HHS Public Access

Author manuscript

Res Ethics. Author manuscript; available in PMC 2023 August 24.

Published in final edited form as:

Res Ethics. 2023 April ; 19(2): 121–138. doi:10.1177/17470161221148387.

Disclosing and Managing Non-Financial Conflicts of Interest in Scientific Publications

David B Resnik

NIEHS/NIH

Abstract

In the last decade, there has been increased recognition of the importance of disclosing and managing non-financial conflicts of interests to safeguard the objectivity, integrity, and trustworthiness of scientific research. While funding agencies and academic institutions have had policies for addressing non-financial interests in grant peer review and research oversight since the 1990s, scientific journals have been only recently begun to develop such policies. An impediment to the formulation of effective journal policies is that non-financial interests can be difficult to recognize and define. Journals can overcome this problem by providing guidance concerning the types of non-financial interests that should be disclosed, including direct research interests, direct professional interests, expert testimony, involvement in litigation, holding a leadership position in a non-governmental organization, providing technical or scientific advice to a non-governmental organization, and personal or professional relationships. The guidance should apply to authors, editors, and reviewers.

Keywords

conflict of interest; financial; non-financial; bias; ethics; policy; journals

1. Introduction

A conflict of interest (COI) is a situation which in individual's judgment concerning a primary interest tends to be unduly influenced (or biased) by a secondary interest (Thompson 1993). For example, if a researcher is conducting a clinical trial of a drug and owns stock in the company that manufactures the drug, their financial interest may unduly influence their judgment concerning the design of the study or the analysis or interpretation of the data (Shamoo and Resnik 2022). (COIs are an important issue in government and in the professions, because they can lead to unethical, illegal, or unprofessional behavior and undermine the public's trust (Davis 1993; Institute of Medicine 2009). Although COIs can lead to unethical, illegal, or unprofessional behavior, they are different from bias or misconduct. One does not need to have actual proof that a person was biased or acted unethically to be concerned about their COI. It is the situation that the person is in that creates the ethical problem (Thompson 1993).[1]

[1]Institutions can also have COIs but these will not be the main focus of this article (see Shamoo and Resnik 2022).

In some circumstances a person with a COI may deliberately violate ethical, legal or other rules to promote their interests, but since interests may influence the human mind subconsciously, a person with a COI may not even be aware that their interests have impacted their thinking and behavior (Kafaee et al. 2021, 2022; Shamoo and Resnik 2022). For example, a physician who receives speaking fees and gifts from a drug company may tend to favor the company's medications when writing prescriptions, possibly against the best medical interests of the patient (Katz et al. 2003). The physician may insist that they would never do anything unethical or unprofessional, while being unaware of how their interests affect their prescribing patterns (Katz et al. 2003).

While COIs have been recognized as a matter of concern in legal practice since the 1300s and in government since the 1800s (Davis 1995; Rose 2000; Davies et al. 2013), they did not emerge as a key issue in scientific research until the mid-1980s, when a series of scandals involving research misconduct and financial interests in biomedical research grabbed the attention of the US Congress and the public (US Congress, Committee on Government Operations 1990; Resnik 1998; Korn 2000). The Public Health Service (PHS), which funds National Institutes of Health (NIH) research, and the National Science Foundation (NSF) responded to these scandals by promulgating policies for misconduct and financial COIs in funded research (Public Health Service 1986, 1995; National Science Foundation 1987). PHS and NSF COI rules require funded research institutions to adopt written policies for disclosing and managing funded investigators' significant financial interests, which are defined as "anything of monetary value" excluding salary or other remuneration from the institution; income from lectures, seminars, teaching engagements, or service on advisory committees or review panels sponsored by public or nonprofit entities; equity interests that do not exceed $10,000; and payments from private corporations that do not exceed $10,000. In 2011, PHS lowered its disclosure threshold for reporting equity interests and payments from private corporations to $5,000 but NSF did not (National Science Foundation 2005; Department of Health and Human Services 2011).

Scientific journals and professional associations around the world have responded to COI problems in research by developing policies and ethical guidelines for researchers. Although very few scientific journals had COI policies in the mid-1980s, today it is estimated that more than 90% of biomedical journals do (Blum et al. 2009; Resnik et al. 2017; Daou et al. 2018; de Lotbiniere-Bassett et al. 2018).[2] Many journals have modelled their policies on guidelines developed by the International Committee of Medical Journal Editors (ICMJE) and the Committee on Public Ethics, two international organizations that have spearheaded efforts to promote integrity in scientific publication (Van der Weyden 2007; Resnik et al. 2017; International Committee of Medical Journal Editors 2022). Professional associations, such as the American Chemical Society, the American Medical Association, the American Physical Society, the American Psychological Association, and the American Society for Microbiology also developed policies for COIs in research (Nissen 2017).

Although COIs have been an important ethical concern in scientific research in the US since the 1980s, other countries, especially European countries, have also taken actions

[2]Some journals use the term 'competing interests' instead of COI, but the terms mean basically the same thing.

to deal with COIs. European countries with COI policies for scientific research include Belgium (Académie Royale des Sciences, des Lettres et des Beaux Arts de Belgique 2009), Denmark (Ministry of Higher Education and Science 2014), France (Agence Nationale de la Recherche 2015), Germany (Deutsche Forschungsgemeinschaft 2019), the Netherlands (Netherlands Organization for Scientific Research 2018), Switzerland (Swiss Academies of Arts and Sciences 2021), and the United Kingdom (United Kingdom Research and Innovation 2022). International organizations, including All European Academies (2017), Council for the International Organizations of Medical Sciences (2016), World Conference on Research Integrity (2010), and World Medical Association (2013) have developed COI guidance.

The ethical and policy debate concerning COIs initially focused on financial interests in research, but in recent years non-financial interests, such as personal or professional relationships, political activity, involvement in litigation, and even philosophical or religious beliefs have also become an important concern (Saver 2012; McKinney and Pierce 2017; Rosenberg 2017; Wiersma et al. 2018; Nature 2018; Neill et al. 2020; Montgomery and Weisman 2021; Grundy 2021; Radun 2021). Although policies related to scientific grant review[3], human and animal research[4],[5] and research misconduct[6] have for many years covered non-financial COIs, journals have also begun to address them. For example, studies indicate that between 53% and 68.8% of journal policies address non-financial COIs (Resnik et al. 2017; Daou et al. 2018; de Lotbiniere-Bassett et al. 2018). High-impact journals published by Nature (2018), Science (2022), and Cell Press (2022) all require authors to disclose financial and non-financial interests that could bias their research or create the perception of bias.

Despite the growing awareness of the importance of addressing non-financial COIs in research, some scientists and scholars, such as Bero and Grundy (2016), Bero (2017), and Grundy et al. (2020), have pushed back against this trend and argued that journal policies should focus on financial COIs and not on non-financial ones. In this article, I will argue that scientific journals should address non-financial COIs in publication, and I will offer some recommendations for policy development.

2. Bias and Conflict of Interest

As noted above, COIs impact behavior by influencing (or biasing) judgment or decision-making (Resnik 2000; Kafaee et al. 2021, 2022). Very often, an individual's interests will align with their primary ethical, legal, or other obligations. For example, when a scientist

[3]For example, NIH prohibits scientists from reviewing a grant application if, within the last three years, they have had a professional relationship (such as mentor or collaborator) with anyone who has a major role on the application (National Institutes of Health 2022).
[4]Federal research regulations prohibit institutional review board (IRB) members from reviewing protocols with which they have a COI (Department of Health and Human Services 2017). Although the regulations do not define a COI, most IRBs require members to recuse themselves from review if they have significant involvement with the protocol or a professional relationship with an investigator on the protocol (see, for example, Duke University 2022).
[5]NIH guidelines for reviewing research involving laboratory animals prohibit animal care and use committee members from having a COI related to the protocol they are reviewing. The guidelines include financial and non-financial interests (such as professional relationships) in the COI definition (National Institutes of Health, Office of Laboratory Animal Welfare, 2002).
[6]The federal research misconduct policy prohibits members of committees that investigate misconduct from having unresolved COIs. The policy does not specify whether COIs are financial or non-financial (Office of Science and Technology Policy 2000).

is interested in determining the veracity of a hypothesis under investigation, the scientist's interests align with their primary obligations to follow epistemic and ethical norms for conducting research, such as honesty, transparency, rigor, etc. (Resnik 2007a). However, sometimes a scientist's secondary interests may conflict with their primary obligations. In the clinical research example mentioned earlier, the investigator could take actions, such as falsifying data or manipulating the statistical analysis, which could increase the stock's price and thereby promote their financial interests, but which would violate their primary obligations to follow epistemic and ethical norms for conducting research (Resnik 2007a).

In the last few decades, social scientists, philosophers, methodologists, and science policy experts have investigated the variety of economic, psychological, cultural, and social factors that can increase the risk of bias in research (Longino 1990; Kourany 2010; Fanelli et al. 2017; Ioannidis 2018). Though money is an important source of potential bias in research (Bero 2013; Elliott and Resnik 2014), it is far from the only source (Resnik 2007b, 2009; McGarity and Wagner 2008). Cognitive psychologists have discovered a variety of subconscious biases that can affect human judgment and decision-making, such as confirmation bias, i.e., the tendency to believe what one wants or expects to believe, and anchoring bias, i.e., the tendency to cling to a belief despite accumulating contrary evidence (Tversky and Kahneman 1974; Kahneman 2011). Confirmation bias can be a significant problem in science when researchers want to try to prove that a hypothesis so they can make money, promote their careers or ideas, or advance a political agenda. The history of science indicates that scientists often succumb to many different sorts of biases, despite their avowed commitment to objectivity (Kuhn 1962, 1977; Kafaee et al. 2021, 2022).

3. Impact of Financial Interests on Scientific Research

Since the 1990s, scientists and scholars have sought to better understand how the financial interests of research organizations and individual researchers affect scientific practice. Numerous studies have found statistically significant associations between sources of funding and published research outcomes (Bekelman et al. 2003; Ridker and Torres 2006; Sismondo et al. 2008; Krimsky 2013; Fabbri et al. 2018). For example, Stelfox et al. (1998) found that 96% of authors who supported calcium channel antagonists had financial relationships to manufacturers compared 63% who had no such relationships; Friedberg et al. (1999) found that 95% of articles with industry funding reported positive results for cancer treatments as opposed to 62% without industry funding; and Friedman and Richter (2004) found that articles published in two top medical journals were 67% more likely to report results that favored a product if one or more authors had disclosed a financial interest as compared to articles in which no such interests were disclosed.

While studies on the relationship between funding and research outcome can identify patterns related to financial interests, they do not explain, at a more fundamental level, how or why these patterns occur. Scientists and scholars therefore have also attempted to develop possible explanations of the association between financial interests and published research outcomes. It is likely that a large percentage of the association between financial interests and research outcomes can be explained by publication and funding decisions made by research sponsors (Krimsky 2003, 2013; Resnik 2007a; Elliott 2011; Sismondo 2008),

not investigator bias. For example, a pharmaceutical company could decide not to publish research data that undermine the profitability of a product it manufactures, as has happened with research involving Merck's drug Vioxx (Krumholz et al. 2007). Funding decisions can also impact outcomes. For example, a medical device company could decide to only fund studies that is has reason to believe will promote its products, or it could defund studies before they have been completed if the data are trending in a direction that goes against the company's interests. By influencing publication and funding in a particular area of research, a company can "seed" the scientific literature with studies favoring its interests (Michaels 2008).

However, investigator biases also influence research outcomes. Although investigators sometimes make decisions at the behest of sponsors, they are still responsible for the choices they make related to research design, data analysis, and data interpretation. Many different decisions pertaining to research design affect study outcomes, such as choices involving sample size, sampling techniques, variables, randomization, blinding, and control groups (Resnik 2007a; Elliott 2011; Lexchin 2012; Ma et al. 2020; Kafaee et al. 2021, 2022). For example, an investigator who is interested in showing that a chemical has no adverse effects could statistically underpower a study so that it is not likely to include enough data to demonstrate an effect (Serdar et al. 2021). Financial interests can also affect how investigators analyze and interpret data. For example, it is often the case that more than one statistical test (e.g., T-test, Chi-Square test, etc.) or model (e.g., linear regression, logistic regression) could be legitimately used to analyze the data (Gardenier and Resnik 2002). A researcher who has a financial interest related to a study could choose a method of analyzing the data that best promotes that interest (Elliott 2011; Lexchin 2012). Issues related to data analysis are paramount in complex studies involving large datasets with many variables, i.e., "big data" (Resnik et al. 2017). Another key area of potential bias is in the evaluation and interpretation of data and evidence. One of the most important decisions in conducting a systematic review of the literature or meta-analysis is deciding which studies to include in the analysis (Ma et al. 2021). Researchers with financial interests at stake could affect the outcome of the analysis by excluding studies that go against those interests.

4. Impact of Non-Financial Interests on Research

While there is considerable statistical evidence concerning the impact of financial interests on published scientific research, there is far less statistical evidence concerning the impact of non-financial interests. However, absence of evidence is not evidence of absence (Ranganathan et al. 2015). One of the main reasons why we lack this type of evidence is that we do not have the requisite data, and we do not have this data because most journal disclosure policies for non-financial interests have been implemented only recently. Hence, it is very difficult to study potential associations between non-financial interests and published research outcomes. In the realm of financial COIs, by contrast, journal disclosure policies have been in effect since the 1990s and researchers have also had access to COI databases, such as the Sunshine Act database, for more than a decade (Open Payments 2022). There are no such databases available for tracking non-financial interests.

While statistical evidence concerning the effects of non-financial interests is lacking, there is some compelling evidence from recent cases. Consider, for example, Andrew Wakefield's research on the measles, mumps, and rubella (MMR) vaccine. In 1998, Wakefield and coauthors published a study in *The Lancet* claiming that the MMR vaccine may cause autism. The journal retracted the paper in 2010 after an investigation by journalist Brian Deer found that Wakefield had not disclosed that he had received funding from a law firm that was suing vaccine manufacturers and had not obtained ethics committee approval for the study. A few years later, Deer examined the medical records used in the study and found that Wakefield had fabricated and falsified data in the paper. Wakefield's interests in this research were more than financial because he has aligned himself with the anti-vaccine movement and advises anti-vaccine groups. Wakefield denies allegations of fraud (Shamoo and Resnik 2022).

In 2012 Gilles-Eric Séralini and coauthors published a controversial paper in *Food and Chemical Toxicology* purporting to show that laboratory animals fed a diet of genetically modified corn over a two-year period had a significantly higher rate of tumor formation than the control group. The paper was retracted by the journal after dozens of scientists claimed the study was poorly designed and statistically flawed. One of the chief ethical criticisms of the paper is that the authors did not disclose that their study was funded by CRIIGEN (Committee of Independent Research and Information on Genetic Engineering), a non-profit organization opposed to genetic engineering. The authors also did not disclose that Séralini was president of CRIIGEN's scientific board (Resnik 2015).

5. Arguments in Favor of Addressing Non-Financial Interests in Scientific Publication

As mentioned previously, many journals are now asking authors to disclose non-financial interests that could bias their research. Several arguments support this policy.

First, as discussed previously, there is substantial evidence that political, personal, professional, and other non-financial interests can influence scientific research. Although the precise extent or scope of this impact requires further study, it is clearly significant.

Second, organizations with political interests in research, such as environmental, public health, or consumer groups, are taking a greater interest in sponsoring scientific research (Schlosberg 2009; English et al. 2018; Radun 2021). While the percentage of total US research and development (R & D) funding from non-profit groups is a small (4.1%) in comparison to the percentage from private companies (70.7%) or the federal government (21.2%), in absolute terms funding from non-profits is substantial. In 2019, non-profit groups funded $26.7 billion worth of research in the US (Congressional Research Service 2021). Although some of these non-profits seemingly have no political axes to grind, many do, as illustrated by the Séralini case discussed above. Research sponsors with political interests can influence the judgment and behavior of scientists seeking funding from the sponsor, identify with the sponsor's goals, or both.

Third, many scientists have become involved in political movements related to topics such as climate change, sustainability, species preservation, biodiversity, pollution, energy policy, genetically modified organisms, toxic chemicals, vaccination, gun control, and abortion rights. For example, in April 2017, hundreds of thousands of scientists participated in the "March for Science" protests in Washington, DC, Boston, MA, Chicago, IL, Los Angeles, CA, San Francisco, CA, Seattle, WA, Phoenix, AZ, Berlin, Germany (Smith-Spark 2017). The protests were organized by the March for Science (2022) organization, which describes itself as "the world's largest grassroots community of science advocates, organizing for a more sustainable and just future." Although political activity by scientists is not new —the Union of Concerned Scientists (2022) has advocated for nuclear weapons control, environmental protection, public health, and other concerns since 1969—the scope and depth of this activity seems to have increased in the last couple of decades (Pielke 2007; Resnik 2009). While scientists have a right (and often a duty, based on their expertise) to participate in political debates, scientists who exercise this right may face ethical issues related to managing the risk of bias or the perception of bias among their colleagues or the public (Pielke 2007; Resnik and Elliott 2016).

Fourth, scientists who serve as expert witnesses often have political or social interests related to their research, as illustrated by the Wakefield case discussed above (Patterson 1999; Rosner and Markowitz 2005; Resnik 2007b; Milroy 2017). Expert witnesses often have financial and non-financial interests related to their research because they receive money for providing testimony and they frequently identify with one side of the case (Crockett 2022). For example, Herbert Needleman (1927–2017) was a pediatric neurologist who conducted ground-breaking research demonstrating that lead exposure interferes with cognitive development in children. Needleman advocated for removing lead gasoline and from interior paint, and he testified in court against the companies that mined lead (Rosner 2005). It is conceivable that Needleman would have waived his fee, if asked to do so, given his opposition to the lead industry. If a scientist decides to waive their fee, then their interests in the case would not be covered by COI policies that require disclosure of payment for expert testimony or consulting.

Fifth, scientists are sometimes involved in litigation when they are plaintiffs or defendants or when they submit amicus briefs in support of a party to a legal matter. For example, in the Association of Molecular Pathology vs. Myriad Genetics, Inc. (2013), a case in which the US Supreme Court ruled that naturally occurring DNA sequences cannot be patented, several scientific organizations, including the American Medical Association, and a group of scientists, physicians, clinical geneticists, filed amicus briefs in support of the plaintiff. These scientists submitted these briefs because they had financial and professional interests affected by the outcome of the case, since they wanted to be able to test for breast cancer genes without being legally liable for infringing Myriad's patents.

6. Arguments Against Addressing Non-Financial Interests in Scientific Publication

Although recognition of the importance of dealing with non-financial COIs in research is growing, some scientists and scholars have argued that scientific journals should focus on financial COIs and not require researchers to address non-financial ones. Bero and Grundy have developed several critiques of the idea that journals should develop policies pertaining to non-financial interests in scientific publication. The first is that these policies will divert attention away from financial interests:

> Focusing on interests such as personal beliefs, experience, or intellectual commitments can divert attention from financial conflicts of interest, which have the potential for widespread influence (Bero and Grundy 2016).

The second is that adopting non-financial COI policies will cause confusion and undermine efforts to address COIs:

> Conflation of “conflicts of interest” with “interests” in general serves to muddy the waters about how to manage conflicts of interest, generating confusion as to the nature and definition of the problem and doubt as to whether conflicts of interest can be addressed at all (Bero and Grundy 2016).

The third is that non-financial COIs are so poorly defined that COI policies will be difficult to implement:

> “Non-financial conflicts of interest” are variably defined, and the term is used to refer to the broadest range of personal, professional, and social attributes Expanding the definition of conflict of interest to include anything that might influence judgment will heighten such challenges (Grundy et al. 2020, pp. 5–6)

Let’s examine these critiques in order. Concerning the first critique, expanding the definition of a COI to include non-financial interests may divert some attention from managing financial COIs in scientific publication, but arguably not enough to justify ignoring non-financial COIs. Since the 1990s, funding agencies have had robust policies for dealing with non-financial COIs, such as professional or personal relationships, in grant review (Shamoo and Resnik 2022). In non-research contexts, such as law, organizations have developed guidelines and practices for managing financial and non-financial interests, so it should also be possible in research. The key is to provide clear and effective guidance to avoid confusion and promote compliance. Concerning the second critique, adopting non-financial COI policies probably will not cause much confusion, provided that journals provide clear guidance (discussed in more detail below) for disclosing non-financial COIs. Concerning the third critique, non-COI policies may be somewhat difficult to implement initially but will probably become much easier to implement over time as researchers become familiar with them and editors and publishers make adjustments. Finally, it should be remembered that financial COI disclosure policies also met with the same sort of skepticism and resistance among researchers when they were first proposed but became widely accepted as researchers became familiar with them (Resnik 1998).

I agree with Bero and Grundy that non-financial COIs are often poorly defined at present and that current guidance is unclear. However, the appropriate response to this problem is not to dismiss non-financial interests as an irrelevant distraction but to define them more clearly and provide effective guidance (Saver 2012; Viswanathan et al. 2013). Indeed, financial interests were also defined unclearly at one point, but this was not used as an excuse to ignore them. Instead, funding agencies, journals, and institutions took steps to define them more clearly.

7. Disclosing and Managing Non-Financial Conflicts of Interest in Scientific Publications

To counter the charge that non-financial COIs are poorly defined, scientific journals can develop policies that provide clear guidance concerning disclosure of non-financial COIs. The guidance could be based on the ICMJE's policy for disclosure of financial and non-financial interests. The ICMJE (2021) has developed a form that authors can fill out and submit to a journal with their manuscript. On the form, authors disclose sources of funding and interests (within the last 3 years), including:

1. Contracts or grants
2. Royalties or licenses
3. Consulting fees
4. Honoraria or speaking fees
5. Support for attending meetings
6. Patents (planned, pending, or awarded)
7. Stock or stock options
8. Receipt or equipment or supplies
9. Leadership role on a board, society, or advocacy group (paid or unpaid)
10. Other financial or non-financial interests

The standard for disclosure is that the interests are related to the content of manuscript. To promote transparency, the ICMJE encourages authors to err on the side of disclosing too much rather than too little.

The ICMJE's form is comprehensive and thorough, but it does not provide sufficient guidance concerning non-financial COIs. Notably absent from the form is any mention of expert testimony. Moreover, the form is only used by authors, not reviewers or editors, but reviewers and editors also may have COIs that should be disclosed and managed (Resnik and Elmore 2018). I recommend, therefore, that journals use a form for authors, editors, and reviewers, that includes the entries on the ICMJE form as well as:

1. **Direct research interests**. For example, an individual is asked to review a paper for a journal but is currently working on the very same topic.

2. **Direct professional interests**. For example, an individual submits a paper to a journal demonstrating the safety of a particular type of eye surgery that the individual routinely perform in professional practice. Note: this interest is partly financial and partly non-financial.

3. **Expert testimony (paid or unpaid)**. Note: paid legal work would be covered by many but not all financial disclosure policies but would also be covered here.

4. **Other involvement in litigation**. For example, being a party to a lawsuit or submitting an amicus brief.

5. **Providing unpaid scientific, technical, legal, or other advice to a non-profit group or other non-government organization (paid or unpaid).** Note: paid work would be covered by most financial disclosure policies, but unpaid work would not be. Also, mere membership in an organization is not enough a strong enough interest to warrant disclosure.

6. **Personal or professional relationships**. For example, an individual is asked to review as manuscript from a collaborator, former student, or advisor.

Absent from this list are political, philosophical, or religious beliefs, because these are difficult to define, delineate, and document. Every scientist has some beliefs that could unduly influence their research and deciding which ones should be disclosed and managed would seem to be a laborious and possibly futile task. Nevertheless, researchers should be aware of how their political, philosophical, or other beliefs may impact their judgment and decision-making and take steps to minimize potential bias in experimental design, data interpretation, and other aspects of inquiry (Elliott and Resnik 2014). They should have the option of disclosing these interests if they believe they could be reasonably expected to bias their research.

Disclosure is an essential step to dealing with COIs, since it is impossible to deal with a COI if one does not know about it. Disclosure promotes transparency, honesty, and accountability in research. Also, reviewers, editors, and readers can use COI information disclosed by authors to evaluate research studies. Although having a COI should not be equated with bias, it can be a risk factor for bias, and should be understood in that way (Thompson 1993; Resnik and Elliott 2013).

Disclosure is often insufficient to address ethical issues related to COIs in research, however. Sometimes it may be necessary to take additional steps to deal with COIs (Shamoo and Resnik 2022). As noted earlier, government funding agencies prohibit some types of COIs for grant proposal review. Very few scientific journals prohibit COIs from authors, however, because they probably rely on peer reviewers and readers to account for the authors' potential bias (Shamoo and Resnik 2022). A notable exception is the New England Journal of Medicine (2022), which prohibits authors of editorials or review articles from having financial interests in the products they are discussing. Also, some biomedical journals will not publish articles directly funded by tobacco companies (Chawla 2022). A less extreme step than prohibiting a COI is managing it. For example, sometimes editors have difficulty finding non-conflicted reviewers for manuscripts, especially in small fields of research when

most people know each other. When this happens, the editors may attempt to manage COIs by using conflicted and non-conflicted reviewers and relying on their own judgment to assesses the fairness of the reviews they receive (Resnik and Elliott 2018).

8. Conclusion

The movement toward greater recognition of the importance of addressing non-financial COIs is a welcome development in research ethics and policy because non-financial COIs, like financial ones, can undermine the objectivity, integrity, and trustworthiness of research. Most funding agencies and academic institutions have developed effective policies for addressing non-financial COIs in grant peer review and research oversight, but many scientific journals do not have policies for dealing with the non-financial COIs of authors, reviewers, or editors. An impediment to the development of effective journal policies is that non-financial COIs are not clearly defined. Journals can overcome this problem by providing guidance concerning the types of non-financial interests that should be disclosed, including direct research interests, direct professional interests, expert testimony, involvement in litigation, holding a leadership position in a non-governmental organization, providing technical or scientific advice to a non-governmental organization, and personal or professional relationships. The guidance should apply to authors, editors, and reviewers.

Acknowledgments

This research was supported by the Intramural Research Program of the National Institute of Environmental Health Sciences (NIEHS), National Institutes of Health (NIH). It does not represent the views of the NIEHS, NIH, or US government.

References

Académie Royale des Sciences, des Lettres et des Beaux Arts de Belgique. 2009. Code of Ethics for Scientific Research in Belgium. https://www.kuleuven.be/english/research/integrity/practices/belspo-code

Agence Nationale de la Recherche. 2015. French Chater for Research Integrity. https://www.hceres.fr/sites/default/files/media/downloads/2015_French_RI_Charter_0.pdf

All European Academies. 2017. The European Code of Conduct for Research Integrity, revised edition. https://www.allea.org/wp-content/uploads/2017/05/ALLEA-European-Code-of-Conduct-for-Research-Integrity-2017.pdf

Association for Molecular Pathology v. Myriad Genetics, Inc. 2013. 569 U.S. 576.

Bekelman JE, Li Y, Gross CP. 2003. Scope and impact of financial conflicts of interest in biomedical research: a systematic review. Journal of the American Medical Association 289(4):454–465. [PubMed: 12533125]

Bero LA. 2013. Why the Cochrane risk of bias tool should include funding source as a standard item. Cochrane database of systematic reviews 12:ED000075.

Bero LA. 2017. Addressing bias and conflict of interest among biomedical researchers. Journal of the American Medical Association 317(17):1723–1724. [PubMed: 28464166]

Bero LA, Grundy Q. 2016. Why having a (nonfinancial) interest is not a conflict of interest. PLoS Biology 14(12):e2001221. [PubMed: 28002462]

Blum JA, Freeman K, Dart RC, Cooper RJ. 2009. Requirements and definitions in conflict of interest policies of medical journals. Journal of the American Medical Association 302(20):2230–2234. [PubMed: 19934424]

Cell Press. 2022. Editorial Policies. https://www.cell.com/trends/editorial-policies

Chawla DS. 2022. Tobacco publishing ban for researchers at industry-owned firms. Nature, 28 January. https://www.nature.com/articles/d41586-022-00197-1.

Congressional Research Service. 2021. U.S. Research and Development Funding and Performance: Fact Sheet. https://sgp.fas.org/crs/misc/R44307.pdf

Council for the International Organizations of Medical Sciences. 2016. International Ethical Guidelines for Health-related Research Involving Humans. https://cioms.ch/wp-content/uploads/2017/01/WEB-CIOMS-EthicalGuidelines.pdf

Crockett Z 2022. The lucrative economics of expert witnesses. The Hustle, 4 June. https://thehustle.co/the-lucrative-economics-of-expert-witnesses/

Daou KN, Hakoum MB, Khamis AM, Bou-Karroum L, Ali A, Habib JR, Semaan AT, Guyatt G, Akl EA. 2018. Public health journals' requirements for authors to disclose funding and conflicts of interest: a cross-sectional study. BMC Public Health 18(1):533. [PubMed: 29688846]

Davies Mark; Leventhal Steven G. and Mullaney Thomas J.. 2013. An abbreviated history of government ethics laws—part II. NYSBA Municipal Lawyer 27(3):49–53.

Davis M 1993. Conflict of interest revisited. Business & Professional Ethics Journal 12(4):21–41.

de Lotbiniere-Bassett MP, Riva-Cambrin J, McDonald PJ. 2018. Conflict of interest policies and disclosure requirements in neurosurgical journals. Journal of Neurosurgery 131(1):264–270. [PubMed: 30117775]

Deutsche Forschungsgemeinschaft. 2019. Guidelines for Safeguarding Good Research Practice. https://wissenschaftliche-integritaet.de/en/code-of-conduct/

Duke University. 2022. Conflict of Interest for an IRB Member. https://irb.duhs.duke.edu/training-and-education/resources/irb-member-portal/conflict-interest-irb-member

Elliott KC. 2011. Is a Little Pollution Good for You? Incorporating Societal Values in Environmental Research. New York, NY: Oxford University Press.

Elliott KC, Resnik DB. 2014. Science, policy, and the transparency of values. Environmental Health Perspectives 122(7):647–650. [PubMed: 24667564]

English PB, Richardson MJ, Garzón-Galvis C. 2018. From crowdsourcing to extreme citizen science: participatory research for environmental health. Annual Review of Public Health 39:335–350.

Fabbri A, Lai A, Grundy Q, Bero LA. 2018. The influence of industry sponsorship on the research agenda: a scoping review. American Journal of Public Health 108(11):e9–e16.

Fanelli D, Costas R, Ioannidis JP. 2017. Meta-assessment of bias in science. Proceedings of the National Academy of Sciences USA 114(14):3714–3719.

Fone B 2000. Homophobia: A History. New York, NY: Picador.

Friedberg M, Saffran B, Stinson TJ, Nelson W, Bennett CL. 1999. Evaluation of conflict of interest in economic analyses of new drugs used in oncology. Journal of the American Medical Association 282(15):1453–1457. [PubMed: 10535436]

Friedman LS, Richter ED. 2004. Relationship between conflicts of interest and research results. Journal General Internal Medicine 19(1):51–56.

Gardenier J and Resnik DB. 2002. The misuse of statistics: concepts, tools, and a research agenda. Accountability in Research 9(2): 65–74. [PubMed: 12625352]

Gould SJ. 1996. The Mismeasure of Man. New York, NY: WW Norton.

Grundy Q 2021. A politics of objectivity: biomedicine's attempts to grapple with "non-financial" conflicts of interest. Science and Engineering Ethics 27(3):37. [PubMed: 34097141]

Grundy Q, Mayes C, Holloway K, Mazzarello S, Thombs BD, Bero L. 2020. Conflict of interest as ethical shorthand: understanding the range and nature of "non-financial conflict of interest" in biomedicine. Journal of Clinical Epidemiology 120:1–7. [PubMed: 31866470]

Institute of Medicine. 2009. Conflict of Interest in Medical Research, Education, and Practice. Washington, DC: National Academies Press.

Ioannidis JA, Trepanowski JF. 2018. Disclosures in nutrition research: why it is different. Journal of the American Medical Association 319(6):547–548. [PubMed: 29222543]

Kafaee M, Marhamati H, Gharibzadeh S. 2021. "Choice-supportive bias" in science: explanation and mitigation. Accountability in Research 28(8):528–543. [PubMed: 33399492]

Kafaee M, Kheirkhah MT, Balali R, and Gharibzadeh S. 2022. Conflict of interest as a cognitive bias. Accountability in Research 29(6):379–396. [PubMed: 34085890]

Kahneman D 2011. Thinking, Fast, and Slow. New York, NY: Farrar, Straus, and Giroux.

Katz D, Caplan AL, Merz JF. 2003. All gifts large and small: toward an understanding of the ethics of pharmaceutical industry gift-giving. American Journal of Bioethics 3(3):39–46.

Keller EF. 1996. Reflections on Gender and Science. New Haven, CT: Yale University Press.

Korn D 2000. Conflicts of Interest in Biomedical Research. Journal of the American Medical Association 284(17):2234–2237. [PubMed: 11056596]

Kourany J 2010. Philosophy of Science after Feminism. New York, NY: Oxford University Press.

Krimsky S 2003. Science in the Private Interest: Has the Lure of Profits Corrupted Biomedical Research? Lanham, MD: Rowman and Littlefield.

Krimsky S 2013. Do financial conflicts of interest bias research?: an inquiry into the “funding effect” hypothesis. Science, Technology, & Human Values 38(4):566–587.

Krumholz HM, Ross JS, Presler AH, Egilman DS. What have we learnt from Vioxx? BMJ. 2007 Jan 20;334(7585):120–3. doi: [PubMed: 17235089]

Kuhn T 1962. The Structure of Scientific Revolutions. Chicago, IL: University of Chicago Press.

Kuhn T 1977. The Essential Tension. Chicago, IL: University Chicago Press.

International Committee of Medical Journal Editors. 2021. Disclosure of interest. https://www.icmje.org/disclosure-of-interest/

International Committee of Medical Journal Editors. 2022. Disclosure of Financial and Non-Financial Relationships and Activities, and Conflicts of Interest https://www.icmje.org/recommendations/browse/roles-and-responsibilities/author-responsibilities--conflicts-of-interest.html

Ioannidis JPA. 2018. Meta-research: why research on research matters. PLoS Biology 16(3):e2005468. [PubMed: 29534060]

Lexchin J 2012. Those who have the gold make the evidence: How the pharmaceutical industry biases the outcomes of clinical trials of medications. Science and Engineering Ethics 18: 247–261. [PubMed: 21327723]

Longino H 1990. Science as Social Knowledge. Princeton, NJ: Princeton University Press.

Ma LL, Wang YY, Yang ZH, Huang D, Weng H, and Zeng HT. 2020. Methodological quality (risk of bias) assessment tools for primary and secondary medical studies: what are they and which is better? Military Medical Research 7: 7. [PubMed: 32111253]

March for Science. 2022. Unite Behind The Science. https://marchforscience.org/

Matthews D 2015. This was the biggest political science study of last year. It was a complete fraud. Vox (May 20). https://www.vox.com/2015/5/20/8630535/same-sex-marriage-study

McGarity TO, Wagner WE. 2008. Bending Science: How Special Interests Corrupt Public Health Research. Cambridge, MA: Harvard University Press.

McKinney RE, Pierce HH. 2017. Strategies for addressing a broader definition of conflicts of interest. Journal of the American Medical Association 317(17):1727–1728 [PubMed: 28464167]

Michaels D 2008. Doubt is Their Product: How Industry’s Assault on Science Threatens Your Health. New York, NY: Oxford University Press.

Milroy CM. 2017. A brief history of the expert witness. Academic Forensic Pathology 7(4):516–526. [PubMed: 31240003]

Ministry of Higher Education and Science. 2014. Danish Code of Conduct for Research Integrity. https://eneri.eu/wp-content/uploads/2018/10/The-danish-code-of-conduct-for-research-integrity-pub.pdf

National Institutes of Health. 2022. Managing Conflict of Interest in NIH Peer Review of Grants and Contracts. https://grants.nih.gov/policy/peer/peer-coi.htm

National Institutes of Health, Office of Laboratory Animal Welfare. 2002. Institutional Animal Care and Use Committee Guidebook, 2nd ed. https://www.aaalac.org/pub/?id=E90164F5-B177-5019-754C-ACA9D13AD57D

Montgomery P, Weisman CB. 2021. Non-financial conflict of interest in social intervention trials and systematic reviews: An analysis of the issues with case studies and proposals for management. Children and Youth Services Review 120:105642.

National Science Foundation. 1987. Misconduct in Science and Engineering: Final Regulations, 45 CFR 689.

National Science Foundation. 2005. Grantee Standards. https://www.nsf.gov/pubs/manuals/gpm05_131/gpm5.jsp

Nature. 2018. Nature journals tighten rules on non-financial conflicts. Authors will be asked to declare any interests that might cloud objectivity. Nature 554:6.

Nature. 2022. Competing Interests. https://www.nature.com/nature-portfolio/editorial-policies/competing-interests

Neill S, Martin L, Harris L. 2020. Is clinical expertise a conflict of interest in research? Womens Health (London) 16:1745506520969616.

Netherlands Organization for Scientific Research. 2018. Netherlands Code of Conduct for Research Integrity. https://www.universiteitenvannederland.nl/files/documents/Netherlands%20Code%20of%20Conduct%20for%20Research%20Integrity%202018.pdf

New England Journal of Medicine. 2022. Editorial policies. https://www.nejm.org/about-nejm/editorial-policies

Nissen SE. 2017. Conflicts of interest and professional medical associations: progress and remaining challenges. Journal of the American Medical Association 317(17):1737–1738. [PubMed: 28464156]

Office of Science and Technology Policy. 2000. Federal Research Misconduct Policy. Federal Register 65(235):76260–76264.

Open Payments. 2022. About. https://openpaymentsdata.cms.gov/about

Patterson MR. 1999. Conflicts of interest in scientific expert testimony. William & Mary Law Review 40(4):5.

Pielke R 2007. The Honest Broker: Making Sense of Science in Policy and Politics. Cambridge, UK: Cambridge University Press.

Public Health Service. 1986 Interim Policies and Procedures for Dealing with Possible Misconduct in Science. NIH Guide to Grants and Contracts 15 (18 July 1986):1–37.

Public Health Service. 1995. Objectivity in research. Federal Register 60(132):35810–35819. https://grants.nih.gov/grants/guide/notice-files/not-od-11-109.html [PubMed: 11660080]

Radun I 2021. Nonfinancial conflict of interest in peer-review: Some notes for discussion. Accountability in Research Oct 10:1–12.

Ranganathan P, Pramesh CS, Buyse M. 2105 Common pitfalls in statistical analysis: “no evidence of effect” versus “evidence of no effect”. Perspectives in Clinical Research 6(1):62–63.

Resnik DB. 1998. Conflicts of interest in science. Perspectives on Science 6(4): 381–408.

Resnik DB. 2000. Financial interests and research bias. Perspectives on Science 8(3):255–285.

Resnik David B. 2007a. The Price of Truth: How Money Affects the Norms of Science. New York, NY: Oxford University Press.

Resnik DB. 2007b. Conflicts of interest in scientific research involving litigation or regulation. The Journal of Philosophy, Science & Law 7 (April 16, 2007): https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2700754/

Resnik DB. 2009. Playing Politics with Science: Balancing Scientific Independence and Government Oversight. New York, NY: Oxford University Press.

Resnik DB. 2015. Retracting inconclusive research: lessons from the Séralini GM maize feeding study. Journal of Agricultural and Environmental Ethics 28:621–633. [PubMed: 26251636]

Resnik DB and Elliott KC. 2013. Taking financial relationships into account when assessing research. Accountability in Research 20:184–205. [PubMed: 23672544]

Resnik DB and Elliott KC. 2016. The ethical challenges of socially responsible science. Accountability in Research 23(1):31–46. [PubMed: 26193168]

Resnik DB, Elliott KC, Soranno PA, Smith EM. 2017. Data-intensive science and research integrity. Accountability in Research 24(6):344–358. [PubMed: 28481648]

Resnik DB and Elmore SA. 2018. Conflict of interest in journal peer review. Toxicologic Pathology 46(2):112–114. [PubMed: 29382273]

Resnik DB, Konecny B, Kissling GE. 2017. Conflict of Interest and Funding Disclosure Policies of Environmental, Occupational, and Public Health Journals. Journal of Occupational and Environmental Medicine 59(1):28–33. [PubMed: 28045794]

Ridker PM, Torres J. 2006. Reported outcomes in major cardiovascular clinical trials funded by for-profit and not-for-profit organizations: 2000–2005. Journal of the American Medical Association 295(19):2270–2274. [PubMed: 16705108]

Rosenberg AR. 2017. "Get the consent"—nonfinancial conflict of interest in academic clinical research. Journal of Clinical Oncology 35(1):11–13. [PubMed: 28034061]

Rose J 2000. The ambidextrous lawyer: conflict of interest and the medieval and early modern legal profession. The University of Chicago Law School Roundtable 7(1):1. Available at: http://chicagounbound.uchicago.edu/roundtable/vol7/iss1/7

Rosner D, Markowitz G. 2005. Standing up to the lead industry: an interview with Herbert Needleman. Public Health Reports 120 (May-June):330–337. [PubMed: 16134577]

Saver RS. 2021. Is it really all about the money? Reconsidering non-financial interests in medical research. Journal of Law, Medicine, and Ethics 40:467–481.

Science. 2022. Science Journals: Editorial Policies. https://www.science.org/content/page/science-journals-editorial-policies#conflict-of-interest

Schlosberg D 2009. Defining Environmental Justice: Theories, Movements, and Nature. New York, NY: Oxford University Press.

Serdar CC, Cihan M, Yücel D, Serdar MA. 2021. Sample size, power and effect size revisited: simplified and practical approaches in pre-clinical, clinical and laboratory studies. Biochemical Medicine (Zagreb) 31(1):010502.

Shamoo AE, Resnik DB. 2022. Responsible Conduct of Research, 4th ed. New York, NY: Oxford University Press.

Sismondo S 2008. Pharmaceutical company funding and its consequences: a qualitative systematic review. Contemporary Clinical Trials 29(2):109–113. [PubMed: 17919992]

Smith-Spark L 2017. March for Science: Protesters gather worldwide to support 'evidence'. CNN April 22, 2017. https://www.cnn.com/2017/04/22/health/global-march-for-science/index.html

Stelfox HT, Chua G, O'Rourke K, Detsky AS. 1998. Conflict of interest in the debate over calcium-channel antagonists. New England Journal of Mediicne 338(2):101–106.

Swiss Academies of Arts and Sciences. 2021. Code of Conduct for Scientific Integrity. https://api.swiss-academies.ch/site/assets/files/25709/kodex_layout_en_web.pdf

Thompson DF. 1993. Understanding financial conflicts of interest. New England Journal of Medicine 329(8):573–6. [PubMed: 8336759]

Tversky A, Kahneman D. 1974. Judgment under uncertainty: heuristics and biases. Science 185 (4157):1124–1131. [PubMed: 17835457]

Union of Concerned Scientists. 2022. We use science to make change happen. https://www.ucsusa.org/

United Kingdom Research and Innovation. 2022. Conflicts of Interests. https://www.ukri.org/about-us/how-we-are-governed/conflicts-of-interests/

US Congress, Committee on Government Operations. 1990. Are Scientific Misconduct and Conflict of Interests Hazardous to our Health? Washington, DC: US Government Printing Office.

Van der Weyden MB. 2007. The ICMJE and URM: providing independent advice for the conduct of biomedical research and publication. Mens Sana Monographs 5(1):15–25. [PubMed: 22058614]

Viswanathan M, Carey TS, Belinson SE, Berliner E, Chang S, Graham E, Guise JM, Ip SS, Maglione MA, McCrory D, McPheeters M, Newberry SJ, Sista P, White CM. 2013. Identifying and Managing Nonfinancial Conflicts of Interest for Systematic Reviews Methods Research Reports. Rockville, MD: Agency for Healthcare Research and Quality.

Wiersma M, Kerridge I, Lipworth W. 2018. Dangers of neglecting non-financial conflicts of interest in health and medicine. Journal of Medical Ethics 44(5):319–322. [PubMed: 29175967]

World Conference on Research Integrity. 2010. Singapore Statement on Research Integrity. https://www.jsps.go.jp/english/e-kousei/data/singapore_statement_EN.pdf

World Medical Association. 2013. Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects. https://www.wma.net/policies-post/wma-declaration-of-helsinki-ethical-principles-for-medical-research-involving-human-subjects/