Public health, policy, and clinical interventions to improve perinatal care for migrant women and infants in high-income countries: a systematic review

Kerrie Stevenson,[a,*] Samuel Edwards,[b] Kemi Ogunlana,[a] Maha Alomari,[a] Rukayat Agoropopoola,[a] William Henderson,[c] Nuria Sanchez Clemente,[d,e] Hannah Rayment-Jones,[f] Majel McGranahan,[b] Maria Marti Castaner,[g] Serena Luchenski,[h] Gracia Fellmeth,[i] Fiona Stevenson,[j] Marian Knight,[i] and Robert Aldridge[k,l]

[a]Great Ormond Street Institute of Child Health, University College London, London, WC1N 1EH, UK
[b]Warwick Medical School, University of Warwick, Coventry, CV4 7HL, UK
[c]Library Services, University College London, London, WC1E 6BT, UK
[d]Centre for Neonatal and Paediatric Infection, St. George's University, London, SW17 0RE, UK
[e]Health Equity Action Lab, Infectious Diseases Epidemiology, London School of Hygiene and Tropical Medicine, London, WC1E 7HT, UK
[f]Department of Women and Children's Health, King's College London, Strand, London, WC2R 2LS, UK
[g]Danish Research Centre for Migration, Ethnicity, and Health, Department of Public Health, University of Copenhagen, Øster Farimagsgade 5, 1014 København K, Denmark
[h]Collaborative Centre for Inclusion Health, University College London, 1-19 Torrington Place, London WC1E 7HB, UK
[i]National Perinatal Epidemiology Unit, Nuffield Department of Population Health, University of Oxford, Old Road Campus, Headington, Oxford OX3 7LF, UK
[j]Research Department of Primary Care and Health, Royal Free Campus, Rowland Hill Street, London, NW33 2PF, UK
[k]Institute for Health Metrics and Evaluation, University of Washington, Seattle, WA 98195, USA
[l]Institute of Health Informatics, University College London, 222 Euston Road, London, NW1 2DA, UK

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Summary

Background Migrant women who are pregnant or postpartum and their infants are often at increased risk of poorer perinatal outcomes compared to host country populations. This review aimed to identify public health, policy, and clinical interventions to improve maternity care for migrant women and their infants in high-income countries (HICs).

Methods In this systematic review we searched EMBASE, EMCARE, MEDLINE and PsycINFO, CENTRAL, Scopus, CINAHL Plus, Web of Science, and grey literature from inception to 13th March 2024, with no language or date restrictions (PROSPERO: CRD42022380678). Interventional and observational studies assessing the effectiveness of any intervention to improve perinatal care for migrant women and their infants in HICs delivered in the pregnancy, peripartum, or postpartum period (up to one year after birth) were included. Quantitative outcomes were extracted. Qualitative studies were excluded. The main outcomes of interest were preterm birth, birthweight, and appointment attendance. Quantitative synthesis was conducted using Harvest plots and binomial exact calculations.

Findings 15,689 records were retrieved, 29 studies comprising data from 16,763,837 women were included. 22 studies (75.9%) included multiple interventions. Five interventions had strong evidence of effectiveness. Two clinical interventions: 100.0% of studies including specialist multidisciplinary teams improved one or more of the main outcomes of interest, namely preterm birth, birthweight, and appointment attendance (95% confidence interval 73.5–100.0%; $p < 0.001$); and 90.9% of studies including specialist in-person interpreting improved one or more of the main outcomes of interest (58.7–100.0%; $p = 0.012$). Three public health or policy interventions: 100.0% of social welfare interventions (75.3%–100.0%; $p < 0.001$) improved one or more of the main outcomes of interest; 100.0% of maternal education interventions (71.5–100.0%. $p < 0.001$), and 83.3% of studies assessing access to free healthcare (51.6–97.9%; $p = 0.039$).

Interpretation The findings suggest that multicomponent interventions comprising multidisciplinary teams, in-person interpreting, maternal education, and social welfare support can improve perinatal outcomes for migrant women and their infants. Removing financial barriers to care may improve perinatal outcomes and be cost saving to healthcare systems. However, these findings should be interpreted with caution given that most included studies were of poor quality and that sensitivity analysis restricting to interventional studies only did not demonstrate any effect on the main outcomes of interest.

*Corresponding author.
E-mail address: k.stevenson@ucl.ac.uk (K. Stevenson).

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Research in context

Evidence before this study

Women who are migrants and who are pregnant or postpartum may be at higher risk of poorer perinatal outcomes because of pre-migration, transit, and post-migration stressors, and this can have longer-term impacts on their health and the health of their children. In preparing for this review, a rapid literature search including the key terms "migrant", "intervention", "maternity care", "high-income" and "systematic review" was conducted for papers published on MEDLINE and PubMed from inception until 13th March 2024. Three systematic reviews were retrieved, none of which identified public health or policy interventions and all of which highlighted the need for further research amongst a more diverse range of HICs.

Added value of this study

Findings from our review suggest perinatal care for underserved migrant women and their infants in HICs could be delivered by multidisciplinary teams with access to specialist in-person interpreters, alongside maternal education programmes. There was good evidence for the effectiveness of group antenatal care, mental health support, and continuity of care through a known midwife, a small team of midwives, or multi-disciplinary professionals alongside social welfare support such as housing, immigration, social welfare, food banks, and free clothing/baby equipment support embedded within clinical services. Wider public health interventions such as these are crucial to achieving the UN's Sustainable Development Goal of access to Universal Health Coverage for all by 2030 which includes financial risk protection and access to quality essential health-care services for all regardless of migration background.

Implications of all the available evidence

The findings highlight the importance of policy and public health interventions alongside equitable clinical care for pregnant migrant women and their infants in HICs. Recognising that the evidence from this review suggests that access to free maternity care for migrant women in HICs can improve outcomes and be cost saving to national and regional healthcare systems, policymakers should consider prioritising this approach to financing maternity care for migrant women. Overall, there is a need for further research exploring the effectiveness of public health and policy interventions in this field, as well as the effectiveness of interventions offering extended postpartum care, infant feeding support, mental health support, and doula services.

Introduction

Approximately 2.3 percent of the world's population lives outside their country of nationality.[1] This constitutes approximately 281 million international migrants and 89 million forced migrants, and this has been increasing in past decades.[1] Rates of migration to high-income countries (HICs) have also been increasing, particularly to the United States (US) and Europe.[1] In the US, migrant women represent approximately 14% of the total female population.[2] In England and Wales, one in three women giving birth is from a migrant background.[3] The majority of international migrants move voluntarily for economic or family reasons, but approximately one third are forced to move due to climate change, conflict, or persecution.[1]

Migrants giving birth in a host country can have difficulty accessing maternity care, and may face significant barriers in maternity services.[4–6] This includes discrimination, poverty, social isolation, lack of knowledge about services, and language barriers.[4–6] Forced migrant women experience additional challenges including war trauma, perilous journeys, and limited access to free healthcare.[5,7,8] The evidence surrounding perinatal outcomes for migrant women and their infants is conflicting[8–14]; some studies have demonstrated as good or better perinatal outcomes for migrant communities compared to host populations, but others have demonstrated poorer outcomes. A systematic review by Gagnon et al. of studies published between 1995 and 2008 demonstrated a lower or similar prevalence of preterm birth and low birthweight amongst migrants compared to women born in high-income host countries.[11] A meta-analysis distinguishing between region of origin demonstrated migrants moving from lower

income countries had poorer perinatal outcomes compared to those from higher income countries. Heslehurst et al. conducted a systematic review of systematic reviews and found that globally asylum seekers and refugees had poorer perinatal outcomes compared to host country populations, but they did not assess outcomes in high-income host countries separately.[9] These outcomes can have an adverse effect on the immediate and longer term health of the mother and child.[8,13,15]

Most HICs provide some level of maternity care for migrant women, but services are rarely tailored to their needs and some charge women for maternity care.[7,16–18] In the US, migrant women who cannot afford to pay for care may be eligible for Medicaid or Refugee Medical Assistance (RMA), but many low-income and undocumented (persons who do not fulfil the administrative requirements established by the country of destination to enter, stay, or exercise an economic activity) migrant women are not offered free care and have to pay out-of-pocket if they cannot afford private medical insurance.[19,20] In the UK, refugees and asylum seekers are offered free maternity care, but undocumented migrants are charged 150% of NHS care costs.[21,22] Across Europe, refugees and asylum seekers are usually offered free maternity care, but undocumented migrants often pay out-of-pocket.[23] Three reviews have explored interventions to improve outcomes for pregnant migrant women and their infants in HICs, but all focused on clinical interventions and none focused on policy or public health interventions.[16,17,24] All included interventions which were qualitatively evaluated, and found that migrant women valued peer support and holistic care. One identified six quantitatively evaluated interventions which were mostly from the US, but they were of weak to moderate quality and focused only on clinical care.[17] All reviews highlighted the need for further research in this area, particularly amongst a more diverse range of HICs.

This systematic review aimed to update the literature through identifying existing interventions that aim to improve perinatal outcomes for migrant women and infants in HICs and determine their effectiveness through quantitative synthesis. Unlike previous reviews which focused only on clinical maternity care and synthesised qualitative outcomes, this review sought to also include interventions addressing the wider determinants of health including policy and public health interventions and focused on quantitative synthesis. In addition, there has been a large increase in literature in this field in the past several years, and no recent systematic reviews exist. The primary objective was to determine what interventions exist to improve perinatal outcomes for migrant women in HICs. The secondary objective was to explore the effectiveness of these interventions by exploring the impact on perinatal outcomes. In this review, the perinatal period is defined as the antenatal, intrapartum, and postpartum period (up to one year after birth). The perinatal outcomes of interest were decided with mothers with lived experience of migration and maternity care in the UK, alongside references to World Health Organisation (WHO) measures of quality in maternity care.[25]

Methods

Public involvement and equality statement

Our authorship team includes mothers living in the UK with lived experience of migration and maternity care in the UK from a range of backgrounds. These women helped design the research question, analyse, and interpret these data to maximise relevance and contextual insight. Together we decided to include an assessment of the involvement of migrant women in the design and or the delivery of the interventions. The terms 'pregnant women' and 'mothers' will be used throughout this review, but the authors recognise not everyone who is pregnant or giving birth will identify as a woman or a mother.

Search strategy and selection criteria

The protocol was registered with PROSPERO (CRD42022380678) in December 2022, peer-reviewed, and published in August 2023.[26] Studies of migrant women who were pregnant or up to one year postpartum were eligible for inclusion.[27] Studies of women aged over fifteen years (usual age of consent for medical treatment), living in a high-income country (HIC) (defined as being in the World Bank high-income economy category), and who were born outside their host country were included, i.e., first-generation migrants.[27,28] Studies in which fewer than 90% of participants were first generation migrants, i.e., not born in the host country, were excluded to maximise the relevance of the findings to the most underserved groups of migrant women. Eligible interventions were any hospital- or community-based initiatives offered in the antenatal, perinatal, or postnatal period (up to one year postpartum) that aimed to improve any maternal or infant outcomes. The comparison group was usual care if data were available. If no comparison group was given, studies were included and assessed as beneficial or not based on before and after comparisons.

The main outcomes of interest were decided based on the literature and input from our stakeholders and service users; these were rates of preterm birth, birthweight, and number of antenatal or postnatal appointments attended. These are also key measures of maternity care quality according to the WHO.[25] However, as per Cochrane systematic review guidance, any outcomes were recorded and synthesised.[29] Observational, quasi-experimental, and experimental intervention studies with quantitative outcomes were included. Abstracts, non-empirical research, opinion, or editorial pieces were excluded, but all were assessed to determine if any relevant studies were cited.

If duplicate reports or publications of the same data were retrieved, the less recent version was excluded. Studies with only qualitative outcomes were excluded given that these studies have been extensively reviewed previously.[16,17,24] Interventions that were not specifically designed or adapted for migrant women or their infants in the perinatal period were excluded to ensure data are focused on interventions that could have direct impact on outcomes for migrant women and their infants. Inclusion and exclusion criteria are summarised in Table 1.

EMBASE, EMCARE, MEDLINE, PsycInfo, CENTRAL, Scopus, CINAHL Plus, and Web of Science were searched for studies published from inception up until 13th March 2024 (Appendix 1). Grey literature sources including Google Scholar and trial registries were searched up until 28th January 2023. The first 150 results from the following sources were searched: Google Scholar, WHO International Clinical Trials Registry Platform, Clinicaltrials.gov, the WHO Website, and the UN Refugee Agency website. The Boolean operators 'AND' and 'OR' were employed to combine the descriptors, where appropriate. No date or language restrictions were applied. Forward and backward citation searching was employed on all included articles, and the reference lists of all included articles were searched. If studies were published in a language other than English, a member of the research team fluent in that language assessed it for likely relevance and extracted the data, if appropriate. The article was translated using Google Translate™ and a second reviewer reviewed its relevance and extracted the data, if appropriate. If none of the research team were fluent in the language, papers were assessed by two reviewers using Google Translate™. EndNote™ was used to collect and manage the studies retrieved.[30] Covidence™ was used for deduplication and study selection.[31]

Screening and data extraction

Two independent reviewers (KS and SE/GF/MMC/NSC/HRJ/KO/RA/MA) screened the abstracts and full texts for relevance. Full texts were assessed for eligibility using a checklist of the inclusion and exclusion criteria. All excluded articles from the full text screening were recorded with reason for exclusion noted. Disagreements between reviewers were discussed and agreement sought from a third reviewer if necessary. If data were not accessible from the paper, the authors were contacted. All extracted data were recorded on the piloted data extraction form by two separate reviewers and cross-checked. A flowchart summarises the selection process (Fig. 1). Study characteristics are summarised in Appendix 2.

Inclusion Criteria	Exclusion Criteria
Observational, quasi-experimental, and experimental intervention studies	Qualitative outcome assessments only
Quantitative outcome measures	Abstracts, non-empirical research, opinion, or editorial pieces
Interventions designed to be delivered in pregnancy, intrapartum, or postpartum (up to one year after birth)	Interventions not specifically designed or adapted for migrant women or their infants in the perinatal period
Studies including women aged over fifteen years (usual age of consent for medical treatment)	Studies in which fewer than 90% of participants were first generation migrants, i.e., not born in host country
Intervention delivered in a high-income country	
Any hospital- or community-based initiatives	

Table 1: **Inclusion and exclusion criteria.**

Deviations from the protocol

The authors originally planned to include only interventional studies in this review. However, following the full literature search it became clear that there were several observational studies of interventions which could provide valuable insights into effective interventions in this area. Thus, it was decided that both observational and interventional studies would be included, and that the findings for interventional studies would be presented separately.

Quality assessment and risk of bias

Two independent reviewers (KS and SE/GF/MMC/NSC/HRJ) performed critical appraisal, and this was cross-checked. The Quality Assessment Tool for Quantitative Studies was used to assess rigor for each included study and confidence in the strength of evidence (Appendix 3).[32] This tool was chosen as it was developed and validated to assess both observational and interventional studies and shows reliability and validity. We expected to identify many non-randomised studies of interventions. These studies have a high risk of time-related bias such as when prevalent users of an intervention rather than incident users are included in analyses and compared to non-users; this is known as lead time bias.[29] We mitigated this by including an assessment of time-related bias using the Risk of Bias in Non-Randomised Studies (ROBINS-I) tool (Appendix 3).[33] Publication bias was not assessed given the lack of standardised outcome data.

Data synthesis

Narrative synthesis was conducted according to Cochrane guidance and included creation of categories of interventions with input from the research team and experts by experience.[34] A meta-analysis was planned if sufficient studies reported data on the same outcomes in a format that could be meaningfully combined into estimates of pooled odds ratios or risk ratios. Due to heterogeneity of outcome measures, meta-analysis was not possible, and we therefore followed Cochrane guidance to create a Harvest Plot.[34] A Harvest Plot is a visual supermatrix summarising vote counting by categorising studies as having a beneficial effect or no effect in each outcome category. Each bar represents a single

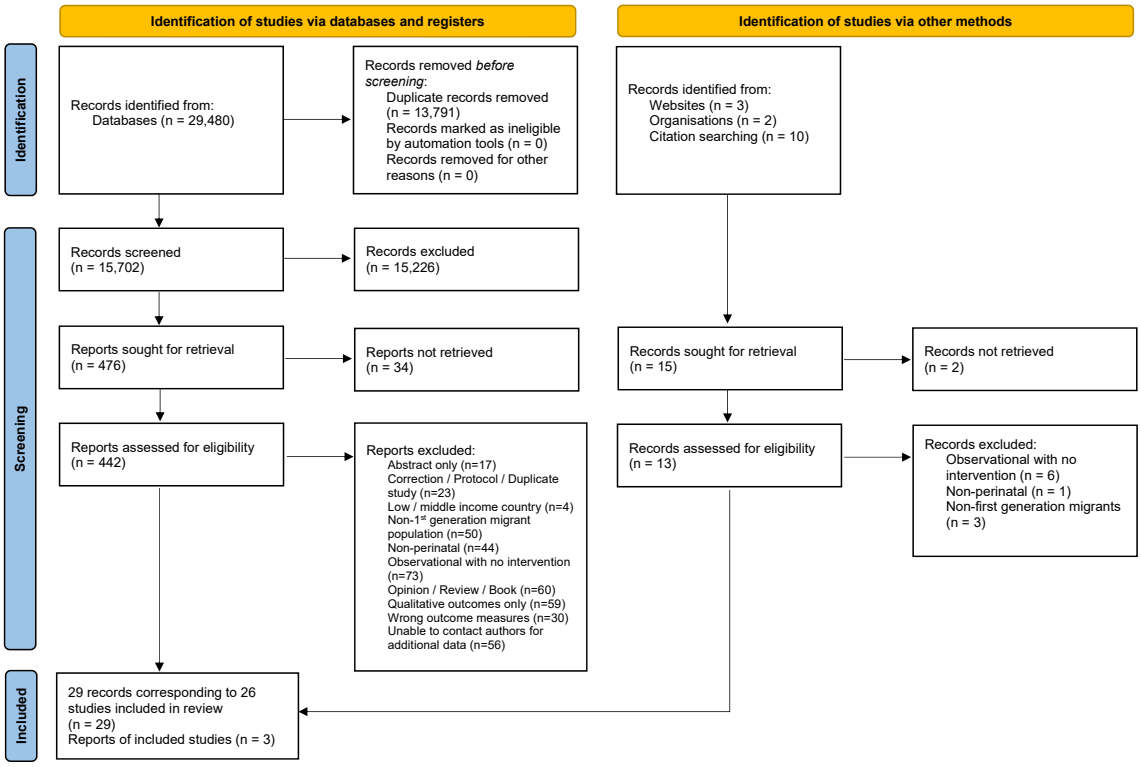

Fig. 1: **Preferred reporting items for systematic reviews and meta-analysis (PRISMA) flow diagram.**

study and is annotated with the reference number. Bar height indicates study quality: strong (tallest), moderate (medium), weak (shortest). Following the Cochrane guidance, for the main outcomes of interest (preterm birth, birthweight, and appointment attendance) an intervention is counted as beneficial if there is evidence of benefit in each outcome separately. For analyses including all outcomes presented in the studies, a study is counted as beneficial if one or more of the outcomes in each outcome group showed evidence of benefit. Vote counting is recommended when there are inconsistent effect measures across studies. Traditional vote counting methods using statistical significance, magnitude of effect, or subjective rules have been shown to be misleading.[34] In accordance with Cochrane guidance, we calculated the proportion of beneficial studies using the binomial exact calculation, i.e., using raw numbers and not relying on statistical tests. We analysed the number of studies showing improvement in the outcomes of interest compared to the number of total outcomes reported per intervention category. Sensitivity analysis according to study quality, method of recruitment, and service user involvement was conducted. Statistical analyses were conducted using R Studio.[35] This strength of evidence assessment was based on the amount of evidence available, visual inspection of the Harvest Plot, the binomial exact calculation, and risk of bias assessment. This systematic review is reported in accordance with the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines.

Role of the funders

The funders had no role in study design, data collection, data analysis, data interpretation, or writing of the report.

Results

The search retrieved 29,495 records, of which 15,689 abstracts were screened after duplicates were removed. 442 full texts were reviewed, and 29 studies were included comprising data from 16,763,837 women (Fig. 1) (Appendix 2).[36–64] Studies were published between 1986 and 2023. 19 studies (66%) were published since 2015. 112 studies included mixed migrant populations, e.g., first- and second-generation migrant women. We contacted all these authors asking for disaggregated data for first generation migrants only (as per our inclusion criteria). 55 (49%) replied, and 22 (20%) were able to provide disaggregated data for first generation migrants. Characteristics of included studies are presented in Table 2. According to the Quality Assessment Tool for Quantitative Studies Tool,[32] 17 studies (59%) were of weak quality, 9 (31%) moderate, and 3 (10%) strong. 5 studies (17%) were at low risk of

Characteristic	n (%)[a]
Study design:	
Randomised Controlled Trial[41,43,46,47]	4 (13.8%)
Cluster Randomised Controlled Trial[39]	1 (3.4%)
Controlled Clinical Trial[36,44,45,55]	4 (13.8%)
Cohort analytic (difference-in-difference)[42]	1 (3.4%)
Cohort (one group pre + post)[40]	1 (3.4%)
Quasi-experimental trial (1 intervention and 1 historical control group)[37]	1 (3.4%)
Interrupted time series analysis[54]	1 (3.4%)
Retrospective Cohort Study[38,48–50,52,53,56–58,60,62–64]	14 (48.3%)
Economic model[59,61]	2 (6.9%)
Country:	
US[41,43,47,49,50,52,57,58,60–64]	13 (44.8%)
Australia[45,51,53,54,56]	5 (17.2%)
Sweden[37,38,46]	3 (10.3%)
Canada[42,48]	2 (6.9%)
UK[44,55]	2 (6.9%)
Denmark[39]	1 (3.4%)
Japan[40]	1 (3.4%)
South Korea[36]	1 (3.4%)
Multi-country[59]	1 (3.4%)
Multi-component intervention:	
Yes[36–54,56,57,65]	22 (75.9%)
No[58–64]	7 (24.1%)
Perinatal period:	
Antenatal[37,39,44,45,48,51–54,56,59,61–64]	15 (51.7%)
Intrapartum[38,46,57]	3 (10.3%)
Postpartum[36,42,55]	3 (10.3%)
Antenatal/Intrapartum[58]	1 (3.4%)
Perinatal Period[40,41,43,47,49,50,60]	7 (24.1%)
Service user involvement in design/delivery:	
No service user involvement[40,44,45,48,49,52,53,56,58–64]	15 (51.7%)
Co-designed[37,39,54]	3 (10.3%)
Co-delivered[36,38,41,46,47]	5 (17.2%)
Co-designed and Co-Delivered[42,43,50,51,55,57]	6 (20.7%)
Intervention categories:[a]	
Maternity care interventions	
Specialist in-person interpreting[18,20,23,27,31,32,36,39]	13 (15.7%)
Trained peer/shared culture worker[36,38,41–43,46,47,50,51,55,57]	11 (13.3%)
Specialist multidisciplinary team[48–51,53,54,56]	7 (8.4%)
Group antenatal care[37,51,54,56]	4 (4.8%)
Continuity of midwifery care[37,53,56,57]	4 (4.8%)
Mental health support[36,48,53,56]	4 (4.8%)
Extended postpartum support[36,41,47,56]	4 (4.8%)
Birth doula[38,46,57]	3 (3.6%)
Infant feeding support[41,42,52]	3 (3.6%)
Public health or policy interventions	
Education materials/classes for mothers[36,39,40,43–45,49,51,52,55,56]	11 (12.9%)
Social welfare assistance[48–50,52,53,55,56]	7 (8.4%)
Free healthcare[58–61,63,64]	6 (7.2%)
Social/peer support[40,41,43,47]	4 (4.8%)
Staff education/process reform[39,54]	2 (2.4%)
Immigration law reforms[62]	1 (1.2%)
Mobile perinatal care[49]	1 (1.2%)
Outcome categories:[a]	
Main outcomes	
Antenatal/postnatal appointment attendance[37,47–52,54,56,58,60,64]	12 (36.4%)
Birthweight[37,44,48,49,52,56,58–60,63,64]	11 (33.3%)
Preterm birth[48,49,52,53,56,58,60,62–64]	10 (30.3%)
All outcomes	
Any perinatal outcome[38,39,44,46,48,49,52,53,55–60,62–64,b]	17 (31.5%)
Care satisfaction/ engagement[37,40,46,50,52,54,56,58,60,64,c]	10 (18.5%)
Adequacy of care[47–49,51,54,58,60,d]	7 (13.0%)
Mental health/wellbeing[36,37,40,43,46,47,51]	7 (13.0%)
Breastfeeding outcomes[41,42,45,47,53,56]	6 (11.1%)
Infant health outcomes[44,47,50,61,62]	5 (9.3%)
Cost-effectiveness[59,61]	2 (3.7%)

[a]Proportions will not total 100% if studies appear in more than one intervention or outcome category. [b]Any maternal or neonatal (up to 28 days old) health outcome: rates of miscarriage, stillbirth, small/large for gestational age, preeclampsia, preterm birth, induction of labour, birthweight, postpartum haemorrhage, mode of delivery, Apgar* score, critical care admission, maternal/neonatal death. [c]Subjective maternal assessment of quality and satisfaction with maternity care received, e.g., through a validated questionnaire; number of antenatal or postnatal appointments attended. [d]An assessment of the sufficiency of the maternity care received including gestational age at booking and adherence to national/international maternity care guidelines.

Table 2: **Characteristics and references of included studies, full study details are provided in Appendix 2 N = 29 studies.**

time-related bias assessed using the Risk of Bias in Non-Randomised Studies (ROBINS-I) Tool,[33] 15 (52%) at moderate risk, 7 (24%) at serious risk, and 2 (7%) did not provide enough information to make an assessment.

Sixteen types of intervention were identified; these were further classified into 'Maternity Care Interventions' defined as interventions that focused on maternity care delivery in hospital or in the community, and 'Public Health or Policy Interventions' defined as policy and public health interventions focused on the broader determinants of health. Operational definitions of intervention categories are presented in Table 3.

As per Cochrane guidance, all outcomes reported in included studies were recorded and categorised. We identified seven main outcome categories: any perinatal outcome, any infant health outcome, breastfeeding outcomes, adequacy of care, care satisfaction/engagement, mental health/wellbeing, and cost-effectiveness. Operational definitions and examples of outcome categories are presented in Table 4.

Amongst all included studies, five intervention groups had the strongest evidence of effectiveness on preterm birth, birthweight, and appointment attendance following the binomial exact calculation. Two were

Intervention category	Operational definition	Examples from included studies
(1) Maternity care interventions		
Specialist multidisciplinary team	Maternity care system that has been specifically tailored to the needs of migrant women including specialist multidisciplinary staff and clinical care.	Specialist multi-disciplinary migrant antenatal care team including clinicians, social workers, interpreters, psychologists.[38,54]
Trained peer/shared culture worker	A migrant woman with experience of giving birth in the host country i.e., a service user who is trained to provide perinatal support, or someone from the same migration or cultural background who is specifically trained to work with migrant women during maternity care.	Somali-speaking doula supporting newly arrived Somali women during birth.[58] Immigrant mothers living in Korea trained to visit new immigrant mothers at home for up to three months postpartum.[37]
Specialist in-person interpreting	A specialist interpreter who is available on-site to interpret in all clinical encounters. This interpreter is experienced in working in a medical context with women from a migrant background.	Qualified specialist interpreters present for all antenatal classes.[51] A community based doula who spoke the same language as the migrant mother they cared for.[47]
Group antenatal care	Antenatal care delivered to migrant women alongside other migrant women in a group setting.	A group pregnancy care and information model for migrant mothers.[52] A multiagency group antenatal care model involving interpreters, clinicians, and social welfare support workers.[55]
Continuity of midwifery care	A known midwife or small team of midwives whom the woman can make a relationship with throughout pregnancy. Sometimes this extends to delivery and postpartum.	A known midwife throughout the antenatal care period.[38] A dedicated midwife and back-up known midwifery team for antenatal, intrapartum, and postnatal care; this includes 24/7 h telephone support from the main midwife.[57]
Extended postpartum support	Additional care and visiting in the postpartum period, i.e., care that extends beyond the standard 28 days postpartum.	Postpartum nursing home visiting for 3 months[37]; postpartum trained peer home visiting for 6 months.[48]
Birth doulas	A person who supports migrant women through labour, and sometimes also before and after birth.	Bilingual community-based doula[39]; Somali-speaking doula supporting newly arrived Somali women during birth.[58]
Postnatal infant feeding support	Postnatal support with infant feeding including breastfeeding, formula, and weaning advice.	Chinese language infant feeding hotline[43]; support from a lactation professional up to 6 months postpartum.[42]
Mental health support	Any form of formal psychological support provided to women in the perinatal period, i.e., provision of care by a trained mental health professional.	Psychologists present at a specialist antenatal refugee health clinic.[49]
(2) Public health or policy interventions		
Social welfare assistance	Support with wider issues relating to the social determinants of health including housing, immigration, social welfare benefits, food banks, and free clothing/baby equipment.	Free baby clothing and equipment[51]; free food supplements.[53]
Education materials/classes for mothers	Classes or educational information given to pregnant women or new mothers.	Group antenatal educational classes[37]; maternal health educational leaflets[40]; conversation cards and lessons to support conversations with clinicians during birth[41]; video and discussion session[46]; maternal and infant oral health education through home visits and telephone calls.[56]
Free healthcare	No or low-cost access to maternity care for all migrant women.	Expanded access to MEDICAID[b] for all migrants, included those who are undocumented[a,59]; free antenatal care to undocumented migrants.[60,a]
Immigration law reform	Changes in the immigration system that make it easier (or more difficult) to prosecute or deport undocumented migrants.[a]	Legal reform to increase police funding for immigration enforcement including prosecutions and deportations of undocumented migrants.[63,a]
Social/peer support	Opportunities to create social networks between migrant women; trained peers working to support other migrant women in the perinatal period, including helping them to navigate a new healthcare system.	Establishing a social network group for migrant women in the perinatal period[41]; cultural bridging and support with navigating the host country system.[54]
Staff education/process reform	Education programmes for maternity care staff; reform of the maternity care system in a hospital or regionally.	Training session for midwives on intercultural communication[40]; reformed data collection system to help tailor care for migrant women.[55]
Mobile perinatal care van	An outreach healthcare van that travels to areas with high proportions of migrant women to signpost women to maternity healthcare providers and provide support with accessing social and welfare support e.g., food banks, immigration advice. Some may also offer some antenatal or postnatal care check-ups.	A mobile van delivering basic perinatal care and welfare support in neighbourhoods with a high proportion of Latina migrants.[50]

[a]Undocumented migrants: persons who do not fulfil the administrative requirements established by the country of destination to enter, stay, or exercise an economic activity. This includes those who have been unsuccessful in asylum applications, those who have continued their residence in a country after their permit or other means of stay expired, or those who have entered a country irregularly.
[b]MEDICAID: a public insurance program that provides health coverage to low-income individuals in the United States. It is jointly funded by the central government and individual states. Each state operates its own Medicaid program within national guidelines.

Table 3: **Operational definitions and examples of intervention categories.**

Outcome category	Operational definition	Examples from included studies
Perinatal outcomes	Any maternal or neonatal (up to 28 days old) health outcome: rates of miscarriage, stillbirth, small/large for gestational age, preeclampsia, preterm birth, induction of labour, birthweight, postpartum haemorrhage, mode of delivery, Apgar[a] score, critical care admission, maternal/neonatal death.	Apgar scores for newborns[39]; A composite perinatal mortality/morbidity outcome: stillbirths, neonatal deaths, Apgar[a] score, umbilical arterial pH, admissions to a neonatal intensive care unit >48 h, and NICU admissions for mechanical ventilation[40]; overall Caesarean section rates.[58]
Adequacy of care	An assessment of the sufficiency of the maternity care received including gestational age at booking and adherence to national/international maternity care guidelines.	Proportion of women attending 5 or more antenatal care visits[57]; proportion of women receiving antenatal care before 13 weeks gestation.[48]
Mental health/wellbeing	Improvement in mental health and wellbeing as measured by a peer-reviewed validated screening tool or clinical interview.	Maternal depression measured using mean EPDS[b] score[37]; maternal anxiety measured STAI[c] score and validated cut-off.[41]
Breastfeeding outcomes	Any measure of breastfeeding uptake or engagement including breastfeeding initiation and duration, breastfeeding on discharge from birth hospital, exclusive breastfeeding postpartum.	Exclusive breastfeeding at discharge from hospital (feeding at the breast, and/or expressed breast milk)[57]; exclusive breastfeeding rate at 2 months postpartum[43]; exclusive breastfeeding continuation at 6 months postpartum.[46]
Care satisfaction/engagement	Subjective maternal assessment of quality and satisfaction with maternity care received, e.g., through a validated questionnaire; number of antenatal or postnatal appointments attended.	Number of missed clinic appointments[51]; women's overall ratings of labour care as measured by a single item question taken from the MFMCQ (Migrant Friendly Maternity Care Questionnaire).[47]
Infant health outcomes	Any health outcome relating to the infant from 28 days old to 1 year old.	Infant deaths (>27 days old and up to one year)[62]; infant put to sleep on back[48]; childhood vaccination status at 1 year old.[45]
Cost-effectiveness	The degree to which something is effective or useful in relation to its cost, i.e., a measure of how responsibly money is spent to achieve the desired results.	Cost-effectiveness analysis (QALYs[d] at a willingness-to pay threshold of $100,000)[62]; saving to the healthcare system.[60]

[a]Apgar score: a standardised tool to describe the condition of the newborn infant immediately after birth. [b]The Edinburgh Postnatal Depression Scale (EPDS) is a peer-reviewed and validated screening questionnaire to assess for perinatal depression. [c]State Trait Anxiety Inventory (STAI) is a peer-reviewed and validated screening questionnaire to assess for anxiety (not exclusively used in the peripartum period). [d]Quality Adjusted Life Year (QALY) is a measure of disease burden, including both the quality and the quantity of life lived.

Table 4: **Operational definitions and examples of outcome categories.**

maternity care interventions: specialist multidisciplinary teams and specialist in-person interpreting; and three were public health or policy interventions: social welfare assistance, free healthcare, and education materials/classes for mothers (Table 5). Three other interventions had relatively strong evidence of effectiveness: group antenatal care, mental health support; and continuity of midwifery care (Table 5). When restricting to only interventional studies (n = 4), none showed a greater proportion of positive outcomes than would have been expected by chance (Table 6). None of the included interventions identified were harmful.

Binomial exact calculations for any outcomes are presented in Appendix 4. Three interventions showed evidence of benefit for any reported outcome measure, namely, specialist in-person interpreting, trained peer/shared culture worker, and free healthcare. When restricting to only interventional studies (n = 12), none showed a greater proportion of beneficial outcomes than would be expected by chance (Appendix 5), Fig. 2 presents the data for the main outcomes of interest: preterm birth, birthweight, and appointment attendance amongst all included studies. Appendix 6 presents the data for the main outcomes of interest for interventional studies only. Data for all outcomes from all included studies is presented in Appendix 7. Appendix 8 presents the data for all outcomes for interventional studies only. A full narrative synthesis of the findings for all interventions is presented in Appendix 9.

Most studies identified in this review (75.9%) were multicomponent, meaning various interventions were delivered as part of one programme. The most common intervention was specialist in-person interpreting which was defined as a specialist interpreter experienced in working in a medical context with women from a migrant background and available on-site to interpret in clinical encounters. This approach demonstrated strong evidence of improvement in the main outcomes of interest. Multidisciplinary teams also showed strong evidence of benefit and typically included midwives, physicians, social workers, interpreters, and psychologists. All offered antenatal care, and approximately half continued into the postnatal period. Seven studies embedded social welfare assistance into their clinical care, and in all cases there was very strong evidence of improvement in the main outcomes of interest. Examples of social welfare support included offering free baby clothing and supplies, free healthy food for mothers and infants, or providing referrals to social welfare services such as housing and employment support. Maternal education programmes were very common, and our findings suggest they improved the main outcomes. Examples included participation in a national programme aimed to educate mothers on healthy nutrition; exercise education and support; and education on birth and infant care. Finally, there was strong evidence that free maternity healthcare improved the main outcomes of interest and was cost-saving to national and regional healthcare systems. One was an economic model assessing the impact of including undocumented migrants in national free antenatal care programmes in Europe, and four explored the impact of expansion of

free prenatal care (MEDICAID) for low-income women in the US.

Sensitivity analysis was carried out by restricting the binomial tests to strong and moderate quality studies only (n = 11 studies). This found that specialist multidisciplinary teams, mental health support, social welfare assistance, and maternal education showed a greater proportion of positive outcomes than would have been expected by chance (Appendix 10). When restricting the analysis to studies that involved service users in the design or delivery of the intervention, none showed a greater proportion of positive outcomes than would have been expected by chance (Appendix 10). Sensitivity analyses were also conducted for all outcomes (Appendix 1).

Discussion

We identified 29 studies comprising interventions which aimed to improve maternity care for migrant women in HICs. Most studies were multi-component interventions, approximately 40% of studies were interventional, and almost two thirds of studies were of weak quality. Clinical interventions with the strongest evidence of benefit on birthweight, preterm birth rates, and perinatal appointment attendance were specialist multidisciplinary teams and specialist in-person interpreting. There is also good evidence to suggest group antenatal care, mental health support, and continuity of midwifery care can improve outcomes for migrant women. Policy and public health interventions with the strongest evidence of benefit were social welfare assistance, free healthcare, and maternal education. Although only seven studies assessed social welfare support, there was very strong evidence of this improving perinatal outcomes amongst migrant women and their infants. Approximately half of studies involved migrant women in intervention design or delivery, and only a third co-designed interventions from the outset with migrant women. A sensitivity analysis including only studies who involved service users in the design or delivery of the intervention found no greater proportion of positive outcomes than would have been expected by chance, but this finding is limited by the lack of studies available.

Only four studies (14%) assessed mental health support despite data to suggest migrant women are at significantly higher risk of perinatal mental illness when compared to host populations.[8] The postnatal period is increasingly recognised as an important time for maternal and infant support, but only four studies (14%) explored interventions during this time.[66] Economic analyses are key to political decision-making on healthcare interventions, but just two (7%) studies included a cost-effectiveness analysis.[59,67] One was an economic model assessing the impact of including undocumented migrants in national free antenatal care programmes in three European countries.[59] The model demonstrated

Studies offering an intervention	Beneficial main outcomes/total main outcomes	Proportion of beneficial outcomes (%)	95% CI of the proportion of beneficial outcomes	p-value
(1) Maternity care interventions				
Specialist multidisciplinary team	12/12	100.0%	73.5–100.0%	<0.001[a]
Specialist in-person interpreting	10/11	90.9%	58.7–100.0%	0.012[a]
Group antenatal care	7/7	100.0%	59.0–100.0%	0.016[a]
Mental health support	7/7	100.0%	59.0–100.0%	0.016[a]
Continuity of midwifery care	6/6	100.0%	54.1–100.0%	0.031[a]
Trained peer/shared culture worker	2/3	66.7%	9.4–99.2%	1.000
(2) Public health or policy interventions				
Social welfare assistance	13/13	100.0%	75.3%–100.0%	<0.001[a]
Maternal education	11/11	100.0%	71.5–100.0%	<0.001[a]
Free healthcare	10/12	83.3%	51.6–97.9%	0.039[a]
Mobile perinatal care	3/3	100.0%	29.2–100.0%	0.25
Immigration law reforms	1/1	100.0%	2.5%–100.0%	1.000
Staff education/process reform	1/1	100.0%	2.5%–100.0%	1.000
Social/peer support	0/1	0.0%	0.0%–97.5%	1.000

CI: Confidence Interval. [a]Significant at $p < 0.05$ level.

Table 5: **Effectiveness of intervention categories across the main outcomes measures (preterm birth, birthweight, and antenatal and postnatal appointment attendance).**

Intervention	Beneficial outcomes/ total outcomes	Proportion of beneficial outcomes (%)	95% CI of the proportion of beneficial outcomes	p-value
(1) Maternity care interventions				
Specialist multidisciplinary team	1/1	100.0%	2.5%–100.0%	1.000
Specialist in-person interpreting	3/4	75.0%	19.4–99.4%	0.625
Group antenatal care	2/2	100.0%	15.8–100.0%	0.500
Mental health support	N/A	N/A	N/A	N/A
Continuity of midwifery care	2/2	100.0%	15.8–100.0%	0.500
Trained peer/shared culture worker	0/1	0.0%	0.0%–97.5%	1.000
(2) Public health or policy interventions				
Social welfare assistance	N/A	N/A	N/A	N/A
Free healthcare	N/A	N/A	N/A	N/A
Maternal education	2/2	100.0%	15.8–100.0%	0.500
Mobile perinatal care	N/A	N/A	N/A	N/A
Immigration law reforms	N/A	N/A	N/A	N/A
Staff education/process reform	N/A	N/A	N/A	N/A
Social/peer support	1/1	100.0%	2.5%–100.0%	1.000

CI: Confidence Interval.

Table 6: **Effectiveness of intervention categories across the main outcomes measures (preterm birth, birthweight, and antenatal and postnatal appointment attendance) restricting to only interventional studies.**

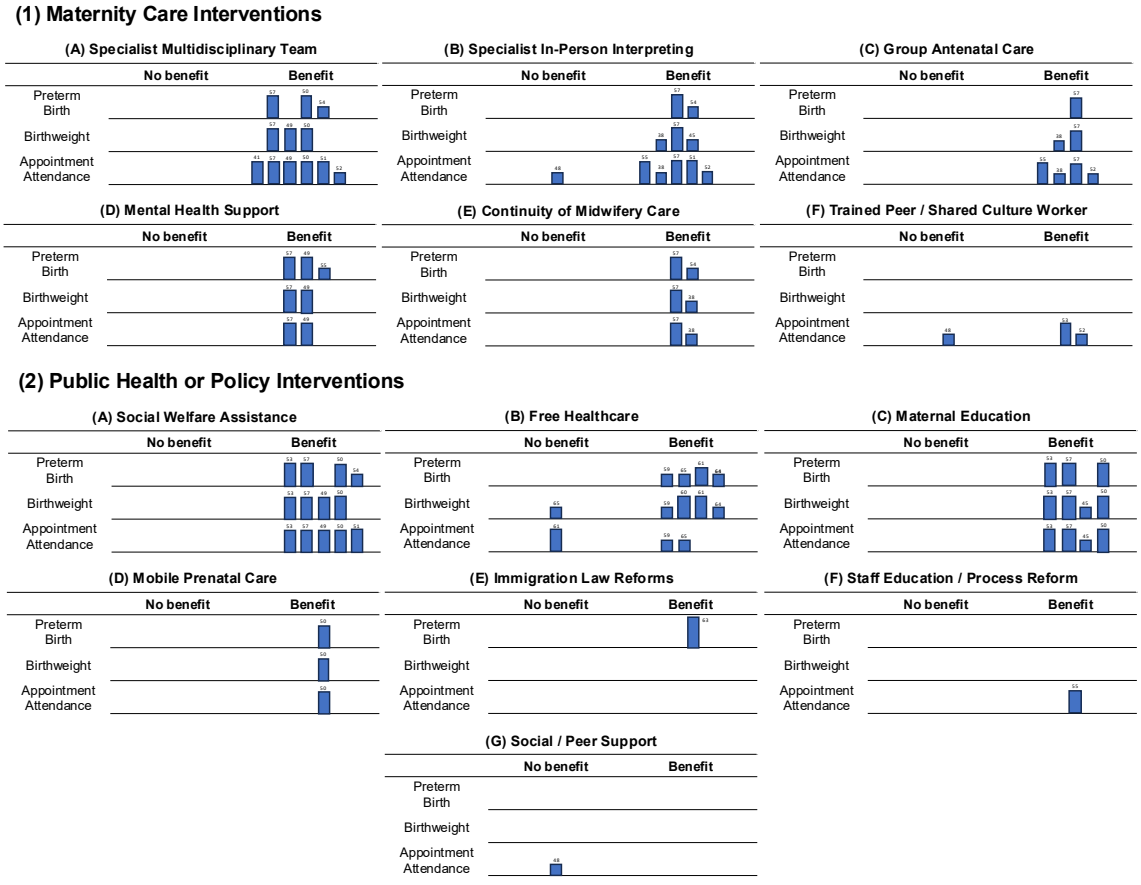

Fig. 2: **Evidence for effectiveness of (1) Maternity Care Interventions and (2) Public Health or Policy Interventions for migrant women by main outcome category – preterm birth, birthweight, appointment attendance.** This harvest plot is a 'supermatrix' presenting thirteen interventions, and three outcomes. Each bar represents a single study and is annotated with the reference number. Bar height indicates study quality: strong (tallest), moderate (medium), weak (shortest). Preterm birth was defined as infants born alive before 37 weeks of pregnancy are completed. Birthweight was defined as the body weight of an infant at birth. Appointment attendance was defined as the number of antenatal and/or postnatal appointments a woman attended.

that providing free access to antenatal care services to undocumented migrants would be cost saving in Germany, Greece and Sweden. Another explored the expansion of free antenatal care programmes to undocumented migrants in the US.[64] It demonstrated that centrally-funded free antenatal care was cost-effective and increased uptake of antenatal care appointments. No studies focused specifically on maternal health indicators e.g., maternal mortality, intensive care admission, preeclampsia, anaemia, or intrapartum blood loss. This represents a significant gap in evidence and should be the focus of future studies.

There are few systematic reviews in this area. Balaam et al. conducted a systematic review in 2020 which aimed to identify perinatal social support interventions for women and new mothers in Europe.[16] Sixteen studies were included and findings were qualitatively synthesised; women valued community-based holistic peer support interventions. We identified four quantitatively assessed interventions offering peer support and found weak evidence of their effectiveness, but this finding was limited by a lack of eligible studies. The NIHR commissioned a systematic review to explore interventions to improve maternity care for migrant women in the UK in 2017.[24] The review only included UK studies and identified four interventions. Two included peer support but none were robustly evaluated, making it difficult to draw conclusions on their effectiveness. We have expanded the literature to look across HICs and have identified strong evidence of benefit for several interventions. We have also systematically assessed the involvement of service users in interventions development. Rogers et al. completed a scoping review of models of maternity and postpartum care in HICs in 2019 and identified 17 studies.[17] Of these, just six had quantitative outcomes and were primarily from the US and of weak or moderate quality, and did not address the wider determinants of health.

Following a more extensive search of the literature, we have identified significantly more studies with quantitative outcomes and also identified policy and public health interventions which could improve outcomes for migrant women in HICs.

The strengths of this review include rigorous methodology in accordance with the Cochrane Handbook of Systematic Reviews. Unlike most previous reviews, we included interventions addressing wider determinants of health including public health and policy interventions. We have demonstrated that there is a growing body of evidence from across HICs, recognising that two thirds of included studies were published since 2015. Unlike previous reviews, we narrowed our eligibility criteria to only include studies where greater than ninety percent of participants were first generation migrants, i.e., not born in the host country. This ensures our findings are directly relevant to the migrant women who often face the biggest challenges in accessing maternity care.[4] We searched databases and the grey literature and had no language or date restrictions. Service users were involved throughout including in conception, analysis, and interpretation which ensures our findings are directly relevant to migrant women.

The findings are limited by the lack of high-quality interventional evidence available; approximately half of the studies were retrospective, and only 14% (n = 4) were RCTs. Owing to heterogenous outcome measures we were unable to assess publication bias formally. However, the inclusion of grey literature may have reduced this bias, as negative outcomes are less likely to be published in academic publications. In addition, several included studies report no benefit suggesting publication bias may be minimal. Over half of included studies did not involve service users in intervention design or delivery, meaning it was difficult to formally assess the effectiveness of involving service users in this process. Additionally, studies often included mixed populations of migrants including economic migrants, refugees, asylum seekers, and undocumented migrants, which makes it difficult to determine the impact on these heterogenous groups.[68] In terms of quality, 59% (n = 17) of included studies were of weak quality, 31% (n = 9) moderate, and only 10% (n = 3) strong. The quality assessment tool used has been shown to have good inter-rater agreement, but may score studies higher than other tools.[69] Almost half of the studies identified were from the US and predominantly conducted amongst Latina migrants which limits the generalisability of the findings. Thus, the findings should be interpreted with caution and the impact of the country of implementation as well as the background of the migrant women involved should be considered. Both are key mediators of effectiveness, particularly with the complex interventions we identified. We only included quantitative studies which limits our understanding of why interventions were successful or not, and their acceptability to participants. The use of vote counting based on raw numbers to assess benefit should be interpreted with caution as a small numerical benefit in an outcome may have little clinical significance.

Given that most included studies were of poor quality and that sensitivity analysis restricting to interventional studies only did not demonstrate any effect on the main outcomes of interest, we have chosen not to present conclusions. Only half of studies involved service users in intervention design or planning, despite increasing evidence to suggest that interventions created with or involving service users are more effective and more acceptable to patients.[70] Overall, there is a need for further research exploring the effectiveness of public health and policy interventions in this field, as well as the effectiveness of interventions offering extended postpartum care, infant feeding support, mental health support, and doula services. The evaluation of all interventions should include an assessment of the impact on maternal mental and physical health. All efforts to improve care and public health or policy interventions must place migrant women at the centre of planning, delivery, and evaluation to ensure evidence is effectively translated into practice.

Contributors

KS, SE, KO, MA, RA, GF, WH, SL, RA, MK, FS contributed to the conception of the review. KS, SE, KO, MA, RA, GF, WH, SL, RA, MK, FS contributed to the methods. KS, SE, GF, KO, MA, RA, NSC, HRJ, MM, MMC contributed to the data curation and verification. KS and RA contributed to the statistical analysis. RA, MK, FS, SL provided supervision. All authors contributed to the data interpretation and review and editing. All authors had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Data sharing statement

All data relating to this publication, including full search strategies, will be made publicly available in the appendices on publication and can be used without permission from the authors.

Declaration of interests

SL is a fellow of Pathway, a UK charity which provides and advocates for health interventions for inclusion health populations, including migrants. The authors declared no conflicts of interest.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.eclinm.2024.102938.

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