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Correcting the scientific record on abortion and mental health outcomes

Julia Littell and colleagues argue that better adherence to ethical standards for correction or retraction of unreliable publications is essential to avoid harmful effects on public policy, clinical practice, and public health

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The scientific community has contended with unreliable research for decades.^{1,2} Ideally, fatally flawed studies will be detected by peer reviewers and rejected by journal editors, but these processes are subjective, varied, and susceptible to error.^{3,4} Post-publication critiques can identify important flaws, and public debate can shed light on the nature of these problems, but these actions do not correct the scientific record. Thus, when authors are unwilling or unable to make sufficient corrections, published papers occasionally have to be retracted to correct the scientific record.

Standards for correction and retraction have been established by the Committee on Publication Ethics (COPE),^{5,6} the International Committee of Medical Journal Editors (ICMJE),⁷ and editors' professional associations, including the Council of Science Editors, World Association of Medical Editors, and European Association of Science Editors. These organisations provide guidance on best practices for science editors and journals. However, problematic science continues to remain uncorrected. The importance of correcting the scientific record has been highlighted by the use of four unreliable studies on the mental health outcomes of abortion in US court cases that have restricted access to abortion.

Four abortion studies

In 2002, *The BMJ* published a cohort study concluding that the risk of depression was higher in women who had an abortion compared with those who continued an unwanted first pregnancy.⁸ Independent re-analysis of the same data found that this study incorrectly identified unwanted first pregnancies and did not control for pre-pregnancy levels of depression, and after correction of these errors abortion was not associated with increased risk of subsequent maternal depression.⁹ *The BMJ* published criticism of the original article¹⁰ and partial corrections,¹¹ but serious methodological problems remain uncorrected (including failure to control for previous depression).

In 2005, the *Journal of Anxiety Disorders* published a cohort study concluding that abortion was associated with higher rates of generalised anxiety than giving birth.¹² An independent re-analysis showed that pre-existing levels of anxiety and exposure to domestic violence fully accounted for the apparent association between abortion and subsequent

anxiety.¹³ The original paper has not been corrected or retracted.

In 2009, the *Journal of Psychiatric Research* published an analysis of the US national comorbidity survey concluding that abortion increased the likelihood of various mental health problems and substance use disorders.¹⁴ The article's results could not be replicated because it contained incorrect statements about its methods^{15,16}; instead of using post-pregnancy outcome measures, as described in the methods section, authors used lifetime measures of mental health problems.^{16,17} Associations between lifetime measures of abortion and lifetime measures of mental health disorders were incorrectly interpreted as evidence that abortion independently contributed to mental health problems.^{14,18} Substantial criticisms of this article were published in the journal and elsewhere.^{15,16} A corrigendum by the authors corrected sample weights¹⁸ but did not address more fundamental analytical problems.^{15,16} Although the study was "decisively debunked"¹⁹ and the editor stated that the authors' conclusions were not supported by their analyses,^{19,20} the journal rejected a call for retraction and invited additional published debate instead (E Hollander, personal communication).

The errors in these papers were accumulated in 2011 when they were included in a systematic review and meta-analysis published in the *British Journal of Psychiatry*. This synthesis of data from 22 studies (on 14 separate datasets) concluded that abortion accounts for a substantial increase in the risk of adverse mental health outcomes.²¹ Eleven of the 22 included studies were authored or co-authored by the sole author of the meta-analysis. The review failed to meet any published methodological criteria for systematic reviews and meta-analyses.²²⁻²⁸ It cited but failed to follow recommendations for avoiding statistical dependencies, which can result in over-representation of some studies and biased estimates in meta-analysis.^{29,30} Of the 36 effect sizes included in one meta-analysis, only four were independent.²⁸ The debunked 2009 paper¹⁴ was represented three times in one meta-analysis. Further, the pooled odds ratio (1.81) was incorrectly interpreted as a risk ratio, thereby inflating the risk estimate. The formula for the population attributable risk factor was incorrect and its application in this

context was misleading.²⁸ Despite numerous substantive and methodological critiques of this article,^{22–28 31 32} the *British Journal of Psychiatry* rejected calls for its retraction in 2012 and in 2023.

In 2022, the journal's owner, the Royal College of Psychiatrists, overturned the recommendations of an independent panel that the article should be retracted after the author and her lawyers threatened legal action.^{33–35} It presented three arguments against retraction: the passage of time since initial publication, existence of a published debate, and the fact that the article had been subject to an earlier investigation.³⁶ Five editorial board members resigned after the decision, suggesting interference with the journal's editorial independence.^{33–35} Serious scientific concerns about the 2011 meta-analysis have still not been adequately addressed.

Real world consequences

All four flawed studies were cited in multiple court cases as evidence that abortion increases the risk of mental health problems.^{37–57} The meta-analysis has been cited in 25 court cases and 14 parliamentary hearings in six countries. The 2009 study was cited in at least 11 court cases and four legislative hearings.

When asked to defend this research against mounting published criticism, authors argued that, because these articles have not been corrected or retracted, they represent sound scientific work and scholarly journals stand behind them.^{49 50} This leaves it to judicial and legislative bodies to determine the veracity of testimony based on these studies. Court decisions have been split: some courts accepted all or portions of this evidence,^{46 57} while others ruled it unreliable or inadmissible.^{44 47}

Despite its severe limitations, the meta-analysis was submitted as evidence of harmful effects of abortion in documents presented in the US Supreme Court case *Dobbs v Jackson Women's Health Organization*,^{51 54–56} which culminated in the 2022 ruling that the US Constitution does not confer a right to abortion. In April 2023, it was again cited in a US district court ruling to invalidate FDA approval for the use of mifepristone for medication abortion.^{52 57} Now before the US Supreme Court, the case could severely restrict abortion access in the US.

Publication ethics

Scientific knowledge accumulates in complex social contexts wherein people contest the trustworthiness of empirical evidence and put forward rival plausible explanations for results. We must maintain uncompromising standards of quality and integrity at every stage in the production and dissemination of scientific research to advance scientific knowledge, accurately inform public policy and clinical practice, and protect public health.

Although authors initiate some post-publication corrections and retractions,^{58 59} ultimately editors are responsible for the content they publish. COPE guidelines state that editorial staff “must be committed to correcting the literature when needed.”⁵ Therefore, when there is clear evidence that published statements are unreliable or invalid, journals should request and publish corrections from authors or post a public expression of concern linked to the original article.^{5 6} When these steps are insufficient, authors and editors should move to retraction.^{5–7 58 60}

COPE states that retraction of articles is needed when they contain “such seriously flawed or erroneous content or data that their findings and conclusions cannot be relied upon.”⁶ Editors must therefore make important—albeit difficult—distinctions between inconsequential imperfections in research articles, unreliable evidence or invalid arguments, and evidence of research

misconduct. All four articles discussed above include unreliable or invalid content that authors and editors have not yet corrected or retracted.

Increased public scrutiny, better technical tools, and improved editorial oversight have led to rising retraction rates (from 4/10 000 articles in 2010 to 8–10/10 000 in 2020).^{58 61 62} With the steep growth in number of papers published annually, retractions are also increasing. These trends pose challenges for journals, but many observers believe retractions reflect successful efforts to stamp out bad science.^{58 61 62} Many journals now have formal policies on retraction,⁶¹ yet practices are inconsistent across journals and there is ample room for improvement.^{58 59 61–67}

Some editors have avoided retraction, as in the cases above, preferring resolution by academic debate, airing “both sides” without commenting on the methodological rigour or weight of the evidence supporting different conclusions.^{63–66} Some editors treated authors' failures to meet basic expectations regarding research integrity as mere differences of opinion or scientific controversies worthy of debate.^{63 64 67} Some incorrectly assumed that retractions can only be made by authors.⁶⁵ Others asserted, contrary to COPE and ICMJE guidelines, that retraction requires evidence of fraud or fabrication. Others claimed that the passage of time renders retraction unnecessary³⁶ (there is no statute of limitations for retractions).⁶⁸ We think these positions miss the mark because the sole purpose of retraction is to correct the scientific record.

Failure to correct fundamental flaws in the scientific foundations of any empirical argument is shirking editorial responsibilities^{5–7} and allows inaccurate information to flourish under the publishers' imprimatur. Responsibilities for scientific integrity and publication ethics must be given the highest priority and must be fully discharged by editors and journals, especially when there are real consequences for patients and public health.

Call to action

The post-publication debates on the four studies we described show that they contain unreliable evidence or invalid conclusions about the mental health outcomes of abortion. We believe that journal editors and their publishers have an ethical obligation to correct the scientific record in these cases. At a minimum, the papers published in *The BMJ*⁸ and *Journal of Anxiety Disorders*¹² should be accompanied by published expressions of concern, given their failures to consider alternative plausible explanations.^{9 13} We believe that the *Journal of Psychiatric Research*¹⁴ and *British Journal of Psychiatry*²¹ papers should both be retracted because of the overwhelming and incontrovertible evidence of their methodological flaws, inaccurate results, and invalid conclusions.^{15 16 19 20 22–28 31 32}

Decisions about retraction should never be compromised by politics, controversy, or legal threats. Scientific controversies are not properly adjudicated by the courts, and journal editors, owners, and publishers must be prepared to face and overcome legal threats, which are likely to be baseless, as the rejection of claims against retraction of a study in *Frontiers in Psychology* has shown.^{35 69} As others have suggested, journals should consider making legal threats public to discourage further use of this tactic.⁷⁰

Solutions and support for many of the dilemmas that editors and publishers face are at hand. Closer adherence to current guidelines on publication ethics, corrections, and retraction could reduce lapses in scientific integrity.^{5–7} More transparent and uniform approaches to retraction are needed to protect the published record and avoid unfair stigmatisation of authors.⁶⁵ Further discussion is needed on the processes, priorities, and institutional supports for

retraction. Journal owners and publishers must fully support editors in their efforts to maintain the integrity of the scientific record, especially on the rare occasions when editors must seriously consider retraction.^{65 70} Allowing inaccurate information to remain in the scientific record can have lasting and deleterious effects on law, public policy, clinical practice, and public health.

Key messages

- Failure to correct or retract unreliable research papers published in medical journals allows misinformation to spread under the journals' imprimatur
- Cumulative lapses in scientific integrity pose ongoing threats to public health and public trust in science
- Unreliable evidence and invalid conclusions about the mental health outcomes of abortion was used to inform policies that restrict access to abortion in the US
- Scientists, editors, journals, and publishers must ensure that published materials are accurate and must correct or retract articles when necessary to maintain the integrity of science

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- 1 Altman DG. The scandal of poor medical research. *BMJ* 1994;308:-4. doi: 10.1136/bmj.308.6924.283. pmid: 8124111
- 2 Pirooska S, Shiely F, Clarke M, Treweek S. Tolerating bad health research: the continuing scandal. *Trials* 2022;23. doi: 10.1186/s13063-022-06415-5. pmid: 35655288
- 3 Tennant JP, Ross-Hellauer T. The limitations to our understanding of peer review. *Res Integr Peer Rev* 2020;5. doi: 10.1186/s41073-020-00092-1. pmid: 32368354
- 4 Klebel T, Reichmann S, Polka J, et al. Peer review and preprint policies are unclear at most major journals. *PLoS One* 2020;15:e0239518. doi: 10.1371/journal.pone.0239518
- 5 Committee on Publication Ethics. General approach to publication ethics for the editorial office. 2022. <https://publicationethics.org/sites/default/files/publication-ethics-editorial-office-cope-flowchart.pdf>
- 6 Committee on Publication Ethics. Retraction guidelines. 2021. <https://publicationethics.org/sites/default/files/retraction-guidelines-cope.pdf>
- 7 International Committee of Medical Journal Editors. Recommendations for the conduct, reporting, editing, and publication of scholarly work in medical journals. 2023;19. <https://www.icmje.org/icmje-recommendations.pdf>
- 8 Reardon DC, Coughle JR. Depression and unintended pregnancy in the National Longitudinal Survey of Youth: a cohort study. *BMJ* 2002;324:-2. doi: 10.1136/bmj.324.7330.151. pmid: 11799033
- 9 Schmiede S, Russo NF. Depression and unwanted first pregnancy: longitudinal cohort study. *BMJ* 2005;331. doi: 10.1136/bmj.38623.532384.55. pmid: 16257993
- 10 Rapid responses. [Responses to: Reardon DC, Coughle JR. Depression and unintended pregnancy in the National Longitudinal Survey of Youth: a cohort study] *BMJ* 2002. <https://www.bmj.com/content/324/7330/151/rapid-responses>
- 11 Reardon DC, Coughle JR. Depression and unintended pregnancy in young women. Authors' reply. *BMJ* 2002;324:-8. doi: 10.1136/bmj.324.7345.1097
- 12 Coughle JR, Reardon DC, Coleman PK. Generalized anxiety following unintended pregnancies resolved through childbirth and abortion: a cohort study of the 1995 National Survey of Family Growth. *J Anxiety Disord* 2005;19:-42. doi: 10.1016/j.janxdis.2003.12.003. pmid: 15488373
- 13 Steinberg JR, Russo NF. Abortion and anxiety: what's the relationship? *Soc Sci Med* 2008;67:-52. doi: 10.1016/j.socscimed.2008.03.033. pmid: 18468755
- 14 Coleman PK, Coyle CT, Shuping M, Rue VM. Induced abortion and anxiety, mood, and substance abuse disorders: isolating the effects of abortion in the national comorbidity survey. *J Psychiatr Res* 2009;43:-6. doi: 10.1016/j.jpsychires.2008.10.009. pmid: 19046750
- 15 Steinberg JR, Finer LB. Examining the association of abortion history and current mental health: a reanalysis of the National Comorbidity Survey using a common-risk-factors model. *Soc Sci Med* 2011;72:-82. doi: 10.1016/j.socscimed.2010.10.006. pmid: 21122964
- 16 Steinberg JR, Finer LB, Coleman, Coyle, Shuping, and Rue make false statements and draw erroneous conclusions in analyses of abortion and mental health using the National Comorbidity Survey. *J Psychiatr Res* 2012;46:-8, discussion 408-11. doi: 10.1016/j.jpsychires.2012.01.019. pmid: 22348853
- 17 Coleman PK. Response to Dr Steinberg and Dr Finer's letter to the editor. *J Psychiatr Res* 2012;46:-9doi: 10.1016/j.jpsychires.2012.01.020
- 18 Coleman PK, Coyle CT, Shuping M, Rue VM. Corrigendum to "Induced abortion and anxiety, mood, and substance abuse disorders: Isolating the effects of abortion in the national comorbidity survey". *J Psychiatr Res* 2011;45:-4. doi: 10.1016/j.jpsychires.2011.06.010
- 19 Guttmacher Institute. Study purporting to show link between abortion and mental health outcomes decisively debunked: journal's editor agrees that Priscilla Coleman's conclusions are not supported by her analyses. Press release, 5 Mar 2012. <https://www.guttmacher.org/news-release/2012/study-purporting-show-link-between-abortion-and-mental-health-outcomes-decisively>

- 20 Kessler RC, Schatzberg AF. Commentary on abortion studies of Steinberg and Finer (Social Science & Medicine 2011; 72:72–82) and Coleman (Journal of Psychiatric Research 2009;43:770–6 & Journal of Psychiatric Research 2011;45:1133–4). *J Psychiatr Res* 2012;46:1. doi: 10.1016/j.jpsychires.2012.01.021
- 21 Coleman PK. Abortion and mental health: quantitative synthesis and analysis of research published 1995–2009. *Br J Psychiatry* 2011;199:–6. doi: 10.1192/bjp.bp.110.077230. pmid: 21881096
- 22 Howard LM, Rowe M, Trevillion K, Khalifeh H, Munk-Olsen T. Abortion and mental health: guidelines for proper scientific conduct ignored. *Br J Psychiatry* 2012;200:–, discussion 78–9, author reply 79–80. doi: 10.1192/bjp.200.174. pmid: 22215867
- 23 Abel KM, Susser ES, Brocklehurst P, Webb RT. Abortion and mental health: guidelines for proper scientific conduct ignored. *Br J Psychiatry* 2012;200:–5, discussion 78–9, author reply 79–80. doi: 10.1192/bjp.200.174a. pmid: 22215868
- 24 Littell JH, Coyne JC. Abortion and mental health: guidelines for proper scientific conduct ignored. *Br J Psychiatry* 2012;200:–6, discussion 78–9, author reply 79–80. doi: 10.1192/bjp.200.175. pmid: 22215869
- 25 Polis CB, Charles VE, Blum RW, Gates WHSr. Abortion and mental health: guidelines for proper scientific conduct ignored. *Br J Psychiatry* 2012;200:–7, discussion 78–9, author reply 79–80. doi: 10.1192/bjp.200.176. pmid: 22215870
- 26 Goldacre B, Lee W. Abortion and mental health: guidelines for proper scientific conduct ignored. *Br J Psychiatry* 2012;200:–, discussion 78–9, author reply 79–80. doi: 10.1192/bjp.200.177. pmid: 22215871
- 27 Robinson GE, Stotland NL, Nadelson CC. Abortion and mental health: guidelines for proper scientific conduct ignored. *Br J Psychiatry* 2012;200:–, discussion 78–9, author reply 79–80. doi: 10.1192/bjp.200.178. pmid: 22215872
- 28 Steinberg JR, Trussell J, Hall KS, Guthrie K. Fatal flaws in a recent meta-analysis on abortion and mental health. *Contraception* 2012;86:–7. doi: 10.1016/j.contraception.2012.03.012. pmid: 22579105
- 29 Lipsey MW. Identifying interesting variables and analysis opportunities. In: Cooper H, Hedges LV, Valentine JC, eds. *The handbook of research synthesis and meta-analysis*. 2nd ed. Russell Sage Foundation, 2009: –58.
- 30 Borenstein M, Hedges LV, Higgins JPT, Rothstein HR. *Introduction to meta-analysis*. John Wiley & Sons, 2009;doi: 10.1002/9780470743386
- 31 Kendall T, Bird V, Cantwell R, Taylor C. To meta-analyse or not to meta-analyse: abortion, birth and mental health. *Br J Psychiatry* 2012;200:–4. doi: 10.1192/bjp.bp.111.106112. pmid: 22215864
- 32 National Collaborating Centre for Mental Health. Induced abortion and mental health: a systematic review of the mental health outcomes of induced abortion, including their prevalence and associated factors. Academy of Medical Royal Colleges, Royal College of Psychiatrists, 2011. https://www.aomrc.org.uk/wp-content/uploads/2016/05/Induced_Abortion_Mental_Health_1211.pdf
- 33 Lambie K, Barnes H. Row over *British Journal of Psychiatry* abortion paper saw panel quit. BBC Newsnight, 20 Jul 2023. <https://www.youtube.com/watch?v=dvJQyX4po>
- 34 Davies M. Row over medical journal's refusal to retract paper used to restrict abortion in US legal cases. *BMJ* 2023;382:–. doi: 10.1136/bmj.p1576. pmid: 37474199
- 35 Quinn R. Weighing retracting an abortion critic's work, with lawyers involved. Inside Higher Ed, 31 Jul 2023. <https://www.insidehighered.com/news/faculty-issues/research/2023/07/31/mulling-retracting-abortion-critics-work-under-legal-eyes>
- 36 Royal College of Psychiatrists. Royal College of Psychiatrists responds to coverage in the *BMJ* and Newsnight. 2023. <https://www.rcpsych.ac.uk/news-and-features/latest-news-detail/2023/07/21/royal-college-of-psychiatrists-responds-to-coverage-in-the-bmj-and-newsnight>
- 37 Cline v Oklahoma Coalition for Reproductive Justice. US Supreme Court Case No 12-1094. Amicus brief. 2013. <https://sblog.s3.amazonaws.com/wp-content/uploads/2013/04/RU-486-Amicus-Brief-FINAL.pdf>
- 38 Gainesville Women's Care v State of Florida. Supreme Court of Florida Case SC16-381. 2016. Amicus brief. 2018. <https://files.ecatholic.com/11291/documents/2016/8/160801Amicus24hrReflection.pdf?1471283932000>
- 39 Whole Women's Health v Hellerstedt. US Supreme Court Case No 15-274. Amicus brief. 2016. https://www.scotusblog.com/wp-content/uploads/2016/02/15-274_amicus_resp_3348Women.authcheckdam.pdf
- 40 ComprehensiveHealth of Planned Parenthood v Lyskowski. District Court, Western Missouri Case 2:16-cv-04313. Declaration. 2017. <https://www.courtlistener.com/docket/4546786/54/2/comprehensive-health-of-planned-parenthood-great-plains-v-lysowski/>
- 41 Planned Parenthood v Rounds. US Court of Appeals for the Eighth Circuit Case Nos. 09-3231 and 09-3233. Amicus brief. 2018. <https://aui.org/wp-content/uploads/2018/10/PP-v-Rounds-AUI-amicus-brief.pdf>
- 42 Planned Parenthood v Indiana. US District Court, Southern Indiana Case 1:18-cv-01219. Declaration. 2018. <https://www.courtlistener.com/docket/6377153/24/1/planned-parenthood-of-indiana-and-kentucky-inc-v-commissioner-indiana/>
- 43 Box v Planned Parenthood. US Supreme Court Case No. 18-1019. Amicus brief. 2018. https://www.supremecourt.gov/DocketPDF/18/18-1019/91001/20190306174548688_37645%20pdf%20Schlueter.pdf
- 44 Boyle v Slatery. US District Court, Middle District of Tennessee Case 3:15-cv-00705, Document #275. Findings of fact. 2020. <https://www.courthousenews.com/wp-content/uploads/2020/10/tm-abortion.pdf>
- 45 Memphis Center for Reproductive Health v Slatery. US District Court, Middle District of Tennessee Case 3:20-cv-00501, Document #27. 2020. <https://www.courtlistener.com/docket/17281219/27/memphis-center-for-reproductive-health-v-slatery/>
- 46 Whole Women's Health Alliance v Rokita. US District Court, Southern District of Indiana. Order. 2021. https://www.govinfo.gov/content/pkg/USCOURTS-insd-1_18-cv-01904/pdf/USCOURTS-insd-1_18-cv-01904-13.pdf
- 47 Bristol Regional Women's Center v Slatery. US Court of Appeals for the Sixth Circuit. Document 21a0175p.06. 2021. <https://www.opn.ca6.uscourts.gov/opinions.pdf/21a0175p-06.pdf>
- 48 SisterSong Women of Color Reproductive Justice Collective v State of Georgia. Superior Court of Fulton County, State of Georgia. Case 2022CV367796. Notice. 2022. <https://fultonderk.org/DocumentCenter/View/1577/NOTICE-11-18-2022-171418-35698654-91C4E345-8801-4210-8FF4-0F2D5CDF7FEF>
- 49 Hearing over future of Michigan's abortion ban continues. 7 April 2023. Accessed 13 April 2023 at: <https://www.fox17online.com/news/local-news/hearing-over-future-of-michigans-abortion-ban-continues>
- 50 Judge pushes back ruling after day two of Michigan abortion ban hearing. 18 August 2022. <https://michiganadvance.com/2022/08/18/judge-pushes-back-ruling-after-day-two-of-michigan-abortion-ban-hearing/>
- 51 Dobbs v Jackson Women's Health Organization. US Supreme Court No 19-1392. Brief for American Association of Pro-life Obstetricians and Gynecologists as amicus curiae in support of petitioners. 2019. https://www.supremecourt.gov/DocketPDF/19/19-1392/184712/20210722163259351_41205%20pdf%20Parker%20%20br.pdf
- 52 Alliance for Hippocratic Medicine v US Food and Drug Administration. US District Court for the Northern District of Texas. Case 2:22-cv-00223-Z. Brief amicus curiae on behalf of Human Coalition in support of plaintiffs' motion for preliminary injunction. 2023. <https://adfmlegalfiles.blob.core.windows.net/files/AHM-AmicusBriefOnBehalfOfHumanCoalition.pdf>
- 53 Planned Parenthood v Reynolds. Iowa Supreme Court. Case 23-1145. Brief of Amicus Curiae for Concerned Women for America. 2023. https://concernedwomen.org/wp-content/uploads/2023/11/CWA_PPVReynolds2023_amicus.pdf
- 54 Dobbs v Jackson Women's Health Organization. US Supreme Court No. 19-1392. Brief of amici curiae: 375 women injured by second and third trimester late term abortions and abortion recovery leaders in support of petitioners. 2019. https://www.supremecourt.gov/DocketPDF/19/19-1392/184712/20210722163259351_41205%20pdf%20Parker%20%20br.pdf
- 55 Dobbs v Jackson Women's Health Organization. U.S. Supreme Court No. 19-1392. Amicus curiae brief of Melinda Thybault, founder of the Moral Outcry Petition, (individually and acting on behalf of 539,108 signers of the Moral Outcry Petition), 2,249 women injured by abortion, the National Institute of Family and Life Advocates (NIFLA), and Florida Voice for the Unborn in support of petitioners for reversal on the merits. https://www.supremecourt.gov/DocketPDF/19/19-1392/184968/20210726175018044_41206%20pdf%20Parker%20III%20br.pdf
- 56 Dobbs v Jackson Women's Health Organization. U.S. Supreme Court No. 19-1392. Brief of amicus curiae for Concerned Women for America in support of petitioners. 2019. https://www.supremecourt.gov/DocketPDF/19/19-1392/185093/20210728111520674_No19-1392_CWA_Diaz-Amicusbrief.pdf
- 57 Alliance for Hippocratic Medicine v US Food and Drug Administration. U.S. District Court for the Northern District of Texas. Case 2:22-cv-00223-Z. Memorandum opinion and order. 2023:11. https://storage.courtlistener.com/recap/gov.uscourts.txd.370067/gov.uscourts.txd.370067.137.0_8.pdf
- 58 Candal-Pedreira C, Pérez-Ríos M, Ruano-Ravina A. Retraction of scientific papers: types of retraction, consequences, and impacts. In: Faintuch J, Faintuch S, eds. *Integrity of Scientific Research*. Springer International Publishing, 2022: –407. doi: 10.1007/978-3-030-99680-2_40
- 59 Li G, Kamel M, Jin Y, et al. Exploring the characteristics, global distribution and reasons for retraction of published articles involving human research participants: a literature survey. *J Multidiscip Healthc* 2018;11:–47. doi: 10.2147/JMDH.S151745. pmid: 29403283
- 60 Kaufman KR, Malhi GS, Bhui KS. When a corrigendum is not sufficient. *BJPsych Open* 2019;5:e55. doi: 10.1192/bjo.2019.41. pmid: 31685064
- 61 Brainard J. Rethinking retractions. *Science* 2018;362:–3. doi: 10.1126/science.362.6413.390. pmid: 30361352
- 62 Van Noorden R. More than 10,000 research papers were retracted in 2023a new record. *Nature* 2023;624:–81. doi: 10.1038/d41586-023-03974-8. pmid: 38087103
- 63 Williams ACC, Hearn L, Moore RA, et al. Effective quality control in the medical literature: investigation and retraction vs inaction. *J Clin Epidemiol* 2023;157:–7. doi: 10.1016/j.jclinepi.2023.02.022. pmid: 36863688
- 64 Williams ACC. Dubious data and contamination of the research literature on pain. *Br J Pain* 2023;17:–9. doi: 10.1177/20494637231190866. pmid: 37538947
- 65 Wager E, Williams P. Why and how do journals retract articles? An analysis of Medline retractions 1988–2008. *J Med Ethics* 2011;37:–70. doi: 10.1136/jme.2010.040964. pmid: 21486985
- 66 Williams P, Wager E. Exploring why and how journal editors retract articles: findings from a qualitative study. *Sci Eng Ethics* 2013;19:–11. doi: 10.1007/s11948-011-9292-0. pmid: 21761244
- 67 Gelman A. On fatally-flawed, valueless papers that journals refuse to retract. 2021. <https://statmodeling.stat.columbia.edu/2021/07/11/on-fatally-flawed-valueless-papers-that-journals-refuse-to-retract/>
- 68 Fang FC, Casadevall A. Retracted science and the retraction index. *Infect Immun* 2011;79:–9. doi: 10.1128/IAI.05661-1

- 69 Frontiers Editorial Office. Retraction: The turnaway study: a case of self-correction in science upended by political motivation and unvetted findings. *Front Psychol* 2022;13:1130026. doi: 10.3389/fpsyg.2022.1130026 pmid: 36636664
- 70 Bhui K, O'Brien A, Upthegrove R, et al. Editorial independence is dead, long live editorial independence: principles, compliance, and recommendations. *PsyArXiv* 2023. [Preprint.] doi: 10.31234/osf.io/eau6r