**A scoping review of nutritional interventions and policy guidelines in the interconception period for prevention of non-communicable diseases**

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**Abstract**

**Introduction**

The interconception period is considered a time when parents are likely to engage with health messages and are in frequent contact with healthcare professionals. Through this scoping review and policy analysis, we synthesised articles and guidelines on interconception care to provide recommendations to improve health outcomes for parents, infants and future generations.

**Methods**

Four databases were searched systematically, using MeSH and free-text terms based on ‘interconception’ and ‘postpartum’. Selected articles included systematic reviews, pilot studies and guidelines on interconception and postpartum interventions published globally and in English by UK public health organisations and government agencies between 1st January 2010-12th January 2021. 30% of titles, abstracts and full-text papers were double-screened. The description table of identified guidelines was used as a template to qualitatively generate key categories, which later developed into a framework of six domains. Findings are described using a narrative synthesis approach.

**Results**

We found 47 documents with guidelines, 29 systematic reviews and six pilot studies on interconception and postpartum care. Six domains were generated: interconception care, nutrition-specific, nutrition-sensitive, personal-centred care, health professional, multi-stakeholder approach. Interconception care opportunities include the postpartum period, family planning, routine practice, and risk assessments. Health and non-healthcare professionals with roles to play in the interconception period include GPs, health visitors, dieticians, nutritionists, health psychologists, community groups, local authorities and charities such as Tommy’s and First Step Nutrition.

**Conclusions**

The interconception and postpartum periods offer crucial opportunities to intervene to reduce possible long-term effects of suboptimal nutrition. Though the policy analysis for this scoping review focused on the UK, the literature review had a global focus and the recommendations can have wider implications for other countries**.**

**Introduction**

Preconception health is the period before conception and is a critical period for improving health outcomes of future generations, including reducing the prevalence of non-communicable diseases (NCDs) in the mother and offspring(1). Increasing evidence suggests that maternal risk factors for later NCDs can worsen through pregnancy and post-delivery, for example associated with postpartum weight retention(2). In addition, parents’ preconception body mass index (BMI) is more strongly associated with the risk of childhood obesity in the offspring than weight gain during pregnancy(3, 4). Similarly, in women with a high BMI, losing weight before the next pregnancy reduces the risk of adverse outcomes such as large for gestational age (LGA) babies(5-8) while inter-pregnancy weight gain increases the risk of LGA births. Though pregnancy can be a “teachable moment” for behaviour change, findings from recent high-quality pregnancy interventions to address obesity suggest that risk factors should be addressed before conception for greatest benefit(9).

Promoting preconception health is challenging given the wide time window (potentially the entire reproductive life) and that prospective parents who require additional support for pregnancy preparation and planning generally do not seek this. Moreover almost 50% of pregnancies are unplanned(10). The interconception period provides an opportunity for engagement when parents are in more frequent contact with healthcare professionals. Moreover, beneficial outcomes might be shown over a shorter timescale than with interventions designed for the preconception period overall. In the UK ~58% of births are second or third parity(11), suggesting that postpartum preconception care could be made available to a large group of women and their partners who may decide to conceive. Outcomes of this include breastfeeding duration, addressing postpartum weight retention, mental health, infant growth and neurocognitive and emotional development, as well as health aspects of a subsequent pregnancy(9, 12, 13).

According to the 2013 WHO policy brief(14) on preconception care, interconception care is delivered between the end of pregnancy and the start of the next pregnancy, notably in the first 24 months postpartum, to improve outcomes for potential future pregnancies(15, 16), promote parental and infant health and to reduce risk factors for NCDs before the next pregnancy(16). It helps to bridge the postpartum period to either a subsequent pregnancy or the decision not to conceive again(17). A proposed framework for interconception care includes risk assessment, health promotion, clinical and psychosocial interventions, and visits at 2 weeks, 6 weeks, 6 months and 1 year postpartum(16). In the UK, Public Health England (PHE) and National Institute for Health and Care Excellence (NICE) guidance recommend that interconception care should be discussed from the first antenatal appointment to the last routine health visitor appointment postpartum, by health professionals including midwives, health visitors, nutritionists and primary care practitioners in clinical and community settings(18).

Through this scoping review and policy analysis, we aimed to synthesise articles and guidelines on interconception care to develop recommendations for use in healthcare and practice, with particular reference to improving nutrition related health outcomes and NCD risk for parents and the next generation. Two research questions were addressed:

1. What models of interconception and postpartum care are in use or have been described in literature globally?

2. What guidelines of interconception and postpartum care are in use or have been described in the UK?

**Materials and Methods**

The scoping review was conducted to explore the published and grey literature on interconception care(19), using three different simultaneous methods: 1) review of studies in the interconception period, 2) review of systematic reviews in the interconception and postpartum period, and 3) grey literature review of policy guidelines in the interconception and postpartum period. A protocol was developed internally but not registered publicly.

1. **Review of studies in interconception period (research question one)**

We specifically searched for and included pilot studies due to the paucity of trials in the interconception period. A scoping search on Google Scholar was conducted to identify all studies exclusively in the interconception period and field experts were consulted (see Table 1). All relevant published papers identified were pilot studies, although these lack the power and rigour of RCTs or systematic reviews, they were included as they provide preliminary evidence.

1. **Review of reviews** **for interventions and postpartum period (research question one)**

Systematic review articles published in English 1st January 2010-12th January 2021 were searched for on four major medical and social science databases: Cochrane library, EMBASE, MEDLINE, and CINAHL. Using a combination of Medical Subject Headings (MeSH) and free-text the search strategy was based on terms relating to the interconception or postpartum period and nutrition which also included wider outcomes including physical activity and prevention of NCDs.

Publications were stored in Endnote X9.2, duplicates removed and papers screened on Rayyan qcri online website(20). Thirty percent of paper titles, abstracts and full text were double screened by a second author. Table 1 shows the inclusion criteria. Discrepancies were resolved by team review, which was deemed the final consensus. Studies were excluded if none of the outcome criteria were part of the reviews but included reviews with additional outcomes besides nutrition. There were no exclusion criteria based on study design. Figure 1 shows paper removal in the screening process.

Assessment of risk of bias for review articles was conducted using the McMaster University Health Evidence Quality assessment tool(21), which uses a 10-point framework to assess the strength of evidence and categorises studies as strong (score 8-10), moderate (5-7) or weak (0-4) quality. A separate assessment of risk of bias was conducted for the pilot studies using an adapted version of the Centre for Reviews and Dissemination (Table 2 & 3)(22). All identified studies were assessed by two independent reviewers (DW, CMJ). Ten percent of studies were double assessed to ensure a level of consistency, and any queries were resolved through discussion. Table 4 shows a descriptive table of the systematic reviews, meta-analyses and pilot studies.

1. **Grey literature review of policy guidelines in the interconception and postpartum period (research question two)**

Additionally, a review of published guidelines from eleven UK public health organisations and government agencies was also conducted. The UK was selected as a case study to identify the current state of recommendations and guidelines for multiple stakeholders in the interconception period. As the policy review identified documents with a range of issues within the interconception and postpartum period, thematic analysis was conducted by two experienced (7 years+) qualitative researchers to synthesis the guidelines into key domains(23). Guideline documents were entered into a reporting table which included the relevant recommendations (Table 5).

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*(Figure and tables presented at the end of manuscript)*

Descriptive tables of the reviews, pilot studies and guidelines were used to underpin the synthesis of the findings and key messages. The guidelines description table was qualitatively analysed using NVivo software version 12 to generate categories, later developed into a framework of six domains, which structure the results. Findings are described using a narrative synthesis approach based on the six key domains of focus of the guidelines(24). Narrative synthesis was conducted to provide a high-level overview of the findings from the three methods described above. Figure 1 shows the systematic inclusion of studies for the review of review; a figure to illustrate the additional two methods was not possible as these methods were searched manually.

**Results**

We found 47 documents with guidelines, alongside 29 systematic reviews and 6 pilot studies on interconception and postpartum care in which the interventions and outcomes may also inform care. These findings are synthesised into a framework for interconception care. A narrative synthesis of the scoping review is presented below and organised by the methods used and the domains that were generated from thematic analysis of the policy documents.

1. **Findings from pilot studies on interconception care during the postpartum period**

Six studies were identified, scoring high (1) to-moderate (5) quality. Pilot studies focused on outcomes, including nutritional supplementation, mental health outcomes, interconception care provision and contraception and process evaluation of the studies(25-31). Interconception care interventions can include risk assessments leading to tailored care, complex interventions and educational components, including counselling, multi-vitamin supplementation, peer support groups, walking programmes, contraception, mental health and substance support and dental care(25, 26). Although none of these interventions were followed up to assess infant outcomes, they have improved women’s uptake of multivitamins supplements, mental health support, use of contraception, physical exercise, and dental care(25, 26, 30). Additionally, women in one pilot interconception intervention prioritised their socioeconomic needs over medical priorities, suggesting that interconception care needs to address the wider determinants of health(27). Health professionals (physicians/nurses) and women involved in interventions, that focused on interconception care, considered the intervention acceptable and appropriate. However, only 13% of health professionals felt they could implement interconception care into routine practice as it did not fit into their current priorities and they expected little interest from women(28).

1. **Evidence for interventions for nutritional outcomes postpartum (Review of reviews)**

Twenty-nine systematic review articles were identified (24 systematic reviews and 5 Cochrane reviews); 20 were of high quality, 7 moderate quality and 2 low quality (Table 3 & 4). Despite recent attention to the interconception period, a systematic review on interconception care for women with a history of gestational diabetes found no eligible published trials(32). Postpartum weight loss programmes, which included a combination of diet support and physical activity, showed the most significant weight reduction in mothers(33-41). Evidence for solely diet or physical activity interventions was inconclusive(33, 37, 42-45). Women’s knowledge of self-care(46), behaviour change strategies such as goal setting (38, 39) and digital interventions(47, 48) were also associated with weight loss. Lifestyle interventions including diet and physical activity for women with previous gestational diabetes mellitus (GDM) showed significant reduction in postnatal diabetes(49-52) and weight loss(52-54), which was more effective when the intervention was delivered soon after delivery(49). There was limited evidence for lifestyle interventions for women with previous diagnosis of a hypertensive disorder of pregnancy(55) or with postpartum iron deficiency anaemia(56). There was no evidence that different doses of postpartum vitamin A supplementation benefited maternal or infant mortality and morbidity(57). One review on dietary, behavioural and medical interventions for postpartum constipation found no eligible trials(58).

Postpartum interventions were delivered in various settings including hospitals, clinics, home, communities, outdoors and school halls(38, 41, 46). Interventions were also delivered by a range of clinical and non-clinical professionals, including midwives, general practitioners, dietitians, heath psychologists, lifestyle counsellors, health coaches, nutrition professionals and interventionists(35, 38, 41, 59, 60). However, clinical health professionals delivering interventions resulted in greater weight loss for mothers compared to non-health professionals(59). Early postnatal discharge combined with home and individualised midwifery support reduced costs and improved the satisfaction, health and wellbeing of both mother and infant(61).

1. **Review of Interconception and postpartum guidelines for policy and healthcare practice**

47 documents with guidelines on interconception and postpartum nutrition and health interventions were identified from health bodies including NICE, PHE and the Royal Colleges, and from parliamentary discussions (Table 5). The guidance highlighted six key domains:

## 3.1. Interconception care

Guidance on nutrition during the interconception period was more aimed at women postpartum without consideration of impacts on potential future pregnancies. Guidelines on the interconception period recommended weight management postpartum and after successive pregnancies(62) and consideration on contraception post-delivery(63, 64). Public Health England (PHE) (2018) guidance advised that interconception plans should be discussed with health visitors in the antenatal period and be flexibly followed up between pregnancies(65).

## 3.2. Nutrition-specific interventions

Nutrition-specific interventions directly address immediate determinants of fetal and child nutrition and development through adequate food and nutrient intake, feeding and caregiving(66). Guidance by the Parliamentary Office of Science and Technology (2017)(67) and other bodies(62, 68-72) recommends that health professionals advise and support women to exclusively breastfeed for up to 6 months, including exploration of the potential barriers. Balanced healthy diets, including example recipes, were recommended to be advised by health professionals; notably, dieticians and nutritionists were advised to include dietary advice for families on low budgets(62, 69, 72-75). Community schemes were recommended, such as cooking and eating clubs(69). Health professionals were recommended to promote supplementation, e.g. with folic acid, vitamins C and D(62, 68, 76, 77), for mothers postpartum through the Healthy Start scheme(69). Women with previous GDM are offered a diabetes test and lifestyle support when planning for subsequent pregnancies, and advised on managing blood glucose levels(78). Women with overweight or obesity are recommended to be offered a tailored weight-loss programme with their health professional or a club such as Slimming World(62, 68, 71, 72, 79-81). Slimming World programmes reduce energy intake whilst meeting the UK dietary guidelines(82).

## 3.3. Nutrition-sensitive interventions

Nutrition-sensitive interventions indirectly address the underlying determinants of fetal and child nutrition and development, such as through nutrition security, caregiving resources, access to health services and safe and hygienic environments(66). Guidelines for indirectly supporting nutrition recommend that postpartum women engage in regular, moderate-intensity physical activity(68, 70, 71, 83). Health professionals were recommended to screen and monitor women’s and infants’ wellbeing(72, 84-88), especially during crises such as COVID-19 lockdowns(89). Overall many guidelines targeted recommendations towards healthcare professionals. This included supporting women with other health issues which indirectly impact on nutrition, such as mental health, recovery from labour, dyspareunia, urinary issues, domestic violence, substance abuse and loss of a pregnancy(71, 86, 90-93). Many of these interventions included an element of social support which can enhance nutritional behaviour and wellbeing(80, 86, 94). Two guidelines recommended and enacted financial schemes for parents with newborns and maternity and paternity payment during the COVID-19 pandemic(95, 96). Guidance also advised that fathers need to be offered information and support in adjusting to their new role and responsibilities within the family unit(73, 86, 89, 97, 98). For parents who have experienced a previous pregnancy loss, extra appointments with health professionals have been proposed as important for reassurance; however there is little guidance on this(92, 98).

## 3.4. Person-centred care

Health professionals were advised to use evidence-based behaviour change techniques to motivate and support families with their nutrition and health(62, 68, 70, 71, 79, 99). This includes being able to help people to identify how their behaviour is affecting their health, draw up an action plan, make the changes and maintain them. Advice and support were recommended to be tailored and personalised to each family to discuss realistic postpartum nutrition plans and expectations that fit into their life(68, 70, 71, 80, 84-86, 90). This type of care was proposed to continue across the reproductive life course from preconception before the first pregnancy to interconception care in subsequent pregnancies(67, 87, 88, 99-101). The interconception period is unique in that health professionals can support women based on their previous pregnancy experience to minimise risk and support healthy behaviour changes.

## 3.5. Role of the health professional

Supportive communication from health professionals was a key thread throughout the guidelines. These recommended that health professionals should provide advice, support and an opportunity to explore family concerns(68, 73, 84-86, 102). This included support for setting goals on breastfeeding, diet and physical activity(62, 68, 70). Continuous, monitored and updated training for health professionals on communication skills and technical knowledge on nutrition and wider health advice was a consistent domain(62, 71).

The guidelines emphasised that continuity of care is needed across the reproductive period, with recommendations to have the same health professionals for each woman and consistent online and in-person support(72, 86). During the COVID-19 pandemic health visitors and mothers became more adept and confident with online communication tools to ensure continuity of care(89, 90, 103), offering an opportunity to use these for blended support in the future(68). Health professionals were also encouraged to be connected to and refer at-risk women to other health professionals or to organisations external to the health system(86, 90). For example, they could identify nutritionally at-risk women through the use of tools such as the FIGO nutrition checklist(104), and provide appropriate support. Women identified as high-risk were recommended to be referred to dieticians for specific nutritional issues, or to health visitors, GPs, and nurses to discuss weight management throughout the reproductive period, especially postpartum(68, 70, 79). Health professionals were advised to have appropriate knowledge and skills to give advice on balanced diets, supplements, nutritional needs of infants and weight management(68, 69, 71, 72).

## 3.6. Need for a multi-stakeholder approach

A consistent domain was that third sectors and local authorities have roles to play in supporting women with breastfeeding, mental health and parenting support and in providing community services and recreational programmes such as walking groups and affordable creches(68, 72, 76, 79, 80, 90, 94). Pharmacists were encouraged to sell healthy start supplementation(76). Community-focused approaches were widely recognised to have a greater reach, ensure that families are not left behind, and provided accessible opportunities for women to discuss and make changes in the interconception period. A multi-stakeholder approach would guarantee a more holistic collaborative strategy to interconception health, with organisations working together to avoid duplicating efforts and save funds. Food manufacturers, retailers and supermarkets were recommended to be engaged in creating healthier food environments(69, 76, 105). The UK Department of Health and Social Care announced a change in legislation to restrict the promotions of unhealthy foods in retailers in April 2022(106), which might hold manufacturers, retailers and supermarkets more accountable. Devolved UK administrations are advised to also engage in co-producing policies that consider the full reproductive life-course, including the interconception period. National parliaments in the UK were advised to hold governments to account in delivering the above policies through select committee scrutiny and advocacy functions.

**Discussion**

This scoping review and policy analysis revealed an important gap in interconception care interventions and guidelines to improve maternal and child health; only one systematic review on interconception care was identified, which itself found no studies. The identified pilot studies on interconconception health provided insight into the potential benefits of intervening in the interconception period, including by improving women’s uptake of multivitamins supplements, mental health support, use of contraception, physical exercise, and dental care(25, 26). These pilot studies should be seen as preliminary evidence and more large-scale research is needed to draw robust conclusions. The identified systematic reviews on intervening in the postpartum period, particularly diet and physical activity interventions, revealed significant reductions in women’s postnatal weight and prevalence of diabetes. The UK guidance advised similar nutrition-based advice to that utilised in the pilot studies and review of reviews, but also had a focus on the wider determinants of health, such as financial aspects. This scoping review provides an overview of the potential components of effective interconception care intervention and guidelines, but further work is needed to gain secure evidence on the short and long term maternal and child health outcomes of intervening in the interconception period**.**

Overall, results from both the scoping review and policy analysis suggest that the interconception and postpartum periods offer important opportunities to reduce possible negative long-term effects on the offspring, or problems for the mother such as GDM, hypertension, nutritional deficiencies, or reduction of postpartum weight retention, and to prevent problems in any future pregnancies.

Postpartum health also affects outcomes of the next pregnancy(107) and experiencing an adverse outcome in a previous pregnancy is a strong predictor of future reproductive risk(108). Postpartum visits are a useful gateway to interconception care(108). Current clinical guidelines for postpartum care recommend support on breastfeeding, healthy diet and physical activity, weight loss and contraception(109). Figure 2 illustrates the opportunities to intervene in the interconception period based on this review.

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Pregnancy planning and contraception offer a window of opportunity to have conversations about interconception nutrition and health with parents. This includes the appropriate language to be used when talking to parents. The studies and guidelines included in our study focused only on people who identified as female. A recent Patient and Public Involvement (PPI) project found that language around gender in the interconception period is not currently inclusive of all genders(110, 111). Language within this period focuses on ‘pregnant women’, ‘mothers’ and ‘fathers’, yet, as one PPI contributor explained *“To become pregnant, you need a uterus (womb) but you don’t need to be a woman*”(110). More work needs to be conducted on how best to engage parents from all backgrounds in the interconception period.

The policy guidance and scoping review evidence suggested conducting risk assessments to screen parents in clinical and community settings. This would support consideration of the parent’s biological, physical and psychosocial factors that can lead to a better understanding of their wider underlying circumstances, pick up asymptomatic and missed cases, reduce inequalities such as some high-risk groups and structure a personalised intervention. It is therefore important to understand the attitudes of families receiving interconception care, concerning their previous pregnancy and its outcomes. This should include conversations about parents’ knowledge of the importance of healthy behaviours such as physical activity and diet for both their own and their child’s health and preparation for a subsequent pregnancy. This would enable parents and health professionals to co-create acceptable and effective interventions in this period.

**Interpretation**

Based on the findings of our scoping review and policy analysis we propose that postnatal care, for example with health visitors or home visiting programmes, should be re-designed to ensure continuity from antenatal to postnatal care and to promote parents’ and baby’s lifelong health(89, 90, 103). This should focus on planning, preparation, optimising health, nutrition and lifestyle for any future pregnancies. Health professionals should be trained in supportive and non- stigmatising communication skills informed by behaviour change techniques(62, 68, 70, 71, 79, 99), to facilitate empowering person-centred consultations and considering the whole reproductive life course(67, 87, 88, 99-101), including the interconception period. Although the success of these types of training is reported in the literature, more needs to be done to train health professionals. One such training based on these principles is Making Every Contact Count (MECC) ‘Healthy Conversation Skills’ training(112). Health Education England extends this training as part of the MECC initiative that enables health and social care practitioners to have brief but meaningful conversations with every patient they meet. Health professionals trained in MECC have the unique opportunity to discuss interconception care with women and their partners.

We suggest that health professionals conduct risk assessments in routine appointments on topics including diet and nutrition, physical activity, mental health, domestic abuse, alcohol or drug use, smoking, finances and housing, and dental health(25, 26). This could include asking parents if they had a high-risk pregnancy. In routine appointments, health professionals could also consider delivery of a diet and physical activity intervention during the postpartum period to support weight management and prevent future diabetes(33-41) and, by proxy, interconception health and health in the next pregnancy. This should be provided in a supportive non-stigmatising manner as we know that parents are prone to weight stigma during preconception, pregnancy and postpartum(113). Future research is needed in in this area exploring pilot interconception interventions in routine care, with long term follow up to assess the impact on parental and infant outcomes including inter-pregnancy weight, GDM, conversion to Type 2 diabetes, breastfeeding and incidence of post-natal depression.

Though the guidance on postpartum follow-up of parents who had GDM or high-risk pregnancies being offered annual HbA1c tests and self-monitoring of HbA1c levels is available, it is unclear how often this is implemented in routine care(78). This also needs to be connected with an offer of an Oral Glucose Tolerance Test in future pregnancies. We call on public health commissioners and managers to improve enrolment of eligible parents with children aged 0-4 years onto the Healthy Start scheme to receive vitamin supplements (folic acid, vitamins C/D)(69). Non-health organisations such as local authorities and the third sector could also contribute to this agenda by providing community programmes to support family-wide nutrition, especially between pregnancies(68, 72, 76, 79, 80, 90, 94). Those in the food production and consumption industries and policy-makers should engage in ways to create healthier food and an overall healthy environment(69, 76, 105).

**Strengths and limitations**

This is a substantial scoping review of international published and grey literature with the UK as a case study within the interconception and postpartum period. Quality assessment was conducted using a validated tool(19). While only 30% of the published systematic reviews were double screened and extracted by two independent reviewers overall there was agreement between the two reviewers and discrepancies were resolved through discussion. The scoping review provides an updated overview of opportunities to deliver interconception care. Though the primary focus was to develop recommendations specific to the UK setting, the findings can support interconception care in other settings too such as other high-income countries that this review draws evidence from A limitation of our analysis is that specific recommendations for countries in the global south would require a separate review considering the differences in dietary patterns, the triple burden of malnutrition and other risk factors for NCDs. Being a scoping review, and due to heterogeneity in outcomes considered, a meta-synthesis could not be performed.

**Conclusion**

Although there is limited evidence of the effectiveness of intervening in the interconception period, evidence from pilot interconception studies and systematic reviews on intervening in the postpartum period provide a starting point for developing future effective interventions and guidelines to improve maternal and child health. Intervening in the interconception period potentially offers a crucial opportunity to intervene to reduce possible long-term effects of suboptimal nutrition on the parent, their child, and in a future pregnancy. Clinical stakeholders can contribute to this agenda through routine appointments, conducting risk assessments, and by being trained to use empowering behaviour change communication skills. Investment by UK public health organisations and government agencies in determining the value of intervening in the interconception period is needed; if found to be effective further investment will be needed inguideline development and translation of guidelines into clinical and community-led practice. This scoping review, using the UK as an example, provides recommendations for healthcare systems to harness opportunities available in the interconception period to improve life-course health for parents and the next generation.

**References**

1. Jacob CM, Newell M-L, Hanson M. Narrative review of reviews of preconceptional interventions to prevent increased risk of obesity and non-communicable diseases in children. *Obesity Reviews*. 2018. 20:5-17

2. Kew S, Ye C, Hanley AJ, Connelly PW, Sermer M, Zinman B, et al. Cardiometabolic implications of postpartum weight changes in the first year after delivery. *Diabetes Care.* 2014;37:1998-2006.

3. Voerman E, Santos S, Inskip H, Amiano P, Barros H, Charles M-A, et al. Association of gestational weight gain with adverse maternal and infant outcomes. *Jama*. 2019;321:1702-15.

4. Ziauddeen N, Wilding S, Roderick PJ, Macklon NS, Alwan NA. Is maternal weight gain between pregnancies associated with risk of large-for-gestational age birth? Analysis of a UK population-based cohort. *BMJ Open*. 2019;9:e026220.

5. Jain AP, Gavard JA, Rice JJ, Catanzaro RB, Artal R, Hopkins SA. The impact of interpregnancy weight change on birthweight in obese women. *American J Obs and Gyne.* 2013;208:e1-. e7.

6. Bogaerts A, Van den Bergh BR, Ameye L, Witters I, Martens E, Timmerman D, et al. Interpregnancy weight change and risk for adverse perinatal outcome. *Obs & Gyne*. 2013;122:999-1009.

7. Villamor E, Cnattingius S. Interpregnancy weight change and risk of adverse pregnancy outcomes: a population-based study. *The Lancet*. 2006;368:1164-70.

8. Poston L, Caleyachetty R, Cnattingius S, Corvalan C, Uauy R, Herring S, et al. Preconceptional and maternal obesity: epidemiology and health consequences. *The Lancet Diabetes & Endocrinology.* 2016;4:1025-36.

9. Barker M, Dombrowski SU, Colbourn T, Fall CHD, Kriznik NM, Lawrence WT, et al. Intervention strategies to improve nutrition and health behaviours before conception. *Lancet* 2018;391:1853-64.

10. Department of Health and Social Care. Annual Report of the Chief Medical Officer. 2016. Available from: https://www.gov.uk/government/publications/chief-medical-officer-annual-report-2016-generation-genome

11. Office of National Statistics. Births in England and Wales: 2017. 2018. Available from: https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/livebirths/bulletins/birthsummarytablesenglandandwales/2017

12. Stephenson J, Heslehurst N, Hall J, Schoenaker D, Hutchinson J, Cade JE, et al. Before the beginning: nutrition and lifestyle in the preconception period and its importance for future health. *Lancet*. 2018;391:1830-41.

13. Fleming TP, Watkins AJ, Velazquez MA, Mathers JC, Prentice AM, Stephenson J, et al. Origins of lifetime health around the time of conception: causes and consequences. *Lancet*. 2018;391:1842-52.

14. World Health Organisation. Preconception care: Maximizing the gains for maternal and child health. 2013. Available from: https://www.who.int/maternal\_child\_adolescent/documents/preconception\_care\_policy\_brief.pdf

15. Badura M, Johnson K, Hench K, Reyes M. Healthy Start: Lessons learned on interconception care. *Women's Health Issues*. 2008;18:S61-S6.

16. Lu MC, Kotelchuck M, Culhane JF, Hobel CJ, Klerman LV, Thorp JM. Preconception care between pregnancies: the content of internatal care. *Maternal and Child Health Journal.* 2006;10:107-22.

17. Sijpkens MK, van den Hazel CZ, Delbaere I, Tydén T, Mogilevkina I, Steegers EA, et al. Results of a Dutch national and subsequent international expert meeting on interconception care. *J Maternal-Fetal & Neonatal Medicine*. 2020;33:2232-40.

18. Public Health England. Making the Case for Preconception Care. 2018. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\_data/file/729018/Making\_the\_case\_for\_preconception\_care.pdf

19. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. I*nt J Social Research Methodology*. 2005;8:19-32.

20. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan—a web and mobile app for systematic reviews. *Systematic Reviews*. 2016;5:210.

21. Dobbins M, DeCorby K, Robeson P, Husson H, Tirilis D, Greco L. A knowledge management tool for public health: health-evidence. *BMC Public Health.* 2010;10:1-16.

22. University of York. Centre for Reviews Dissemination. Systematic reviews: CRD's guidance for undertaking reviews in health care: University of York, Centre for Reviews & Dissemination; 2009.

23. Bowen GA. Document analysis as a qualitative research method. Qualitative research journal. 2009; 9: 27-40

24. Popay J, Roberts H, Sowden A, Petticrew M, Arai L, Rodgers M, et al. Guidance on the conduct of narrative synthesis in systematic reviews. A product from the ESRC methods programme Version. 2006;1:b92.

25. DeMarco MP, Shafqat M, Horst MA, Srinivasan S, Frayne DJ, Schlar L, et al. Interventions to Increase Multivitamin Use Among Women in the Interconception Period: An IMPLICIT Network Study. *Maternal and Child Health Journal*. 2021: 25:207-13.

26. Srinivasan S, Schlar L, Rosener SE, Frayne DJ, Hartman SG, Horst MA, et al. Delivering interconception care during well-child visits: an IMPLICIT Network study. *J American Board of Family Medicine*. 2018;31:201-10.

27. Handler A, Rankin KM, Peacock N, Townsell S, McGlynn A, Issel LM. The implementation of interconception care in two community health settings: Lessons learned. *American Journal of Health Promotion*. 2013;27:eS21-eS31.

28. Sijpkens MK, Lagendijk J, Van Minde MR, de Kroon ML, Bertens LC, Rosman AN, et al. Integrating interconception care in preventive child health care services: The Healthy Pregnancy 4 All program. *PloS One.* 2019;14:e0224427.

29. Ravindran S, Yoganathan S, Cairncross ZF, Dennis C-L, Enders J, Graves L, et al. Pilot Randomized Controlled Trial of an Interconception Intervention Provided by Public Health Nurses. *Maternal and Child Health Journal*. 2020;24:1161-9.

30. Coonrod DV, Welborn D, Casillas R, Jimenez B-f, Sturgeon AN, Records K, et al. Interconception health services for women at high risk for adverse pregnancy outcomes: A descriptive study. *Journal of Advances in Medicine and Medical Research*. 2014; 7:3844-55.

31. Upadhya KK, Psoter KJ, Connor KA, Mistry KB, Levy DJ, Cheng TL. Cluster randomized trial of a pre/interconception health intervention for mothers in pediatric visits. *Academic Pediatrics*. 2020;20:660-9.

32. Tieu J, Bain E, Middleton P, Crowther CA. Interconception care for women with a history of gestational diabetes for improving maternal and infant outcomes. *Cochrane Database of Systematic Reviews.* 2013; https://doi.org/10.1002/14651858.CD010211.pub3

33. Amorim Adegboye AR, Linne YM. Diet or exercise, or both, for weight reduction in women after childbirth. *Cochrane Database of Systematic Reviews*. 2013; https://doi.org/10.1002/14651858.CD005627.pub3

34. Choi J, Fukuoka Y, Lee JH. The effects of physical activity and physical activity plus diet interventions on body weight in overweight or obese women who are pregnant or in postpartum: a systematic review and meta-analysis of randomized controlled trials. *Preventive Medicine*. 2013;56:351-64.

35. Dalrymple KV, Flynn AC, Relph SA, O'Keeffe M, Poston L. Lifestyle interventions in overweight and obese pregnant or postpartum women for postpartum weight management: A systematic review of the literature. *Nutrients*. 2018;10:1704.

36. Dodd JM, Deussen AR, O'Brien CM, Schoenaker DAJM, Poprzeczny A, Gordon A, et al. Targeting the postpartum period to promote weight loss: A systematic review and meta-analysis. *Nutrition Reviews.* 2018;76:639-54.

37. Ferguson JA, Daley AJ, Parretti HM. Behavioural weight management interventions for postnatal women: A systematic review of systematic reviews of randomized controlled trials. *Obesity Reviews.* 2019;20:829-41.

38. Lim S, O'Reilly S, Behrens H, Skinner T, Ellis I, Dunbar JA. Effective strategies for weight loss in post-partum women: a systematic review and meta-analysis. *Obesity Reviews*. 2015;16:972-87.

39. Nicodemus NA, Jr. Prevention of Excessive Gestational Weight Gain and Postpartum Weight Retention. *Current Obesity Reports.* 2018;7:105-11.

40. van der Pligt P, Willcox J, Hesketh KD, Ball K, Wilkinson S, Crawford D, et al. Systematic review of lifestyle interventions to limit postpartum weight retention: implications for future opportunities to prevent maternal overweight and obesity following childbirth. *Obesity Reviews*. 2013;14:792-805.

41. Hutchesson MJ, de Jonge Mulock Houwer M, Brown HM, Lim S, Moran LJ, Vincze L, et al. Supporting women of childbearing age in the prevention and treatment of overweight and obesity: a scoping review of randomized control trials of behavioral interventions. *BMC Women's Health. 2020;20:14.*

42. Berger AA, Peragallo-Urrutia R, Nicholson WK. Systematic review of the effect of individual and combined nutrition and exercise interventions on weight, adiposity and metabolic outcomes after delivery: evidence for developing behavioral guidelines for post-partum weight control. *BMC Pregnancy and Childbirth.* 2014;14:319.

43. Neville CE, McKinley MC, Holmes VA, Spence D, Woodside JV. The Effectiveness of Weight Management Interventions in Breastfeeding Women-A Systematic Review and Critical Evaluation. Birth: *Issues in Perinatal Care.* 2014;41:223-36.

44. Taylor RM, Wolfson JA, Lavelle F, Dean M, Frawley J, Hutchesson MJ, et al. Impact of preconception, pregnancy, and postpartum culinary nutrition education interventions: a systematic review. *Nutrition Reviews*. 2021;79:1186-203

45. Vincze L, Rollo M, Hutchesson M, Hauck Y, MacDonald-Wicks L, Wood L, et al. Interventions including a nutrition component aimed at managing gestational weight gain or postpartum weight retention: A systematic review and meta-analysis. *JBI Database of Systematic Reviews and Implementation Reports*. 2019;17:297-364.

46. Garad R, McPhee C, Chai TL, Moran L, O'Reilly S, Lim S. The role of health literacy in postpartum weight, diet, and physical activity. *Journal of Clinical Medicine.* 2020;9:1-14.

47. Lau Y, Klainin-Yobas P, Htun TP, Wong SN, Tan KL, Ho-Lim ST, et al. Electronic-based lifestyle interventions in overweight or obese perinatal women: a systematic review and meta-analysis. *Obesity Reviews* 2017;18:1071-87.

48. Sherifali D, Nerenberg KA, Wilson S, Semeniuk K, Ali MU, Redman LM, et al. The Effectiveness of eHealth Technologies on Weight Management in Pregnant and Postpartum Women: Systematic Review and Meta-Analysis. *Journal of Medical Internet Research*. 2017;19:e337.

49. Goveia P, Canon-Montanez W, De Paula Santos D, Lopes GW, Ma RCW, Duncan BB, et al. Lifestyle intervention for the prevention of diabetes in women with previous gestational diabetes mellitus: A systematic review and meta-analysis. Frontiers in Endocrinology. 2018;9:00583.

50. Guo J, Chen J-L, Whittemore R, Whitaker E. Postpartum Lifestyle Interventions to Prevent Type 2 Diabetes Among Women with History of Gestational Diabetes: A Systematic Review of Randomized Clinical Trials. *Journal of women's Health* (2002). 2016;25:38-49.

51. Li N, Yang Y, Cui D, Li C, Ma RCW, Li J, et al. Effects of lifestyle intervention on long-term risk of diabetes in women with prior gestational diabetes: A systematic review and meta-analysis of randomized controlled trials. *Obesity Reviews*. 2021;22:e13122.

52. Schoenaker DA, de Jersey S, Willcox J, Francois ME, Wilkinson S, editors. Prevention of Gestational Diabetes: The Role of Dietary Intake, Physical Activity, and Weight before, during, and between Pregnancies. *Seminars in Reproductive Medicine;* 2021: 38: 352-365

53. Hewage SS, Wu S, Neelakantan N, Yoong J. Systematic review of effectiveness and cost-effectiveness of lifestyle interventions to improve clinical diabetes outcome measures in women with a history of GDM. *Clinical Nutrition ESPEN*. 2020;35:20-9.

54. Jones E, Fraley H, Mazzawi J. Appreciating Recent Motherhood and Culture: A Systematic Review of Multimodal Postpartum Lifestyle Interventions to Reduce Diabetes Risk in Women with Prior Gestational Diabetes. *Maternal & Child Health Journal*. 2017;21:45-57.

55. Lui N, Jeyaram G, Henry A. Postpartum interventions to reduce longterm cardiovascular disease risk in womenafter hypertensive disorders of pregnancy:A systematic review. *Obstetric Medicine.* 2019;12:28.

56. Markova V, Norgaard A, Jorgensen KJ, Langhoff-Roos J. Treatment for women with postpartum iron deficiency anaemia. *Cochrane Database of Systematic Reviews*. 2015; https://doi.org/10.1002/14651858.CD010861.pub2.

57. Oliveira-Menegozzo JM, Bergamaschi DP, Middleton P, East CE. Vitamin A supplementation for postpartum women. *Cochrane Database of Systematic Reviews*. 2010: https://doi.org/10.1002/14651858.CD005944.pub2

58. Turawa EB, Musekiwa A, Rohwer AC. Interventions for treating postpartum constipation. *Cochrane Database of Systematic Reviews.* 2014: https://doi.org/10.1002/14651858.CD010273.pub2.

59. Lim S, Liang X, Hill B, Teede H, Moran LJ, O'Reilly S. A systematic review and meta-analysis of intervention characteristics in postpartum weight management using the TIDieR framework: A summary of evidence to inform implementation. *Obesity Reviews*. 2019; 20:1045-56.

60. Van Der Pligt P, Willcox J, Hesketh K, Ball K, Wilkinson S, Crawford D, et al. Systematic review of lifestyle interventions to limit postpartum weight retention in women following childbirth. *Journal of Paediatrics and Child Health*. 2013; 14:792-805.

61. Panagopoulou V, Hancock J, Tziaferi S. Midwifery in the Postnatal Period: A Systematic Review of the Literature. *Nosileftiki*. 2017;56:125-37.

62. National Institute for Health and Social Care Excellence. Training in maternal and child nutrition. 2020. Available from: https://pathways.nice.org.uk/pathways/maternal-and-child-nutrition/training-in-maternal-and-child-nutrition

63. Public Health England. Health matters: reproductive health and pregnancy planning. 2018. Available from: https://www.gov.uk/government/publications/health-matters-reproductive-health-and-pregnancy-planning/health-matters-reproductive-health-and-pregnancy-planning

64. Public Health England. Understanding the contraceptive needs of postnatal women. 2018. Available from: https://www.gov.uk/government/case-studies/understanding-the-contraceptive-needs-of-postnatal-women

65. Public Health England. Making the Case for Preconception Care. 2018. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\_data/file/729018/Making\_the\_case\_for\_preconception\_care.pdf

66. Ruel MT, Quisumbing AR, Balagamwala M. Nutrition-sensitive agriculture: What have we learned so far? *Global Food Security.* 2018;17:128-53.

67. Parliamentary Office of Science and Technology. Dietary Advice, Pregnancy & Breastfeeding. 2017. Available from: https://post.parliament.uk/research-briefings/post-pn-0551/

68. National Institute for Health and Social Care Excellence. Weight management before, during and after pregnancy. 2010. Available from: https://www.nice.org.uk/guidance/ph27

69. National Institute for Health and Social Care Excellence. Strategy, policy and commissioning for maternal and child nutrition. 2020. Available from: https://pathways.nice.org.uk/pathways/maternal-and-child-nutrition#path=view%3A/pathways/maternal-and-child-nutrition/strategy-policy-and-commissioning-for-maternal-and-child-nutrition.xml&content=view-index

70. National Institute for Health and Social Care Excellence. Maternal and child nutrition in primary and secondary care and community health services. 2020. Available from: https://pathways.nice.org.uk/pathways/maternal-and-child-nutrition#path=view%3A/pathways/maternal-and-child-nutrition/maternal-and-child-nutrition-in-primary-and-secondary-care-and-community-health-services.xml&content=view-index

71. Public Health England. Maternity high impact area: Supporting healthy weight before and between pregnancies. 2020. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\_data/file/942476/Maternity\_high\_impact\_area\_3\_Supporting\_healthy\_weight\_before\_and\_between\_pregnancies\_.pdf

72. Department for Education. An evaluating of improving practice in Sure Start – Kilkeel Sure Start, Promotion of health families’. 2020. Available from: https://www.etini.gov.uk/sites/etini.gov.uk/files/publications/an-evaluation-of-improving-practice-in-sure-start.pdf

73. First Steps Nutrition. Eating well for new mums. 2020. Available from: https://static1.squarespace.com/static/59f75004f09ca48694070f3b/t/5fa27fa1073fea76aa16865e/1604485056122/Eating+Well+for+New+Mums+30+October+2020+live.pdf

74. First Steps Nutrition. Healthy Start and Best Start Foods A practical guide. 2020. Available from: https://static1.squarespace.com/static/59f75004f09ca48694070f3b/t/5f2c2a9a7038053a06b025db/1596730047318/Healthy\_Start\_and\_Best\_Start\_for\_web\_29July2020.pdf

75. Parliamentary business. Evidence from Public Health England following Elaine Rashbrook. 2020. Available from: https://committees.parliament.uk/oralevidence/70/html/

76. National Institute for Health and Social Care Excellence. Vitamin D: supplement use in specific population groups. 2017. Available from: https://www.nice.org.uk/guidance/ph56

77. House of Lords. Bread and Flour Regulations (Folic Acid) Bill. 2016. Available from: https://bills.parliament.uk/bills/1782

78. National Institute for Health and Social Care Excellence. Diabetes in pregnancy overview. 2020. Available from: https://www.nice.org.uk/guidance/ng3

79. National Institute for Health and Social Care Excellence. Community and leisure services and weight management programme. 2020.Availble from: https://pathways.nice.org.uk/pathways/diet/community-and-leisure-services-and-weight-management-programmes

80. National Institute for Health and Social Care Excellence. Active Mothers: moving away from Obesity Through Healthier lifestyle Exercise Relaxation and Support In Bexley. 2016. Availble from: https://www.nice.org.uk/sharedlearning/active-mothers-in-bexley-active-mothers-moving-away-from-obesity-through-healthier-lifestyle-exercise-relaxation-and-support-in-bexley

81. Tommy's. Helping women lose weight after pregnancy. 2021. Available from: https://www.tommys.org/research/research-topics/pregnancy-complication-research/obesity/helping-women-lose-weight-after-pregnancy

82. Coe S, Spiro A, Lockyer S, Stanner S. Ensuring a healthy approach to long‐term weight management: Review of the Slimming World programme. *Nutrition Bulletin*. 2019;44:267-82.

83. Royal College of General Practitioners. UK physical activity and lifestyle guidelines - what's new?; 2020. Availble from: https://www.rcgp.org.uk/clinical-and-research/about/clinical-news/2020/february/uk-physical-activity-and-lifestyle-guidelines---what-is-new.aspx

84. National Institute for Health and Social Care Excellence. Maternal and child nutrition. 2015. Available from: https://www.nice.org.uk/guidance/qs98/resources/maternal-and-child-nutrition-pdf-2098975759045

85. National Institute for Health and Social Care Excellence. Maternal and child nutrition overview. 2020. Available from: https://pathways.nice.org.uk/pathways/maternal-and-child-nutrition#path=view%3A/pathways/maternal-and-child-nutrition/maternal-and-child-nutrition-overview.xml&content=view-index

86. National Institute for Health and Social Care Excellence. Postnatal care overview. 2020. Available from: https://www.nice.org.uk/guidance/ng194

87. House of Commons. Conception to Age 2: the first 1001 days. 2015. Availble from: https://commonslibrary.parliament.uk/research-briefings/cdp-2015-0133/

88. Mental Health Foundation. Changing the perfect picture: an inquiry into body image. 2021. Available from: https://committees.parliament.uk/work/226/changing-the-perfect-picture-an-inquiry-into-body-image/

89. Parliamentary Business. Becoming a new parent during the pandemic. 2020. Availble from: https://publications.parliament.uk/pa/cm5801/cmselect/cmpetitions/526/52607.htm

90. Royal College of Obstetricians & Gynaecologists TRCoM. Guidance for Antenatal and Postnatal Services in the evolving Coronavirus (COVID-19) pandemic. 2020. Available from: https://www.rcog.org.uk/globalassets/documents/guidelines/2020-07-10-guidance-for-antenatal-and-postnatal.pdf

91. Royal College of Obstetricians & Gynaecologists. Better for women. 2019. Available from: https://www.rcog.org.uk/better-for-women

92. Tommy's. Improving support in a pregnancy after stillbirth or neonatal death (the IMPS study) 2021. Available from: https://www.tommys.org/research/research-topics/stillbirth-research/improving-support-pregnancy-after-stillbirth-or-neonatal-death-imps-study

93. The Maternity Services Action Group SG. A Refreshed Framework for Maternity Care in Scotland. 2011. Availble from: https://www.gov.scot/publications/refreshed-framework-maternity-care-scotland-maternity-services-action-group/

94. Department for Education. An evaluating of improving practice in Sure Start – Down Sure Start 1. 2020. Available from: https://www.etini.gov.uk/sites/etini.gov.uk/files/publications/an-evaluation-of-improving-practice-in-sure-start.pdf.

95. UK Government. Sure Start Maternity Grant. 2020. Available from: https://www.gov.uk/sure-start-maternity-grant

96. Parliamentary business. The impact of COVID-19 on maternity and parental leave: Government Response to the Committee’s First Report. 2020. Availble from: https://committees.parliament.uk/publications/2186/documents/24746/default/

97. Parliamentary business. First 1000 days of life – Health and social care committee. 2019. Availble from: https://publications.parliament.uk/pa/cm201719/cmselect/cmhealth/1496/1496.pdf

98. Tommy's. Improving miscarriage support for men. 2021. Availble from: https://www.tommys.org/research/research-topics/miscarriage-research/improving-miscarriage-support-women-partners-and-family

99. Department for International Development. Family Planning Communications. 2016. Availble from: https://assets.publishing.service.gov.uk/media/5b97f746e5274a137ded0378/023\_Family\_planning\_communications\_\_K4D\_template\_.pdf

100. House of Lords - Science and Technology Select Committee. Corrected oral evidence: Ageing: Science, Technology and Healthy Living. 2020. Avaible from: https://publications.parliament.uk/pa/ld5801/ldselect/ldsctech/183/18302.htm

101. Department of Health and Social Care. Healthy Lives, Healthy People: our strategy for public health in England. 2010. Available from: https://www.gov.uk/government/publications/healthy-lives-healthy-people-our-strategy-for-public-health-in-england

102. National Institute for Health and Social Care Excellence. Doncaster Family Nurse Partnership, making a real difference for young pregnant women and their baby. 2011. Available from: https://www.nice.org.uk/sharedlearning/doncaster-family-nurse-partnership-making-a-real-difference-for-young-pregnant-women-and-their-baby

103. The Royal College of Midwives. Guidance for midwives, student midwives and maternity support workers providing community based care during the Covid-19 pandemic. 2020. Availble from: https://www.rcm.org.uk/media/3900/home-visit-guidance-for-midwives.pdf

104. International Federation of Gynecology and Obstertrics. FIGO nutrition checklist for pre-pregnant/early pregnant women. 2015. Availble from: https://obgyn.onlinelibrary.wiley.com/action/downloadSupplement?doi=10.1002%2Fijgo.13321&file=ijgo13321-sup-0001-Supinfo.pdf

Sciences, Faculty of Medicine, University of Southampton, MRC Lifecourse Epidemiology Unit and the NIHR Biomedical Research Centre, University of Southampton and University Hospital Southampton NHS Foundation Trust – Written evidence. 2020. Available from: https://committees.parliament.uk/writtenevidence/300/html/

106. Promotions of unhealthy foods restricted from April 2022 [press release]. 2020. Availble from: https://www.gov.uk/government/news/promotions-of-unhealthy-foods-restricted-from-april-2022

107. W Walker LO, Francine Nichols R. The broken thread of health promotion and disease prevention for women during the postpartum period. *J Perinatal Education.* 2015;24:81.

108. Johnson KA, Gee RE, editors. Interpregnancy care. Seminars in Perinatology; 2015; 39:310-315.

109. McAuliffe FM, Killeen SL, Jacob CM, Hanson MA, Hadar E, McIntyre HD, et al. Management of prepregnancy, pregnancy, and postpartum obesity from the FIGO Pregnancy and Non‐Communicable Diseases Committee: A FIGO (International Federation of Gynecology and Obstetrics) guideline. *International Journal of Gynecology & Obstetrics*. 2020;151:16-36.

110. Danielle Schoenaker. Chrysalis [Internet]2021. [cited 2021]. Available from: <https://chrysalisgim.org.uk/blogs/member-support-coordinators-blog/inclusive-language-in-pregnancy-and-parenthood/>.

111. Schoenaker DA, Gafari O, Taylor E, Hall J, Barker C, Jones B, et al. Informing public health messages and strategies to raise awareness of pre-conception health: a public consultation. T*he Lancet.* 2021;398:S77.

112. Lawrence W, Black C, Tinati T, Cradock S, Begum R, Jarman M, et al. ‘Making every contact count’: evaluation of the impact of an intervention to train health and social care practitioners in skills to support health behaviour change. *Journal of Health Psychology*. 2016;21:138-51.

113. Hill B, Rodriguez ACI, editors. Weight stigma across the preconception, pregnancy, and postpartum periods: A narrative review and conceptual model. Seminars in reproductive medicine; 2021:

Tables and figures

**Figure legends**

Figure 1. PRISMA Flow Diagram of review of reviews

(Uploaded in supplementary documents)

Figure 2. Care opportunities for nutrition in the interconception period

(Uploaded in supplementary documents)

**Table 1. Inclusion criteria and search terms**

Organisations and agencies included: NICE, Public Health England (PHE), Royal College of General Practice, Royal College of Obstetricians and Gynaecologists, Royal College Of Midwives, UK Department of Health Social Care, UK House of Commons and Lords Hansard archives, parallel parliament, SUREstart, Tommy’s, and First Steps Nutrition Key words on interconception and postpartum were entered into the organisation or agencies’ search tab to identify relevant documents.

|  |  |  |
| --- | --- | --- |
| **PICO** | **Inclusion criteria description** | **Search terms** |
| Publication type | Published research articles, national and local guidelines.  | See databasesEnglish, 2010-current 12.02.2021, review, human |
| Study Design | All study designs evaluating maternal and child nutrition interventions.  | Pilot OR Pilot evaluation OR Implement\* OR Evaluation |
| Population | Women and men who have experienced at least one pregnancy in the UK (and Europe if needed) | Interconception OR Inter\*conception ORInterpregnancy OR inter\*pregnancy ORConsecutive pregnancy OR PerinatalOR post\*partum OR post\*natal OR following childbirth OR post\*pregnancy OR after birth OR following pregnancy OR birth interval AND UK OR United Kingdom OR Britain OR England OR Scotland OR Wales OR Ireland |
| Interventions  | Interconception care models from primary care and community care. | Primary Care OR GP OR general practitioner\* OR Health visitor OR Nurse OR Secondary OR Health professional ORMidwife\* OR Community OR Healthcare provider\* OR Dietician\* OR Obstetrician\*AND Nutrition\* OR Diet\* OR food OR eat\* OR nutrient  |
| Outcomes  | At least one of the following nutrition, diet, physical activity, non-communicable disease outcomes for:* NCDs
* Body composition
* Nutrient status
* Diet
* Physical activity
* Behavioural outcomes such as changes in self-efficacy, attitude, knowledge
* Both maternal and infant outcomes will be extracted if available.
 | Outcome based search terms were not added as nutrition interventions included many different outcomes related to lifestyle changes, such as those described in the box on the left.  |

**Table 2. Risk of Bias for pilot studies**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Author, year | Study design | Assignment to treatment groups truly random | Assessors randomised  | Participants Randomised  | Blinding | Similar at baseline | Selection criteria  | Loss at follow up | Interconception assessment  | Intervention delivery | Primary outcome variability  | Intention to treat  | Analytical methods | Cofounding analysis | Sample size | Score |
| Coonrod, 2014 | -1 | -1 | -1 | -1 | 0 | +1 | 0 | 0 | -1 | -0 | -1 | -1 | 0 | +1 | -1 | -6 |
| Handler, 2013 | -1 | -1 | -1 | -1 | +1 | 0 | -1 | -1 | -1 | 0 | +1 | -1 | 0 | +1 | -1 | -6 |
| Sijpkens, 2019 | 0 | -1 | -1 | -1 | 0 | +1 | -1 | +1 | -1 | 0 | +1 | -1 | +1 | 0 | 0 | -2 |
| Srinivasan 2018, DeMarco 2020 | +1 | 0 | -1 | -1 | +1 | 0 | 0 | 0 | +1 | 0 | +1 | -1 | +1 | +1 | 0 | 3 |
| Ravindran et al 2020 | +1 | +1 | -1 | 0 | +1 | +1 | +1 | 0 | -1 | 0 | +1 | +1 | 0 | +1 | -1 | 5 |
| Upadhya, 2020 | +1 | +1 | +1 | +1 | +1 | +1 | +1 | 0 | -1 | 0 | +1 | +1 | +1 | +1 | 0 | 10 |

Footnote: ROB score: +1 is low ROB, 0 is medium, -1 is high ROB.

**Table 3. Risk of Bias of systematic reviews**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Author, year | PICO | Inclusion criteria  | Search Strategy | Years covered | Level of evidence in primary studies | Methodological quality of the primary studies | Transparent results | Combine findings across studies | Appropriate methods used to combine studies | Data support author interpretation  | Score | Risk of bias |
| Adegboye, 2013 | 🗸 | 🗸 | X | 🗸 | 🗸 | X | 🗸 | 🗸 | 🗸 | 🗸 | 8 | Strong |
| Berger, 2014 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | X | 🗸 | X | 🗸 | 7 | Moderate  |
| Choi, 2013 | 🗸 | 🗸 | X | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 9 | Strong |
| Dalrymple, 2019 | 🗸 | 🗸 | X | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 9 | Strong |
| Dodd, 2019  | 🗸 | 🗸 | X | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 9 | Strong |
| Ferguson, 2019 | 🗸 | 🗸 | X | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | X | X | 7 | Moderate |
| Garad, 2020 | 🗸 | 🗸 | X | 🗸 | 🗸 | X | 🗸 | 🗸 | 🗸 | 🗸 | 8 | Strong |
| Goveia, 2018 | 🗸 | 🗸 | X | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 9 | Strong |
| Guo, 2016 | 🗸 | 🗸 | X | 🗸 | 🗸 | 🗸 | 🗸 | X | X | 🗸 | 7 | Moderate |
| Hutchesson,2020 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | X | N/A | 🗸 | X | 🗸 | 7 | Moderate |
| Hewage, 2019 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | X | 🗸 | 🗸 | 🗸 | 🗸 | 9 | Strong |
| Jones 2016 | 🗸 | 🗸 | X | 🗸 | 🗸 | 🗸 | X | X | X | X | 5 | Moderate |
| Lau, 2017 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 10 | Strong |
| Li, 2020 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | X | 🗸 | 9 | Strong |
| Lim, 2015 | 🗸 | 🗸 | X | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 9 | Strong |
| Lim, 2019 | 🗸 | 🗸 | X | 🗸 | 🗸 | X | 🗸 | 🗸 | 🗸 | 🗸 | 8 | Strong |
| Lim, 2020 | 🗸 | 🗸 | X | 🗸 | 🗸 | 🗸 | X | 🗸 | 🗸 | 🗸 | 8 | Strong |
| Lui 2019 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | X | 🗸 | 9 | Strong |
| Markova 2015 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | X | 🗸 | 9 | Strong |
| Neville, 2014 | 🗸 | 🗸 | X | 🗸 | 🗸 | X | X | 🗸 | X | 🗸 | 6 | Moderate |
| Oliveira, 2016 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 10 | Strong |
| Panagopoulou, 2017 | X | X | X | 🗸 | X | X | X | X | X | 🗸 | 2 | Weak |
| Schoenaker 2021 | 🗸 | X | X | X | 🗸 | X | X | X | X | N/A | 2 | Weak |
| Sherifali, 2017 | 🗸 | 🗸 | X | 🗸 | 🗸 | X | 🗸 | 🗸 | 🗸 | 🗸 | 8 | Strong |
| Taylor 2020 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | X | 🗸 | 9 | Strong |
| Tieu, 2017 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | N/A | 🗸 | 9 | Strong |
| Turawa, 2020 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 10 | Strong |
| van der Pligt, 2013 | 🗸 | 🗸 | X | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | X | 🗸 | 8 | Strong |
| Vincze, 2019 | 🗸 | 🗸 | X | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 9 | Strong |

**Table 4 Description table of included interconception and postpartum reviews**

| **#** | **Author, Year, Country** | **Aims** | **Participants** | **Method** | **Intervention** | **Key findings** | **RoB** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Interconception (n=7)** |  |
| 1 | Sijpkens et al 2019, Netherlands  | To integrate Preventive Child Health Care (PCHC) services and perform an implementation evaluation | Physicians and nurses (n=112) to new parents. | Pilot study | Preventive Child Health Care (PCHC) trained physicians and nurses (n=112) in seven Dutch municipalities discussed interconception care with new parents during their routine 6 month infant visit.  | Sixty percent of the PCHC professionals promoted interconception care, the possibility of interconception care was discussed in 29% (n = 1,849) of all visits, almost half PCHC professionals found discussions on interconception care during visits acceptable and appropriate, yet only 13% of professionals felt that the topic of interconception care could be incorporated into routine practice. | -2 |
| 2 | Ravindran et al 2020, Canada | To examine the feasibility and acceptability of an interconception intervention delivered by public health nurses. | Public health nurses in rural and urban Canada to women between 2 and 12 months postpartum after a first birth.  | Pilot study | A pilot randomised control trial was conducted in three urban and rural sites in Ontario, Canada, delivered by public health nurses. Women (n=16) in the intervention arm received preconception risk assessment, tailored education and clinical follow-up referrals, whereas the control received standard care. Participants completed a survey with open-ended questions to assess acceptability. | Most participants were satisfied with the intervention, including the number and length of sessions and content of recommendations. | 5 |
| 3 | Srinivasan et al 2018, DeMarco et al 2020, USA | To address specific maternal risk factors for poor subsequent birth outcomes | Mothers with children aged 0-24 months in the US. | Intervention study | Mothers (n= 11,521) attending ‘well child visits’ in 19 health centres in the United States (US) were risk assessed, and 60% of the high risk mothers receive counselling and multivitamin supplementation.  | Direct provision of multivitamin supplementation was found to be more effective than solely counselling about the use of multivitamin supplementation. Women who were most likely to become pregnant were more likely to initiate multivitamin supplementation by the next routine visit. | 3 |
| 4 | Coonrod et al, 2014, USA  | To describe and present results of preconception care services aimed at underserved women who have experienced an adverse birth outcome. | 102 women who have experienced a prior preterm birth or stillbirth | Retrospective descriptive study. | Women (n=102) in Phoenix, US, who had experienced prior preterm birth or stillbirth, were enrolled onto an intervention providing education delivered by clinicians, peer support groups, a walking program, contraception, folic acid, dental care, mental health and substance support prior to a future pregnancy.  | All women with mental health issues were supported, 93% who were not planning for a pregnancy were on contraception, 75% were taking folate supplement, 53% were exercising, and 37% received dental care. | -6 |
| 5 | Handler et al, 2013, USA  | To evaluate the implementation of a pilot interconceptional care program | 220 low-income African-American women with a prior adverse pregnancy outcome | Pilot study | Low-income African-American women(n=220) who had experienced prior preterm birth or a stillbirth were invited to an intervention that integrated social services, family planning, and medical care.  | Women perceived themselves as healthy and did not see medical care as a priority compared to their socioeconomic needs. Women’s perception of contraception effectiveness did not align with clinical knowledge. | -6 |
| 6 | Upadhya et al, USA (2020) | To assess the effectiveness of a pre/interconception women's health intervention delivered during pediatric primary care using a cluster randomized trial. | Paediatric clinicians (physician or nurse practitioner) delivered to mothers with infants under 12 months old. | RCT | Paediatric clinicians (physician or nurse practitioner) were trained to screen and deliver a brief educational intervention to mothers in the intervention arm, and mothers (n=415) in both arms received preconception health information and a 90-day supply of multivitamin.  | Contraceptive use, pregnancy incidence, and the use of preventive care was not significant for mothers in the intervention, however the intervention increased the daily folic acid use and reduced prevalence of smoking at 6 months follow-up but not at 12 months. | 10 |
| 7 | Tieu et al, 2017 | To assess the effects of interconception care for women with a history of GDM on maternal and infant health outcomes. | Women who have been diagnosed with gestational diabetes mellitus (GDM) in a previous pregnancy. Diagnosis of GDM made according to individual study criteria. | Cochrane Systematic Review of RCTs | No eligible published trials were identified.Three ongoing trials 1. the effects of a diet and exercise intervention 2. effects of an intensive lifestyle intervention, supported with liraglutide treatment, 3. the effects of a weight loss and exercise intervention compared with lifestyle education | No eligible published trials were identified. | 9 |
| **Postpartum (n=28)** |  |
| **Postpartum weight loss (n=17)** |  |
| 1 | Amorim Adegboye et al, 2013 US (n=10), Australia (n=2), UK (n=1), Taiwan (n=1) | To evaluate the effect of diet, exercise or both for weight reduction in women after childbirth, and to assess the impact of these interventions on maternal body composition, cardiorespiratory fitness, breastfeeding performance and other child and maternal outcomes | Women recruited to the intervention programme up to 24 months after childbirth and were overweight or obese, or had gained excessive weight during pregnancy, or both. | Cochrane Systematic Review of RCTs | All studies involved aerobic exercise programmes and majority studies gave prescription of a calorie‐restricted diet.Programme ranging from six months to a one‐year long. | * 14 RCTs included
* Women who exercised did not lose significantly more weight than women in the usual care group.
* Women who took part in a diet or diet plus exercise programme lost significantly more weight than women in the usual care group.
 | 8 |
| 2 | Berger et al, 2014US(n=9), Iran (n=1), UK (n=1), Taiwan (n=1), Greece (n=1), Sweden (n=1) | To assess the benefits and harms of postpartum behavioral weight management interventions that included nutrition, exercise, or combined nutrition and exercise components. | Women who were postpartum, enrolled in the study in the early postpartum period (up to 12 weeks following delivery); women from any geographical and racial/ethnic background. | Systematic review of RCTs | Combined nutrition and exercise interventions solely exercise interventions, and nutrition-only intervention.Trials ranged from one day to six months after delivery. The duration of the interventions was 3 to 9 months. | * 13 RCTs included.
* Greater weight loss in the combined intervention group vs. standard care, ranging from 0.17 kg to 4.9 kg.
* Results from exercise and nutrition only interventions were inconclusive.
 | 7 |
| 3 | Choi et al, 2013US (n=3), UK (n=1) | To review the effectiveness of physical activity (PA) and PA plus diet interventions in managing weight among overweight or obese pregnant or postpartum women. | Women in the postpartum period. | Systematic review of RCTs | All studies included physical activity (exercise classes or pedometers) and diet counselling including one to one and weight loss session groups. Interventions ranged between 10 weeks and 9 months | * 4 postpartum women RCTs included.
* Postpartum women in the combined intervention groups significantly lost more body weight (− 1.22 kg; 95% CI: − 1.89, − 0.56) than those in the control groups.
* Supervised physical activity plus diet interventions were the most effective.
 | 9 |
| 4 | Dalrymple et al, 2018 | To evaluate the effectiveness of lifestyle interventions in overweight or obese pregnant and/or postpartum women for managing postpartum weight up to 2 years after giving birth. | Pregnant and postpartum women with a BMI > 25 kg/m2 | Systematic review of RCTs | Intervention content included a combined approach of diet and physical activity or diet only.The intervention duration between 10 weeks to 10 months.Delivered by dietitian, lifestyle counsellor, health coach, nutrition professional or an interventionist. | * 15 RCTs included (postpartum n=12; pregnancy and postpartum n=3)
* Postpartum interventions reported significant improvements in postpartum weight when compared to the control group.
* Interventions associated with gestational weight gain (GWG) and postpartum weight retention (PPWR)
 | 7 |
| 5 | Dodd et al, 2018 | To evaluate postpartum dietary and/or physical activity interventions to promote weight loss and improve health in a subsequent pregnancy | Women who had given birth to a healthy singleton infant and (1) were overweight or obese; (2) had a normal BMI upon commencing pregnancy but whose gestational weight gain | Systematic review and meta-analysis of RCTs | Diet interventions alone, physical activity intervention alone, and combined diet and physical activity. | * 27 RCTs included.
* A combined intervention provided greater postpartum weight loss. which was maintained at 12 months postpartum.
* Dietary intervention in the postpartum period were more likely to have significant weight loss at the completion of the intervention compared with women who received no intervention.
 | 9 |
| 6 | Ferguson et al, 2019 | To investigate the effectiveness of lifestyle weight management interventions for postnatal women. | Postnatal women no restriction on BMI, without a history of GDM. | Systematic review of systematic reviews | Both diet and physical activity interventions, physical activity alone, and dietary interventions alone.Trials greater than 12 weeks duration were included.  | * Nine systematic reviews included.
* Meta-analysis showed that lifestyle interventions involving physical activity and/or dietary changes resulted in a reduction in postnatal weight.
* Participants who received interventions of between 3 and 12 weeks duration was −2.6 kg lower than the comparator group.
 | 7 |
| 7 | Garad et al, 2020US (n=16), UK (n=3), Australia (n=5), Greece (n=1), Israel (n=1), Sweden (n=2), Japan (1), Canada (n=2), Thailand (n=1), Taiwan (n=1), Iran (n=3). | To identify the health literacy domains utilized in postpartum weight management interventions and to determine their impact on weight, diet and physical activity in postpartum women | Postpartum women within two years post-delivery | Systematic review and meta-analysis of RCTs | Interventions included self-care, social support or participation in decision-making or co-design. Three studies has interactions with health providers.Delivered by dietitians, Health interventionist, behavioural counsellor.Delivered at/by text/phone, Centre, clinic, home, community, outdoor and school hall. | * 33 RCTs included.
* Health literacy domain self-care was associated with a significant reduction in body weight and increase in physical activity.
* No other health literacy domain was associated with significant outcomes in weight, energy intake, or physical activity.
 | 8 |
| 8 | Hutchesson et al, 2020US (n=40), Australia (n=14) | To examine the extent and range of research undertaken to evaluate behavioral interventions that support women of childbearing age to prevent or treat overweight and obesity | Women of childbearing age | Systematic review of RCTs and systematic reviews | Most interventions had a combination of diet and physical activity alone or in combination. The interventions were delivered by dietitians or nutritionists and clinicians.Iinterventions delivered at hospitals, clinic and the participant’s homes.  | * 87 RCTs and 3 systematic reviews included.
* Interventions focused on promoting both changes to dietary behaviour and physical activity to achieve changes to weight-related outcomes.
 | 7 |
| 9 | Lau et al, 2017Postnatal: US (n=3), Australia (n=1), Sweden (n=1), and antenatal are the rest. | To assess effective are e‐based lifestyle interventions for improving maternal and neonatal outcomes among overweight or obese perinatal women | Women with overweight or obesityduring the perinatal period (starting from pregnancy to 1 year postpartum). | Systematic review and meta‐analysis of RCTs | E‐based lifestyle interventions setting behavioural goals and receiving lifestyle counselling including dietary control. Theoretical/conceptual frameworks used design interventions.Duration of the intervention from 4 weeks to 12 months. | * 5 postpartum RCTs and 2 pregnancy and postpartum RCTs included.
* Meta‐analyses demonstrated significant result for limiting gestational weight gain, losing postnatal weight in 1–2 months, increasing self‐reported moderate and vigorous physical activity and reducing caloric intake using diet‐related software.
* E‐based lifestyle intervention is an acceptable approach.
 | 10 |
| 10 | Lim et al, 2020US(n=14), Australia (n=4), UK (n=3), Iran (n=3), Canada (n=2), Greece (n=1), Sweden (n=1), Japan (n=1), Israel (n=1), Taiwan, (n=1), Thailand (n=1) | To describe the associations between behavioural strategies and weight loss in postpartum women. The secondary aim was to describe the associations between behavioural strategies and key lifestyle factors associated with weight loss (i.e., diet (energy intake) and physical activity) in postpartum women. | Postpartum women within 2 years of delivery | Systematic review and meta-analysis of RCTs | Lifestyle modification (diet, physical activity, or behavioural therapy). The behavioural change strategies of problem solving, goal setting of outcome, reviewing outcome goal, feedback on behaviour, self-monitoring of behaviour, behavioural substitution.  | * 46 RCTs included.
* Meta-analysis showed postpartum lifestyle interventions significantly improved weight and physical activity but not in energy intake.
* No individual strategy was significantly associated with weight or physical activity outcomes. Behavioural strategies relating to self-regulation are associated with greater reduction in energy intake.
 | 8 |
| 11 | Lim et al, 2019US (n=15), Australia (n=4), UK (n=3), Iran (n=3), Canada (n=2), Sweden (n=2), Greece (n=1), Thailand (n=1), Japan (n=1), Taiwan (n=1) | To evaluate the intervention characteristics associated with weight loss in postpartum women using the Template for Intervention Description and Replication (TIDieR) framework | Postpartum women within 2 years of childbirth | Systematic review and meta‐analysis of RCTs | Most studies provided individualized lifestyle, dietary or physical activity goals or plans.Delivered by health professionals, dietitians or nutritionists, exercise physiologists, and non-health professionals. named theory for the intervention, mostly social cognitive theory (n = 8) and transtheoretical model (n = 2). | * 33 RCTs included.
* Diet and physical activity combined had significantly greater weight loss compared with physical activity‐only interventions.
* Health professional‐delivered interventions had significantly greater weight loss than those delivered by non-health professionals.
 | 8 |
| 12 | Lim et al, 2015USA (n=24), Australia (n=6), Taiwan (n=4), Canada (n=3), Austria (n=1), Finland (n=1), Greece (n=1), Netherlands (n=1), Sweden (n=1), Japan (n=1), UK (n=1), China (n=1), Thailand (n=1) | To identify lifestyle intervention strategies associated with weight loss in post‐partum women | Post‐partum women within 12 months of delivery | Systematic review and meta‐analysis | Combined diet and exercise interventions, exercise‐only and diet‐only interventions. Interventions required in‐person participation or telephone‐delivery. A range of health professionals – nurses, dietitians, exercise physiologists, diabetes educators, research assistants, trained counsellors, health educators and fitness instructors. | * 46 studies included, 32 RCTs included in meta-analysis.
* Diet and physical activity when combined were significantly more effective on weight loss compared with physical activity alone.
* Studies with self‐monitoring had significantly greater weight lost than those without.
 | 9 |
| 13 | Neville et al, 2014US (n=5), Sweden (n=1) | To systematically review the literature about the effectiveness of weight management interventions in breastfeeding women. | Breastfeeding mothers, ≤2 years postpartum and with a body mass index greater than 18.5 kg/m2 | Systematic review | All studies included an exercise component either on its own or combined with dietary modification or a dietary intervention. All interventions were home‐based with pre‐ and post‐intervention measurements carried out in a clinic or research center. | * 6 studies included.
* Dietary‐based intervention studies appeared to be the most efficacious in promoting weight loss; however, few studies were tailored toward the needs of breastfeeding women.
 | 6 |
| 14 | Panagopoulou et al, 2017 | To present thecontemporary parameters of midwifery care in the postnatal period. | Midwifery careto women in the postnatal period | Systematic review and qualitative meta-synthesis | Diet, exercise and postnatalweight management. Postnatal care at home compared to the hospital, doctor led or midwifery led care.  | * 355 studies included.
* Early postnatal discharge combined with home midwifery support reduces costs and improves the satisfaction, health and wellbeing of both mother and infant.
 | 2 |
| 15 | Sherifali et al, 2017US (=7), Spain (n=2),UK (n=1) | To assess the effectiveness of eHealth technologies for weight management during pregnancy and the postpartum period and to review the efficacy of eHealth technologies on health behaviors, specifically nutrition and physical activity. | Adult women of childbearing age in the postpartum period (and during pregnancy)  | Systematic review and meta-analysis  | Health behaviour component (nutrition or physical activity) in the eHealth technology.Diabetes prevention program with 12 online modules. Duration of the interventions ranged from 23 to 52 weeks.  | * 4 postpartum studies included (6 pregnancy included studies).
* The effect for postpartum women resulted in a significant reduction in weight after 3 to 12 months.
* Significant reduction in total daily energy intake of 442.0 kcal and in percentage of total daily intake of fat and added sugars
 | 8 |
| 16 | Van der Pligt et al, 2013US (n=6), Canada (n=1), Taiwan (n=1), Finland (n=1), Greece (n=1), Sweden (n=1), | To evaluate the effectiveness of lifestyle interventions aimed at reducing postpartum weight retention. | Women postpartum | Systematic review | Diet, physical activity combined and alone interventions. Studies included theoretical frameworks. Intervention delivery by nurses, dietician, certified fitness instructor, trained counsellor, study assistant. Setting included home, clinics, and combination of both. | * 11 studies included.
* Both dietary and physical activity components had the most success at decreasing postpartum weight retention.
 | 8 |
| 17 | Vincze et al, 2019 | To evaluate the effectiveness of interventions that include a nutrition component aimed at improving gestational weight gain and/or postpartum weight retention. | Women (≥18 years) up to 12 months postpartum (and during pregnancy) | Systematic review of studies | Combination of individualised physical activity and diet interventions. Dieticians were the main deliverers of the intervention.Interventions started from 24 hours post-delivery to 24 months postpartum. Intervention duration ranged from 10 weeks to 10 months. | * 14 RCTs included in postpartum period, 5 started during pregnancy and continued to postpartum.
* Meta-analysis found that postpartum women in the intervention group lost 3.25 kg more on average than those in the comparator group.
* Successful postpartum interventions after childbirth included at least one interaction with a dietitian or nutritionist and included a structured physical activity intervention in addition to dietary content and specifically monitoring weight.
 | 9 |
| **Lifestyle interventions for women with previous gestational diabetes mellitus (GDM) (n=6)** |  |
| 18 | Goveia et al, 2018US (n=3), Australia (n=4), China (n=4), Spain (n=1), Malaysia (n=1), Israel (n=1), Ireland (n=1) | To systematically review postpartum randomized trials to summarize the benefits of lifestyle interventions for women with previous GDM | Women with previous GDM. Women with current or previous diagnosis of type 1 or type 2 diabetes were excluded. | Systematic review and meta‐analysis of RCTs | Most interventions focused on changes in diet and physical activity.Studies included remote contact, facilitated group sessions, face to face individual sessions either at home or the hospital/clinic.Duration of follow up ranged between 6 months and 5 years.  | * 15 RCTs included, 8 RCTs were included in the meta-analysis.
* Meta-analysis found 25% reduction on incidence of diabetes. Only trials offering intervention soon after delivery (< 6 months postpartum) were effective.
* No benefit was found regarding measures of glycemia. Although moderate reductions in weight and waist circumference were observed, effects were larger with longer follow-up.
 | 9 |
| 19 | Guo et al, 2016Australia & US (n=7), China and Hong Kong (n=5) | To evaluate the outcomes of clinical trials that focus on diabetes prevention among women with pervious GDM. | Women previously diagnosed with having GDM. | Systematic review of RCTs | Postpartum lifestyle interventions included combined and sole nutrition and physical activity intervention. Women were recruited from 6 weeks to 4 years postpartum and the study duration ranged from 12 weeks to 60 months. Specialists such as dieticians, exercise physiologists, or diabetes educators were employed to deliver the intervention. | * 12 RCTs included.
* The mean annual type 2 diabetes mellitus incidence (T2DM) of the intervention group was lower but not significant than the comparison group.
* About 50% of studies and two-thirds of studies, respectively, reported a significant decrease in insulin resistance-related measures and weight-related measures in the intervention group compared with the comparison group.
 | 7 |
| 20 | Hewage et al, 2020US (n=3), China (n=3), Ireland (n=2), Hong Kong (n=1), Malaysia (n=1), Israel (n=1), Egypt (n=1), Spain (n=1).  | To review the effectiveness and cost-effectiveness of lifestyle interventions on anthropometric, glycemic and cardiovascular outcomes in women with previous gestational diabetes mellitus (GDM). | Women with a history of GDM of any parity or ethnic origin | Systematic review and meta-analysis of RCTs and cost-effectiveness analysis | Lifestyle education focused mainly on education and provided counselling on improving physical activity and dietary behaviour.Most studies included one-to-one sessions, some had group meetings or supplemented with phone-consultations.Trial duration/follow-up was 13 weeks to 12 months. | * 21 included RCTs and 16 studies included in the meta-analysis.
* Meta-analysis found significant postpartum weight mean reduction in the intervention arm.
* The effect of lifestyle intervention on weight change was significantly greater in studies of longer duration.
 | 9 |
| 21 | Jones et al, 2017 | To synthesize current knowledgeand practices around tailoring multimodal interventions forsituational and cultural relevance to reduce DM risk in women with prior GDM | Women with prior GDM | Systematic review of RCTs  | Diet and physical activity interventions with behaviour change.Modes: Telephone and mailings (n = 7) and websites (n = 3) at home. Interventions started both during pregnancy and in the postpartum period | * 10 RCTs included.
* RCTs found both significant reduction of total fat intake, total carbohydrate intake, and glycemic load.
* RCTs found non-significant small changes in weight loss, decreased dietary fat, and increased breastfeeding
* No RCTs found improvement in physical activity.
 | 5 |
| 22 | Li et al, 2020Postpartum: China (n=6), Spain (n=1), US (n=1), Malaysia (n=1) | To address: (1) the effects of lifestyle intervention (diet and/or physical activity and the use of insulin if needed) during pregnancy on the risk of diabetes postpartum and (2) the effects of lifestyle intervention (diet and/or physical activity) within 3 years after delivery, that is, before the peak risk period of diabetes after delivery, on the long‐term risk of diabetes among women with prior GDM. | Women with GDM in the index pregnancy without having type 1 or type 2 diabetes mellitus before the intervention | Systematic review of RCTs | Nutrition, physical activity and lifestyle interventions.Intervention duration between 4 weeks and 3 years. Most lifestyle interventions were delivered within 3 years postpartum.  | * 10 RCTs included for postpartum
* Lifestyle intervention within 3 years after delivery was highly effective in reducing the risk of postpartum diabetes.
* Lifestyle intervention during pregnancy was not effective at reducing the risk of postpartum diabetes.
 | 9 |
| 23 | Schoenaker et al, 2021 | To provide anoverview of findings from observational and intervention studies on the role of diet,physical activity, and weight (change) during these periods in the primary preventionof GDM | Women at risk of GDM | Review of systematic review with meta-analysis  | Preconception risk assessmentDiet, physical activity alone and combined. Digitally deliveredand linked health technology (smartphones, Web sites,text messaging, wearables, and sensors) | * 12 RCTs included.
* Healthcare providers could play a role in supporting healthy behaviors and prevention of weight retention, and contribute to providing continuum of care before, during, and between pregnancies.
 | 2 |
| **Postpartum additional outcomes (n=5)** |  |
| 24 | Lui et al, 2019 | To identify trialed interventions to reduce cardiovascular risk after hypertensive disorders after pregnancy (HDP)  | Women <10 years postpartum after HDP | Systematic review of RCTs | One calcium trial starting from the first follow-up visit outside of pregnancy and continued until 20 weeks' gestation if another pregnancy occurred.One online education programme RCT to increase awareness of risk factors and personalized phone-based lifestyle coaching in women who had a preeclampsia affected pregnancy in the 5 years preceding enrolment. | * 2 RCTs included.
* Calcium trial found a non-significant trend toward decreased blood pressure.
* Education RCT found significant increase in knowledge of CVD risk factors, reported healthy eating and decreased physical inactivity.
 | 9 |
| 25 | Markova et al, 2015 | To assess the efficacy and harms of the available treatment modalities for women with postpartum iron deficiency anaemia. These include oral and parenteral iron, erythropoietin, and blood transfusion. | Women with a postpartum Hb value of 120 g/L (7.4 millimoles per litre) or less, | Systematic review of RCTs | Interventions included: Oral iron therapy, folate (folic acid and vitamin B9), parenteral administration of iron, Erythropoietin, blood transfusionallogeneic blood.  | * 22 RCTs included.
* Evidence was not clear regarding the efficacy of the interventions on postpartum iron deficiency anaemia.
* Intravenous iron was superior regarding gastrointestinal harms, however anaphylaxis and cardiac events occurred and more data are needed to establish whether this was caused by intravenous iron.
 | 9 |
| 26 | Oliveira et al, 2016 | To evaluate the effects of vitamin A supplementation for postpartum women on maternal and infant health. | Postpartum women, breastfeeding or not, from countries where vitamin A deficiency is a concern were eligible. | Systematic review of RCTs | Maternal vitamin A supplementation (beta‐carotene or retinyl palmitate in oil or water‐miscible formulation) alone or in combination with other micronutrients (examples: iron, folic acid, vitamin E). | * 14 RCTs included.
* There was no evidence of benefit from different doses of vitamin A supplementation for postpartum women on maternal and infant mortality and morbidity, compared with other doses or placebo.
 | 10 |
| 27 | Taylor et al, 2020High-income countries (n = 20), middle-income countries (n = 8), low-income countries (n = 3).  | To determine the impact of culinary nutrition-education interventions for women with or without their partners during preconception, pregnancy, or postpartum on parental cooking skills, nutrition knowledge, parent/child diet quality, or health outcomes. | Women (including or not including their partners) up to 5 years postpartum (including or not including their child or children).  | Systematic review of studies | Practical cooking lesson, meal planning, culinary medicine and nutrition, and cooking or culinary skills education of any duration.The frequency of the study intervention ranged from weekly to monthly, and some interventions were provided in intense, short bursts ranging from 2 to 12 consecutive days | * 12 included postpartum studies
* Significant improvement in cooking skills of postpartum women and parents in the intervention group at follow-up
* Significantly higher mean infant-feeding practice scores by mothers in the intervention group.
* Significant improvements in food hygiene for complementary feeding practices.
 | 9 |
| 28 | Turawa et al, 2014 | To evaluate the effectiveness of interventions for treating postpartum constipation. | Women in the postpartum period. | Systematic review of RCTs | Interventions could include laxatives, surgery, as well as educational and behavioural interventions. | 0 RCTs included.  | 10 |

Footnote: abbreviations include: Body Mass Index (BMI), Confidence intervals (CI), Gestational diabetes mellitus (GDM), gestational weight gain (GWG), kilograms (kg), physical activity (PA), Preventive Child Health Care (PCHC), postpartum weight retention (PPWR), Randomised Control Trials (RCTs), type 2 diabetes mellitus incidence (T2DM), United States (US)

**Table 5. Health guidelines mapped to the six domains identified in the paper**

|  |  |  |
| --- | --- | --- |
| Organisation (number of documents) | Target group | Six Domains (cross indicates that the guidance included the domain) |
| Interconception care | Nutrition-specific interventions | Nutrition-sensitive interventions | Person-centred care | Role of the health professional | Need for a Multi-stakeholder approach |
| NICE (16) | Health Professionals |  | X | X | X | X | X |
| Parliamentary guidance (13) | Member of parliament |  | X | X | X | X | X |
| Royal Colleges (5) | Health Professionals |  |  | X | X | X |  |
| Public Health England guidance (4) | Health Professionals | X | X | X | X | X |  |
| Tommy’s charity (4) | Researchers, women considering a pregnancy |  | X | X | X | X |  |
| Sure Start (3) | Families  |  | X | X | X | X | X |
| First Steps Nutrition (2) | Health professionals |  | X |  |  | X |  |

Footenote: Charitable organisations and NGOs with a website provide information for the general public