

Media Framing and Commercial Surrogacy: An Artificial Intelligence-Driven Analysis

Received 05/29/2025
Review began 06/23/2025
Review ended 07/18/2025
Published 08/06/2025

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DOI:

<https://doi.org/10.7759/s44389-025-07078-4>

Niusha Shafiabady¹, Jutharat Attawet², Talha Nawaz³, Pauline Murray-Parahi², Mark Brady⁴, Ethar Alsharaydeh⁵

1. Discipline of Information Technology, Peter Faber Business School, Australian Catholic University, Sydney, AUS 2. Faculty of Health, Charles Darwin University, Sydney, AUS 3. Electrical Engineering and Information Technology, University of Erlangen Nuremberg, Erlangen, DEU 4. School of Law, Charles Darwin University, Sydney, AUS 5. School of Nursing and Midwifery, Charles Darwin University, Sydney, AUS

Corresponding authors: Niusha Shafiabady, nshafiabady@hotmail.com, Talha Nawaz, talha.nawaz@fau.de

Abstract

Commercial surrogacy has sparked global debates, with advocates highlighting its potential to address infertility and critics raising ethical concerns about exploitation and commodification. Media plays a crucial role in shaping public opinion, often serving as the primary source of information in this contentious area. This study leverages artificial intelligence to analyse media content and identify the most influential factors shaping media trends and public surrogacy practice. A diverse dataset of articles from Google News, spanning 2020 to 2024, was analysed using AI models, including Logistic Regression, Decision Tree, XGBoost, K-Nearest Neighbors, Random Forest, and Extra Tree. The findings highlight 'surrogate exploitation' as the most critical factor influencing media narratives and public sentiment. The study underscores the media's pivotal role in shaping policy by emphasising ethical concerns, potentially driving more stringent regulatory frameworks to protect surrogates, intended parents, and children. By providing insights into media dynamics, the research advocates for balanced and ethical media representation, setting the stage for future investigations into the ethical and social implications of commercial surrogacy.

Categories: AI applications, AI/ML-based decision support systems, Explainable AI

Keywords: commercial surrogacy, artificial intelligence, media dynamics, ethic, policy

Introduction

The practice of commercial surrogacy has ignited global debate with varied reactions. Estimates suggest around 10,000 babies are born via surrogacy worldwide each year, with the global market valued between US \$22 and US \$81 billion in 2024 and projected to grow rapidly [1]. Advocates promote its potential to address infertility, while critics raise ethical concerns, risks of exploitation, and the commodification of human life [2]. Numerous studies examine influences on commercial surrogacy, encompassing legal, economic, cultural, and ethical dimensions [3,4]. It emphasises the global legal heterogeneity, potential economic imbalances, and cultural variations shaping attitudes. The ethical dimensions, including concerns about exploitation and commodification, are acknowledged, underscoring the difficulty in establishing universal ethical standards in the context of diverse perspectives and values. The controversial nature of commercial surrogacy sparks significant debate, with the media playing a crucial role as a medium, raising awareness and influencing public opinion. Media serves as a conduit through which narratives are framed and disseminated, influencing perceptions and judgments. In scenarios where knowledge is limited, or experience is lacking, the media becomes a primary source of information and a significant determinant of public sentiment [5]. Media outlets - including traditional channels such as television and newspapers, as well as social media platform such as Facebook, Twitter, Instagram, and TikTok - contribute to the framing of narratives around aspects of commercial surrogacy. Traditional media often frames the issue through curated reporting and expert commentary, establishing which aspects are seen as most newsworthy [6]. In contrast, social media enables the rapid spread of personal stories and opinions, intensifying emotional reactions and sometimes amplifying misinformation [7]. Together, these different modes of framing can sway public perception, with varying impacts depending on the emphasis given to particular aspects of the issue [8,9].

For instance, one study by Ventura et al. [5] investigated how opinions regarding surrogacy and gay parenting were shaped by a Television (TV) news story in Spain. Through focus group interviews, the findings indicated that framing strategies employed in the news tend to foster negative attitudes towards surrogacy. This extended to homosexual couples seeking to become parents as well, demonstrating that legitimisation or stigmatisation by media significantly influences public opinion around surrogacy, impacting all involved in the process.

In another study examining perspectives on surrogacy in Chinese social media, the authors reported that a majority of commenters on a microblog discussing the surrogacy of a Chinese celebrity were opposed to it.

How to cite this article

Shafiabady N, Attawet J, Nawaz T, et al. (August 06, 2025) Media Framing and Commercial Surrogacy: An Artificial Intelligence-Driven Analysis. Cureus J Comput Sci 2 : es44389-025-07078-4. DOI <https://doi.org/10.7759/s44389-025-07078-4>

Ethical and moral concerns largely drive this opposition on social media. Such discussions and objections on a social media platform can shape public opinion and potentially influence policies related to surrogacy [10].

While human interest stories serve to raise awareness around the complex issues, they are often emotionally charged, and are selective in their portrayal of the issues. Expert commentary also plays a crucial role in influencing public discourse and a balanced range of opinions is necessary to promote a better understanding of the complexities involved.

Given the impact media has on public perspectives and its role in shaping policy on debated issues like commercial surrogacy, this study aims to identify the most influential factors in how media shapes trends in commercial surrogacy. Understanding these factors can help us develop more effective strategies to address the influential factors perceived by the public, thereby better shaping public opinion and informing policy decisions. To the researchers' knowledge, this is the first study of its kind to analyse media using Artificial Intelligence (AI) to identify influential factors related to debated issues like commercial surrogacy.

Following Millbank [11], the study endeavours to predict factors contributing to the formation of media trends around commercial surrogacy. The objective is to employ a critical media analysis of the elements influencing the narrative around commercial surrogacy. The findings equip researchers and policymakers with insights into commercial surrogacy. Through understanding the interplay between media representation, public perception, and policy decisions, this study provides an informed understanding of media representations around commercial surrogacy influencing its practice.

Materials And Methods

The study utilises a diverse dataset consisting of multiple articles covering surrogacy in various countries. Each article is assigned a unique number within the dataset. Data were searched from Google News, the most used research engine worldwide [12], focusing on documentaries, news reports, and media coverage from 2020 to 2024. The year 2020 was chosen as the starting point because the COVID-19 pandemic profoundly disrupted surrogacy practices. Travel bans, lockdowns, and policy shifts changed traditional surrogacy destinations, delayed cases, and intensified public debate. Capturing data from 2020 to 2024 allows the study to reflect these critical changes and evolving perspectives. This dataset captures evolving perspectives on surrogacy practices. It showcases geographic diversity, with each country assigned a numerical code, and the dataset also includes important demographic information, such as author gender and the age groups discussed in the articles. Additionally, the dataset categorises political bias in news reporting as either Neutral, Left-leaning, or Conservative/Right-leaning.

A total of 520,000 news articles were resulted from Google News search, and 150 of these were selected for predictive modeling. According to the AI lead expert, this sample size is sufficient for accurate data prediction. The systematic selection process involved assigning odd-numbered articles to three researchers for content analysis, ensuring methodological rigor through moderation and consensus. A structured spreadsheet was used for organisation, incorporating numerical values for inputs like geographical origin, political stance, and support for surrogates. The analysis categorised articles into three classifications: against surrogacy, supportive of surrogacy, and uncertain stance. These categories were used to train six AI models: Logistic Regression (LR), Decision Tree (DT), Extreme Gradient Boosting (XGBoost), K-Nearest-Neighbors (KNN), Random Forest (RF), and Extra Tree (ET), to predict outcomes related to commercial surrogacy practices, encompassing both support and opposition which could influence its future practice. Multiple binary indicators within the dataset provide a detailed view of various aspects of surrogacy. These include references to the surrogacy industry, discussions on the financial implications of surrogacy, and the current legal climate surrounding commercial surrogacy in different countries. A summary of the input features in the dataset is presented in Table 1.

Feature	Annotation
Article number	N/A
Year of the report	1=2020, 2=2021, 3=2022, 4=2023, 5=2024
Country of the report	0=N/A
	1=US
	2=IRE
	3=AUS
	4=IND

	5=GA
	6=UK
	7=Italy
	8=China
	9=Greece
	10=Ukraine
	11=Israel
	12=Russia
	13=Afghanistan
	14=Taiwan
	15=Denmark
	16=South Africa
	17=Canada
	18=Swiss
	19=NZ
	20=Morocco
	21=Pakistan
Author gender	F=1, M=2, Team/can't identify=0
Age	NA/can't identify=0, 20-30 yrs=1, 30-40 yrs=2, >40=3
Politics	0=Neutral, 1=left leaning media, 2=conservative/right leaning media
Industry (does article mention surrogacy industry)	0=no, 1=yes
Does the article mention the high cost of surrogacy	0=not discussed, 1=mentioned
Does the article mention the current regulations related to commercial surrogacy in the country of report	1=permitted, 2=banned, 3=not sure
The article says that the current regulations support surrogates	0=not mentioned, 1=yes, 2=No
The article says that the current regulations support Intended Parents (IP)	0=not mentioned, 1=yes, 2=No
The article says that the current regulations support the child	0=not mentioned, 1=yes, 2=No
The article reports surrogate exploitation	1=yes, 2=no, 3=not reported/not sure
The article reports IP exploitation	1=yes, 2=no, 3=not reported/not sure
The article reports children exploitation	1=yes, 2=no, 3=not reported/not sure
The article reports surrogacy contracts or agreement	0=not mentioned, 1=mentioned
The article reports that current Policy supports surrogacy	0=no, 1=yes
The article reports ethics/ethical issues in surrogacy	0=no, 1=yes
The article reports Government's role in surrogacy process	0=not, 1=mentioned
The article reports court referrals in surrogacy issues	0=not, 1=mentioned
The article reports law/s in relation to surrogacy	0=not, 1=mentioned
The article reports the legality of surrogacy	0=illegal, 1=legal, 2=not mentioned

TABLE 1: Summary of the Input Features Contained in the Dataset

The input features were predicted using different AI methods. The outcome was the report's influential factors to commercial surrogacy practice. The outcomes were discretised into three possible cases if the report supported, undermined, or not reported/uncertain about commercial surrogacy.

Methods

This article employed various AI techniques, including LR, DT, XGBoost, KNN, RF, and ET, to forecast outcomes related to surrogacy practice.

LR, a supervised machine learning algorithm, utilised a logistic function to model outcome probabilities in single trials. The software employed supports binary, one-vs-rest, and multinomial LR. Multinomial LR was specifically applied due to the three-class nature of the targeted variables (1=support, 2=undermine, 3=not reported/not sure), indicating the advantages and limitations of these AI techniques in the context.

Multinomial LR was employed to predict class probabilities across three categories. The probability that input X_i belongs to class k is modeled as:

$$\hat{p}_k(X_i) = \frac{\exp(X_i W_k + W_{0,k})}{\sum_{l=0}^{K-1} \exp(X_i W_l + W_{0,l})} \quad (1)$$

where W_k and $W_{0,k}$ denote the weight vector and bias term for class k , respectively. This formulation applies the softmax function to the class-specific linear scores, ensuring a normalized probability distribution across all classes.

The primary strength of the LR model lies in its ease of implementation, efficiency, and effectiveness in addressing classification problems. However, a notable drawback is the reduced accuracy in scenarios with high correlation among input variables [13]. To mitigate this limitation, the researchers meticulously examined correlations among input variables and determined that, in this case, the input variables did not exhibit high levels of correlation.

The DT, a widely employed AI technique, classifies a population into segmented branches resembling an inverted tree. Known for its user-friendly nature and swift implementation, this technique simplifies the intricate relationship between the target and input variables. Notably, it exhibits robustness to outliers [14]. Despite being occasionally surpassed by more advanced AI techniques, the DT remains valuable for its simplicity, offering continued utility in various contexts.

XGBoost stands as a widely employed, scalable end-to-end tree-boosting technique. In recent years, it has been extensively utilised by AI experts, consistently delivering state-of-the-art outcomes for numerous AI challenges [15]. Unlike the original gradient boosting DT technique, XGBoost constructs boosting trees in parallel, enhancing efficiency. The Python version of this library, freely available for implementation, was utilised in this study.

The KNN algorithm, a straightforward yet powerful predictor, involves two key steps. Initially, it identifies the k closest instances to the unseen instance. In the subsequent step, it determines the most frequently occurring class among these k instances for the unseen instance [16].

The ET, a tree-based ensemble method for tackling classification and regression challenges, leverages randomisation by constructing random trees in extreme scenarios. This algorithm proves effective with the right parameter choices for specific problems, showcasing notable strengths in accuracy and computational efficiency [17]. Consequently, the authors opted for this AI technique in the present study.

RF is a popular machine learning technique that works well for tasks involving regression and classification, particularly when sample sizes are small. It has been used in a number of disciplines, including finance and biology. Nevertheless, there are certain difficulties when selecting features with RF because the algorithm's key features are frequently dispersed over the feature space, which goes against the presumption of functional consistency amongst useful features [18].

Results

Experimental design/setup

The objective of the study was to categorise articles into three classifications: against surrogacy, supportive of surrogacy, and uncertain stance. These categories were used to train six AI models - LR, DT, XGBoost, KNN, RF, and ET - to predict outcomes related to commercial surrogacy practices. The models aimed to identify patterns of support or opposition that could influence the future of surrogacy. Then, feature importance was computed for all the trained models to see which factor contributed the most

toward commercial surrogacy.

The study employed several shallow machine learning models such as LR, DT, KNN, RF, and ET. These models were selected for their ease of interpretability, relatively low computational cost, and suitability as strong baseline methods. After training, SHAP (SHapley Additive exPlanations) values were applied to assess feature importance, helping to determine which factors most significantly influenced attitudes toward surrogacy practices.

From the outcome finding, XGBoost is also the best-performing model, yet the accuracy is 58%. The LR model is the second-best performing model with an accuracy of 56%, followed by the ET model with an accuracy of 54%. For the rest of the three models, the accuracy rate was below 50%, which indicates they were not suitable for training in this instance. Table 2 summarises the findings from the experiment.

Features	XGBoost	KNN	Extra Tree	Decision Tree	Logistic Regression	Random Forest
	Accuracies					
	58.00%	48.00%	54.00%	46.00%	56.00%	46.00%
	Feature Importance Score					
Year	0.1132700	0.0201000	0.0996500	0.3611400	0.3775900	0.0504900
Country	0.1345300	0.1005000	0.1075900	0.6170500	0.5501800	0.2521000
Gender	0.2408800	0.0201000	0.1037500	0.1893600	0.8269700	0.0984000
Age	0.2598100	0.0201000	0.0519400	0.3732000	0.4989400	0.1076100
Politics	0.8649500	0.0301500	0.5358300	0.6406100	0.5679200	0.1808800
Industry	0.1421800	0.0201000	0.0584800	0.1316400	1.0000000	0.0295800
Surrogacy _Cost	0.1993900	0.0201000	0.0682000	0.4579300	0.8945400	0.0801800
Current_regulations	0.5166400	0.0000000	1.0000000	0.1542700	0.0134600	0.6886200
Support_surrogate	0.0815200	0.0552800	0.3065000	0.1113900	0.5864300	0.2483200
Support_IP	0.0000000	0.0201000	0.0639300	0.0556900	0.6104700	0.0703300
Support_Child	0.2880600	0.0603000	0.3160100	0.3415900	0.9734300	0.2533200
Surrogate_exploitation	1.0000000	0.0402000	0.6091000	1.0000000	0.3215100	0.6405400
IP_exploitation	0.1158200	0.0201000	0.4221000	0.0000000	0.9750800	0.4698300
Child_Exploitation	0.4352600	0.0402000	0.6245600	0.7386000	0.8248800	0.5122900
Contract-agreement	0.0741600	0.0201000	0.0000000	0.0000000	0.8008800	0.0000000
Policy	0.3058800	0.0100500	0.1220600	0.1410900	0.2100300	0.0631000
Ethics	0.2824400	0.0201000	0.2929200	0.4147000	0.0000000	0.1994400
Government_role	0.0441000	0.0201000	0.1285800	0.0519800	0.6649700	0.0670000
Court	0.1820500	0.0100500	0.0095900	0.0540100	0.4026000	0.0097900
Law/s	0.3708600	0.0201000	0.0267000	0.0000000	0.3750500	0.0318800
Legality	0.2769200	0.0150800	0.1601100	0.2027200	0.6953700	0.1014600

TABLE 2: Accuracies and Feature Importance of All Classifiers for the Outcome

XGBoost, Extreme Gradient Boosting; KNN, K-Nearest Neighbors

Logistic regression

The LR model identifies "Industry" as the most influential feature, implying that the industry's portrayal in news articles strongly influences whether commercial surrogacy is undermined or supported. "IP exploitation" and "Support Child" are also vital, indicating that concerns about exploitation of IPs and the

overall welfare of children significantly impact the perception of commercial surrogacy.

Decision tree

DT highlights "Surrogate_exploitation" as the most critical feature, indicating that concerns about surrogate exploitation strongly influence whether commercial surrogacy is undermined or supported. "Child_Exploitation" and "Politics" again play important roles in shaping these opinions.

Extra tree

The ET model again emphasises "Current_regulations" as a crucial feature, indicating that current regulations are pivotal in determining whether commercial surrogacy is undermined or supported. "Child_Exploitation" and "Surrogate_exploitation" also play notable roles in shaping opinions on commercial surrogacy.

K-nearest neighbor

KNN highlights the importance of "Country" and "Support_Child", indicating their substantial influence on whether commercial surrogacy is undermined or supported. "Surrogate_exploitation" and "Support_surrogate" also influence shaping opinions on commercial surrogacy.

XGBoost

XGBoost highlights "Suroogate_exploitation" as the most critical feature, indicating that concerns about surrogate exploitation strongly influence whether commercial surrogacy is undermined or supported. "Current_regulations" and "Policy" again play important roles in shaping these opinions.

Random forest

The RF model places considerable importance on "Current_regulations", indicating that the current regulation in the country of report significantly influences whether commercial surrogacy is undermined or supported. "Surrogate_exploitation" and "Child_exploitation" also play important roles in shaping opinions on commercial surrogacy. Table 3 represents the top five features for all models.

Method	Top 5 Features	Feature Importance Scores
LR	Feature # 7 Industry	1.000000
	Feature # 14 IP_exploitation	0.975080
	Feature # 12 Support_Child	0.973430
	Feature # 8 Surrogacy_Cost	0.894540
	Feature # 4 Author gender	0.826970
DT	Feature # 13 Surrogate_exploitation	1.000000
	Feature # 15 Child_Exploitation	0.738600
	Feature # 6 Politics	0.640610
	Feature # 3 Country of report	0.617050
	Feature # 8 Surrogacy_Cost	0.457930
ET	Feature # 9 Current_regulations	1.000000
	Feature # 15 Child_Exploitation	0.624560
	Feature # 13 Surrogate_exploitation	0.609100
	Feature # 6 Politics	0.535830
	Feature # 14 IP_exploitation	0.422100
KNN	Feature # 3 Country of report	0.100500
	Feature # 12 Support_Child	0.060300
	Feature # 10 Support_Surrogate	0.055280
	Feature # 15 Child_Exploitation	0.040200
	Feature # 13 Surrogate_exploitation	0.040200
XGBoost	Feature # 13 Surrogate_exploitation	1.000000
	Feature # 6 Politics	0.864950
	Feature # 9 Current_regulations	0.516640
	Feature # 15 Child_Exploitation	0.435260
	Feature # 21 Law/s	0.370860
RF	Feature # 9 Current_regulations	0.688620
	Feature # 13 Surrogate_exploitation	0.640540
	Feature # 15 Child_Exploitation	0.512290
	Feature # 14 IP_exploitation	0.469830
	Feature # 12 Support_Child	0.253320

TABLE 3: Top 5 Features for All Methods

LR, Logistic Regression; DT, Decision Tree; XGBoost, Extreme Gradient Boosting; KNN, K-Nearest Neighbors; RF, Random Forest; ET, Extra Tree

Notably, for predicting outcomes, the best model in terms of accuracy was XGBoost. The top five features identified by this model indicate that ‘surrogate exploitation’ is the most influential factor in commercial surrogacy practices, which can significantly impact policy and regulation in the country or practice.

Discussion

The findings of this study provide a new lens through which we can view the intricate relationship between media representation, influential factors to practice, and policy-making in the realm of

commercial surrogacy. Leveraging AI to dissect media content offered unique insights into the complexity and the influential factors in shaping the trends and practice of contemporary commercial surrogacy. AI has increasingly been utilised across various fields, including medicine, for predictive purposes. This technology introduces advanced methods that surpass traditional approaches, offering new opportunities for innovation and efficiency [19]. The primary revelation was the emphasis on surrogate exploitation, which emerged as the most critical factor influencing media narratives and, eventually, public opinion.

Our findings show that XGBoost was the most accurate model to predict the influential factors for commercial surrogacy practice. The XGBoost model's identification of 'surrogate exploitation' as the most influential factor underscores the media's pivotal role in highlighting ethical concerns. This finding aligns with ongoing global debates on the moral and ethical dimensions of commercial surrogacy [20], suggesting that media coverage heavily sways public sentiment by focusing on potential exploitation risks. This emphasis may drive more stringent regulatory frameworks aimed at protecting surrogates. Recent research by Attawet et al. [20] supports this finding, demonstrating that media portrayal significantly influences public opinion on surrogacy by emphasising ethical dilemmas and potential exploitation.

The study reveals that the existing regulatory landscape is a significant determinant of media narratives, as media framing often aligns with prevailing legal frameworks and policy environments, shaping how issues like commercial surrogacy are portrayed in public discourse. For example, in India - where commercial surrogacy was legal and widely practiced until its ban in 2015 [21] - media coverage initially emphasized success stories of foreign couples achieving parenthood, portraying surrogacy as a compassionate and economically beneficial practice. However, after the regulatory shift, media narratives began to focus more heavily on exploitation, legal loopholes, and the need to protect vulnerable women [22]. Media reports frequently highlight the legal status and protections (or lack thereof) afforded to surrogates, intended parents, and children, indicating that current laws not only shape the practice of surrogacy but also influence how it is publicly perceived. This underscores the need to reevaluate existing legal structures to ensure they adequately address ethical concerns and safeguard all parties involved. As Gunnarsson Payne and Handelsman-Nielsen [23] and Horsey [24] argue, inconsistent regulatory frameworks across countries create a fragmented and often confusing environment, leading to divergent media portrayals and public perceptions of surrogacy.

The ethical issues surrounding commercial surrogacy, as highlighted by media reports, point to a need for comprehensive policy reforms. The findings suggest that policymakers must consider the media's portrayal of surrogacy when crafting laws, as public opinion, influenced by media narratives, plays a crucial role in shaping the acceptance and practice of surrogacy. This interplay between media representation, public perception, and policy decisions underscores the importance of developing ethical and informed policies that protect the rights and dignity of surrogates, intended parents, and children. Research suggests that incorporating media analysis into policy-making processes can provide a more holistic understanding of the societal impacts of surrogacy [25,26].

The study debates the media's role in potentially biasing public opinion through selective reporting. While the focus on exploitation highlights necessary ethical concerns, it also raises questions about the balance and diversity of media narratives. Propaganda and disinformation have existed for millennia [27,28]; however, in the context of commercial surrogacy, the ubiquity of social media, the infiltration of fake news, and the ability to sway or create the impression of public consensus can distort understanding of surrogacy practices and fuel polarized policy debates. For example, during high-profile cases such as the "Baby Gammy" case in Thailand (2014), misinformation and emotionally charged narratives spread rapidly on social media - often lacking legal or medical context - contributing to moral panic and prompting swift legislative reforms banning international commercial surrogacy [29-31]. Future research could explore the extent of media bias and its impact on public perception, aiming for a more balanced representation that considers both the benefits and risks of commercial surrogacy. Muir et al. [32] argue that media framing can significantly impact public sentiment, calling for more balanced and comprehensive reporting on surrogacy. To achieve this, future studies could employ systematic content analysis of traditional and social media coverage across different countries, examining variables such as tone, source credibility, thematic focus (e.g., altruism vs. exploitation), and the presence of misinformation. Such methods would allow researchers to quantify bias, identify dominant narratives, and assess how they correlate with local regulatory frameworks and shifts in public opinion.

The utilisation of AI to analyse media content presents both opportunities and challenges. While AI can efficiently process large datasets and identify trends, it may also introduce biases based on the training data and algorithms used. The study's methodology highlights the potential of AI in media studies but also calls for careful consideration of AI biases and the need for transparent and ethical AI practices. Ensuring that AI models are trained on diverse and representative datasets is crucial for minimising bias and providing accurate insights into media dynamics. AI-driven media analysis can uncover hidden patterns and trends that may not be immediately apparent through traditional analysis methods, offering deeper insights into how media shapes public opinion [15].

Furthermore, the study's insights into the factors influencing media trends can inform more effective strategies for addressing public concerns and shaping policy. Policymakers can leverage these findings to develop regulations that not only protect the rights and dignity of all parties involved in surrogacy but also align with societal values. This approach can foster a more ethical and sustainable surrogacy practice, ensuring that surrogacy arrangements are conducted transparently and respectfully. Recent studies emphasise the importance of incorporating media analysis into the regulatory framework to address public concerns more effectively [26,33].

Moreover, this study highlights the complex interplay between media narratives and public policy, suggesting that policymakers need to be aware of how media portrayal can shape legislative agendas. The media holds a unique position of influence, not only in what is reported but also in what is omitted [34]. As media evolves with new technologies and platforms, understanding its influence becomes even more critical. For instance, the proliferation of social media platforms introduces new dynamics in how information is disseminated and consumed and has vastly contributed to the surge in the dissemination of fake news [35]. This shift necessitates a more nuanced approach to analysing media content, as highlighted by Ausat [36], who found that social media often amplifies ethical concerns and can rapidly shape public opinion. Opinion mining [37] or sentiment score-based classification through a detailed analysis of emotional context has been advocated by Narang et al. [35]. Recent geopolitical events, conflict, and even pandemics like COVID-19 are fertile ground for disinformation and underscore the need to challenge fake news. However, there are limits to audience interest. Comparing responses to media disinformation related to the Ukraine-Russian conflict and COVID-19, Sánchez del Vas and Tuñón Navarro [38] reported that while fact-checking initially increased for both, it waned more rapidly for the conflict as audience interest focussed on COVID-19 and attributed this to the impact COVID-19 had on their lives.

Conclusions

This study demonstrates that the XGBoost model was the best-performing model in classifying media representations of commercial surrogacy, achieving an accuracy of 58%. The model identified surrogate exploitation as the most influential factor shaping media narratives, reflecting a strong emphasis on ethical concerns. This finding aligns with ongoing global debates about the moral dimensions of commercial surrogacy. Additionally, the analysis revealed notable differences in how political biases and geographic contexts frame issues such as regulation and the experiences of intended parents and surrogates. Together, these results provide empirical evidence that media coverage plays a critical role in shaping public perception and informing policy discourse. By systematically mapping these representations, the study offers a data-driven basis for future research on the social and regulatory implications of commercial surrogacy.

Appendices

Authors of this study created and used the private dataset that may be requested from the corresponding author.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Niusha Shafiabady, Talha Nawaz, Pauline Murray-Parahi, Jutharat Attawet, Mark Brady, Ethar Alsharaydeh

Acquisition, analysis, or interpretation of data: Niusha Shafiabady, Talha Nawaz, Pauline Murray-Parahi, Jutharat Attawet, Mark Brady, Ethar Alsharaydeh

Drafting of the manuscript: Niusha Shafiabady, Talha Nawaz, Pauline Murray-Parahi, Jutharat Attawet, Mark Brady, Ethar Alsharaydeh

Critical review of the manuscript for important intellectual content: Niusha Shafiabady, Talha Nawaz, Pauline Murray-Parahi, Jutharat Attawet, Mark Brady, Ethar Alsharaydeh

Supervision: Niusha Shafiabady

Disclosures

Human subjects: All authors have confirmed that this study did not involve human participants or tissue.

Animal subjects: All authors have confirmed that this study did not involve animal subjects or tissue.

Conflicts of interest: In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from

any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

References

1. Surrogacy Statistics. (2025). Accessed: July 18, 2025: <https://gitnux.org/surrogacy-statistics/>.
2. Sifris R: Commercial surrogacy and the human right to autonomy. *Journal of Law and Medicine*. 2015, 23:365-377.
3. Panitch V: Global surrogacy: Exploitation to empowerment. *Gender Justice and Development: Vulnerability and Empowerment*. Palmer E (ed): Routledge, London; 2017. 97-112.
4. Deonandan R: Recent trends in reproductive tourism and international surrogacy: ethical considerations and challenges for policy. *Risk Management and Healthcare Policy*. 2015, 8:111-119. [10.2147/RMHP.S63862](https://doi.org/10.2147/RMHP.S63862)
5. Ventura R, Rodríguez-Polo XR, Roca-Cuberes C: Wealthy gay couples buying babies produced in India by poor womb-women: Audience interpretations of transnational surrogacy in TV news. *Journal of Homosexuality*. 2019, 66:609-634. [10.1080/00918369.2017.1422947](https://doi.org/10.1080/00918369.2017.1422947)
6. Entman RM: Framing: toward clarification of a fractured paradigm. *Journal of Communication*. 1993, 43:51-58. [10.1111/j.1460-2466.1993.tb01304.x](https://doi.org/10.1111/j.1460-2466.1993.tb01304.x)
7. Papacharissi Z: Affective publics and structures of storytelling: sentiment, events and mediality. *Information Communication & Society*. 2015, 19:307-324. [10.1080/1369118x.2015.1109697](https://doi.org/10.1080/1369118x.2015.1109697)
8. Schmid JCP: Narrative framing: storytelling, structures, and perspectives. *Frames and Framing in Documentary Comics*. Palgrave Macmillan, Cham; 2021. 201-274. [10.1007/978-3-030-63303-5_5](https://doi.org/10.1007/978-3-030-63303-5_5)
9. Santos Í, Carvalho LM, Portugal e Melo B: The media's role in shaping the public opinion on education: A thematic and frame analysis of externalisation to world situations in the Portuguese media. *Research in Comparative and International Education*. 2022, 17:29-50. [10.1177/17454999211057753](https://doi.org/10.1177/17454999211057753)
10. Liu Y, Xian X, Du L: Perspectives on surrogacy in Chinese social media: A content analysis of microblogs on Weibo. *The Yale Journal of Biology and Medicine*. 2022, 95:305-316.
11. Millbank J: From Alice and Evelyn to Isabella: Exploring the narratives and norms of 'new' surrogacy in Australia. *Griffith Law Review*. 2012, 21:101-136. [10.1080/10383441.2012.10854734](https://doi.org/10.1080/10383441.2012.10854734)
12. Halavais A: *Search Engine Society*. John Wiley & Sons, Cambridge, UK; 2017.
13. Ranganathan P, Pramesh C, Aggarwal R: Common pitfalls in statistical analysis: logistic regression. *Perspectives in Clinical Research*. 2017, 8:148-151. [10.4103/picr.PICR_87_17](https://doi.org/10.4103/picr.PICR_87_17)
14. Song Y-Y, Ying L: Decision tree methods: applications for classification and prediction. *Shanghai Archives of Psychiatry*. 2015, 27:130-135.
15. Chen T, Guestrin C: XGBoost: A scalable tree boosting system. *KDD '16: Proceedings of the 22nd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining*. 2016, 785-794. [10.1145/2939672.2939785](https://doi.org/10.1145/2939672.2939785)
16. Bramer M: *Principles of Data Mining*. Springer, London; 2020. [10.1007/978-1-4471-7493-6](https://doi.org/10.1007/978-1-4471-7493-6)
17. Geurts P, Ernst D, Wehenkel L: Extremely randomized trees. *Machine Learning*. 2006, 63:3-42. [10.1007/s10994-006-6226-1](https://doi.org/10.1007/s10994-006-6226-1)
18. Tian S, Yu R, Zhou F, Zhan N, Li J, Wang X, Peng X: Prediction of HER2 status via random forest in 3257 Chinese patients with gastric cancer. *Clinical and Experimental Medicine*. 2023, 23:5015-5024. [10.1007/s10238-023-01111-3](https://doi.org/10.1007/s10238-023-01111-3)
19. Hinton G: Deep learning—A technology with the potential to transform health care. *JAMA*. 2018, 320:1101-1102. [10.1001/jama.2018.11100](https://doi.org/10.1001/jama.2018.11100)
20. Attawet J, Alsharaydeh E, Brady M: Commercial surrogacy: Landscapes of empowerment or oppression explored through integrative review. *Health Care For Women International*. 2024, 1-19. [10.1080/07399332.2024.2303520](https://doi.org/10.1080/07399332.2024.2303520)
21. Attawet J: Mapping transnational commercial surrogacy arrangements in South and Southeast Asia. *Medico-Legal Journal*. 2021, 89:128-132. [10.1177/0025817220985099](https://doi.org/10.1177/0025817220985099)
22. Pande A: Transnational commercial surrogacy in India: gifts for global sisters?. *Reproductive BioMedicine Online*. 2011, 23:618-625. [10.1016/j.rbmo.2011.07.007](https://doi.org/10.1016/j.rbmo.2011.07.007)
23. Gunnarsson Payne J, Handelsman-Nielsen M: The surrogacy question, unresolved: surrogacy policy debate as a hegemonic struggle over rights. *Critical Policy Studies*. 2022, 17:372-389. [10.1080/19460171.2022.2105736](https://doi.org/10.1080/19460171.2022.2105736)
24. Horsey K: The future of surrogacy: a review of current global trends and national landscapes. *Reproductive BioMedicine Online*. 2024, 48:103764. [10.1016/j.rbmo.2023.103764](https://doi.org/10.1016/j.rbmo.2023.103764)
25. Bou-Karroum L, El-Jardali F, Hemadi N, et al.: Using media to impact health policy-making: an integrative systematic review. *Implementation Science*. 2017, 12:1-14. [10.1186/s13012-017-0581-0](https://doi.org/10.1186/s13012-017-0581-0)
26. Yeung D: Social media as a catalyst for policy action and social change for health and well-being: Viewpoint. *Journal of Medical Internet Research*. 2018, 20:e94. [10.2196/jmir.8508](https://doi.org/10.2196/jmir.8508)
27. Allcott H, Gentzkow M: Social media and fake news in the 2016 election. *The Journal of Economic Perspectives*. 2017, 31:211-236. [10.1257/jep.31.2.211](https://doi.org/10.1257/jep.31.2.211)
28. Tandoc Jr EC, Lim ZW, Ling R: Defining "fake news": A typology of scholarly definitions. *Digital Journalism*. 2017, 6:137-153. [10.1080/21670811.2017.1360143](https://doi.org/10.1080/21670811.2017.1360143)
29. Cohen E: Surrogacy as international business and national disgrace of Thailand. *Asian Anthropology*. 2015, 14:115-132. [10.1080/1683478x.2015.1046034](https://doi.org/10.1080/1683478x.2015.1046034)
30. Whittaker A: Merit and money: The situated ethics of transnational commercial surrogacy in Thailand. *International Journal of Feminist Approaches to Bioethics*. 2014, 7:100-120. [10.3138/ijfab.7.2.0100](https://doi.org/10.3138/ijfab.7.2.0100)
31. Attawet J: Reconsidering surrogacy legislation in Thailand. *Medico-Legal Journal*. 2022, 90:45-48. [10.1177/00258172221074246](https://doi.org/10.1177/00258172221074246)
32. Muir SR, Roberts LD, Sheridan LP: The portrayal of online shaming in contemporary online news media: A media framing analysis. *Computers in Human Behavior Reports*. 2021, 3:100051. [10.1016/j.chbr.2020.100051](https://doi.org/10.1016/j.chbr.2020.100051)
33. Schmälzle R, Huskey R: Integrating media content analysis, reception analysis, and media effects studies. *Frontiers in Neuroscience*. 2023, 17:1155750. [10.3389/fnins.2023.1155750](https://doi.org/10.3389/fnins.2023.1155750)
34. Hwang K: The complex interplay of causal narratives in public policy and political discourse. *Journal of*

- Infrastructure, Policy and Development. 2024, 8:3079. [10.24294/jipd.v8i2.3079](https://doi.org/10.24294/jipd.v8i2.3079)
35. Narang P, Singh AV, Monga H: Sentiment score-based classification for fake news using machine learning and LSTM-BiLSTM. *Soft Computing*. 2024, 28:10983-11000. [10.1007/s00500-024-09884-9](https://doi.org/10.1007/s00500-024-09884-9)
 36. Ausat AMA: The role of social media in shaping public opinion and its influence on economic decisions. *Technology and Society Perspectives (TACIT)*. 2023, 1:35-44. [10.61100/tacit.v1i1.37](https://doi.org/10.61100/tacit.v1i1.37)
 37. Wankhade M, Rao ACS, Kulkarni C: A survey on sentiment analysis methods, applications, and challenges. *Artificial Intelligence Review*. 2022, 55:5731-5780. [10.1007/s10462-022-10144-1](https://doi.org/10.1007/s10462-022-10144-1)
 38. Sánchez del Vas R, Tuñón Navarro J: Disinformation on the COVID-19 pandemic and the Russia-Ukraine War: Two sides of the same coin?. *Humanities and Social Sciences Communications*. 2024, 11:1-14. [10.1057/s41599-024-03355-0](https://doi.org/10.1057/s41599-024-03355-0)