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Research Article

Meeting the needs of women in the perinatal period, who use or are in treatment for using drugs: A mixed-methods systematic review

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Abstract

Background: Women who use and/or are in treatment for using drugs during the perinatal period have complex health and social care needs. Substance use in the perinatal period is multifaceted, with many confounding factors that may impact the long-term health and well-being of both mothers and children. Evidence is needed to identify which psychosocial interventions are effective for women who use and/or are in treatment for drug use during the perinatal period.

Objective(s): (1) Describe the range of psychosocial interventions available for women who use and/or are in treatment for drugs in the perinatal period; (2) to document evidence on the effectiveness of interventions and (3) identify interventions that women feel most meet their needs.

Design: A mixed-methods systematic review was conducted following a predetermined protocol and the Joanna Briggs Institute guidance for mixed-methods systematic reviews, adopting a segregated approach.

Review methods: Eight databases were searched for articles meeting the inclusion criteria on 7 April 2022, and updated searches were run on 5 February 2024. The search was limited to include peer-reviewed articles published after 1990 and available in English. In total, 15,655 articles were identified. Following screening by four reviewers by title and abstract and then full text, 197 articles were included in the review. A data extraction template was used to extract study characteristics and results. Quality was assessed using the mixed-methods Quality Appraisal Tool. Cohen's *d* was used to measure the effect size for quantitative data to understand if an intervention had a small (> 0.2), medium (> 0.5) or large effect (> 0.8). Effectiveness was measured through three outcomes: (1) improvements and engagement with and retention in substance use treatment services for women in the prenatal and postnatal period; (2) reductions in substance use by women in the perinatal period and (3) improvements in engagement with and retention in prenatal care. For qualitative data, articles were grouped by the intervention type and the authors' analytical themes and conclusions were thematically synthesised.

Results: The 197 included studies described 217 separate interventions. Most interventions (85.3%) were community-based, delivered in more than one way (49.3%), and delivered in single settings (50.6%), although some were colocated alongside other services (22.1%).

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No conclusive evidence for effectiveness was established for any type of intervention, although most interventions that improved retention in substance use services included practical support. The qualitative synthesis supported these findings and additionally suggested that women appreciated being able to access multiple services in one place: non-judgemental, trauma-informed services and peer-support models.
Limitations: There were wide discrepancies in the types of information reported related to the age of some studies, limiting our ability to evaluate the effectiveness through quantitative analysis. The qualitative analysis was similarly limited as not all the identified qualitative papers included the views of women about treatment received.
Conclusions: Interventions that included practical support were found to be more effective in both the quantitative and qualitative findings. There is also some evidence for the effectiveness and feasibility of integrated, multidisciplinary interventions in both the quantitative and qualitative data.
Future work: There is a need for up-to-date, high-quality research studies into interventions for pregnant women who use and/or are in treatment for drug use. It is additionally important that the voices of women are considered in future research.
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Background

Women who use and/or are in treatment for using drugs during the perinatal period often have complex health and social care needs, with many having experienced multiple adversities, including histories of domestic violence and trauma, complex mental and physical health problems and poverty.[1–5] There has been a demonstrable increase worldwide in psychoactive substance use during the perinatal period, which can lead to poor outcomes for both mother and baby, including preterm labour and impaired child growth and development.[6–8] While women who use drugs, and/or are in treatment for using drugs, require standard maternity care, they often have co-occurring physical or/and mental health difficulties[9,10] and often do not 'fit' into standard care pathways.[11] Infants of women who use drugs and/or are in treatment for using drugs are often removed from their care at birth.[12–14] Research into repeat removals has highlighted the lack of available support and poor outcomes for mothers who have a child removed at birth.[15–17] Substance use in pregnancy is thus a multifaceted public health problem[18] that has implications for the long-term health and well-being of both mothers and children.[19,20]

Previous systematic reviews have been conducted with a focus on mothers who use or are in treatment for substance use.[14,21–25] The majority have not focused specifically on the perinatal period, or have concentrated on specific types of treatments, rather than exploring the full range of psychosocial and substance use treatment interventions available. In 2010 and 2012, a meta-analysis and systematic review were conducted into integrated treatment programmes for women with substance use issues.[21,22] In 2015, a systematic review was published, which set out to evaluate the effectiveness of psychosocial interventions for pregnant women enrolled in illicit drug treatment programmes.[23] However, these reviews reported on findings from a small number of quantitative studies and did not explore the full range of interventions available for pregnant women who use drugs and/or are in treatment for drug use. Several of these reviews focused specifically on maternal substance use in the context of child protection outcomes.[14,24,25] The voices of pregnant women using the interventions were also missing from these reviews. Additional evidence is needed to understand the range of different approaches and how interventions meet the needs of this group of women and their babies. This mixed-methods systematic review (MMSR) sought to identify which psychosocial interventions and other services and approaches to delivering care are best suited to improve outcomes for mothers and their infants.

Objectives

The review had three primary objectives. These were to:

1. identify the range of interventions and approaches that have been developed for women who use drugs and/or are in treatment for using drugs (illicit and prescribed opioids; stimulants and benzodiazepines) in the perinatal period (Q1)
2. evaluate the effectiveness of interventions for women who use drugs and/or are in treatment for using drugs in the perinatal period (Q2)
3. understand how women who use drugs and/or are in treatment for using drugs in the perinatal period find these services and treatment approaches to meet their needs (Q3).

These objectives were subsequently subdivided into smaller objectives. For objective 1, we wanted to know

the different components that interventions included, how interventions were delivered and the setting of the interventions. For objective 2, we used the findings from quantitative studies to show what approaches were most effective at improving engagement with substance use services, reducing substance use and improving engagement with and retention in perinatal care. Objective 3 used findings from qualitative studies to ascertain women's views on whether the interventions tested met their needs.

Methods

Following a predetermined protocol and the Joanna Briggs Institute guidance for MMSR,[26] a segregated approach was adopted. The inclusion and exclusion criteria were specified in advance of the review and were outlined in the review protocol submitted to PROSPERO.[27] Through the course of conducting the review, some deviations to the protocol were made and recorded. This included limiting the number of outcomes addressed by quantitative findings to key outcomes as specified by our Expert Advisory and Co-Production Group (EACG). An additional deviation was the exclusion of grey literature and any non-peer-reviewed studies, as these were captured within our scoping review of clinical and best practice guidelines.[11] These decisions are detailed in our Methodology section and are also included within a protocol deviation document that accompanied our review submission.

Eligibility criteria

The inclusion and exclusion criteria are outlined in *Table 1*.

Articles that included interventions which looked at polysubstance use, including alcohol, were included in the review. However, articles that looked only at addressing alcohol use during the perinatal period were excluded from our search. This decision was primarily made because there is a different degree of stigma for women who use illicit drugs compared to alcohol, including criminal implications.[11] Additionally, this review is part of a larger piece of work that looked at women who used illicit drugs (excluding alcohol only) during pregnancy in the UK, and the intention of this review was to support this study.

Data sources

Eight databases were searched: MEDLINE, Global Health, PsycInfo® (American Psychological Association, Washington, DC, USA), Web of Science, Cumulative Index to Nursing and Allied Health Literature, EMBASE, MIDIRS and Applied Social Sciences Index and Abstracts. The databases were chosen to ensure the identification of a full breadth of interventions. Searches were conducted individually across the eight platforms and were subsequently exported to EndNote [Clarivate Analytics (formerly Thomson Reuters), Philadelphia, PA, USA]. These searches were then exported to Covidence (Melbourne, VIC, Australia), a systematic review management platform.[28] The search spanned the years 1990–2022. 'Snowball' searching was conducted when a clearly relevant intervention was referenced by an included article. Updated searches were also conducted, ensuring that articles published between 1 January 1990 and 4 February 2024 could be included.

Search strategy

Table 2 presents original search strategy as it appears in the PROSPERO protocol included keywords related to the perinatal period, substance use and treatment.[27]

This search strategy was used as a starting point and was subsequently expanded to reflect appropriate medical subject heading terms relevant to individual databases (see *Appendix 1*). The searches were adapted from a MEDLINE search that was created in conjunction with a Cochrane librarian, the research team and librarians from King's College London and the University of Huddersfield. The

TABLE 1 Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
• All types of study design • Drug use among women in the perinatal period (opioids – illicit or prescribed, stimulants and benzodiazepines) • Interventions, including psychosocial and clinical, prenatally and postnatally, aimed at improving women's engagement/retention in drug treatment and/or prenatal care • Psychosocial and clinical interventions aimed at improving mother/child interaction/bonding, parenting and reducing rates of out-of-home care • Multidisciplinary/integrated interventions designed to improve women's access to services and support	• Women who do not use nor are in treatment for illicit and prescribed opioids, stimulants and benzodiazepines • Women who are exclusively problem drinkers • Women who are not pregnant or in the perinatal period (up to 18 months) • The study is not about an intervention • The study is not in English • The study is a duplicate • The paper is not empirical research (e.g. systematic review) • Not written between 1 January 1990 and 4 February 2024 • The article has been retracted

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adapted search strategies were reviewed and validated by librarians before execution.

Data collection process

An extraction sheet based on the Template for Intervention Description and Replication guidelines[29] was developed and agreed by the research team (see *Report Supplementary Material 1*). This was used to record intervention characteristics, and separate qualitative and quantitative sheets were utilised to collect study results. For mixed-methods studies, qualitative and quantitative data were extracted separately. Any other outcome measures and any adverse effects reported by the study authors were noted.

TABLE 2 The PROSPERO search strategy

(pregnant OR prenatal OR perinatal OR antenatal) AND (baby or infant or babies or newborn or neonate) AND (drug *use OR substance *use OR addict* OR drug *use OR injecting drug use OR heroin OR opioid OR opiate OR methadone* OR buprenorphine OR benzo* OR stimulant OR crack OR cocaine OR *amphetamine) AND (treatment* OR intervention* OR program* OR engag* OR psycho OR clinical OR social work OR safeguard* OR child protect* child welfare)

Study risk of bias

The mixed-methods appraisal tool[30] was used to assess the risk of bias in the included studies (see *Report Supplementary Material 2*). Appraisals were conducted independently and 25% were verified by the research team. Discrepancies were resolved by discussion and consensus.

Patient and public involvement or community engagement and involvement

Review questions and outcomes were coproduced with our EACG, which included practitioners, policy-makers, academic experts and experts by experience. The EACG received regular progress updates and meetings with

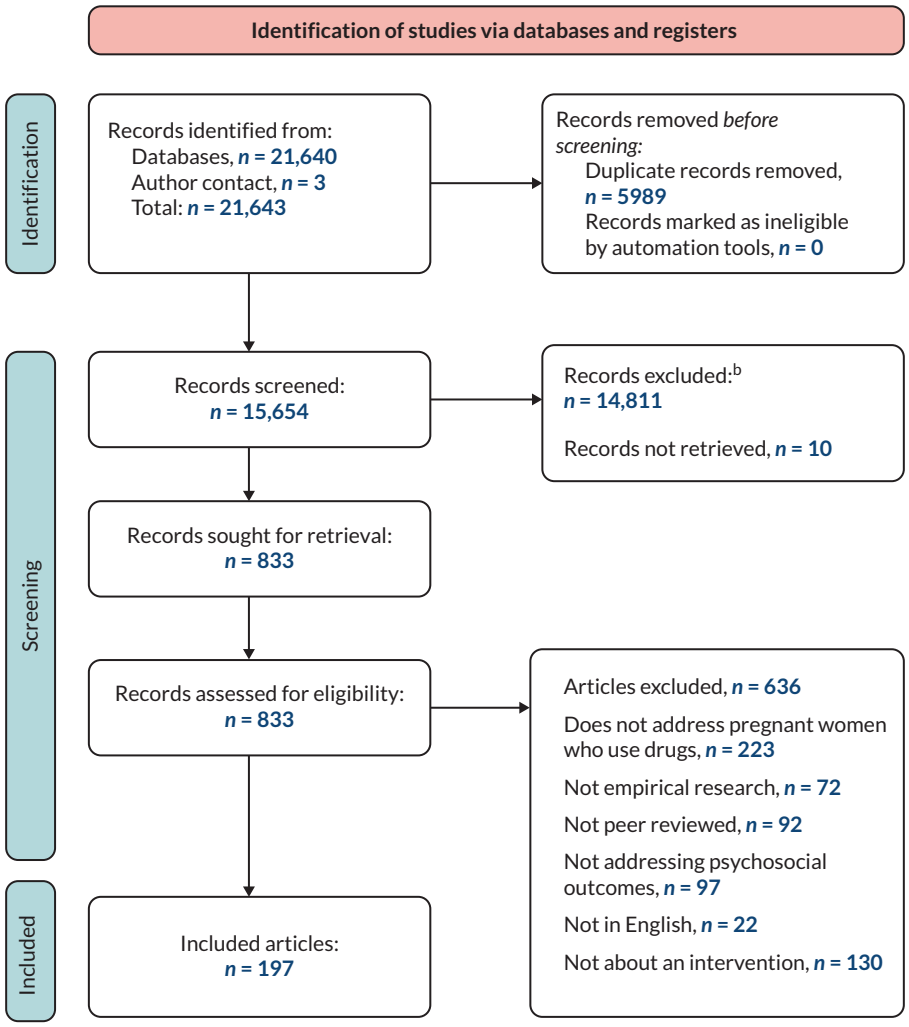

FIGURE 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses diagram. a, Consider, if feasible to do so, reporting the number of records identified from each database or register searched (rather than the total number across all databases/registers); b, If automation tools were used, indicate how many records were excluded by a human and how many were excluded by automation tools.

experts by experience, highlighting the importance of consistent, person-centred language. Following this feedback, and in an effort to use non-stigmatising language,[31] we have chosen to use the term 'Women who use and/or are in treatment for using drugs' to describe our population. This term was selected as it includes a broad range of women, including those who use drugs, those who are in treatment for drugs and those who both use and are in treatment for drugs.

Equality, diversity and inclusion

We extracted data on age, ethnicity, socioeconomic deprivation and health (including mental health). There was poor reporting of ethnicity, particularly in earlier studies. This is considered within our findings and discussion.

Analysis

For our first objective, we wanted to know how many separate reported interventions were described within the included articles. Characteristics of these interventions were subsequently extracted and described. If an intervention changed significantly over time, this was considered as a separate intervention. The categorisation of interventions involved a systematic extraction of summaries that outlined the key functional components of each intervention. These summaries were then analysed to identify common themes and patterns, allowing for the grouping of interventions into broader categories based on their shared characteristics. This process facilitated a clearer understanding of the setting, mode of delivery and overall components of the interventions, providing a framework for further analysis. Some articles included in the review only answered the first objective, as they were not otherwise related to the outcomes of interest.

Objective 2 was answered through statistical analysis of the quantitative data. Findings were first sorted into broad categories based on how the findings from individual studies were described. For example, when analysing engagement with and retention in substance use treatment, we grouped together articles that included findings related to the amount of time that participants spent in treatment. We then organised studies in each category by study type and type of intervention. Where there were more than four studies within a category that were quasi-experimental and of the same intervention type, meta-analysis was considered. However, we were unable to undertake meta-analysis for any outcomes due to heterogeneity in the intervention type as well as variations in reporting. We confirmed this point with a statistician who instead suggested we measure the Cohen's *d* of included studies. We used effect direction plots that are often used in reviews that include diverse study and intervention types.[32]

For each outcome, the effect size (Cohen's *d*) was calculated (see *Report Supplementary Material 3*).[33–35] Effect direction was calculated as meaningful if it showed an effect size > 0.2.[36] This threshold for determining a meaningful effect size was determined in consideration of the needs of the population under study and that small changes could still be considered to be clinically important for women who use drugs during pregnancy. The studies were then put into an effect direction table, with an upward arrow representing a meaningful effect (in three sizes to reflect small, medium and large effects), a diamond representing no significant effect and a downward arrow representing a negative effect.[32] Some studies included findings related to more than one outcome of interest. Where only meaningful effect sizes were found within these outcomes, we averaged the effect sizes to determine if there was a small, meaningful or large effect. For those studies where both meaningful and non-meaningful effect sizes were found within the same outcome, if > 70% of the findings showed the same effect direction, then they were considered to show a change. Studies showing < 70% were viewed as inconclusive. For some studies, standard deviation was estimated to find the effect size. Studies were excluded from the statistical analysis if we were unable to calculate the effect size due to limited information reported (or where we had sought additional information from the study author but not received this), or if the studies were purely descriptive and did not include any element of measurement that could illustrate a change due to the intervention. It was not possible to determine the proportion of the effect of the intervention due to inconsistencies in reporting and study designs.[32,37]

Objective 3 was answered through analysis of the qualitative data using the research question: 'how do women who use and/or are in treatment for using drugs in the perinatal period find these services and treatment approaches meet their needs?'. This question was used to guide a thematic synthesis[38] of the analytic themes and conclusions identified by authors of the included studies. Firstly, studies were screened for suitability to be included in the analysis. Studies that did not report the women's views (such as those that included only the staff or service providers' views) were excluded. Additionally, studies that reported on more than one site were checked to ensure that data had been pooled and analysed as one data set. Studies that did not fit with any other intervention groups were briefly described along with key points from the author-identified themes and conclusions relating to the women's views of the intervention. The papers

were then categorised (*Table 3*) into the components of the intervention reported on by women. Two reviewers then further refined and agreed the categories (see *Report Supplementary Material 4*).

The authors' themes, conclusions and key findings of the remaining studies were then transferred to a Microsoft Word (Microsoft Corporation, Redmond, WA, USA) table, where they were compared, and any similarities and differences were identified. For most categories (n = 9), thematic analysis,[38–41] was conducted within a Microsoft Word document table. Where there were extensive qualitative data to be coded, NVivo 14 (QSR International, Warrington, UK) was used.[42–56]

Results

A total of 15,655 articles were identified and screened for inclusion at title and abstract. The four reviewers then independently double-screened 25% of all records in Covidence. Disagreements were resolved through discussion and with the use of a third reviewer. Discussion with the research team was conducted if no consensus was reached. Two hundred and fifty articles were screened through this process. Altogether, 14,811 articles were excluded at title and abstract. Reviewers independently screened 844 articles at full text and double-screened 25%. When screening at full text, files were identified that corresponded to conference or poster abstracts. The research team contacted corresponding authors to see if their work had been published in full text in any peer-reviewed journals. Three further full-text, peer-reviewed articles were identified. In total, 197 articles were included after screening at full text (*Figure 1*). Authors were also contacted for any missing data.

Of these, 119 articles were quantitative (6.4%), 52 articles were qualitative (26.3%) and 19 articles (9.6%) used mixed-methods. Three articles (1.5%) were described as mixed-methods, although they only reported on qualitative data, and four articles (2%) were described as mixed-methods and only reported on quantitative data. The included articles were published between 1991 and 2023, with most published between 2000 and 2010 (n = 56, 28.4%). Most included studies were from the USA (n = 148, 75.1%), followed by Canada (n = 20, 10.1%) and the UK (n = 8, 4%). Most included studies concerned

TABLE 3 Table of definitions (qualitative categories)

Category	Definition
Care co-ordination/case management	Lead practitioner managed/co-ordinated care within multidisciplinary colocated or non-colocated services
Group work	Learning and support programmes delivered in groups and run by facilitators
Integrated care (not colocated)	Multiagency service provision (may include obstetric care, addictions services, social work and primary care), which is accessed in multiple locations with communication and co-ordination between services
Multidisciplinary colocated service (one-stop-shop)	Multiple types of services located within one location. Often includes additional support services such as food, transport or housing support as well as primary and antenatal care, substance use support and social work services
Peer support	Support (either standalone or integrated into an existing service) which is delivered by someone with lived experience of perinatal substance use
Psychotherapy	A form of therapeutic intervention which often includes a focus on past experiences and emotions. This could also include manualised approaches such as CBT motivational interviewing and mother–infant dyadic approaches
Residential rehabilitation	Specialist perinatal substance use residential rehabilitation care, where women can live and receive treatment for substance use while maintaining care of their babies
Telehealth	Provision of care, such as screening, appointments or prescribing, remotely using electronic/telecommunications technologies (e.g. mobile phones)
Trauma-informed	Service or intervention being delivered in a way that recognises the impact of trauma upon the individuals' physical, psychological and social well-being and prioritises safety and relationship-based practice and prevention of retraumatisation
Miscellaneous	Interventions which did not fit into any other categories

CBT, cognitive–behavioural therapy.

interventions that were delivered throughout the perinatal period (*n* = 115, 58.3%), and nearly half of the studies were aimed at addressing polysubstance use (*n* = 90, 45.6%).

Of the 160 studies that reported the age of their sample, ages ranged from 14 to 55 years, with some interventions treating mothers and children for several years post partum. Only 24 (12.1%) studies included peer involvement in the delivery of interventions, and even fewer involved or consulted service users in the research itself (*n* = 11, 5.6%). The quality of a significant proportion of the included studies was poor, with 26.3% (*n* = 52) not including clear research questions, and 29.4% (*n* = 58) not addressing the research question through the collected data.

Ethnicity was reported within 134 (68%) of the included studies, of which some presented incomplete ethnicity data (*n* = 60/134, 44.77%), and many of the studies collected data on race (e.g. white, black and multiheritage) rather than ethnicity (e.g. British and Asian). Some studies with incomplete data collected information on ethnicity in unclear ways, for example, stating that 20% of their sample were 'foreign' with no additional data.[57] For the available data, most of the samples reported either a white majority (*n* = 36/74, 48.6%) or a black majority (*n* = 30/74, 40.5%). Additionally, how women and their children were described sometimes revealed pre-existing biases and assumptions. For example, a 2005 article reported that 'Girls who grow up in a chaotic, unkempt, disorderly household with little emphasis on convention and religion are more likely to have later drug use',[58] and an article from 2008 described an intervention in Hong Kong which included abortion counselling within the first appointment of an early intervention programme.[59]

Interventions were defined in a variety of ways, with articles commonly referring to integrated, multidisciplinary or one-stop-shop interventions. In this review, we define integrated (or multidisciplinary) care as a multiagency service provision that is accessed in multiple locations with communication and co-ordination between services. Colocated or one-stop-shop programmes were defined as multiple types of services located within one location.

Objective 1: types of interventions available

There were 217 separate interventions reported. In this context, 'intervention' refers to a planned set of actions or strategies designed to bring about change in a specific situation, particularly in health, social or behavioural contexts. Interventions aim to improve outcomes by addressing a problem, modifying behaviours or providing support to individuals or groups.[60,61] For objective 1, we describe the mode of delivery and setting of each intervention, as well as the different components (e.g. health and child welfare) of the intervention.

Mode of delivery

The following modes of delivery were included within the reported 217 interventions: individual, group, family (including interventions aimed at the parent/child dyad), telephone, internet and community outreach (*Figure 2*).

The interventions were most frequently delivered to individuals (*n* = 207, 95.3%), followed by group interventions (*n* = 104,47.9%) and family interventions (*n* = 81, 37.3%). Most interventions (*n* = 151, 69.5%) were delivered via more than one mode of delivery. For instance, 43 interventions (19.8%) were delivered both by individual and group methods, and 35 interventions (16.1%) were delivered to individuals, groups and family members. The number of interventions that were delivered by telephone and internet were much smaller (telephone: *n* = 12 and internet *n* = 7, total *n* = 19, 8.8%). Most telephone and

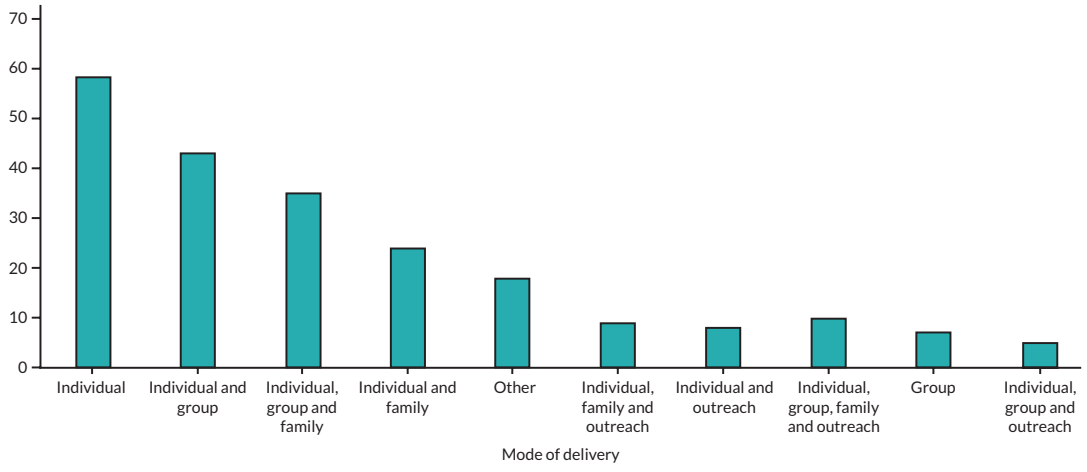

FIGURE 2 Mode of delivery of interventions.

internet studies took place between 2020 and 2023 (*n* = 14/19, 73.6%), and this appears to be an emerging mode of intervention delivery.

Setting

Interventions were delivered in a range of settings, including outpatient clinics, hospitals, residential rehabilitation facilities, prisons, family courts or via telecommunication (*Figure 3*). There were 48 interventions (22.1%) colocated alongside other services. Most interventions (*n* = 185, 85.3%) were community based. Many interventions were delivered in single settings (*n* = 110, 50.6%), with the majority of those being offered in the community (*n* = 81, 37.3%). However, interventions were also delivered in multiple settings with nearly half (*n* = 107, 49.3%) of the interventions being offered in more than one setting.

Intervention categories

The review looks at psychosocial interventions. To define the category of 'psychosocial interventions', we used the definition from the systematic review by Terplan *et al.*, which categorised drug treatment interventions into pharmacological or psychosocial methods.[23] The review defined psychosocial methods as involving contingency management methods and manual-based techniques such as motivational interviewing, CBT and psychotherapy.[23]

Table 4 shows the interventions divided into different categories according to their component parts. This includes the different types of treatment offered by the different interventions as well as the different mechanisms for support provided by separate interventions. The numbers reported below for the separate categories are

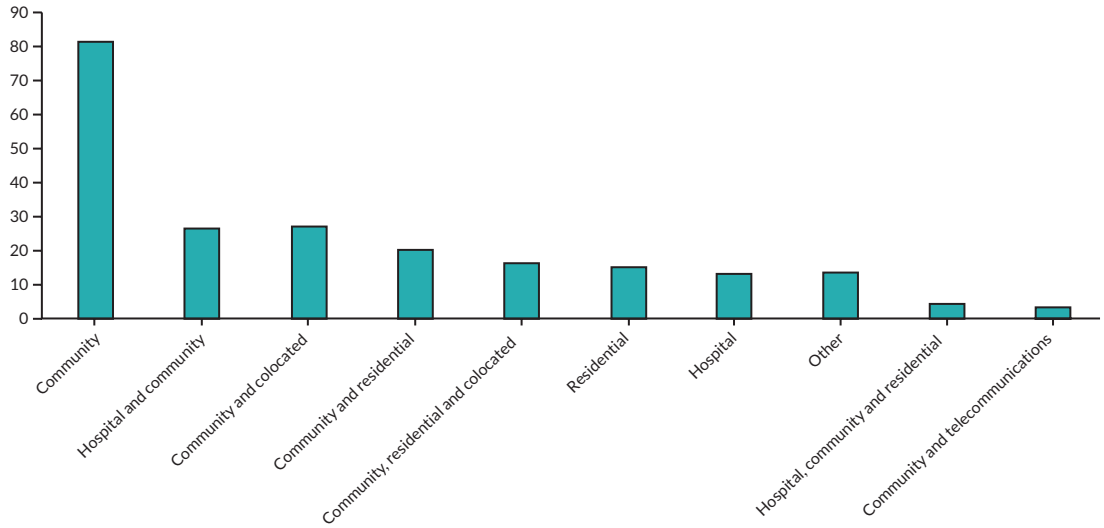

FIGURE 3 Setting of interventions.

TABLE 4 Intervention categories

Category	Definition
Psychosocial (*n* = 217)	This category included psychosocial methods as involving contingency management, psychotherapy and manual-based techniques, including motivational interviewing and CBT. Any interventions that included a psychotherapeutic element such as group therapy, education, peer support and 12-step recovery have been included
MAT (*n* = 83)	Any pharmacological-based intervention, including methadone, buprenorphine, unspecified MAT, buprenorphine/naloxone, naltrexone or detoxification interventions
Perinatal health care (*n* = 144)	Any healthcare intervention designed to improve maternal and/or infant outcomes, including midwife led prenatal and postnatal care, obstetric care, prenatal screening, scanning and paediatric care
Practical support (*n* = 116)	This category included any intervention that supported mothers or infants practically, including support with transport, child care, housing, nutrition, family planning, complementary therapies, financial support and support to attend appointments
Child welfare (*n* = 41)	This category included any intervention element that supported a child's welfare and safeguarding needs, including social work interventions that involved child protection or rehabilitation, child reunification and social work case work that specifically addressed child welfare concerns

MAT, medication-assisted treatment.

not exclusive and reflect how many times the separate components were reflected across interventions.

The interventions spanned many different treatment areas. All 217 interventions had at least one psychosocial component. However, the interventions were complex, offering different arrangements and combinations of services (*Figure 4*). Overall, there were 15 different ways in which the intervention components overlapped to create comprehensive interventions. Alongside psychosocial components, the interventions included MAT (*n* = 83, 38.7%) for opioid dependence, perinatal health care (*n* = 144, 66.3%), practical support (*n* = 116, 53.4%) and child welfare (*n* = 41, 18.8%).

A small number of interventions (*n* = 31, 14.2%) were purely psychosocial, and the remaining 186 (85.7%) included two or more components. The most frequent intervention type reported were interventions that included psychosocial, perinatal health care and practical support components (*n* = 49, 22.5%).

Objective 2: effective approaches

In order to address the effectiveness of the interventions for women in the perinatal period, the quantitative synthesis focused on three critical outcomes: (1) improvements in engagement and retention in substance use treatment services, (2) reduction in illicit substance use and (3) improvements in engagement and retention in prenatal care. These outcomes were identified (and agreed with our advisory group) as being of most relevance to our main objective of understanding the effectiveness of the interventions for women during the perinatal period. Of the 142 studies that included quantitative data, 61 studies were excluded from the analysis as they did not address these critical outcomes.

Improvements in engagement with and retention in substance use treatment services for women in the prenatal and postnatal periods

Studies were considered to address engagement in substance use treatment services if they measured engagement with or attendance at substance use

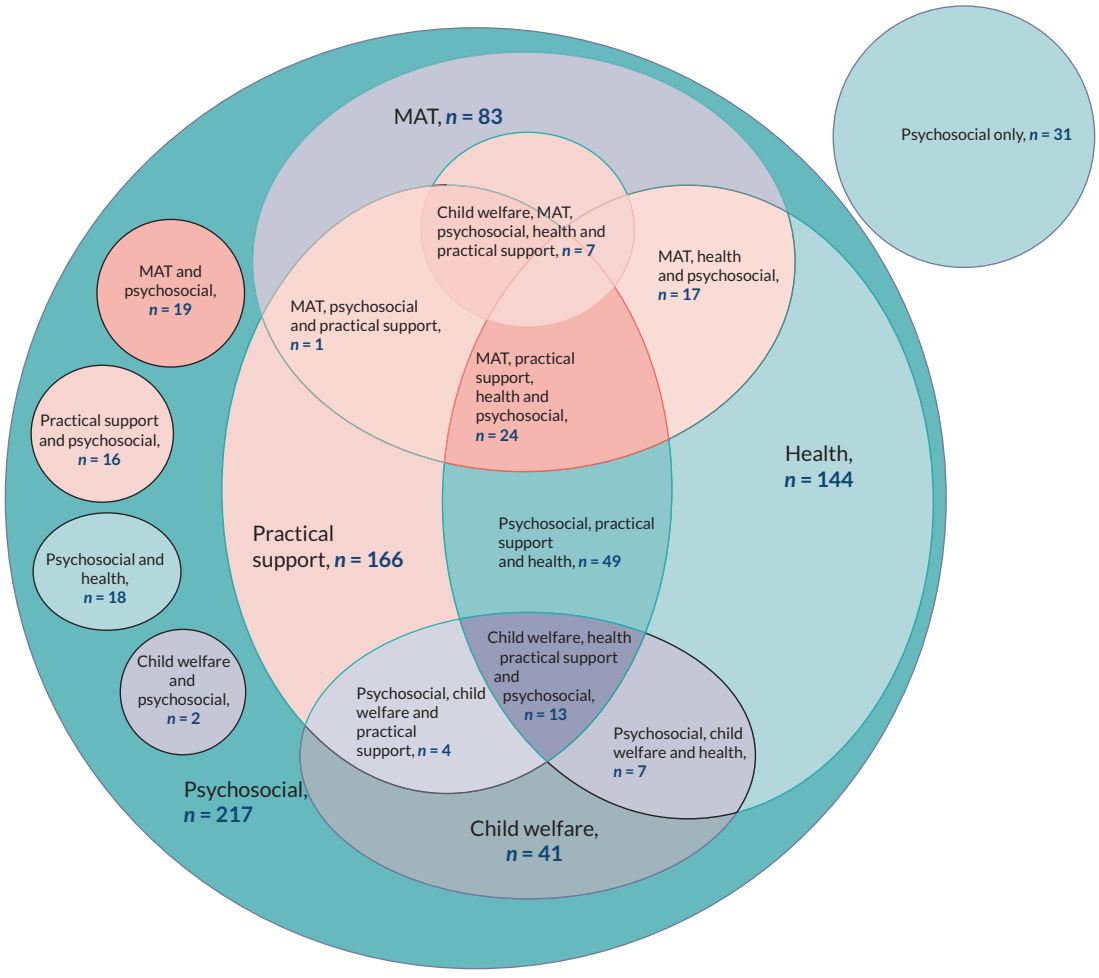

FIGURE 4 Euler diagram of intervention categories.

treatment sessions, retention in substance use treatment services during the perinatal period and the length of time spent in treatment during the perinatal period. Overall, 37 studies addressed engagement in substance use treatment services. Ten studies were excluded from the effect direction plot due to a lack of reported information; therefore, we were able to analyse 27 studies within this outcome. In total, 18 studies[62–79] measured the effectiveness of an intervention versus control, with 1 study[80] measuring improvements over time, and 1 study[81] testing pre and post intervention effectiveness. Seven studies compared different interventions tested within the same study, for example, contingency management versus motivational interviewing.[82–88] The studies were grouped according to the following outcomes: amount of time in treatment (women staying in treatment for longer), successful completion (more women successfully completing the intervention) and enrolment/engagement in treatment (more women enrolling into the intervention).

Nineteen studies measured outcomes relating to the amount of time in treatment.[62–69,71–74,76,78–80,82,83,85] Of those studies, findings reported in nine were inconclusive, and one study[63] showed a negative impact. Nine studies[64,65,67,68,73,76,79,80,83] demonstrated that the intervention had a meaningful impact on the amount of time women were retained in treatment. For these nine studies with meaningful effect, there were differences between the sample size, study type and intervention type. However, all meaningful studies included a practical support component, and seven included a health component. All nine studies with meaningful effect sizes differed in terms of mode of delivery and setting, but five (55.5%) included residential treatment and six (66.6%) were colocated. Two studies with large effect sizes were for contingency management,[67,68] one was an intensive outpatient programme for women and children[77] and one was testing methadone maintenance.[76]

Seven studies[70,75,77,84,86–88] tested the 'completion' of substance use treatment interventions. Interventions defined completion in different ways; some studies expected participants to complete all sessions of a given intervention, while others measured completion against predefined treatment goals. Another study deemed the treatment to be successful if women were maintained on MAT at the time of labour and had not been lost to clinical care.[62] Types of interventions included in this outcome comprised of contingency management, home visiting, MAT and a residential detoxification programme. Only one, a text- and telephone-based screening and referral intervention[84] showed a meaningful effect of medium size. However, it is difficult to draw conclusions regarding the findings related to successful completion due to the poor quality of the data (see *Report Supplementary Material 2*) Additionally, studies had unclear definitions of successful programme completion, with at least one requiring abstinence[64] and one advocating for harm reduction.[65] Only two studies looked at improvements in engaging women in treatment, and these findings were similarly inconclusive with only one (a manualised home intervention) showing a large effect size.[73]

Reductions in substance use by women in the perinatal period

This outcome looked at whether illicit substance use was reduced during the perinatal period and did not consider reductions in opioid substitution therapy. The studies in this category were organised according to the substance that was reported (opioids, cocaine, benzodiazepine, amphetamine or polydrug use). In total, 58 studies addressed this outcome and 42 of those studies could be included within the effect direction plot.[62,64–66,69,71,75,76,78–83,85–112] Overall, 32 studies were included in the effect direction plot tested effectiveness by comparing intervention versus control (n = 16/32, 50%),[62,64–66,69,71,78,89,92,94–96,98,101,102,103,106] pre/post intervention (n = 15/32, 46.9%)[75,79,81,88,90,91,93,97,99,100,102,104,105,107,112] and one by length of time in treatment.[80] Ten studies compared the effectiveness of different interventions within the same study (see *Report Supplementary Material 4*).[76,82,83,85–87,108–111] Substance use reduction was primarily measured by toxicology screening (n = 27/58, 46.6%), followed by clinical records (n = 11/58,19%) and self-report (n = 10/58, 17.2%).

Of 22 studies that measured a reduction in illicit opioid use, 9[65,81,90–92,94,105,110,111] showed a meaningful effect size. Setting and mode of delivery of the interventions varied, as did the study type, sample size and the specific intervention being tested. However, all studies included MAT, six included perinatal health care and four included practical support. The interventions that showed the largest effect sizes for reducing illicit opioid use included integrated addiction and obstetric care,[90] MAT, alongside a voluntary health and education group,[105] patient navigation[81] and buprenorphine.[110]

Of 22 studies[62,64–66,69,85–88,90,92,93,95–98,100,108–112] that measured cocaine use, 11[65,66,85–87,90,92,93,97,100,112] showed a reduction in use. Seven of the 11 (63.6%) studies included a healthcare element, and 6 (54.5%) included MAT, suggesting that these studies addressed women using both opioids and cocaine. Only three (27.2%) studies included practical support; the mode of delivery and setting varied. Interventions that showed a large effect size in improvements in

cocaine/crack cocaine included integrated obstetric and addiction care,[92] contingency management,[96] case management[100] and residential treatment.[87]

Eleven[75,79,80,82,83,89,99,101,102,104,112] of 17 (64.7%) studies of interventions for women who were polydrug users showed a meaningful effect size for reductions in substance use. The studies varied in the intervention being tested, study design and sample size. Eight of the 11 (81.8%) studies[65,81,90,92,94,105,110,111] that showed a meaningful effect size included practical support components. The studies were all community based, with multiple modes of delivery. Interventions that showed a large effect size in reducing polydrug use included residential and outpatient substance use and treatment services,[101] an intensive outpatient programme for women and children,[80] a home visitation intervention[104] and case management.[82]

There were six studies of interventions that were described as either integrated/multidisciplinary or as colocated, one-stop shops, comprising both substance use treatment services and prenatal care. The studies looked at different outcomes, but all showed a reduction in substance use; four showed a reduction in opioid use,[90–92,94] three[90,93,94] showed a reduction in cocaine use, two in benzodiazepine use,[92,93] one in amphetamine[92] and one showed a reduction in polydrug use.[89] Two[90,92] of the interventions included large effect sizes.[90,92] All of these intervention studies included MAT, psychosocial and perinatal healthcare components, with four including practical support. These interventions contained multiple modes of delivery and settings. Additionally, both case management and residential interventions each included large effect sizes for reductions in different substances, suggesting that these interventions may be effective at reducing illicit substance use.

Improvements in engagement with and retention in prenatal care

In total, 24 studies looked at improvements in engagement with and retention in prenatal care. The studies were grouped according to the following outcomes: engagement (the number of prenatal visits attended), date of the first prenatal appointment and postnatal engagement.

Five studies were excluded from the effect direction plot due to a lack of reported information; 12 studies tested effectiveness by measuring the intervention versus control (*N* = 12/24, 50%),[62,63,74,76,78,92,94–96,103,113,114] change over time (*N* = 3/24, 12.5%),[115–117] and 1 study compared pre and post intervention[118] (see *Report Supplementary Material 4*).[67] Three studies compared the effectiveness of interventions tested within the same study.[87,119,120]

Of nine studies[76,87,92,94,103,113,115,117,119] measuring improvement in the date of first prenatal visit, five[94,103,113,117,119] were inconclusive and four[76,87,92,115] showed a meaningful effect. There was no consistency in the four meaningful studies in terms of mode of delivery, setting or what part of the intervention was being tested, but three of the four studies included MAT. One study looked at postnatal engagement and showed a meaningful effect size.[74]

Of the four studies[62,63,95,96] testing the impact of contingency management on engagement with and retention in prenatal care, two[95,96] showed meaningful effect sizes and two were inconclusive.[62,63] The studies measuring the impact of integrated treatment services on engagement/retention in prenatal care were also inconclusive. Fourteen studies[62,63,74,76,78,92,94–96,114,116–118,120] assessed engagement in prenatal care. Seven were inconclusive,[62–63,74,78,94,116,120] while seven studies (with a range of sample sizes and study designs) showed a meaningful improvement.[76,92,95,96,114,117,118] There were no similarities in the studies that were inconclusive in terms of the study type, sample size, type of intervention, setting or mode of delivery. With one exception,[118] all the studies that reported improvement in engagement with prenatal care included MAT in addition to psychosocial interventions. Four (28.5%) of the studies also included practical support elements (e.g. child care and transportation). Three of the studies, that were inconclusive (21.4%) in relation to engagement in prenatal care, did not have MAT included. The studies that included a large effect size included two studies that measured prenatal addiction treatment, contingency management and therapeutic child care,[95,96] integrated addiction and obstetric care[92] and methadone maintenance.[76]

While we are unable to draw firm conclusions from these findings, it is of note that interventions in contingency management and opiod subsitution treatment showed large effect sizes in all three key outcomes: reductions in women's illicit drug use, improved engagement to prenatal care and improved engagement to substance use treatment.

Objective 3: women's experiences of psychosocial interventions

A total of 75 qualitative or mixed-methods studies were included in the review and were considered for inclusion in the qualitative synthesis. Of these, only 35 included the views of women about the treatment they received and were able to be included in the qualitative synthesis. Studies reported on a range of intervention types, including colocated or one-stop shops (*n* = 15, 42.9%); integrated models of care (*n* = 4, 11.4%); peer support

(*n* = 4, 11.4%); psychotherapy (*n* = 2, 5.7%); telehealth (*n* = 2, 5.7%); group work (*n* = 2, 5.7%); case management/care–co-ordination (*n* = 1, 2.8%); trauma informed (*n* = 1, 2.8%) and miscellaneous (*n* = 4, 11.4%). Sample sizes ranged from 1 to 2595 (case records), but the total sample population within the synthesised studies was unclear, as some studies did not report the sample size, or it was reported unclearly. Full details of the individual study characteristics are available in *Report Supplementary Material 1*; however, we note that many of the studies did not provide an accurate reporting of ethnicity or socioeconomic status. The most common data collection tool was individual qualitative interviews (*n* = 13, 37.1%), followed by multimethod (e.g. combinations of interviews, focus groups and questionnaires) (*n* = 10, 28.5%) (see *Report Supplementary Material 4*).

Colocated and one-stop shop services

There were more studies of colocated or one-stop shop services than any other treatment approach (*n* = 24, 68.6%); and of these, 15 were appropriate for analysis.[42–56] Thematic analysis revealed there were consistent reports across these studies that being able to access multiple services in one location was beneficial to the women and their children.[42,47,53] One of the most often recognised benefits reported was increased support networks,[42,45–47,51,56] which included peer support as well as access to professional care. Participants reported colocated services helped to improve their health and well-being,[42,43,46,47,49,56] their child's health[43,46] and with maintaining or regaining custody of their baby and other children.[42,43,46,54] Women also associated reduced substance use with the support from multidisciplinary services.[42,45,50,54,56] This was attributed directly to a variety of aspects within colocated services, including substance use counselling,[44] education classes,[46] culturally sensitive approaches to care[43,50,51] or being encouraged to remain in the programme when providing urine for toxicology screening. Staff adopting a non-judgemental approach and the importance of the relationship with staff was stressed as essential,[43,44,46–52,54,56] with one paper noting that a non-judgemental approach from staff encouraged women to attend the service.[50]

Although most of the authors' themes reflected positive experiences of colocated services reported by women, there were also studies where women had not felt the support was beneficial.[56] Some reported feeling judged and manipulated by staff,[51,53,55] and some felt child protection procedures had been detrimental to their well-being and engagement with the service.[46,54] In a few studies, gaps in care were identified; for example, there was a lack of continued and follow-on support following the birth of the baby, which was noted in two studies,[52,54] and in another study, where aftercare had been provided, this had been found to be helpful.[49]

Integrated models of care

Nine studies reported on integrated (not one-stop shop) models of care, with four (44.4%)[122–125] being suitable for analysis. From these, four main themes were identified: (1) the attitude of staff and having a positive relationship with staff were highlighted as important; (2) flexibility and an individualised approach were reported to be beneficial; (3) building/enhancing support networks was identified as helpful; and in one paper, the opportunity to access peer support was welcomed by women;[123] and (4) experience and fear of child removal were stated to be both a barrier to, and a motivation for, engagement.

Additionally, one paper identified that the over-riding focus on the baby can be experienced negatively by women,[124] and the physical space and accessibility of the service were identified as important in another study.[123]

Peer support

Although many of the one-stop shop and other integrated models of care included elements of peer support, five studies[126–130] specifically reported on women's experiences of peer support interventions, and four[126–129] of these were included in the analysis. Five themes were identified across the included papers. Overall, the women reported positive experiences and benefits of peer support, which included a strong impact on their recovery, increased engagement in substance use treatment and improved uptake of integrated and additional services. Women reported valuing their relationships with peers,[126,127,129] noting they felt safe, and that relationships with peers helped them change how they saw themselves. Studies also found assistance from peer-support workers to be helpful as it was non-authoritarian and not instructive,[126–128] as well as aspirational and inspirational.[127] It was highlighted that there was a need to ensure that peer-support workers receive formal support in their role.[126,129]

Psychotherapy interventions

The two[131,132] papers that included women's views on psychotherapy treatments both indicated that these approaches were acceptable and helpful to their participants. One article[131] found that women's distress initially increased but that the treatment supported women to think differently about themselves and found it helpful that the intervention was delivered as part of an integrated service.

Telehealth

Telehealth interventions consisted of app-based support and education and were found to be acceptable, informative and helpful in the two[133,134] analysed studies. They also suggested that the apps had helped to improve communication with service providers. Notably, one study[134] reported that using the app reduced negative feelings related to stigma.

Group work

Although many of the integrated and one-stop shop models of care also included elements of group work, two papers[135,136] specifically reported women's views on group work. They found positive benefits overall to the participants' well-being and engagement with antenatal care. The groups were found to improve participants' social connections and help them make new friendships as well as strengthening existing external relationships. Group work also seemed to help women develop trust in healthcare practitioners. One study noted that women felt more empowered, developed a greater sense of agency and were more able to take personal responsibility for their recovery because of engagement in group work.[136]

Case management or a care co-ordination approach

Case management or a care co-ordination approach was considered in five papers, however, only one[137] reported women's views. This paper suggested women found that case management provided support, guidance and structure, which helped them work on their goals. Natural supports (such as partners, friends and family) allowed women to develop personal and social connections in a therapeutic way. Overall, taking part in the intervention developed women's self-esteem, confidence in their own abilities and increased parental resilience.

Trauma informed approach

Many of the studies across all types of intervention reflected on or mentioned a trauma-informed approach as helpful, while two focused on this specifically, and one[130] reported the women's views of a trauma-informed approach. This paper found that the structure of the group was received positively; women liked the open and supportive environment of the groups and non-judgemental facilitation. Participants appreciated discussing their trauma and learning about how it affected their current parenting, reporting increased confidence in their parenting ability and personal recovery as a result.

Miscellaneous

There were eight miscellaneous qualitative studies that did not fit with any other treatment or intervention group, and only four reflected women's views and could be included in the analysis. Of these, one described women's view on receiving support from a Perinatal Substance Educator,[138] and another study concerned women's experience of a specialist health visitor.[139]

Additional studies described women's views about an intervention delivering various complementary therapies,[140] while another captured women's experiences of MAT while enrolled in a perinatal substance use programme.[141]

Discussion

This review describes the range of psychosocial interventions available for women who use drugs, and/or are in treatment for using drugs in the perinatal period, to document evidence on the effectiveness of interventions and to identify the interventions that women feel met their needs most. Interventions included multiple components, were located in diverse settings and used a range of delivery modalities. We found some evidence that integrated programmes decrease substance use during the perinatal period; however, there was a high heterogeneity within the type of interventions and the overall quality of evidence was low, so we have no certainty as to the overall size of the effect. We also found some preliminary evidence in favour of some types of interventions towards improvements in engagement with and retention in substance use treatment services and improvement in engagement with and retention in prenatal care. However, it was difficult to determine the impact or effect of specific interventions, likely due to the diversity of studies and types of interventions. There is some evidence that interventions that include practical support components enable women to engage in or remain in treatment for substance use and to reduce their illicit substance use. There is also evidence to suggest that interventions which include MAT support women both in reducing their substance use and in engaging in prenatal care. Finally, there is evidence that multidisciplinary colocated services that include both substances use treatment and prenatal care are effective in supporting women to reduce their substance use.

Only a small number of studies included women's views and voices in the design of the research, although this may be explained by the fact that patient and public involvement in research is a relatively new phenomenon and many of our included studies were from the 1990s. Although most interventions were described by women as positive and helpful, there was more evidence to suggest

that women found colocated and one-stop shop models of care to be more helpful than other types of interventions. Overall, women valued services where staff adopted a non-judgemental approach and fostered positive relationships with them. A trauma-informed approach, cultural sensitivity, flexible and individualised care were also aspects of care that women appreciated across the range of interventions. This echoes findings from previous reviews which advocated for trauma-informed approaches for women who use or are in treatment for drugs during pregnancy.[11] Approaches that supported women to increase their confidence in parenting and knowledge were also valued by women, as were those that helped them to extend or develop their support networks. Peer support was welcomed in many types of interventions, as women appreciated having the opportunity to speak with someone who could relate to their experiences. Additionally, treatment engagement was supported through accessible locations and a positive and welcoming environment. However, the findings also highlighted that some women did not feel supported enough[56] and felt judged.[51,53,55] Moreover, there was a need for additional support in the postnatal period.[52,54]

It was not always possible to compare the qualitative and quantitative findings, as some types of interventions were only reported quantitatively or qualitatively. For example, studies testing contingency management were predominately randomised controlled trials, while peer-support interventions tended to be described through qualitative methods. Women's views were absent from many of the interventions that were tested for effectiveness. However, some conclusions could be drawn. In both the quantitative and qualitative results, there was evidence for the effectiveness of interventions that included practical support. This is consistent with the existing literature which has shown that women benefit from multiagency support that includes help with issues such as housing, transport and child care.[94,95]

The finding that integrated interventions resulted in reduced illicit substance use during the perinatal period is consistent with other literature; a review of 21 integrated interventions for pregnant or parenting women concluded that integrated programmes were associated with significant reductions in substance use but that the success rate was comparable to the non-integrated programmes.[21] Other systematic reviews indicate that integrated treatment programmes may help to prevent out-of-home placements[14] and improve outcomes for children.[22] These are notable findings since recent qualitative research has highlighted the long-term adverse psychological and physical health consequences for women who have lost their children to the care system,[17] and, indeed, the qualitative findings from our review highlighted women's fear of child removal as a barrier to accessing services. Canfield *et al.*'s review of the characteristics of women who lose care of their children highlighted that women who engage with substance use treatment and prenatal care are more likely to retain care of their infants.[25] Our findings that access to and engagement with substance use treatment are supported by integrated services, and the provision of practical measures has implications for the design of future services. It is important to note, however, that research[96,97] also indicates that women who engage with substance use treatment prenatally may relapse to substance use postnatally. This supports the need for interventions for mothers that extend beyond the perinatal period, include substance use treatment and psychosocial care and address socioeconomic and housing insecurity.

Future research

This review provides important insights into a wide range of psychosocial interventions that aim to improve outcomes for women who use substances during pregnancy and their infants. However, the quantitative findings are limited due to the quality of the studies included within the review, the variation in study type and outcome measures. This highlights the need for high-quality research studies into interventions for pregnant women who use or are in treatment for drug use. This is a highly vulnerable population, and a focussed programme of research is urgently required. Although findings of this review are inconclusive, for reasons described above, it does provide insights into interventions that are likely to be effective, for example, contingency management, MAT and peer support. And while some approaches (e.g. case management and home visiting) show some positive effect sizes in either access to substance use treatment, prenatal care or reductions in substance use, the studies were too limited in number to draw robust conclusions. Future research should investigate specific intervention types. Additionally, subgroup analysis of higher-quality evidence is an important area of future research. The review provides important evidence for future research about the mode of delivery of interventions and the importance of context, for example, colocation or one-stop shop, case management and co-ordination as well as trauma-informed and non-judgemental approaches. Interventions for women who use substances are complex interventions involving multiple components operating at different levels and in complex contexts. It is essential that future research is theory-informed, developed and described to ensure robust and replicable findings. There is also a need for further research on emerging interventions

such as telemedicine, which has increased rapidly since the COVID-19 pandemic.[142]

It is additionally important that more studies include the voices of women, both within the design of the studies and to explore their views on intervention delivery.

Strengths and limitations

We have comprehensively described the range and complexity of interventions for women who use drugs in the perinatal period since 1990 and have identified approaches and interventions that women report as meeting their needs. The analysis of 217 separate interventions – incorporating both qualitative and quantitative studies – has captured the consistency of intervention components over the last 30 years. The wide time span covered by the review and the large number and diversity of interventions have also limited our ability to evaluate the effectiveness of the interventions included. Furthermore, patterns of drug use and treatment options have changed considerably since 1990, which may also limit current relevance. Although our search was exhaustive over seven separate databases, it is possible that we may have missed relevant papers and interventions that may have added additional context to this review.

Poor quality and discriminatory reporting of the ethnicity of participants, stigmatising language and researcher bias against harm reduction and towards abstinence were all evident, although many of these studies were from the 1990s and early 2000s. Other research has highlighted the stigma faced by pregnant women who use and/or are in treatment for using drugs and how this may be exacerbated for women in poverty and of minority ethnicity.[11,99] A further limitation is that most studies in this review were conducted in the USA, which has historically had different patterns of drug use as well as different healthcare and substance use treatment systems. Access to prenatal care and health care for women who do not have health insurance is limited in USA, and the criminalisation of substance use may be disproportionately enforced against women of minority ethnicity and women in poverty.[11,99–101] This may limit the transferability of the findings to other countries.

The quality appraisal (see *Report Supplementary Material 2*) highlights the poor quality of data available within the studies. Sixty (30.5%) of the studies did not include clear research questions, or the collected data did not address the research question. Studies were often limited in terms of how data were presented, and often did not account for cofounders or consider outcomes for women who dropped out of interventions.

This review only included studies that reported on maternal outcomes, meaning that relevant interventions that only reported on neonatal outcomes were not included. Further analysis of neonatal outcomes was beyond the scope of the current review.

There are also limitations with our chosen synthesis method. The quantitative analysis was limited due to the variation in study quality, type and reporting method in addition to the number of different intervention types. The heterogeneity of data meant that meta-analysis was not possible. Although the study followed Cochrane guidance on reporting effect direction where meta-analysis was not possible, we were unable to calculate effect sizes for all studies. The number of outcomes addressed in the review alongside the number of included studies has limited the detail we were able to include. While Cohen's *d* was useful to understand the effect of separate interventions, it does not account for practical significance or the degree of overlap between groups and was often difficult to calculate, considering the amount of heterogeneous data. The decision was made to not include studies where there was not enough statistical information to determine the effect size, something which may have been possible with additional time. Using a 70% threshold to determine the meaningful effect was an overall useful metric, but the differences in how outcomes were reported within studies and the necessity of categorising them within broad categories mean that some nuance of study findings may have been lost in the reporting.

The qualitative synthesis was limited as not all the identified qualitative papers included the views of women about the treatment or service they had received. Additionally, some synthesised practitioners' views with the women's views, and it was not possible to differentiate these findings. Furthermore, themes and key findings were often written in such a way that, although they suggested how services should be delivered, these conclusions were not always directly related to the views of the women, or experiences of women from multiple intervention sites were amalgamated.

Conclusions

Women who use and/or are in treatment for using drugs have multiple, complex needs. This review has illustrated that in order to meet those needs, psychosocial interventions are often complex and comprise many different components. Of 217 interventions, 147 (67.7%) were comprehensive with multiple support components. However, these complex interventions have not always

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been rigorously tested. There were issues with the quality of studies, and in some cases, concerns about discriminatory language and views implied towards women who use or are in treatment for using drugs perinatally. The views and experiences of the women who are the recipients of these interventions were often absent.

Our findings suggest that integrated interventions, and interventions containing practical support, help to reduce women's illicit substance use and are perceived positively by women. Since pregnancy can be an opportunity for women to engage with services and to change their patterns of drug use, it is vital that we identify the most effective and appropriate way to meet women's needs. Our review highlights a need for further high-quality research studies in this area.

Key learning points

- There is some evidence that multidisciplinary, integrated services are effective at meeting the needs of women who use and/or are in treatment for using drugs during the perinatal period.
- Interventions that contain components of practical support (such as food vouchers, transport and advocacy) have also been shown to be helpful in increasing engagement with treatment and reductions in substance use during the perinatal period.
- Trauma-informed and person-centred care, and interventions which include peer support are appreciated by women.

Additional information

CRediT contribution statement

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Faraj Abu-Elbar Santirso: Validation.

Data-sharing statement

Requests for access to data should be addressed to the corresponding author or to the data custodian (Polly Radcliffe).

Ethics statement

Ethical approval was received for this research from North of Scotland Research ethics committee, with approval received on 9 May 2022 (22/NS/0047).

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List of supplementary material

Report Supplementary Material 1
Characteristics of included studies

Report Supplementary Material 2
Quality appraisal

Report Supplementary Material 3
Quantitative analysis

Report Supplementary Material 4
Qualitative analysis

Supplementary material can be found on the NIHR Journals Library article page (https://doi.org/10.3310/GJPR0321).

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

List of abbreviations

CBT	cognitive–behavioural therapy
EACG	Expert Advisory and Co-Production Group
MAT	medication-assisted treatment
MMSR	mixed-methods systematic review

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Appendix 1 Database-specific search terms

Date of search: 4 July 2022

Original search prior to running updated searches in January 2024

Full electronic search strategy for one major database included in search (MEDLINE)

Search line numbers	MEDLINE search terms	Number of hits
1	social welfare/ or maternal welfare/ or social work/ or exp social support/ or child welfare/ or patient compliance/ or patient care management/ or professional-family relations/ or professional-patient relations/	228,452
2	exp perinatal care/ or prenatal exposure delayed effects/ or midwifery/ or nurse midwives/	68,770
3	counseling/ or cognitive behavioral therapy/	66,491
4	therapeutics/	8568
5	(patient$ adj3 complian$).tw.	21,628
6	((continuit$ or contingen$ or behavio$ or social$ or psychosocial or (child adj2 protect$)) adj3 (therap$ or intervention$ or treat$ or engag$ or program$ or manag$)).tw.	131,000
7	incentive$.tw.	32,862
8	((interagenc$ or multiagenc$ or interdepart$ or multidepart$ or interdisciplin$ or multidisciplin$ or ((inter or multi) adj2 (agenc$ or disciplin$ or depart$))) adj3 (work$ co-operat$ or cooperat$ or organi?ation$ or partnership$)).tw.	3280
9	(safeguard$ or (social adj3 work$)).tw.	38,814
10	or/1-9	540,612
11	Postpartum Period/	28,818

Full electronic search strategy for one major database included in search (MEDLINE)		
Search line numbers	**MEDLINE search terms**	**Number of hits**
12	Pregnancy/	943,573
13	Pregnant Women/	11,794
14	(prenatal or perinatal or antenatal or postpartum or postnatal).tw.	338,071
15	pregnan$.tw.	553,116
16	or/11-15	1,209,282
17	substance-related disorders/ or amphetamine-related disorders/ or cocaine-related disorders/ or exp drug overdose/ or exp narcotic-related disorders/ or substance abuse, intravenous/ or substance abuse, oral/	162,666
18	((drug$ or substanc$ or narcotic$ or opioid$ or opiat$ or heroin$ or diamorphine or morphine or benzodiazepine$ or methadone$ or buprenorphine or benzo$ or stimulant or crack or cocaine or amphetamine$ or methamphetamine$) adj3 (use$ or abus$ or disorder$ or addict$ or depend$)).tw.	353,984
19	exp narcotics/	136,154
20	cocaine/ or crack cocaine/	26,486
21	or/17-20	513,922
22	10 and 16 and 21	4768
23	limit 22 to yr="1990 - 2020"	**3007**