commissioned call on 'mental health and well-being among young women' focusing on pregnancy.

Research question (RQ)

(1) What nature-based social activities are available to promote mental health and well-being, (2) are they acceptable to young pregnant women and (3) what networks are necessary to deliver and test these interventions?

Objectives

1. To conduct a mapping exercise of the social, nature-based, support and services available in the East Midlands to promote mental health and well-being.
2. To develop a diverse young women's maternity research involvement group, to explore their views on acceptability of interventions and barriers and facilitators to participation.
3. To develop a comprehensive network of partners to support and/or deliver a future feasibility study, including non-governmental organisations (NGOs), policy-makers and additional academic expertise.

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Methods

This project comprised development work to underpin an application to a future commissioned call on promoting the well-being and mental health of young women. For these calls our focus will be on the sub-population of pregnant young women. This work included: (1) a mapping exercise, (2) gathering the expert views of women, (3) developing networks and partnerships and (4) synthesis.

Mapping exercise (to address RQa and Objective 1)

A mapping exercise (April–July 2022) was completed of community social, nature-based, support and services available to pregnant young women in the East Midlands to promote mental health and well-being. The intention was to map all relevant activities available to the general population that meet our inclusion criteria, not only those specifically targeted at this group. This was to provide a comprehensive picture of what is available which can then be adapted for use amongst young pregnant women in future work. The mapping work followed the processes described in Price *et al.*'s[41] 'Seven steps to mapping health service provision' but was modified for our focus on community rather than NHS services. This included the following seven steps:

(1) Defining target service: the target service was defined as social, nature-based support and/or services to promote mental health and well-being which are available to (but not necessarily exclusively targeted at) young pregnant women aged 16–24.
Inclusion criteria: service includes social elements and based in nature; service is free of charge to reduce health inequalities based on ability to pay; services which are inclusive to young pregnant women; services which promote mental health and well-being; in the East Midlands including local services offered by national organisations.
Exclusion criteria: services targeting individuals with specific health issues, unless pregnancy-related; services that aim to treat, rather than prevent, mental health issues; services which exclude young pregnant women; NHS services/support which are not based in the community.
(2) Identifying informants: informants were identified using existing networks, public health departments, link workers, and directories of voluntary services, along with internet and social media search engines to identify nature-based projects. These were projects that took place outdoors in natural settings or had a focus on connecting with nature. We engaged with the local government-funded green prescribing for mental health *test and learn* sites in Nottinghamshire and Derbyshire[38] to assist with contacting relevant organisations. Organisations were asked to complete the survey (*explained below*), including knowledge of other services and/or support in the region and contact details. This was designed to create a snowball sampling effect to reach organisations which may only be known by others offering similar support.
(3) Designing the survey: a short online survey was created using Microsoft Forms and emailed to organisations to ascertain the services/support provided. The survey design was discussed and piloted within the project team, and then piloted with two members of the Nottingham Maternity Research Network who have experience of working or volunteering within community groups. The survey asked for a description of the service, organisational issues, how users access the service and/or project and ascertaining interest in further research. This resulted in an online survey of 27 questions with a mix of multiple choice and free text answers (see *Report Supplementary Material 1*).
(4) Data collection: data collection was online, with links to the survey being shared via direct email to organisations identified in steps 2 and 3, through the local green prescribing test and learn sites, and through social media. Direct emails with no response were repeated to increase response rates.
(5) Data analysis: data from the survey were categorised by type of activity, whether the provider felt it could be adapted for young pregnant women (if not already available to them), and interest in involvement in future research. This was to inform the next stages of the study – exploring women's views and developing networks.

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(6 and 7) Communicating findings and updating service map: findings from the mapping survey will be disseminated in an accessible format through our networks and social media.

Provider focus groups

Focus groups were conducted (August 2022) with providers of nature-based activities identified in the mapping survey and shortlisted by the Research Influencer Group (RIG) (*described below*). The focus group questions explored their views on how green prescribing works in practice, and whether they see any opportunities or challenges in working with young pregnant women. The focus groups were facilitated by two researchers using a semi-structured guide and notes were taken. Focus group notes were analysed by one researcher to highlight key themes arising from the data which could inform future study design. These were conducted after the young women's focus groups (*detailed below*) to be able to explore any issues raised by the young women.

Exploring women's views and developing a young women's PPI group (to address RQ2 and Objective 2)

A series of four focus groups were held with young women with experience of pregnancy (April–June 2022). They were identified through several different approaches such as engaging with local organisations (e.g. children's centres and community groups), through existing networks, and social media (Facebook and Twitter). The focus groups enabled young women to learn more about this research and share their views about spending time in nature during pregnancy. These were facilitated by two researchers using a semistructured guide (see *Report Supplementary Material 2*) and notes were taken. Focus group notes were analysed by one researcher to determine key themes arising from the data to inform future study design. Women from these sessions were invited to join us as 'Research Influencers' and to form a RIG. The RIG consisted of five young women (previously pregnant) and acted as a public contributor advisory group to inform this project and will continue into the future commissioned call. Meetings were held online via video conferencing and members were reimbursed for their time in line with NIHR guidelines for public involvement in research. We also continued to explore women's views throughout this project by regularly engaging with our established Nottingham Maternity Research Network.

The focus of the RIG was to review the findings of the mapping exercise and select suitable interventions that would be acceptable to young pregnant women and potentially most beneficial to their mental health and well-being. These formed the shortlist of interventions to test within the future evaluative study application. The RIG also met to review findings of the study and plan next steps. This involved talking about the design of the future evaluative study, including recruitment, retention, outcomes and dissemination. Prior to these meetings, an information session was held to give RIG members an overview of the research process and their role as public contributors, and the opportunity to ask questions.

Developing networks and partnerships (to address RQ3 and Objective 3)

Organisations providing green social activities: the services shortlisted by the RIG were contacted to discuss the project further. Shortlisted providers were also invited to participate in the provider focus groups. The aim of these discussions was to ensure services could be adapted for young pregnant women. Organisations working with ethnically and socioeconomically diverse populations to address potential health inequalities were prioritised as intervention providers.

Research and implementation networks: additional expertise was sought, where necessary, to supplement our team. This was through discussions in team meetings and external advice via the

Research Design Service (RDS) and the North Wales Organisation for Randomised Trials in Health (NWORTH) Clinical Trials Unit (CTU), and contact with agencies working with young pregnant women.

Synthesis

Information from the mapping survey, public participation and involvement (PPI) work, provider focus groups and stakeholder discussions was synthesised by the project team to propose a theory of change for the intervention and create an outline research plan for a future feasibility study. These will form the basis of the application to the future commissioned call.

Ethical approval

This was preparatory work consisting of PPI and co-design of future research. This work therefore did not meet the Frascati definition of research and did not require ethical approval. To confirm this status, the study was submitted to the University of Nottingham Faculty of Medicine and Health Sciences Research Ethics Committee. This committee reviewed study details and confirmed that ethical approval was not required (ref: FMHS 510-0322).

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Results

Mapping survey

[Following NIHR reporting guidance, some of the findings have been published separately at https://www.mdpi.com/1660-4601/20/20/6921. A summary of findings are presented here.]

This online survey was distributed directly to organisations found through local networks, search engines and word of mouth (April–July 2022). It was also circulated through provider networks and social media. The survey found 68 nature-based projects or organisations operating across the East Midlands (from a total of 76 responses), with 94% of these stating that the activity is designed to promote mental health and well-being. There was a mix of projects including gardening, walking and arts groups. There were also projects based in forests, such as forest schools, and farms. Many organisations (46%) offered more than one type of activity or project, catering to different groups and interests at different times. Just over half of organisations stated that their activities were already available to young pregnant women or those with new babies (53%). Many organisations welcomed the idea of nature-activities during pregnancy and after birth and felt that they were able to adapt the activities to suit. Almost all organisations were happy to be contacted in relation to future research.

Exploring women's views

Four PPI focus groups were completed with young women under 25 years who had experience of pregnancy at a younger age (total *n* = 11). These women were recruited through social media, word of mouth and local services (e.g. children's centre). One of the focus groups was held in person at a young parents group, the others were held online via MS Teams calls. Sharing demographics was optional as this was PPI work rather than research. From those who did share details (*n* = 5) young women described their ethnicity as White British (*n* = 3) and black/Black British [African (*n* = 1); Caribbean (*n* = 1)]. Education attainment ranged from A levels or post-secondary vocational qualifications to university (first degree). Women were aged 22–25 years and had been pregnant within the last 2 years.

The purpose of the focus group was to discuss whether they felt this was an important topic, and what their experiences and views were about doing nature activities during pregnancy. These women were very positive about the idea of doing nature activities during pregnancy. They felt strongly that being outdoors and in nature was beneficial to mental (and physical) health during and after pregnancy. This was based on their experience of attending similar nature groups, accessing nature more informally, and some who may not have spent much time in nature during pregnancy. Another benefit of being outdoors, for example, going for walk, was that there were more opportunities for social interactions. This included both chance encounters with people they already knew and brief interactions with others, which were helpful during what can be a very lonely time. These encounters also avoided the pressure of a more intense interaction if individuals were shy or socially anxious. Having an opportunity to socialise and a reason to 'get out of the house' during and after pregnancy was an important aspect to the young women. Many mentioned that they lost most of their friends during pregnancy as they were no longer able to do the activities that were part of their lives prior to pregnancy (e.g. social activities that included alcohol or late nights out). Group-based nature activities were seen as a very positive opportunity to make new friends with women who were going through the same things and expand support networks. Some women also mentioned that they would welcome meeting new people of different ages as they lacked parental figures in their lives. Others suggested that the same age might be better as older people may disapprove (stigma of young pregnancy). Additionally, women felt it would be nice for their babies, as they would also have more opportunities to interact with their peers.

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There were some very useful discussions about what types of activities women may like to do and what may make them more (or less) likely to participate. These included many activity ideas such as walking, yoga, gardening, meditation, outdoor cooking, music, arts and crafts and more. Some young women felt being with animals would be helpful, but also noted that it could present a risk to pregnant women. The young women felt that having an activity to do might help to take the pressure off when meeting new people and trying to find things to talk about; also, that having space to continue conversations afterwards, perhaps in a café, would be beneficial. It was suggested that mid-pregnancy may be the best time to start a group activity and that it would be most beneficial to continue throughout pregnancy and beyond into the first few months with a new baby. Most young women agreed that around once a week or fortnight was the best frequency for nature groups, with a duration of 1–2 hours.

There were some key issues raised to consider such as transport, facilities and anxieties about attending. It was important for some that the nature-activity was accessible by public transport. Others were anxious about public transport and preferred something walkable or accessible by car. The young women highlighted the need for appropriate facilities to be available, such as toilets and baby-changing areas. They also mentioned that some women may be anxious about attending a new group. Suggestions to combat this included: being able to bring someone with them for at least the first session; having good-quality information available about the activities so that they know exactly what to expect; introduction or endorsement by a health professional (e.g. midwife or health visitor) and setting up a WhatsApp group to enable women to chat and get to know each other prior to sessions starting. It was also thought important that young women were made aware of the potential mental health benefits of being in nature. The groups felt that the best ways to recruit women for future research would be through midwives, health visitors, family nurses and social media (particularly Facebook).

Forming the Research Influencer Group

Women from the focus groups were invited to be involved in the study by joining our RIG. This was done by mentioning the opportunity to all women during the focus groups and then following up with an e-mail or giving out a flyer during the in-person session with more information. From this, five young women made contact and decided to join the RIG. These women are aged 25 years or under and include a range of educational achievement levels and ethnicities. All had been pregnant 0–3 years prior. The first RIG meeting was held on 30 June 2022 and consisted of an information/training session for the young women to learn more about the research process and what their involvement would be. The second RIG meeting was on 14 July 2022 and was for women to choose the nature-based intervention (*detailed below*). In the third RIG meeting (4 August 2022) we asked members about the detail of intervention and study design; this was co-designed with them, resulting in the outline research plan (*detailed below*).

Choosing an intervention

During the second RIG meeting the young women were presented with the results of the nature-activities mapping survey. This included a list of 62 applicable organisations and/or projects in the East Midlands (*Figure 1*). These were presented to the RIG via a PowerPoint presentation grouped into seven different categories: walking groups, woodland/forest schools, community gardens/allotments, multi-activities, animal activities (e.g. care farms), arts activities and 'other'. From this they went through all these projects to shortlist those that may be suitable for a nature-based intervention with young pregnant women. This also involved considering information from the young women's focus groups and selecting projects that aligned with those findings. The RIG shortlisted 29 projects and decided on preferred interventions based upon what was available. The preferred interventions were walking groups and multi-activity nature groups, including activities such as outdoor cooking, yoga and arts and crafts. Overall, it was decided that the variety of activities in multi-activity groups (which may include walking) would most appeal to young women and therefore this was the chosen intervention.

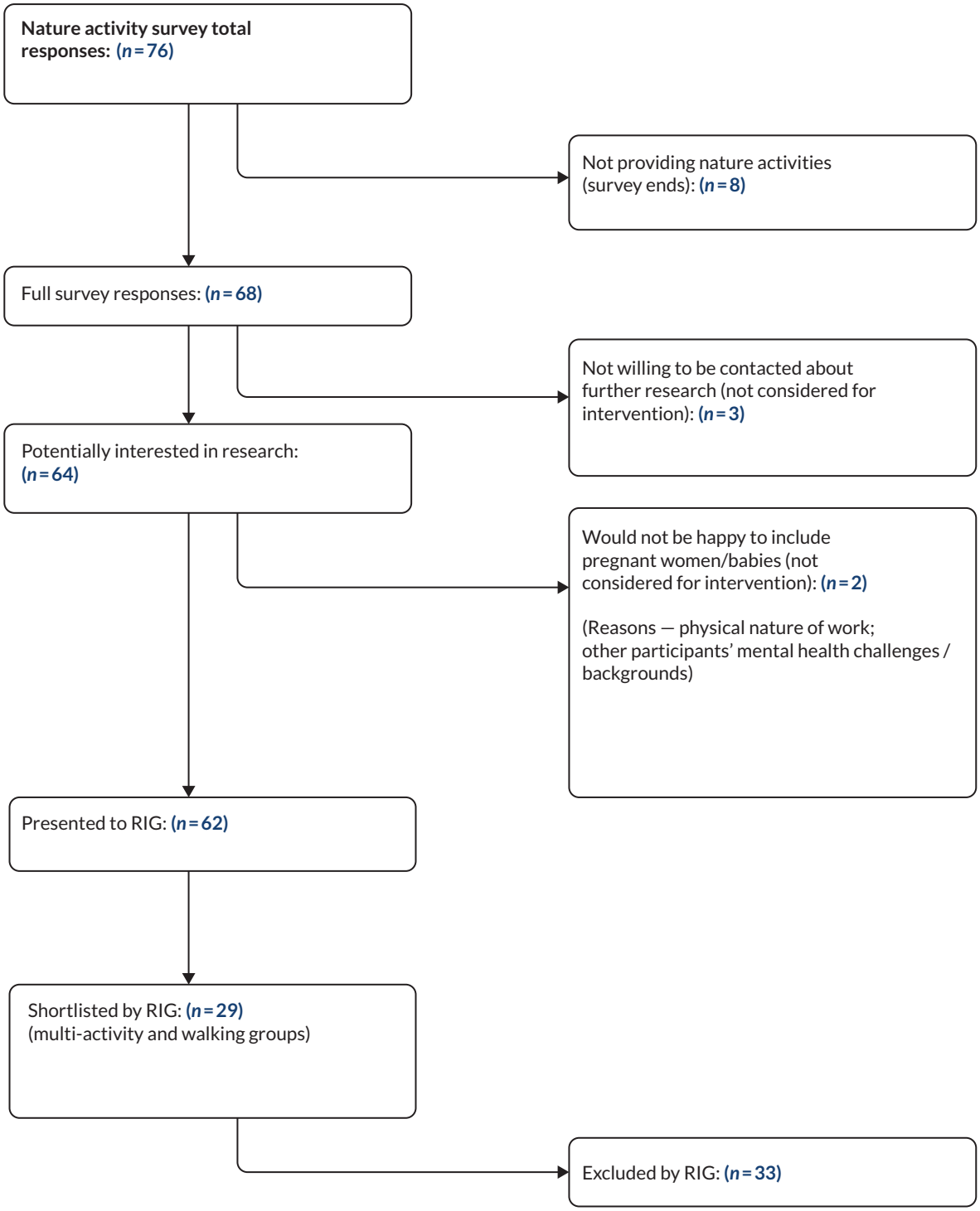


FIGURE 1 Pathway to choosing intervention.

Provider focus groups

Two focus groups (n = 6) were completed with providers of nature activities during August 2022. Organisations and/or projects shortlisted by the RIG were invited to attend one of two focus groups to share their experiences and expertise in running nature-based activities. The purpose of these focus groups was to add more information to the intervention and study design from a provider perspective, complementing the young women's perspective gained through PPI activities.

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The providers of nature activities felt that these would be very beneficial to young pregnant women in both the short and long term. They described the sessions as being a time to focus on the woman at a time which is very isolating and can be frightening, enabling women to try things and learn skills in a new setting that may increase self-esteem. They described sites as an oasis and calming space, helping people to lose themselves in activities and not focus on worries or anxieties. The providers felt that there were both long- and short-term benefits to women, including being able to pass on developed habits to their children (e.g. spending time in nature, mindfulness). Some suggested specific activities which can be helpful for well-being, such as cooking, crafts and relaxation. Others felt that activities should be tailored to each group of women and take a more organic approach based on their interests. Most providers agreed that longer-term interventions are more likely to have a greater effect on well-being; however, some also felt there may be measurable benefits after 6–12 weeks.

Providers were asked to give their opinion on the current proposed design of the research in terms of potential challenges or opportunities. There were issues raised about practicalities of visiting nature sites: for example, the need to consider transportation (e.g. bus routes) and the funding participants would need to use public transport. Achieving attendance was also raised as an issue as providers have had experiences of low numbers; they suggested over-recruitment and strategies to reduce anxiety to account for this. Expectations should be managed in terms of types of facilities available and the necessary clothing/footwear. The need for additional risk assessment for pregnancy was deemed minimal, but there may be disclaimers and consent forms for women to complete. Other issues raised included the need for refreshments, and the time of year impacting some activities. Providers would need detailed information about the research to plan activities and apply for their own funding.

Most of the experiences of green prescribing have been negative, with some providers having both good and bad experiences so far. Providers commented on lack of funding for their services and poor-quality referrals. Some providers have managed to make the system work through different means such as by-passing social prescribers or being very prescriptive about which referrals are appropriate.

Providers valued longer-term outcomes such as the effect on the baby and family, and whether participants have incorporated any of the aspects into everyday life (e.g. parenting). They felt it would also be useful to have information on overcoming barriers to participation.

Developing networks and partnerships

We have developed the networks and team required for the future research. We now have the support of the NWORTH CTU, who will assist with methodological and statistical expertise in developing the future evaluative research study. We have also added additional members to our team to offer methodological and subject expertise in health economics, public health, complex interventions and nature-connectedness. We are in contact with RDS East Midlands and Public Health Research Applications and Design Advice (PHRADA) advisors to help support the upcoming funding application.

We have had conversations with other individuals and organisations with expertise in working with young women and green prescribing such as the Derbyshire and Nottinghamshire green prescribing test and learn sites, a consultant in Public Health, midwives working with young pregnant women, children's centres and family nurses. We have also discussed the project with interested external non-profit organisations such as NESTA (an 'innovation agency for social good'). Additionally, we are building strong relationships with the nature activity providers who will deliver the intervention.

Theory of change

A simplified theory of change was developed (*Figure 2*) to illustrate how and why the intervention may lead to changes in behaviour. This was based on extensive discussions with young women about

the experiences of being young and pregnant, both within the focus groups and with RIG members. This is also based on information from nature providers in both focus groups and individual meetings, from their experience of delivering these interventions and how behaviour has changed among their attendees. For example, women expressed the importance of developing peer support groups during pregnancy and suggested that participating in nature activities would help to minimise social pressures associated with meeting new people. Anxiety about joining a new group was also raised by nature providers as a key issue and they stressed the importance of high-quality information being provided to women to reduce anxieties. These are examples of emerging conditions that would need to be met in a future intervention to maximise the chances of success. This theory of change will be developed further in the next steps of this research programme (feasibility study) as this will add more information to support a full-scale definitive RCT and implementation thereafter.

Outline research plan

From the work completed in this Application Development Award an outline research plan has been developed. This has been co-created in a meaningful way based on our PPI work with young women and our engagement with nature-activity providers.

This will consist of final intervention development (Phase 1) and a feasibility randomised controlled trial (RCT) (Phase 2) of a nature-based intervention to promote mental health and well-being among young pregnant women. This will trial the recruitment procedures, outcome measures and health economic methods, and provide information on retention. The proposed research will also include a process evaluation (Phase 3) utilising both quantitative and qualitative methods to explore how things operated in practice and evaluate whether it is feasible to progress to a definitive trial. Phase 4 of the study will focus on dissemination and impact, and explore the next steps to progress this research.

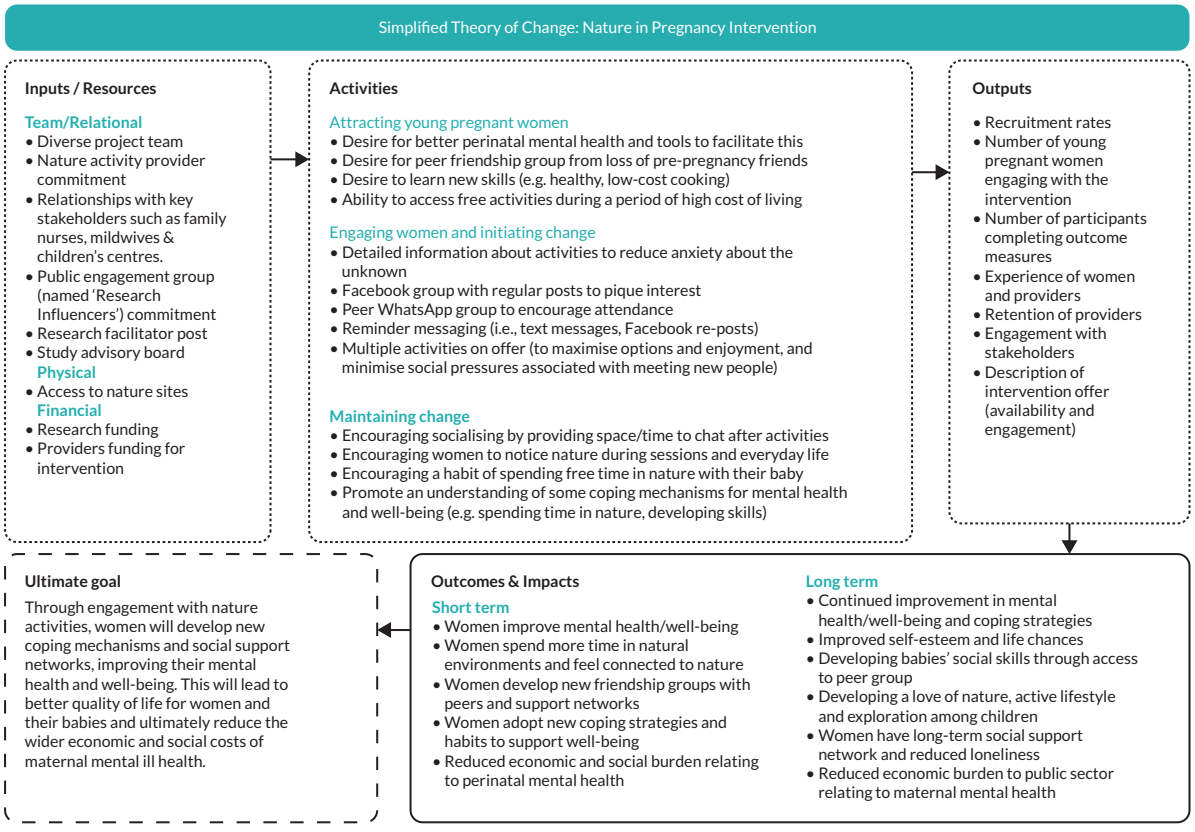


FIGURE 2 Simplified theory of change.

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Equality, diversity and inclusion

This preparatory study did not collect detailed information relating to equality, diversity and inclusion. Women who took part in focus groups and the RIG were asked to provide demographic information; however, this was not compulsory. This study used a mix of online and in-person focus groups to minimise the risk of women being excluded due to lack of digital access. Due to the small number of women involved and geographic context, there are likely to be missing voices that have not been represented. Future work should ensure inclusive sampling across the demographic context of pregnancy at a younger age.

Conclusions and recommendations

Nature-based activities with young pregnant women are a new intervention for promoting well-being that requires further evaluation to determine effectiveness and acceptability. In this limited preparatory work, nature-based activities were well liked by young women who had experience of going to similar groups and liked in principle by those without experience. There was a lot of enthusiasm among the young women for this approach to promoting mental health and well-being. There are already many nature activity groups in existence in the East Midlands, from which young women were able to choose an appealing intervention for future research. There is also sufficient interest from providers of the activities to make an evaluative study feasible.

This project has provided a wealth of information to inform the refinement of a nature-based activities intervention to suit young pregnant women. It represents strong public involvement and preparatory work to support future research into this topic. It also highlights the different types of nature-based interventions already existing in the East Midlands. However, this project was also limited by its nature of being a short-term, low-cost, Application Development Award. Therefore, this is preparatory work rather than research and the findings will lead to future work, including more in-depth qualitative research as part of an evaluative study.

A definitive trial to test the effect of nature-based interventions on the mental health and well-being of young pregnant women is required. The recommendation of this preparatory work is progression towards this through a feasibility randomised controlled trial to evaluate whether a definitive trial could be conducted.

Limitations

This preparatory work is limited by small samples of young women in the PPI focus groups, due to some women not attending as planned. This may have influenced the discussion and increases the likelihood of some seldom-heard voices not being included. Both in-person and online focus groups were conducted to reduce the risk of digital exclusion; however, methods of recruitment may have impacted on which young women were able to take part. Due to the sampling approach employed in the mapping survey, it is possible that not all community organisations will have been reached. However, the snowballing aspect of sampling increases the likelihood of reaching the most well known in local communities. The lack of green prescribing programmes in some areas may have also affected recruitment.

Future work

Future research is needed to test the nature-based intervention; this would be in the form of a future feasibility RCT of nature-based interventions to promote the mental health and well-being of young pregnant women as described in *Outline research plan*. Future research is also needed to further explore nature-providers' experiences of green prescribing, including barriers and facilitators to implementation.

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Contributions of authors

Gina Sands (https://orcid.org/0000-0001-6277-8609) conducted the mapping survey of nature activities, the PPI work with young women, and the nature provider focus groups.

Holly Blake (https://orcid.org/0000-0003-3080-2306) conducted the nature provider focus groups.

Tim Carter (https://orcid.org/0000-0002-1608-5112) was involved in advising on all aspects of study design.

Helen Spiby (https://orcid.org/0000-0002-1946-1718) conducted the PPI work with young women, and the nature provider focus groups.

All authors were involved in advising on all aspects of study design and contributed to critical review of publications.

This article

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This article was published based on current knowledge at the time and date of publication. NIHR is committed to being inclusive and will continually monitor best practice and guidance in relation to terminology and language to ensure that we remain relevant to our stakeholders.

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List of abbreviations

CTU	Clinical Trials Unit
NGO	non-governmental organisation
NHS	National Health Service
NWORTH	North Wales Organisation for Randomised Trials in Health
PHRADA	Public Health Research Applications and Design Advice
PPI	public participation and involvement
RCT	randomised controlled trial
RDS	research design service
RIG	Research Influencer Group

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