Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Learning from Maternal Mortality Confidential Enquiries: Sociodemographic Determinants Relevant to Equitable Guideline Development

Anangsha Kumar
anangsha.kumar@kcl.ac.uk
King's College London
Anita Banerjee
King's College London
Megan Hall
King's College London
Karen Joash
Imperial College NHS Trust
Anastasija Arechvo
King's College London
Kypros Nicolaides
King's College London
Holly Lovell
King's College London
Connie Rose Gabor
Basildon University Hospital, Mid and South Essex NHS Foundation Trust
Sasha Nayar
King's College London
Lisa Story
King's College London
Srividhya Sankaran
Guy's and St Thomas' Hospital NHS Foundation Trust

Research Article

Keywords: confidential enquiry, health equity, checklist, inclusivity, healthcare inequalities, diversity

Posted Date: November 5th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-11006982/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License. Read Full License

Additional Declarations: No competing interests reported.

Abstract

Background

Confidential enquiry systems are central to maternal mortality surveillance, transforming individual case reviews into actionable lessons to improve clinical practice. While some high-income countries have established national confidential enquiry systems, no comparative synthesis has examined the sociodemographic determinants of maternal mortality reported across these systems. This study reviewed confidential enquiry reports from high-income populations to assess variation in reporting of sociodemographic determinants associated with maternal mortality and to develop country-specific equity checklists to support guideline development.

Methods:

High-income populations were identified using the World Bank Group classification (July 2025). Each country was searched using a structured approach for the most recent publicly available Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK (MBRRACE) equivalent English-language report. Surveillance characteristics and sociodemographic determinants associated with maternal mortality were extracted and country-specific equity checklists were subsequently developed from determinants identified in each report.

Results

Eighty-five high-income populations were identified. Sixteen had publicly available national confidential enquiry reports in English. Country-specific equity checklists were developed for each of these 16-world bank listed populations. The included surveillance reports demonstrated substantial variation in maturity, case ascertainment, review methodology and scope. Reporting of sociodemographic determinants also varied considerably between countries, with distinct thematic emphases amongst different countries.

Conclusion

The observed variation in reported sociodemographic determinants supports development of country-specific equity checklists, enabling more contextually relevant consideration of equity during the development and evaluation of women's health guidelines.

Background

Confidential enquiry systems are a cornerstone of maternal mortality surveillance in high-income countries. Unlike routine vital statistics, confidential enquiries use anonymised, no-blame reviews to systematically collect detailed clinical, social, and system-level information surrounding each maternal death, enabling the identification of modifiable factors, recurring themes, and system-level contributors that inform quality improvement and service redesign (1, 2). MBRRACE-UK, one of the earliest and most comprehensive confidential enquiry systems, has demonstrated how structured national review can identify modifiable factors contributing to adverse perinatal outcomes (3).

Although these enquiries identify clinical and organisational contributors to maternal deaths, they also demonstrate how sociodemographic circumstances can affect delivery of maternity care (2). MBRRACE highlights how in the UK, maternal mortality among women living in the most deprived areas has been more than twice that among women in the least deprived areas, while marked inequalities have also persisted among women from Black and Asian ethnic backgrounds (3). Other recurring concerns include delayed access to care among migrant women, communication difficulties where professional interpretation is unavailable, geographical barriers to specialist services, and failure to make appropriate adjustments for women with disabilities or complex social circumstances (3). Evidence from European high-income settings has similarly identified migration as important contributor to adverse maternal outcomes (4).

Leading health organisations such as World Health Organisation (WHO), Centers for Disease Control and Prevention and National Institute of Health emphasise the importance of embedding equity into clinical decision-making processes (5). While clinical guidelines play a central role in standardising care, the consideration of equity within their recommendations remains under investigated (6). A review of WHO guidelines from 2014 to 2020 found that two-thirds of their recommendations lacked evidence for consideration of health equity (7) with half of COVID-19 recommendations lacking equity-informed evidence (8). Therefore, despite its importance, equity continues to be overlooked in clinical guidance thereby widening disparities further (9).

A potential cause for this could be lack of standardised frameworks. Clinical recommendations, when informed by socio-demographic insights highlighted in confidential enquiry reports, may ensure that guidance is tailored to populations of varied ethnic backgrounds, socioeconomic status, and language. National reviews have repeatedly shown that when guidelines fail to account for equity; recommendations can inadvertently perpetuate disparities in maternal outcomes (10). Therefore, embedding equity throughout guideline development and tailoring interventions to the diverse needs, helps address the structural inequities potentially overcoming avoidable harm. This study was therefore aimed to review available maternal mortality confidential enquiry reports from high-income populations with established reporting systems and surveillance structures, evaluate their surveillance characteristics, assess variation in their reporting of sociodemographic determinants associated with maternal mortality and finally develop country-specific equity checklists to serve as a reference for future guideline development.

Methods

Search Strategy and Screening criteria:

A list of high-income populations was obtained from the World Bank Group income classification as of July 2025. Each country was then searched by AK to identify the most recent publicly available national confidential enquiry report, maternal mortality review, or equivalent publication with case-based qualitative analysis examining maternal and/or perinatal mortality similar to MBRRACE-UK. The search was conducted between July and October 2025 using Google searches. Search terms combined the country name with terms including “maternal mortality,” “maternal death,” “confidential enquiry,” “maternal mortality review,” “maternal death audit,” “obstetric surveillance,” “maternal mortality surveillance,” and “MBRRACE.” Searches were conducted in English and only reports available in English were eligible for inclusion. This is because the study aimed to develop reproducible bespoke checklists based on qualitative review of enquiry reports. Translation of reports from multiple languages was beyond the scope of the study and may have introduced inconsistencies in the interpretation of nuanced sociodemographic findings. Publications arising from multinational obstetric surveillance collaborations, including INOSS-affiliated systems, were also eligible where they provided relevant country-level case review or surveillance data (11). Their inclusion was therefore justified as these reports often complement/substitute for formal national mortality audits in high-income settings (12). Global summaries, statistical databases, routine mortality estimates, and publications without case-based qualitative review were excluded.

Data extraction:

Reports and associated methodological publications were screened against the eligibility criteria. For included reports, data were extracted using a framework encompassing surveillance duration and reporting frequency, geographical and population coverage, case ascertainment, review process and scope of assessment alongside the sociodemographic determinants of maternal mortality considered in each report. This framework was mutually agreed by the members of the research team. Screening and initial data extraction was undertaken by one reviewer (AK) and subsequently checked by two members of the author group (CG, SN). Any discrepancies were resolved through discussion and consensus with another reviewer (SS).

Country Specific Bespoke Checklist development:

Sociodemographic determinants identified within each eligible report were collated by country and harmonised where different terminology described the same underlying concept (Supplementary Table 1). Each distinct determinant was translated into a checklist item and organised within broader thematic domains in a composite framework (Table 2 - first column) to provide structured prompts for consideration during guideline development. No weighting or hierarchy was applied; inclusion reflected reporting within the source confidential enquiry rather than the relative importance of a determinant. The resulting checklists (Supplementary Table 1 - last column) were considered descriptive, evidence-informed frameworks rather than validated measurement instruments.

Comparative analysis of sociodemographic determinants:

A descriptive comparative analysis was undertaken to examine variation in the reporting of sociodemographic determinants between countries. A composite framework of equity determinants as described above was developed by collating all unique sociodemographic determinants identified across the included reports (Table 2). Each country was subsequently mapped against this framework using a binary presence-absence matrix, and the results were visualised as a heat map to compare reporting patterns. The matrix was used solely to visualise whether each determinant was explicitly reported within each source and was not used to generate a numerical score, ranking

or assessment of surveillance quality. Countries were then grouped according to the predominant themes (Fig. 1). These thematic groupings were developed inductively from the extracted determinants and were intended to identify similarities in various national reporting priorities (Table 3).

Results

Screening of the World Bank Group database identified 85 countries and territories classified as high-income. The full list of high-income countries, their MBRRACE equivalent confidential enquiry reports included in the analysis, and the equity determinants discussed in the respective reports is provided in Supplementary Table 1. 16 had an eligible English-language confidential enquiry report or equivalent case-based maternal mortality publication and were included in the comparative analysis. These represented a heterogeneous group of surveillance approaches, including established national confidential enquiry programmes, national maternal mortality surveillance or audit systems, and country-level descriptive data reported through multinational obstetric surveillance collaborations. France (13), Italy (14), and the Netherlands (15), had established national surveillance programmes whose reports were produced through, or associated with, national obstetric surveillance systems, whereas Denmark, Finland, Iceland, Norway and Sweden (16) were represented by a multinational Nordic report. The Channel Islands and Saint Martin (French part) were retained as separate World Bank high-income populations but were mapped to the UK and French confidential enquiry reports, respectively, because they did not have independent eligible reports. Google searches of publicly available national sources did not identify additional maternal mortality confidential enquiry reports equivalent to MBRRACE-UK beyond those included in this review. However, reports published exclusively in local languages or not readily accessible through web searches may have been missed.

Characteristics of maternal mortality confidential enquiry reports:

The characteristics of the included maternal mortality surveillance systems are summarised in Table 1. Considerable variation was observed in the maturity, population/geographic coverage, case ascertainment, review processes and scope of national confidential enquiry systems. Established programmes from the UK, France, New Zealand, Netherlands, Australia and Japan have operated for more than two decades and undertake multidisciplinary confidential reviews using comprehensive national case ascertainment methods. In contrast, Italy, Slovakia and the Nordic countries have only recently established enhanced surveillance systems incorporating confidential review. Additionally, the Nordic countries focused specifically on maternal deaths from sepsis rather than comprehensive national enquiries.

Table 1
CHARACTERISTICS OF CONFIDENTIAL ENQUIRY REPORTS INCLUDED IN THE STUDY

Countries	Reports	Duration/ Frequency	Coverage	Ascertainment	Review	Scope
Australia	Australia's Mother and Babies by Australian Institute of Health and Welfare	Covers deaths from 1991 and first report published in 1994. National Maternal Mortality Data Collection (NMMDC) collected annually, while *Australia's Mothers and Babies* is updated several times each year.	National with limited aggregated maternal-death data from Western Australia	Case identification methods not publicly available.	Healthcare professionals	All recognised deaths during pregnancy and within 42 days of delivery.
Channel Islands	MBRRACE-UK	Covers maternal deaths from 1952 with first report published in 1954. Published annually, with causes of death reviewed through a three-year topic cycle.	National including Republic of Ireland	Notifications and detailed information for all eligible deaths gathered via hospital, GP and ambulance records, post-mortem reports, local clinician reports and local investigation findings.	Each death is assessed in four core areas obstetrics, pathology, midwifery and anaesthesia with additional specialist review where required.	All women who die during pregnancy or within one year after the end of pregnancy, irrespective of pregnancy outcome, place or circumstances of death.
Denmark	Maternal deaths from sepsis in the Nordic countries during 2005–2021: A descriptive study in collaboration with *NOSS*	Reporting maternal deaths from sepsis occurring 2005–2017 in Denmark, Finland, Iceland, Norway and Sweden with first publication in 2025. It is not a recurring national report series so far but included in the study because of being an INOSS country.	Multinational including Denmark, Finland, Iceland, Norway and Sweden.	National audit groups reviewed each maternal death from sepsis using hospital records.	National audit groups assessed the quality of management for every maternal death from sepsis.	Only maternal deaths from sepsis (direct and indirect) were analysed in this publication, although the underlying audit groups reviewed all maternal deaths.
Finland	Maternal deaths from sepsis in the Nordic countries during 2005–2021: A	Same as Denmark	Same as Denmark	Same as Denmark	Same as Denmark	Same as Denmark

Footnote: Channel Islands and Saint Martin (French part) were retained as separate World Bank high-income populations but were assigned the United Kingdom and French confidential enquiry reports, respectively, as they do not have independent maternal mortality confidential enquiry systems

Countries	Reports	Duration/ Frequency	Coverage	Ascertainment	Review	Scope
	descriptive study in collaboration with *NOSS*					
France	Maternal Deaths in France: Better Understanding for Better Prevention: 6th Report of the National Confidential enquiry on Maternal Mortality 2013–2015 in collaboration with FROSS	First report published in 2006 covering deaths from 1999. Reports are produced every three years.	National	Multisource active ascertainment: death certificates, national linkage of birth and death records, the national hospital discharge database (PMSI), plus direct reporting through Perinatal Health Networks	A pair of clinician assessors gathers detailed case information; files are then anonymised and reviewed collectively by the National Committee of Experts on Maternal Mortality (CNEMM), which includes obstetrician-gynaecologists, anaesthetist-intensivists, midwives and epidemiologists	All pregnancy-associated deaths occurring during pregnancy or up to 1 year after the end of pregnancy, irrespective of cause or pregnancy outcome.
Iceland	Maternal deaths from sepsis in the Nordic countries during 2005–2021: A descriptive study in collaboration with *NOSS*	Reporting maternal deaths from sepsis occurring 2005–2017 in Denmark, Finland, Iceland, Norway and Sweden with first publication in 2025. It is not a recurring national report series so far.	Multinational Nordic study including Denmark, Finland, Iceland, Norway and Sweden	National audit groups reviewed each maternal death from sepsis using hospital records	National audit groups assessed the quality of management for every maternal death from sepsis	Only maternal deaths from sepsis (direct and indirect) were analysed in this publication, although the underlying audit groups reviewed all maternal deaths.
Ireland	Confidential Maternal Death Enquiry in Ireland Report for 2019–2021 October 2023	Covers maternal deaths from 1952 with first report published in 1954. It is published annually, with causes of death reviewed through a three-year topic cycle	National including Republic of Ireland	Notifications and detailed information for all eligible deaths including hospital, GP and ambulance records, post-mortem reports, local clinician reports and local investigation findings.	Each death is assessed in four core areas obstetrics, pathology, midwifery and anaesthesia with additional specialist review where required	All women who die during pregnancy or within one year after the end of pregnancy, irrespective of pregnancy outcome, place or circumstances of death
Italy	Maternal Mortality in Italy estimated by the Italian Obstetric Surveillance System – 2024 in collaboration with ItOSS	First report in 2019 with retrospective analysis from 2006	National	Record linkage between the national/regional Death Registry and Hospital Discharge Databases, supplemented by prospective incident reporting and confidential enquiries through active surveillance	Multidisciplinary committee with details of members not provided	All maternal deaths occurring during pregnancy or within 42 days of the end of pregnancy, with late maternal deaths (> 42 days to 1 year after the end of pregnancy) also reviewed.

Footnote: Channel Islands and Saint Martin (French part) were retained as separate World Bank high-income populations but were assigned the United Kingdom and French confidential enquiry reports, respectively, as they do not have independent maternal mortality confidential enquiry systems

Countries	Reports	Duration/ Frequency	Coverage	Ascertainment	Review	Scope
Netherlands	Confidential enquiry into maternal deaths in the Netherlands, 2006–2018 by Audit Committee on Maternal Mortality and Morbidity in collaboration with NethOSS	First report in 1998 covering deaths from 1983 with irregular frequency for subsequent reports	Nationwide	Deaths identified by Audit Committee on Maternal Mortality and Morbidity (AMSM) which are cross-checked by Statistics Netherland. Since 2016, NethOSS has provided secure national electronic reporting, with monthly prompts to hospital contacts.	Audit Committee on Maternal Mortality and Morbidity (AMSM) by medical specialists, midwives and GPs. Cases were also cross-checked against Statistics Netherlands	Maternal deaths during pregnancy or within 42 days postpartum are included, with late maternal deaths up to 1 year postpartum
New Zealand	16th Annual Report of the Perinatal and Maternal Mortality Review Committee	First report in 2007 covering deaths from 2005 with detailed reporting every 3 years	National. New Zealand -wise	National multisource case identification through clinical/local notification and national mortality data, centrally collated by PMMRC.	Multidisciplinary panel comprising obstetricians and gynaecologists, midwives, anaesthetists, an obstetric physician/haematologist, clinical epidemiologists and other specialists	Includes all direct and indirect maternal deaths occurring during pregnancy or within 42 days of the end of pregnancy. Coincidental deaths are identified separately but excluded from maternal mortality analyses. Late maternal deaths (43 days to < 1 year postpartum) are reported separately and may be reviewed where identified
Norway	Maternal deaths from sepsis in the Nordic countries during 2005–2021: A descriptive study in collaboration with *NOSS*	Reporting maternal deaths from sepsis occurring 2005–2017 in Denmark, Finland, Iceland, Norway and Sweden with first publication in 2025. It is not a recurring national report series so far.	Multinational Nordic study including Denmark, Finland, Iceland, Norway and Sweden	National audit groups reviewed each maternal death from sepsis using hospital records	National audit groups assessed the quality of management for every maternal death from sepsis	Only maternal deaths from sepsis (direct and indirect) were analysed in this publication, although the underlying audit groups reviewed all maternal deaths.
Slovak Republic	Maternal Mortality in Slovakia in the Years 2007–2023 by Slovak Gynaecology	Surveillance system introduced in 2007 with report published in 2025.	National, covering Slovakia	Cases were identified from maternity-department death reports, the Statistical Office of the Slovak Republic,	Review panel not publicly available	Maternal deaths during pregnancy, childbirth or within 42 days after termination of

Footnote: Channel Islands and Saint Martin (French part) were retained as separate World Bank high-income populations but were assigned the United Kingdom and French confidential enquiry reports, respectively, as they do not have independent maternal mortality confidential enquiry systems

Countries	Reports	Duration/ Frequency	Coverage	Ascertainment	Review	Scope
	and Obstetrics Society	Retrospective population-based analysis, not as a regularly published confidential-enquiry series like MBRRACE-UK		the SGOS database, severe acute maternal morbidity reports, active searches of non-obstetric hospital departments and mass-media sources		pregnancy, including direct, indirect, coincidental deaths, suicides and deaths of unknown cause
St Martin (French part)	Maternal Deaths in France: Better Understanding for Better Prevention: 6th Report of the National Confidential enquiry on Maternal Mortality 2013–2015 in collaboration with FROSS	First report published in 2006 covering deaths from 1999 with reports are produced every three years	National	Multisource active ascertainment: death certificates, national linkage of birth and death records, the national hospital discharge database (PMSI), plus direct reporting through Perinatal Health Networks	A pair of clinician assessors gathers detailed case information; files are then anonymised and reviewed collectively by the National Committee of Experts on Maternal Mortality (CNEMM), which includes obstetrician-gynaecologists, anaesthetist-intensivists, midwives and epidemiologists	All pregnancy-associated deaths occurring during pregnancy or up to 1 year after the end of pregnancy, irrespective of cause or pregnancy outcome.
Sweden	Maternal deaths from sepsis in the Nordic countries during 2005–2021: A descriptive study in collaboration with *NOSS*	Reporting maternal deaths from sepsis occurring 2005–2017 in Denmark, Finland, Iceland, Norway and Sweden with first publication in 2025. It is not a recurring national report series so far.	Multinational Nordic study including Denmark, Finland, Iceland, Norway and Sweden	National audit groups reviewed each maternal death from sepsis using hospital records	National audit groups assessed the quality of management for every maternal death from sepsis	Only maternal deaths from sepsis (direct and indirect) were analysed in this publication, although the underlying audit groups reviewed all maternal deaths.
United Kingdom	MBRRACE-UK 2025	Covers maternal deaths from 1952 with first report published in 1954. It is published annually, with causes of death reviewed through a three-year topic cycle	National including Republic of Ireland	Notifications and detailed information for all eligible deaths including hospital, GP and ambulance records, post-mortem reports, local clinician reports and local investigation findings.	Each death is assessed in four core areas obstetrics, pathology, midwifery and anaesthesia with additional specialist review where required	All women who die during pregnancy or within one year after the end of pregnancy, irrespective of pregnancy outcome, place or circumstances of death

Footnote: Channel Islands and Saint Martin (French part) were retained as separate World Bank high-income populations but were assigned the United Kingdom and French confidential enquiry reports, respectively, as they do not have independent maternal mortality confidential enquiry systems

Countries	Reports	Duration/ Frequency	Coverage	Ascertainment	Review	Scope
Japan	Proposals for improving maternal safety (2023 edition): Insights from the analysis of maternal deaths in Japan – 2025	Started in 2011 covering deaths from 2010	National	National clinician/institutional reporting	Multidisciplinary case review. The programme established a maternal-death case review/evaluation committee in 2010 comprising 24 professionals from multiple disciplines.	All maternal deaths occurring during pregnancy or within one year after delivery

Footnote: Channel Islands and Saint Martin (French part) were retained as separate World Bank high-income populations but were assigned the United Kingdom and French confidential enquiry reports, respectively, as they do not have independent maternal mortality confidential enquiry systems

Heat map of sociodemographic determinants:

Across the included enquiry reports, 21 unique sociodemographic determinants were identified and synthesised into a composite framework. To facilitate comparison across countries, these extracted determinants for each high-income population was visualised as a heat map (Table 2). Considerable variation was observed in the determinants reported by the enquiry systems. Some determinants, including maternal age, were consistently reported across most countries, whereas others were unique to individual surveillance systems. The UK reported the broadest range of sociodemographic determinants. In contrast, Japan uniquely identified family background, childcare circumstances, social isolation and financial problems, while Australia and New Zealand placed greater emphasis on indigenous status and geographical factors in the context of maternal and perinatal mortality. The Nordic International Network of Obstetric Survey Systems (INOSS) reports demonstrated a more consistent reporting pattern, primarily focusing on maternal age, body mass index, country of birth, education, vulnerability factors, marital status, tobacco use and level of antenatal care.

TABLE 2: HEATMAP OF SOCIO-DEMOGRAPHIC DETERMINANTS ACROSS 16 STUDIED WORLD BANK LISTED POPULATIONS

Sociodemographic Determinant	Australia	Channel Islands	France	Ireland	Italy	Japan	Netherlands	New Zealand	St Martin (French Part)	UK	Denmark	Finland	Iceland	Norway	Slovak Republic	Sweden
Maternal Age	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+
Ethnicity/Race		+		+			+	+		+						
Indigenous Status	+															
Country of Birth/Nationality			+		+				+		+	+	+	+		+
Migration Status		+								+						
Language Barrier		+								+						
Socio-economic Status		+								+						
Place of Residence/Geographic Location	+	+	+					+	+	+						
Deprivation/ Vulnerability		+	+					+	+	+	+	+	+	+		+
Education											+	+	+	+		+
Occupation		+								+						
Smoking/Tobacco	+			+			+	+			+	+	+	+		+
Body Mass Index		+		+						+	+	+	+	+		+
Obesity			+				+		+							
Disability		+								+						
Family Background/Relationship						+										
Social Isolation/Lack of Social Support						+										
Financial problems						+										
Childcare situation/Child's Health						+										
Marital Status											+	+	+	+		+
Level of Antenatal Care											+	+	+	+		+

Footnote: Channel Islands and Saint Martin (French part) were retained as separate World Bank high-income populations but were assigned the United Kingdom and French confidential enquiry reports, respectively, as they do not have independent maternal mortality confidential enquiry systems.

Thematic patterns across national confidential enquiry reports:

Distinct thematic patterns in the reporting of sociodemographic determinants emerged across national confidential enquiry systems, reflecting differing national priorities and contexts. UK including Channel Islands demonstrated a strong emphasis on migration- and ethnicity-related determinants. Australia, New Zealand, France including St Martin's predominantly highlighted geographical determinants and vulnerability, reporting indigenous status, place of residence and deprivation as important contributors to maternal mortality. Japan differed from all other countries by focusing on family and social support factors. Lifestyle-related determinants were most consistently reported by Denmark, Finland, Iceland, Norway, Sweden, Ireland and Netherlands (Fig. 1). To provide a higher-level conceptual overview, the identified determinants were grouped into eight overarching themes (Table 3).

TABLE 3: OVERARCHING THEMES BASED ON DETERMINANTS CONSIDERED

Theme	Determinants
Demographic & Life-course	Age
Race, Ethnicity, Culture & Migration	Ethnicity/Race, Indigenous status, Country of birth/Nationality, Migration status, Language barrier
Place of Residence	Geographic location, rurality
Socioeconomic Position	Socioeconomic status, Education, Occupation, Deprivation/Vulnerability
Social Capital & Family Circumstances	Marital status, Family background/relationship, social isolation, financial problems, Childcare situation
Disability	Disability
Clinical/Anthropometric Risk Factors	Smoking/Tobacco, BMI/Obesity
Health System & Care Process	Level of antenatal care

Discussion

This review of international practices demonstrated that most high-income populations still lack an official regular and standardised confidential enquiry system capable of providing case-based learning from maternal and perinatal deaths. Only a limited number had official, MBRRACE equivalent English-language reports (Supplementary Table 1). Although members of INOSS, some countries had not yet published a formal maternal mortality report in English, highlighting ongoing gaps in surveillance transparency and international accessibility. Despite advances in maternal health surveillance, most countries continue to rely on statistical reporting or partial surveillance systems rather than systematic confidential enquiries capable of generating case-based learning (17–19). Even in high-income populations, implementation remains uneven, with many systems remaining descriptive rather than analytical and lacking comprehensive national review processes (20–24). Although several countries, including Denmark and Canada, have expanded structured maternal mortality surveillance, and the United States has established state-based Maternal Mortality Review Committees, approaches remain heterogeneous in terms of availability, scope, maturity and national coordination (25–28). Consequently, opportunities for consistent international learning and prevention remain limited.

Among countries with published reports, substantial variation was observed in both the breadth and focus of reported sociodemographic determinants. These findings demonstrate that such determinants are shaped by national demographic characteristics, healthcare systems and population-specific maternal health challenges. Additionally, the observed variation in this study not only reflected the differences in population and healthcare characteristics but also in the maturity and methodology of national surveillance systems. Long-established confidential enquiry programmes, such as MBRRACE-UK, employ comprehensive national case ascertainment and multidisciplinary confidential review of all maternal deaths. In contrast, other systems rely on cause-specific reviews, which may inherently identify and report a narrower range of sociodemographic determinants. Therefore, differences in reported equity domains should be interpreted within the context of the underlying surveillance framework rather than as true differences in the importance of individual determinants.

Literature consistently shows that marginalised populations including racial and ethnic minorities, migrants, individuals with lower socioeconomic status, and those with limited access to care experience disproportionately high rates of severe maternal morbidity and mortality (29). While clinical guidelines aim to standardise care and reduce disparities, previous study by our research team revealed a paucity of equity and diversity considerations within such guideline development (9). Building on this, the research group previously developed a national checklist for the UK for screening clinical guidelines to assess their integration of health equity. However, it became evident that such a checklist although suitable for the UK, may have limited relevance for other countries and may be more difficult to replicate in countries with differently organised healthcare systems, where contextual determinants of maternal outcomes differ substantially. For example, factors such as proximity to healthcare facilities, doctor-to-population ratios, and systemic barriers to accessing advanced care may vary between settings (30, 31). Even among high-income countries such as the United States and Australia, the underlying challenges might differ markedly from those in the United Kingdom (32). This further supports the need for not only a reference equity framework but country-specific equity assessment tools.

Strengths and Limitations:

This study has several strengths. It is the first in the literature to highlight this discrepancy and find a solution. Its comparative approach allows the development of bespoke equity assessment tools specific to each country. This cross-national perspective enables a nuanced understanding of how sociodemographic determinants vary across different global health systems. It demonstrates the checklists' potential value as a descriptive guide for future guideline development in addressing inequity.

However, the study also has its limitations. First, although the country-specific checklists represent evidence-informed frameworks derived from national confidential enquiry reports, but they have not undergone formal validation. Consequently, their reliability, usability and ability to identify equity gaps within clinical guidelines remain unknown. Second, the study was limited to publicly available English-language reports from high-income countries and may therefore have excluded relevant confidential enquiry systems reported in other languages or unpublished national reports. Finally, patient and public involvement was not incorporated into the development of the checklists.

Recommendations:

Future work should evaluate the checklists through expert consensus and by prospective application to respective national women's health guidelines to determine whether they identify meaningful differences. Assessment of their inter-rater reliability when applied by independent reviewers and evaluation of their construct validity will also be important before widespread implementation. Following this, routine use of these equity screening checklists should be incorporated into guideline appraisal and supported by professional organisations. Finally, the framework should be refined through co-production with women and families with lived experience to ensure that it captures patient-identified priorities and inequities in maternity care, particularly in light of repeated evidence from UK confidential enquiries and the Amos Review that women's voices are often overlooked.

Conclusion

This study highlights substantial variation in the reporting of sociodemographic determinants of maternal mortality across high-income populations. By analysing national reports, we identified key sociodemographic factors influencing maternal outcomes and used them to develop bespoke equity templates. This provides a structured guidance to evaluate guidelines within differing healthcare contexts. Implementation and validation of these checklists will be essential next steps to ensure that future guideline development meaningfully addresses the underlying drivers of inequity in maternal health.

Declarations

Author Contributions:

Anangsha Kumar - Conceptualisation, Data curation, Validation, Methodology, Writing: original draft, Writing: review and editing, Anita Banerjee - Conceptualisation, Writing: review and editing, Megan Hall - Writing: review and editing, Karen Joash - Conceptualisation, Writing: review and editing, Anastasija Arechvo - Writing: review and editing, Kypros Nicolaides - Writing: review and editing, Holly Lovell - Methodology, Writing: review and editing, Connie Rose Gabor - Writing: review and editing, Sasha Nayar - Methodology, Lisa Story - Supervision, Conceptualisation, Methodology, Writing: review and editing, Srividhya Sankaran - Supervision, Conceptualisation, Methodology, Writing: review and editing

Dr Lisa Story and Dr Srividhya Sankaran jointly supervised this work.

Funding - Dr Anangsha Kumar is funded by the Fetal Medicine Foundation. Holly Lovell is funded by an NIHR Doctoral Clinical Academic Fellowship [NIHR302860].

Informed Consent Statement: Not applicable.

Conflicts of Interest: The authors declare no conflicts of interest.

Ethics Approval: Ethical approval was not required for this study as it involved analysis of publicly available, previously published reports and did not involve human participants, identifiable individual-level data, or primary data collection. Accordingly, the Declaration of Helsinki was not applicable to this study.

References

1. Lewis G. Beyond the numbers: reviewing maternal deaths and complications to make pregnancy safer. Br Med Bull. 2003;67:27–37.
2. Cantwell R, Clutton-Brock T, Cooper G, Dawson A, Drife J, Garrod D, et al. Saving Mothers' Lives: Reviewing maternal deaths to make motherhood safer: 2006–2008. The Eighth Report of the Confidential Enquiries into Maternal Deaths in the United Kingdom. BJOG. 2011;118(Suppl 1):1–203.
3. Allison Felker RP, Rohit Kotnis S, Kenyon M, Knight, editors. Saving Lives, Improving Mothers' Care - Lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2020-22. 2024 October, 2024.
4. Esscher A, Binder-Finnema P, Bodker B, Hogberg U, Mulic-Lutvica A, Essen B. Suboptimal care and maternal mortality among foreign-born women in Sweden: maternal death audit with application of the 'migration three delays' model. BMC Pregnancy Childbirth. 2014;14:141.
5. Dewidar O, Sayfi S, Pardo JP, Welch V, Wright GC, Akl EA et al. Enhancing health equity considerations in guidelines: health equity extension of the GIN-McMaster Guideline Development Checklist. eClinicalMedicine. 2025;82.
6. Guerra-Farfan E, Garcia-Sanchez Y, Jornet-Gibert M, Nunez JH, Balaguer-Castro M, Madden K. Clinical practice guidelines: The good, the bad, and the ugly. Injury. 2023;54(Suppl 3):S26–9.
7. Dewidar O, Tsang P, Leon-Garcia M, Mathew C, Antequera A, Baldeh T, et al. Over half of the WHO guidelines published from 2014 to 2019 explicitly considered health equity issues: a cross-sectional survey. J Clin Epidemiol. 2020;127:125–33.
8. Dewidar O, Bondok M, Abdelrazeq L, Aliyeva K, Solo K, Welch V, et al. Equity issues rarely addressed in the development of COVID-19 formal recommendations and good practice statements: a cross-sectional study. J Clin Epidemiol. 2023;161:116–26.
9. Kumar A, Cocking A, Hall M, Morris J, Sankaran S, Lovell H, et al. Assessment of Grades of Recommendations and Applicability of Royal College of Obstetricians and Gynaecologists Green-Top Guidelines: A Cross-Sectional Study. BJOG: Int J Obstet Gynecol. 2026;133(9):1771–6.
10. Allison Felker RP, Rohit Kotnis S, Kenyon M Knight, on behalf of MBRRACE-UK, editors. Saving Lives, Improving Mothers' Care Compiled Report - Lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2020-22.: Oxford: National Perinatal Epidemiology Unit, University of Oxford 2024.; 2024 October,2024.
11. Krištúfková A, Borovský M, Daniš J, Adamec A, Vargová M, Korbeľ M. The International Network of Obstetric Survey System. Ceska Gynekol. 2020;85(2):139–43.
12. Knight M. The International Network of Obstetric Survey Systems (INOSS): benefits of multi-country studies of severe and uncommon maternal morbidities. Acta Obstet Gynecol Scand. 2014;93(2):127–31.
13. CRESS-UMR1153 ISPF. Maternal deaths in France: better understanding for better prevention — 6th report of the National Confidential Enquiry on Maternal Mortality (ENCMM) 2013–2015. Paris 2022.
14. Maraschini A, Mandolini D, Lega I, D'Aloja P, Corsi Decenti E, Baglio G, et al. Maternal mortality in Italy estimated by the Italian Obstetric Surveillance System. Sci Rep. 2024;14(1):31640.
15. Kallianidis AF, Schutte JM, Schuringa LEM, Beenakkers ICM, Bloemenkamp KWM, Braams-Lisman BAM, et al. Confidential enquiry into maternal deaths in the Netherlands, 2006–2018. Acta Obstet Gynecol Scand. 2022;101(4):441–9.
16. Kvalvik SA, Amark H, Helmig RB, Gissler M, Nyflot LT, Skrede S, et al. Maternal deaths from sepsis in the Nordic countries during 2005–2021: A descriptive study. Acta Obstet Gynecol Scand. 2025;104(9):1783–92.
17. Lau G. Are maternal deaths on the ascent in Singapore? A review of maternal mortality as reflected by coronial casework from 1990 to 1999. Ann Acad Med Singap. 2002;31(3):261–75.
18. Poland S. Indicator 3.1.1 – Maternal mortality ratio (maternal deaths per 100,000 live births) Warsaw: Statistics Poland; 2024 [Available from: https://sdg.gov.pl/en/statistics_glob/3-1-1/
19. Organization WH. Countries – WHO Data 2025 [Available from: https://data.who.int/countries/
20. Zaloum SF, Callaghan J, Goepfrich A, Dudenhausen J, Paulson L, Hellmeyer L, et al. Limitations in the recording of maternal mortality in Germany: An analysis of statistical challenges. J Health Monit. 2025;10(3):e13382.
21. Aflaki K, Ray J. How other countries can improve Canada's maternal mortality statistics. Obstetric Med. 2023;16.
22. Teiti I, Aubry M, Fernandes-Pellerin S, Patin E, Madec Y, Boucheron P, et al. Unravelling the determinants of human health in French Polynesia: the MATAEA project. Front Epidemiol. 2023;3:1201038.
23. Vigneron E. [Geographic aspects of mortality in French Polynesia]. Soc Sci Med. 1993;36(10):1339–48.
24. Callaghan J, Dudenhausen J, Paulson L, Hellmeyer L, Vetter K, Ziegert M et al. Analysis of maternal mortality in Berlin, Germany – discrepancy between reported maternal mortality and comprehensive death certificate exploration. J Perinat Med. 2023;52.

25. Bodker B, Hvidman L, Weber T, Moller M, Aarre A, Nielsen KM, et al. Maternal deaths in Denmark 2002–2006. Acta Obstet Gynecol Scand. 2009;88(5):556–62.
26. Cook JL, Sprague AE. Measuring Maternal Mortality in Canada: An Update on the Establishment of a Confidential Enquiry System for Preventing Maternal Deaths #savingmoms #savingbabies. J Obstet Gynaecol Can. 2019;41(12):1768–71.
27. About Maternal Mortality Review Committees Atlanta. CDC: Centers for Disease Control and Prevention 2024 [.
28. National Vital Statistics System Hyattsville: Centers for Disease Control and Prevention National Center for Health Statistics. 2025 [. Available from: https://www.cdc.gov/nchs/nvss/index.htm
29. Howell EA. Reducing Disparities in Severe Maternal Morbidity and Mortality. Clin Obstet Gynecol. 2018;61(2):387–99.
30. Rolfe MI, Donoghue DA, Longman JM, Pilcher J, Kildea S, Kruske S, et al. The distribution of maternity services across rural and remote Australia: does it reflect population need? BMC Health Serv Res. 2017;17(1):163.
31. Fontenot J, Brigance C, Lucas R, Stoneburner A. Navigating geographical disparities: access to obstetric hospitals in maternity care deserts and across the United States. BMC Pregnancy Childbirth. 2024;24(1):350.
32. Papanicolas I, Berenson RA, Sawaya T, Skopec L. Maternal outcomes and pre, syn, and post-partum care in the united states and five high-income countries: An exploratory comparative qualitative study. Health Policy. 2024;149:105154.
33. Supplementary. Table 1.

Figures

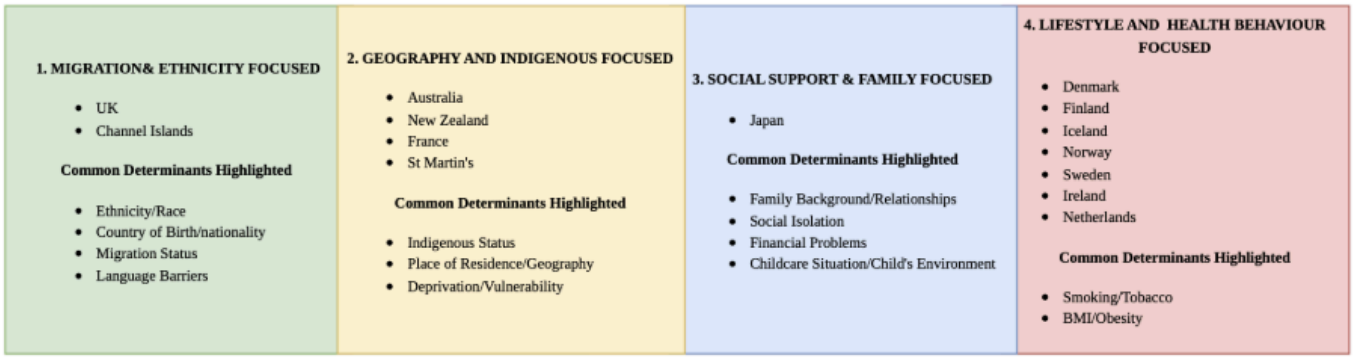


Figure 1

THEMATIC GROUPING OF COUNTRIES BASED ON DOMINANT DETERMINANT FOCUS

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- SupplementaryTable1.docx