A Mixed-Methods Analysis of Women's Health Misinformation on Social Media

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Abstract. Propelled by the COVID-19 pandemic and recent overturning of Roe vs. Wade in the United States[1], concerns have grown around the proliferation of reproductive health misinformation online. While a body of work in HCI has explored female health and wellbeing from a socio-technical perspective, a knowledge gap relating to women's health misinformation and how it presents on social media remains. We report a mixed-methods content analysis of the ideological rhetoric, sources, and claims present in a sample of 202 officially fact-checked posts relating to female reproductive health. We found that reproductive health misinformation is diverse in its sources and represents a range of ideological standpoints, including pro-choice, feminist, and anti-authority rhetoric. We also found that claims are often tacit in nature, and rely on subtle manipulation and exaggerations to convey misleading narratives, as opposed to complete fabrications. In sum, we present a timely and nuanced analysis of the women's health misinformation ecosystem. Our findings may inform priorities for HCI interventions that abate health misinformation, and more broadly, support women in navigating a complex and polarised information landscape.

Keywords: Misinformation · Women's health · Social media

1 Introduction

Misinformation is increasingly recognised as a threat to public health, democracy, and trust in scientific authorities [12]. While health misinformation pre-dates the digital era, social media provides novel opportunities for this material to spread at scale and take root within vulnerable communities [26]. Accordingly, it is recognised that women face unique threats from online health misinformation arising from social inequalities such as increased childcare burden [5] and medical discrimination [28]. Misinformation related to women's health has attracted greater public interest in recent years, owing to the COVID-19 pandemic which saw widespread vaccine hesitancy among expectant mothers [7], and the landmark overturning of Roe vs. Wade in the United States. These highly disruptive

[1] On June 24th 2022, the Supreme Court of the United States (SCOTUS) reversed Roe vs. Wade, effectively removing the constitutional right to abortion [21].

events have caused concerns about a looming reproductive health infodemic, exacerbated by a lack of moderation on social media, and structural barriers to accessing evidence-based health information [21].

Now, more than ever, is a focused and targeted response to women's health misinformation needed, to support vulnerable communities as they navigate some of the most trying public health events in recent history. It is well-established that factors such as information sources, ideological frames, and media formats can influence how users engage with information on social media, and impact how trustworthy or compelling they find certain material [25, 23]. Understanding these attributes therefore, is key to developing a user-centered model for fostering information literacy among social media users [17]. However, we currently know very little about these characteristics with respect to women's health, as existing studies of misinformation typically overlook the element of gender [2].

Motivated to explore the major themes, ideological framing, and sources of women's health misinformation online, we collated and analysed a sample of 202 fact-checked posts from a range of social media platforms. We also explored the geographical distribution of fact-checking organisations, and tracked changes in the topical focus of posts over time. We contribute a baseline for understanding women's health misinformation across the social media ecosystem, and identify common rhetorical techniques used to promote misinformative health narratives, such as appealing to female empowerment, or fostering distrust towards authority. Insights from our study may inform interventions aimed at inoculating users against these narratives, and developing information literacy among women.

2 Related Work

Over the last several decades, the women's health movement has addressed inequalities in the medical treatment of women across a wide range of health concerns, including reproductive health, sexuality, and mental health [9]. Though there has been a growing HCI interest in exploring women's health [1, 29], little work focuses specifically on misinformation. Nonetheless, it is known that gender can bear on how individuals engage with misinformation [2] and that women, particularly new and expectant mothers, are at increased risk of harm, since anti-vaccine misinformation often strategically appeals to maternal identity to undermine trust in medical authorities [5]. The overturning of Roe vs. Wade has introduced additional threats: almost overnight, social media was flooded with dangerous at-home methods for inducing miscarriages, which many users perceived as credible alternatives to medical abortion [26]. It is feared that an 'abortion infodemic' may worsen rates of maternal mortality across the United States, in particular, for Black women who face medical discrimination and structural barriers to reproductive care [21, 28]. Concerns have been voiced elsewhere around the world, such as in India, where menstrual stigma compounds the harmful impacts of low health literacy [18].

In recent years, social media platforms have begun working with independent fact-checking organisations to "identify and correct provably false claims that are

timely, trending and consequential" [19]. Along with content removal and down-ranking, fact-check labelling constitutes one of the most prominent responses to misinformation [26]. While the intervention can potentially increase media literacy [12], user responses to content labelling are complex in practice and depend on baseline trust towards information authorities, as well as the broader cultural and political climates in which misinformation is embedded [3, 23]. Therefore, fact-checking interventions on their own, may fail to address the psychological and affective drivers of misinformation belief [11]. We argue that effectively combating misinformation requires familiarity with the ideological space that it occupies. Our aim is to explore the themes and nuances of this content as it exists in the wild, to understand the phenomenon in greater depth, and inform priorities for design interventions. We now describe our methods for conducting an analysis of existing reproductive health misinformation on social media.

3 Methodology

3.1 Sample

Our sample consisted of social media posts which have been identified as misinformation by official fact-checking organisations. Despite the limited resources of fact-checkers, this approach is scalable, accurate, and eliminates the time-consuming and subjective task of determining whether a post is misinformation [24]. In line with work by Simon et al. [27], we used the Google Fact Check Explorer API [13] to collect credible fact-check articles from across the Internet.

3.2 Data Collection and Screening

We queried the API at the end of March 2023, with a set of keywords relating to female reproductive health. Though women's health covers a broad range of health topics and themes, we narrowed our focus to reproductive health as this is the timeliest and most widely explored component of women's health research [9]. Our keywords were informed by scholarly literature [9, 1], online medical databases [20], and iterative testing using the Fact Check Explorer tool. The following set of finalised keywords were used to query the database: *reproductive health, women's health, menstruation, period, abortion, miscarriage, birth control, contraception, fertility, pregnancy.*

We collected all English-language articles returned by the API, and extracted a description of each claim being debunked, the fact-checking verdict (e.g., *False* or *Misleading*), the full text of the article and where available, a link to the original social media post. We automatically excluded duplicates (n=673), articles over two years old (n=358), and articles assigned a *True* or *Mostly True* verdict (n=9), to ensure that only recently circulating misinformation was included in the sample. We then manually screened the remaining 278 articles for eligibility. We included articles which were both relevant to female reproductive health issues, and made a provably inaccurate claim about health. This left a total of 202 fact-check articles for further analysis.

3.3 Coding Instrument

A codebook for reproductive health misinformation was developed, tested, and used for our study. The codebook consisted of several factual characteristics such as the post's creation date and the name of the fact-checker, as well as variables capturing different types of claims, sources, and levels of falsity. Our coding frame was broadly adapted from previous content analyses of COVID-19 misinformation [27, 24] and women's weight loss material [10].

Claims and Rhetoric Our typology of claims was constructed inductively, due to the lack of scholarly work taxonomising reproductive health misinformation. We drafted an initial set of claims by reading each article and post in full, and capturing the overarching focus of the misinformation. Our first iteration of coding produced three broad categories, relating to menstruation and fertility, the COVID-19 vaccination, and reproductive politics. On our second iteration, we re-read and compared posts across categories, to capture more fine-grained nuances in the material. For example, posts relating to reproductive politics were assigned to sub-categories of *governmental surveillance* or *criminalisation*. This process yielded a final taxonomy of nine sub-codes, organised under the three major categories described previously. We coded for ideological rhetoric deductively, in line with previous research which suggests that distrust of medical authority, female empowerment, and appeals to parental identity feature heavily in women's health misinformation [5, 16]. We re-reviewed posts with a focus on their underlying rhetoric, and noted whether these sentiments were present.

Sources The articles in our sample typically dealt with a single claim, but included multiple examples of social media posts containing it. As such, we recorded the social media, news, or information websites mentioned in each article, to get a broad sense of the platforms focused on by fact-checkers. In addition, we sought information about the authors, to provide additional context about the specific individuals or organisations responsible for creating misinformation. If publicly available, we used the claimant's profile information and a sample of recent posts to classify users under four categories: unverified users (members of the public), mainstream public figures, online influencers, and news outlets.

Level of Falsity We analysed the falsity rating of each article in line with methods by Shahi et al. [24]. We reviewed each fact-checker's rating system, collected similar verdicts, and mapped them to a single label based on the post's level of falsity. Verdicts relating to totally false or fabricated information were coded under *False*, whereas more nuanced verdicts such as *Misleading* and *Missing Context* were unified under the *Partially False* category.

3.4 Data Analysis

The first iteration of our codebook was developed using a subset of 50 posts, then piloted within the research team. Coding discrepancies were resolved through discussion. In line with standard practices for social media content analysis [10], we re-coded the full dataset with the finalised codebook, and performed a simple descriptive analysis to derive the prevalence of different claims, sources, and types of misinformation in the sample.

3.5 Ethical Considerations

Ethical concerns associated with using social media data include participant re-identification and a lack of informed consent from users [4]. As such, we only processed material that was publicly available, and maintained strict anonymity of social media users by collecting high-level codes and metadata, and paraphrasing quotes. The study was approved by our institutional ethical board.

Reflexivity Statement As UK-based researchers at the intersection of HCI and women's health, we view media literacy and access to evidence-based information as critical dimensions of wellbeing in the digital age. Our work is situated within feminist HCI practice [1, 29], and is framed by our desire to embed social justice into the design of interventions [6].

4 Results

Our study aimed to understand the major themes, ideological framing, and sources of fact-checked women's health misinformation on social media. We analysed 202 unique fact-check articles published between 2nd April 2021 and 23rd March 2023. The major topical themes included COVID-19 vaccination, fertility and menstruation health myths, and reproductive politics. The majority of posts in the sample (64.9%, n=131) contained tacit misinformation, where facts had been skewed or misrepresented, as opposed to totally fabricated information, which comprised just under a third of the sample (29.2%, n=59).

4.1 Fact-Checking Trends

Temporal The articles in our sample were published over two years, with Figure 1 illustrating the number of articles published per-quarter over this period. The shape of the graph suggests several peaks and troughs over the two years, with the highest point observed during the summer of 2022: a total number of 79 articles (39.1% of the total sample) were published during Q2 and Q3 of 2022. We note that this period correlates with the overturning of Roe vs. Wade in the United States, and indeed, of the articles published in this period, approximately two-thirds (n=53) relate directly to abortion and reproductive care in post-Roe America. This is in contrast to previous periods, which were dominated by misinformation relating to the COVID-19 vaccine, or general female wellbeing.

Geographical A total of 21 fact-checking organisations were present in our sample. As shown in Figure 2, the most commonly occurring source was *Full-Fact* (12.9%, n=26), a UK-based independent fact-checking organisation. Many fact-checkers were location-specific, and broadly prioritised information relevant to specific countries or national interests. The largest share of articles were published by US-oriented fact-checkers (43.1%, n=87), and the second-largest by global organisations which covered multiple countries and territories (17.8%, n=36). Fact-checkers based in Europe (14.9%, n=30) and Asia (14.3%, n=29) were also common, comprising a similar share of the sample. The least-covered regions were Africa (6.4%, n=13) and Oceania (3.5%, n=7).

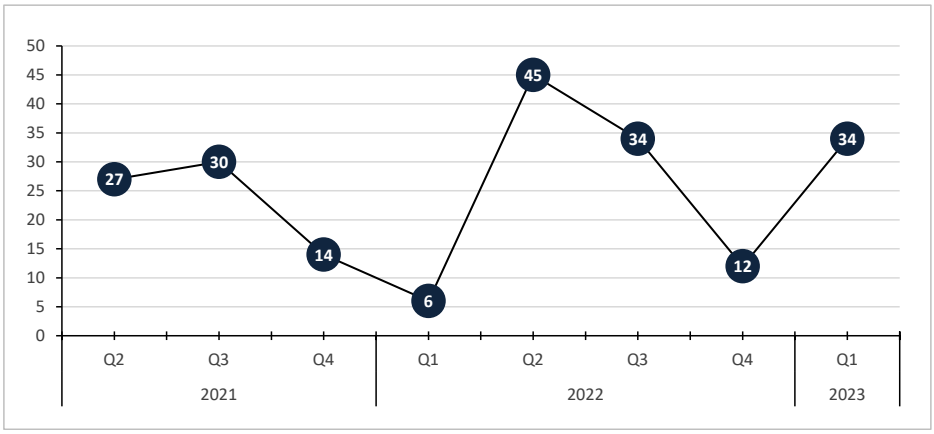

Fig. 1. Articles published per-quarter between the start of April 2021 and the end of March 2023.

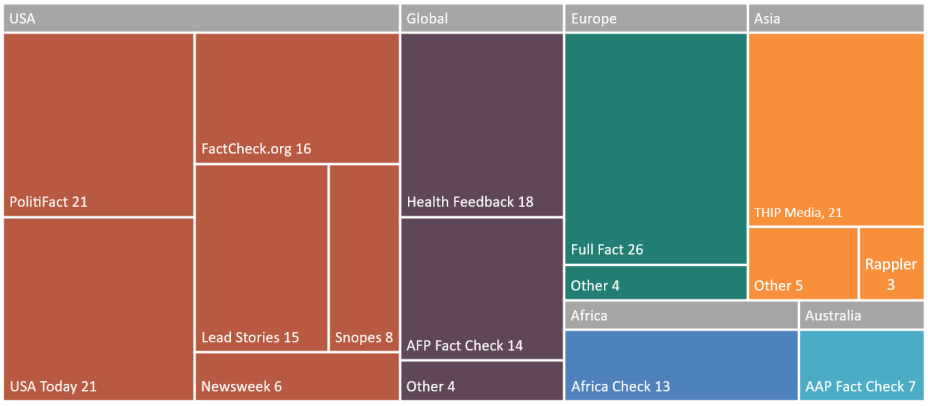

Fig. 2. Overview of the fact-checkers represented in our sample and their geographic locations. Organisations with fewer than 3 articles are collapsed into the *Other* category.

4.2 Platforms and Sources

The most commonly occurring platform was Facebook, which appeared in 45.5% of articles (n=92). Also frequently observed were Twitter (26.2%, n=53) Instagram (22.3%, n=45), and TikTok (4.0%, n=8). In addition to social media sites, a sizeable number of claims originated on digital news platforms (13.9%, n=28) such as the Mail Online, Fox News, and The Express. The largest category of posts were created by unverified members of the public on social media (32.1%, n=65). Of the posts originating from public figures (29.7%, n=60), approximately half could be attributed to political activists (n=29), and the other half to elected officials or medical professionals. Thirty posts were associated with news outlets, mostly conspiratorial networks, though (n=9) originated from quality or

mainstream news sources. Less common categories included health influencers (7.9%, n=16), cases where the claimant could not be reliably identified (8.4%, n=17), and other sources, such as meme pages and a personal blog (6.9%, n=14).

4.3 Claims and Rhetoric

The largest share of articles in the sample related to the COVID-19 vaccination (39.1%, n= 79). Just under two-thirds of posts in this category stated that taking the Pfizer vaccine would lead to miscarriages, using skewed statistics or out-of-date government documents to substantiate the claim. Themes of distrust towards the government and pharmaceutical industry featured heavily in this category, with several posts referring to global vaccination campaigns as 'mass murder', and targeting women with conspiratorial narratives: *"[the men] at big pharma don't have your back."*

Several other posts spread inaccuracies about menstruation or fertility (32.6%, n=66). Many contained ineffective home remedies: most were harmless, but fact-checkers identified others as potentially toxic to health. For instance, a handful of posts described dangerous herbal methods for inducing miscarriage. Whilst they often had the disclaimer *"avoid these herbs if pregnant"*, the timing (soon after Roe vs. Wade), could suggest that they were intended as an alternative method for abortion [22]. Posts relating to fertility and menstruation often appealed to female empowerment and bodily exploration. For example, a popular video on 'menstrual masking', in which menstrual blood is used as a skin treatment [15], used hashtags such as *#SmashThePatriarchy*, and encouraged viewers to post their own videos as a way to break menstrual taboos.

Lastly, a quarter of the misinformation in our sample related to reproductive care in the United States following the overturning of Roe vs. Wade. Fear of criminalisation was a common theme in this category, with posts inaccurately describing instances of women and girls being jailed for procuring abortions, or fabricating governmental surveillance policies. Posts in this category were overwhelmingly pro-choice in rhetoric, and conveyed fear, frustration, and unease alongside politicised anti-republican[2] sentiments: *"GOP 'Alpha Males' are more afraid of our vaginas than they are of weapons of war."*

5 Discussion and Conclusion

We conducted an exploratory study of reproductive health misinformation on social media by analysing a sample of officially fact-checked posts. Our results illustrate a great diversity in the focus, rhetoric, and origins of online misinformation, with a number of implications for future interventions.

First, we found that women's health misinformation can originate from 'unusual suspects' such as reputable news outlets, individuals with legitimate medical credentials, and elected officials. In a similar vein, we found that the material

[2] Refers to the mainstream Republican political party in the United States, otherwise known as the GOP.

in our sample was most likely to be tacit and subtly misleading, rather than altogether false. Thus, we highlight the value in educating users of the diversity in misinformation, and developing their psychological resistance against misinformation that is subtle, and likely to bypass their credibility judgement strategies. One existing approach involves implementing digital nudges, which visually draw a user's attention to common credibility cues through highlighting or context-aware prompting [8]. Our findings show that reproductive health misinformation employs a range of visual and rhetorical techniques, which are inextricably tied to social and medical contexts. For example, COVID-19 vaccine misinformation was more likely to rely on misreadings of official data, whereas content posted after the overturning of Roe vs. Wade tended to exploit fears of criminalisation. As such, a customisable nudging system designed to facilitate reflection on a broad range of media characteristics and rhetorical techniques may support women in navigating tacit and challenging material.

In a departure from studies which report that abortion misinformation is more likely to be anti- than pro-choice [14], almost all of the posts relating to abortion in our sample represented pro-choice standpoints; a trend which the overturning of Roe vs. Wade may explain. Many posts conveyed a message of liberation from medical oppression, which has been identified as a common dimension of both reproductive health misinformation, and alternative health narratives more widely [27, 17, 16]. Moreover,previous HCI research has identified that users are less critical towards information consistent with their ideologies and fears [25], suggesting that women, particularly those belonging to minority or disenfranchised groups, may be at particular risk from misinformation which appeals to past and current medical discrimination [28]. Therefore, our findings raise questions about how interventions may be tailored to specific communities of users, and address differential vulnerabilities which arise from misinformation exposure. In particular, we encourage fully recognising the role played by structural inequalities on how marginalised individuals process health information, and grounding design practice in addressing the feelings of disillusionment and uncertainty that drive engagement with misinformative health narratives [23].

We recognise limitations in our study. Firstly, our sample comprised of English-language content relating to female reproductive health. Though this ensured a focused sample, women's health encapsulates more holistic markers of wellness such as nutrition, physical, and mental health [9]. Future work could explore misinformation beyond the Anglosphere, and investigate a greater range of topics, including dieting, which is known to attract a great deal of misinformation [10]. Furthermore, though we provide a strong snapshot of the ecosystem of women's health misinformation, we did not explore users' lived experiences. Therefore, a key priority for future work is to conduct observational research on how women engage with health misinformation in-situ, to contextualise and validate the current study. Overall, our analysis provides a conceptual baseline for understanding the shades of grey inherent in reproductive health misinformation, and offers directions for culturally sensitive interventions which address users' holistic needs to promote health literacy.

References

1. Almeida, T., Comber, R., Balaam, M.: HCI and Intimate Care as an Agenda for Change in Women's Health. In: Proceedings of the CHI Conference on Human Factors in Computing Systems. pp. 2599–2611. ACM, San Jose California USA (2016). https://doi.org/10.1145/2858036.2858187
2. Almenar, E., Aran-Ramspott, S., Suau, J., Masip, P.: Gender Differences in Tackling Fake News: Different Degrees of Concern, but Same Problems. Media and Communication **9**(1), 229–238 (Mar 2021). https://doi.org/10.17645/mac.v9i1.3523
3. Appling, S., Bruckman, A., De Choudhury, M.: Reactions to Fact Checking. Proc. ACM Hum.-Comput. Interact. (2022). https://doi.org/10.1145/3555128, place: New York, NY, USA Publisher: CSCW, Association for Computing Machinery
4. Ayers, J.W., Caputi, T.L., Nebeker, C., Dredze, M.: Don't quote me: reverse identification of research participants in social media studies. npj Digital Medicine **1**(1), 30 (2018). https://doi.org/10.1038/s41746-018-0036-2
5. Baker, S.A., Walsh, M.J.: 'A mother's intuition: it's real and we have to believe in it': how the maternal is used to promote vaccine refusal on Instagram. Information, Communication & Society **0**(0), 1–18 (2022). https://doi.org/10.1080/1369118X.2021.2021269
6. Bardzell, S.: Feminist HCI: Taking Stock and Outlining an Agenda for Design. In: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. pp. 1301–1310. CHI '10, Association for Computing Machinery, New York, NY, USA (2010). https://doi.org/10.1145/1753326.1753521, https://doi.org/10.1145/1753326.1753521
7. Bhattacharya, O., Siddiquea, B.N., Shetty, A., Afroz, A., Billah, B.: COVID-19 vaccine hesitancy among pregnant women: a systematic review and meta-analysis. BMJ Open **12**(8) (2022). https://doi.org/10.1136/bmjopen-2022-061477
8. Bhuiyan, M.M., Horning, M., Lee, S.W., Mitra, T.: NudgeCred: Supporting News Credibility Assessment on Social Media Through Nudges. Proc. ACM Hum.-Comput. Interact. **5**(CSCW2) (Oct 2021). https://doi.org/10.1145/3479571, https://doi.org/10.1145/3479571
9. Cohen, M.: Towards a framework for women's health. Patient Education and Counseling **33**(3), 187–196 (1998). https://doi.org/10.1016/S0738-3991(98)00018-4
10. Dedrick, A., Merten, J.W., Adams, T., Wheeler, M., Kassie, T., King, J.L.: A Content Analysis of Pinterest Belly Fat Loss Exercises: Unrealistic Expectations and Misinformation. American Journal of Health Education **51**(5), 328–337 (2020). https://doi.org/10.1080/19325037.2020.1795754
11. Ecker, U.K.H., Lewandowsky, S., Cook, J., Schmid, P., Fazio, L.K., Brashier, N., Kendeou, P., Vraga, E.K., Amazeen, M.A.: The psychological drivers of misinformation belief and its resistance to correction. Nature Reviews Psychology **1**(1), 13–29 (2022). https://doi.org/10.1038/s44159-021-00006-y, https://www.nature.com/articles/s44159-021-00006-y
12. Flintham, M., Karner, C., Bachour, K., Creswick, H., Gupta, N., Moran, S.: Falling for Fake News: Investigating the Consumption of News via Social Media. In: Proceedings of the CHI Conference on Human Factors in Computing Systems, pp. 1–10. Association for Computing Machinery, New York, NY, USA (2018), https://doi.org/10.1145/3173574.3173950
13. Google: Google Fact Check Explorer - About (2023), https://toolbox.google.com/factcheck/aboutfce

14. Han, L., Boniface, E.R., Han, L.Y., Albright, J., Doty, N., Darney, B.G.: The Abortion Web Ecosystem: Cross-Sectional Analysis of Trustworthiness and Bias. Journal of Medical Internet Research **22**(10), e20619 (2020). https://doi.org/10.2196/20619
15. Healthnews: Period-Blood Face Mask: Why Gynecologists Disapprove? (2023), https://healthnews.com/beauty/skin-care/is-period-blood-good-for-skin-care/
16. Jolly, N.: Why are women buying GOOP? Women's health and the wellness movement. Birth **47**(3), 254–256 (2020). https://doi.org/10.1111/birt.12495
17. Lewandowsky, S., van der Linden, S.: Countering Misinformation and Fake News Through Inoculation and Prebunking. European Review of Social Psychology **32** (Feb 2021). https://doi.org/10.1080/10463283.2021.1876983
18. McCammon, E., Bansal, S., Hebert, L.E., Yan, S., Menendez, A., Gilliam, M.: Exploring young women's menstruation-related challenges in Uttar Pradesh, India, using the socio-ecological framework. Sexual and Reproductive Health Matters **28**(1), 1749342 (2020). https://doi.org/10.1080/26410397.2020.1749342
19. Meta: How Meta's third-party fact-checking program works (2021), www.facebook.com/formedia/blog/third-party-fact-checking-how-it-works
20. OASH: A-Z Health Topics, https://www.womenshealth.gov/a-z-topics
21. Pagoto, S.L., Palmer, L., Horwitz-Willis, N.: The Next Infodemic: Abortion Misinformation. Journal of Medical Internet Research **25**, e42582 (2023). https://doi.org/10.2196/42582, https://www.jmir.org/2023/1/e42582
22. Rougerie, P.: Abortifacient plants are dangerous, and ineffective as an abortion method (2022), https://healthfeedback.org/claimreview/abortifacient-plants-dangerous-and-ineffective-as-abortion-method/
23. Saltz, E., Leibowicz, C.R., Wardle, C.: Encounters with Visual Misinformation and Labels Across Platforms: An Interview and Diary Study to Inform Ecosystem Approaches to Misinformation Interventions. In: Extended Abstracts of the 2021 CHI Conference on Human Factors in Computing Systems. pp. 1–6. ACM, Yokohama Japan (2021). https://doi.org/10.1145/3411763.3451807
24. Shahi, G.K., Dirkson, A., Majchrzak, T.A.: An exploratory study of COVID-19 misinformation on Twitter. Online Social Networks and Media **22**, 100104 (Mar 2021). https://doi.org/10.1016/j.osnem.2020.100104
25. Shahid, F., Kamath, S., Sidotam, A., Jiang, V., Batino, A., Vashistha, A.: "It Matches My Worldview": Examining Perceptions and Attitudes Around Fake Videos. In: CHI Conference on Human Factors in Computing Systems. pp. 1–15. ACM, New Orleans LA USA (2022). https://doi.org/10.1145/3491102.3517646
26. Sharevski, F., Loop, J.V., Jachim, P., Devine, A., Pieroni, E.: Abortion Misinformation on TikTok: Rampant Content, Lax Moderation, and Vivid User Experiences (2023), http://arxiv.org/abs/2301.05128
27. Simon, F., Howard, P.N., Nielsen, R.K.: Types, sources, and claims of COVID-19 misinformation. Tech. rep., Reuters Institute (2022)
28. Thomas, S.P.: Trust Also Means Centering Black Women's Reproductive Health Narratives. Hastings Center Report **52**(S1) (2022). https://doi.org/10.1002/hast.1362
29. Tuli, A., Chopra, S., Kumar, N., Singh, P.: Learning from and with Menstrupedia: Towards Menstrual Health Education in India. Proc. ACM Hum.-Comput. Interact. **2**(CSCW) (Nov 2018). https://doi.org/10.1145/3274443