What do Prevention of Future Death Reports tell us about maternity care in UK hospitals?

Georgina Cosma[1], Patrick Waterson[1], Thomas G. Jun[1], and Jonathan Back[2]

[1]Loughborough University
[2]Health Services Safety Investigations Body, UK
[1]g.cosma@lboro.ac.uk

1 Introduction

Prevention of Future Death (PFD) reports, issued by coroners following inquests into unexpected deaths, provide valuable cross-organisational perspectives on patient safety issues. These independent judicial assessments often identify system-level failures not apparent through investigations conducted by individual healthcare providers. In 2017, the UK government and NHS had set a goal to reduce stillbirths, newborn deaths, maternal deaths, and newborn brain injuries by 50% by 2025. However, there has been little progress on decreasing maternal mortality rates. In fact, when excluding deaths from COVID-19, the maternal mortality rate between 2010-2012 and 2018-2020 increased by 3% [1]. Despite persistent disparities in maternal mortality—with Black women experiencing rates higher than White women [2]—maternal and neonatal deaths have not been systematically analysed across PFD reports. This study extracts and analyses coroners' reports related to maternal and neonatal healthcare through automated identification and multi-framework thematic analysis. The study builds on our past work on using Natural Language Processing and machine learning methods to extract intelligence from maternity investigation reports using human factors [3], [4], [5].

2 Methods and Data

We developed a specialised web scraping tool to extract PFD reports (in pdf and html format) from the UK Judiciary website using maternal healthcare search terms (Midwifery, Birth, Baby, Maternal, Infant, Obstetrics, Neonatal, Perinatal, Pregnancy, Postnatal, Antenatal, Maternity, Stillbirth, Antepartum, Fetal/Foetal) cross-referenced with judiciary categories. This approach enabled identification of maternal cases that might be classified under various categories. Our analysis examined the complete content of these PFD reports for comprehensive identification of safety concerns and contextual factors. For our analytical framework, we employed three complementary frameworks: (1) The Safety Intelligence Research Framework (SIRch) with sociotechnical categories [3]; (2) Factors focusing on equity dimensions extracted from the "Black maternal health, House of Commons Committee report" [2]; and (3) an extended framework capturing emerging themes including structural inequities and digital access barriers extracted from a separate textual analysis of the PFD reports. We implemented an Enhanced Clinical BERT Analyser utilising the Bio_ClinicalBERT model (a domain-specific language model pretrained on biomedical and clinical text) to conduct semantic analysis across all three frameworks simultaneously. This approach generates contextual embeddings for both document text and thematic keywords, enabling identification of conceptual similarities even when specific terminology varies. Our methodology employs a dual-component scoring system that combines semantic similarity (70% weight) with keyword matching density (30% weight), producing confidence scores classified as High (≥ 0.8), Medium (0.65-0.8), or Low (<0.65). The analyser incorporates contextual window analysis, examining text surrounding keyword matches to enhance semantic relevance, and employs redundancy reduction algorithms to prevent theme duplication while maintaining hierarchical relationships. For each report, we identified relevant themes across all frameworks, documenting cross-framework relationships to identify conceptual overlaps and gaps. This triangulation approach allows comprehensive thematic coverage while revealing framework-specific blindspots in safety concerns identification.
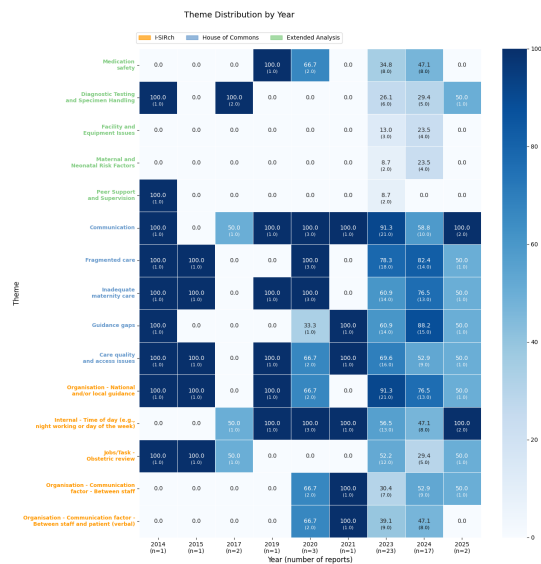
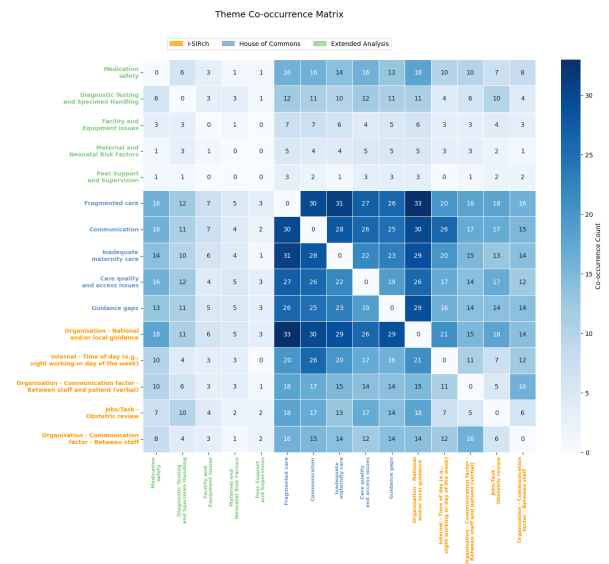Figure 1: Top 15 theme distribution by year

Figure 2: Top 15 theme co-occurrence

Table 1: Top 10 theme comparison. Extended analysis(*), I-SIRch(+), House of Commons report(-)

PFD reports (this study)	% (of 51)	HSIB reports (our previous study)[3]	% (of 188)
Medication safety (*)	78.4%	Organisation-Communication factor	84.6%
Person-Staff(characteristics & performance)(+)	78.4%	Organisation-Teamworking	82.4%
Organisation-Team culture factor (+)	74.5%	Job/task-Assessment investigation testing screening	79.8%
Consent/agency(lack of informed consent, agency over care decisions) (-)	66.7%	Person Patient-Physical characteristics	62.8%
Diagnostic Testing & Specimen Handling (*)	64.7%	Person Staff-Slip or lapse	52.7%
Person - Patient - Record of attendance (+)	62.7%	Organisation-Escalation/referral factor	51.6%
Internal - Physical layout and Environment (+)	56.9%	Organisation-National and local guidance	48.9%
Person - Staff - Decision error (+)	41.2%	Technologies and Tools-Interpretation	47.9%
Peer Support and Supervision (*)	39.2%	Job/task-Obstetric review	47.3%
External - Societal factor (+)	39.2%	Person Staff-Decision error	47.3%

3 Results

This study applied three investigative frameworks to analyse 51 Prevention of Future Deaths (PFD) reports in maternity care. A summary of the top themes is shown in Figs 1-2. Our analysis identified Medication Safety and Person-Staff characteristics as the most frequently occurring themes, each appearing in 78.4% of PFD reports, followed by Organisation-Team culture (74.5%), Consent/Agency (66.7%), and Diagnostic Testing (64.7%). Comparing with our previous study of 188 HSIB reports [3] (Table 1), we found similarities and differences in thematic distributions. HSIB reports frequently featured Organisation-Communication (84.6%), Teamworking (82.4%), and Job/task-Assessment (79.8%). Both reporting systems identified staff decision errors as significant (41.2% in PFD vs. 47.3% in HSIB), suggesting consistent recognition of human judgment factors in maternity incidents. Themes from the UK House of Commons Health and Social Care Committee's 2021 report on Black maternal healthcare and outcomes [2] were common in our analysis, with Consent/Agency ranking fourth (66.7%), followed by Guidance gaps (37.3%), Care quality issues (31.4%), and Communication (29.4%). While we incorporated factors derived from this report on Black maternal health, we could not evaluate their performance across different ethnic groups as ethnicity data was not available in the PFD reports. Our refined ClinicalBERT model showed improved performance in identifying clinical themes like Medication Safety but had limitations with broader systemic factors. This diversity of findings demonstrates the value of incorporating multiple frameworks for comprehensively identifying safety priorities in maternity care.

4 Study context

References

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