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# What Is Ethics in Research & Why Is It Important?

by David B. Resnik, J.D., Ph.D.

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*The ideas and opinions expressed in this essay are the author's own and do not necessarily represent those of the NIH, NIEHS, or US government.*

When most people think of ethics (or morals), they think of rules for distinguishing between right and wrong, such as the Golden Rule ("Do unto others as you would have them do unto you"), a code of professional conduct like the [Hippocratic Oath](https://www.nlm.nih.gov/hmd/greek/greek_oath.html) ([https://www.nlm.nih.gov/hmd/greek/greek\\_oath.html](https://www.nlm.nih.gov/hmd/greek/greek_oath.html)) ("First of all, do no harm"), a religious creed like the Ten Commandments ("Thou Shalt not kill..."), or a wise aphorisms like the sayings of Confucius. This is the most common way of defining "ethics": **norms for conduct** that distinguish between acceptable and unacceptable behavior.

Most people learn ethical norms at home, at school, in church, or in other social settings. Although most people acquire their sense of right and wrong during childhood, moral development occurs throughout life and human beings pass through different stages of growth as they mature. Ethical norms are so ubiquitous that one might be tempted to regard them as simple commonsense. On the other hand, if morality were nothing more than commonsense, then why are there so many ethical disputes and issues in our society?

[Alternatives to Animal Testing](https://www.niehs.nih.gov/health/topics/science/sya-iccvam/index.cfm) (<https://www.niehs.nih.gov/health/topics/science/sya-iccvam/index.cfm>)

Alternative test methods are methods that replace, reduce, or refine animal use in research and testing

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One plausible explanation of these disagreements is that all people recognize some common ethical norms but interpret, apply, and balance them in different ways in light of their own values and life experiences. For example, two people could agree that murder is wrong but disagree about the morality of abortion because they have different understandings of what it means to be a human being.

Most societies also have legal rules that govern behavior, but ethical norms tend to be broader and more informal than laws. Although most societies use laws to enforce widely accepted moral standards and ethical and legal rules use similar concepts, ethics and law are not the same. An action may be legal but unethical or illegal but ethical. We can also use ethical concepts and principles to criticize, evaluate, propose, or interpret laws. Indeed, in the last century, many social reformers have urged citizens to disobey laws they regarded as immoral or unjust laws. Peaceful civil disobedience is an ethical way of protesting laws or expressing political viewpoints.

Another way of defining 'ethics' focuses on the **disciplines that study** standards of conduct, such as philosophy, theology, law, psychology, or sociology. For example, a "[medical ethicist](https://www.iep.utm.edu/bioethic/#SH3b)" (<https://www.iep.utm.edu/bioethic/#SH3b>) is someone who studies ethical standards in medicine. One may also define ethics as a **method, procedure, or perspective** for deciding how to act and for analyzing complex problems and issues. For instance, in considering a complex issue like [global warming](https://www.niehs.nih.gov/research/programs/geh/index.cfm) (<https://www.niehs.nih.gov/research/programs/geh/index.cfm>), one may take an economic, ecological, political, or ethical perspective on the problem. While an economist might examine the cost and benefits of various policies related to global warming, an environmental ethicist could examine the ethical values and principles at stake.

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Many different disciplines, [institutions](https://gradschool.duke.edu/professional-development/programs/responsible-conduct-research/rcr-policies-and-resources)

(<https://gradschool.duke.edu/professional-development/programs/responsible-conduct-research/rcr-policies-and-resources>), and professions have standards for behavior that suit their particular aims and goals. These standards also help members of the discipline to coordinate their actions or activities and to establish the public's trust of the discipline. For instance, ethical standards govern conduct in medicine, law, engineering, and business. Ethical norms also serve the aims or goals of research and apply to [people who conduct scientific research](https://www.niehs.nih.gov/careers/index.cfm) (<https://www.niehs.nih.gov/careers/index.cfm>) or other scholarly or creative activities. There is even a specialized discipline, research ethics, which studies these norms. See [Glossary of Commonly Used Terms in Research Ethics](https://www.nih.gov/research/resources/bioethics/glossary/index.cfm)

(<https://www.nih.gov/research/resources/bioethics/glossary/index.cfm>).

There are several reasons why it is important to adhere to ethical norms in research. First, norms **promote the aims of research** (<https://www.niehs.nih.gov/about/strategicplan/index.cfm>), such as knowledge, truth, and avoidance of error. For example, prohibitions against [fabricating](https://ori.hhs.gov/federal-research-misconduct-policy) (<https://ori.hhs.gov/federal-research-misconduct-policy>), falsifying, or misrepresenting research data promote the truth and minimize error.

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Second, since research often involves a great deal of cooperation and coordination among many different people in different disciplines and institutions, ethical standards promote the **values that are essential to collaborative work**, such as trust, accountability, mutual respect, and fairness. For example, many ethical norms in research, such as [guidelines for authorship](http://www.icmje.org/recommendations/browse/roles-and-responsibilities/defining-the-role-of-authors-and-contributors.html)

(<http://www.icmje.org/recommendations/browse/roles-and-responsibilities/defining-the-role-of-authors-and-contributors.html>), copyright and [patenting policies](https://www.niehs.nih.gov/about/techtransfer/index.cfm) (<https://www.niehs.nih.gov/about/techtransfer/index.cfm>), data sharing policies, and confidentiality rules in peer review, are designed to protect intellectual property interests while encouraging collaboration. Most researchers want to receive credit for their contributions and do not want to have their ideas stolen or disclosed prematurely.

Third, many of the ethical norms help to ensure that researchers can be held **accountable to the public**. For instance, federal policies on research misconduct, conflicts of interest, the human subjects protections (<https://www.niehs.nih.gov/research/clinical/patientprotections/index.cfm>), and animal care and use (<https://www.niehs.nih.gov/health/topics/science/sya-iccvam/index.cfm>) are necessary in order to make sure that researchers who are funded by public money can be held accountable to the public.

Fourth, ethical norms in research also help to build **public support** for research. People are more likely to fund a research project if they can trust the quality and integrity of research.

Finally, many of the norms of research promote a variety of other important **moral and social values**, such as social responsibility, human rights, animal welfare, compliance with the law, and public health and safety. Ethical lapses in research can significantly harm human and animal subjects, students, and the public. For example, a researcher who fabricates data in a clinical trial may harm or even kill patients, and a researcher who fails to abide by regulations and guidelines relating to radiation or biological safety may jeopardize his health and safety or the health and safety of staff and students.

## Codes and Policies for Research Ethics

Given the importance of ethics for the conduct of research, it should come as no surprise that many different professional associations, government agencies, and universities have adopted specific codes, rules, and policies relating to research ethics. Many government agencies have ethics rules for funded researchers.

- National Institutes of Health (NIH) (<https://ethics.od.nih.gov/>)
- National Science Foundation (NSF) (<https://www.nsf.gov/pubs/manuals/manual15.pdf>)
- Food and Drug Administration (FDA) (<https://www.fda.gov/about-fda/jobs-and-training-fda/ethics>)
- Environmental Protection Agency (EPA)  
(<https://nepis.epa.gov/Exe/ZyNET.exe/9101HELH.TXT?ZyActionD=ZyDocument&Client=EPA&Index=1981+Thru+1985&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A%5Czyfiles%5CIndex%20Data%5C81thru85%5CTxt%5C00000024%5C9101HELH.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=p%7Cf&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1&SeekPage=x&ZyPURL>)
- US Department of Agriculture (USDA) (<https://www.ethics.usda.gov/>)
- Singapore Statement on Research Integrity (<https://wcrif.org/singapore-statement>)
- American Chemical Society, The Chemist Professional's Code of Conduct  
(<https://www.acs.org/content/acs/en/careers/career-services/ethics/the-chemical-professionals-code-of-conduct.html>)
- Code of Ethics (American Society for Clinical Laboratory Science) (<https://www.ascls.org/about-us/code-of-ethics>)
- American Psychological Association, Ethical Principles of Psychologists and Code of Conduct  
(<https://www.apa.org/ethics/code/index>)
- Statement on Professional Ethics (American Association of University Professors)  
(<https://www.aaup.org/report/statement-professional-ethics>)
- Nuremberg Code (<https://history.nih.gov/display/history/Nuremberg+Code>)
- World Medical Association's Declaration of Helsinki (<https://www.wma.net/what-we-do/medical-ethics/declaration-of-helsinki/>)

## Ethical Principles

The following is a rough and general summary of some ethical principles that various codes address\*:

## **Honesty**

Strive for honesty in all scientific communications. Honestly report data, results, methods and procedures, and publication status. Do not fabricate, falsify, or misrepresent data. Do not deceive colleagues, research sponsors, or the public.

## **Objectivity**

Strive to avoid bias in experimental design, data analysis, data interpretation, peer review, personnel decisions, grant writing, expert testimony, and other aspects of research where objectivity is expected or required. Avoid or minimize bias or self-deception. Disclose personal or financial interests that may affect research.

## **Integrity**

Keep your promises and agreements; act with sincerity; strive for consistency of thought and action.

## **Carefulness**

Avoid careless errors and negligence; carefully and critically examine your own work and the work of your peers. Keep good records of research activities, such as data collection, research design, and correspondence with agencies or journals.

## **Openness**

Share data, results, ideas, tools, resources. Be open to criticism and new ideas.

## **Transparency**

Disclose methods, materials, assumptions, analyses, and other information needed to evaluate your research.

## Ethical Decision Making in Research

Although codes, policies, and principles are very important and useful, like any set of rules, they do not cover every situation, they often conflict, and they require considerable interpretation. It is therefore important for researchers to learn how to interpret, assess, and apply various research rules and how to make decisions and to act ethically in various situations. The vast majority of decisions involve the straightforward application of ethical rules. For example, consider the following case,

### Case 01

The research protocol for a study of a drug on hypertension requires the administration of the drug at different doses to 50 laboratory mice, with chemical and behavioral tests to determine toxic effects. Tom has almost finished the experiment for Dr. Q. He has only 5 mice left to test.

However, he really wants to finish his work in time to go to Florida on spring break with his friends, who are leaving tonight. He has injected the drug in all 50 mice but has not completed

### Accountability

all of the tests. He therefore decides to extrapolate from the 45 completed results to produce the 5 additional results. Take responsibility for your part in research and be prepared to give an account (i.e. an explanation or justification) of what you did on a research project and why.

Many different research ethics policies would hold that Tom has acted unethically by fabricating data. If this study were sponsored by a federal agency, such as the NIH, his actions would constitute a form of **research misconduct** (<https://ori.hhs.gov/federal-research-misconduct-policy>), which the government defines as "fabrication, falsification, or plagiarism" (or FFP). Actions that nearly all researchers classify as unethical are viewed as misconduct. It is important to remember,

however, that misconduct occurs only when researchers **intend to deceive**: honest errors related to sloppiness, poor record keeping, miscalculations, bias, self-deception, and even

### Intellectual Property

Honor patents, copyrights, and other forms of intellectual property. **Reasonable disagreements** about research methods, procedures, and results are not misconduct. Give proper acknowledgment for contributions to research. **Consider the following** as a guide.

### Confidentiality

Protect confidential communications, such as papers or grants submitted for publication, personnel records, trade or military secrets, and patient records.

### Responsible Publication

Publish in order to advance research and scholarship, not to advance just your own career. Avoid wasteful and duplicative publication.

### Responsible Mentoring

Help to educate, mentor, and advise students. Promote their welfare and allow them to make their

## **Respect for Colleagues**

Respect your colleagues and treat them fairly.

## **Social Responsibility**

Strive to promote social good and prevent or mitigate social harms through research, public education, and advocacy.

## **Non-Discrimination**

Avoid discrimination against colleagues or students on the basis of sex, race, ethnicity, or other factors not related to scientific competence and integrity.

## **Competence**

Maintain and improve your own professional competence and expertise through lifelong education and learning; take steps to promote competence in science as a whole.

## **Legality**

**Case 02** Dr. T has just discovered a mathematical error in his paper that has been accepted for publication in a journal. The error does not affect the overall results of his research, but it is potentially misleading. The journal has just gone to press, so it is too late to catch the error before it appears in print. In order to avoid embarrassment, Dr. T decides to ignore the error.

## Human Subjects protection

Dr. T's error is not misconduct nor is his decision to take no action to correct the error. Most researchers, as well as many different policies and codes would say that Dr. T should tell the journal (as research authors) subjects are informed and consider publishing maximized benefits. When conducting research on human subjects, researchers should consider publishing maximized benefits. Failing to publish a correction or to take special precautions could violate the principles of respect for human dignity, privacy, and autonomy, and could also violate the principle of beneficence and strive to distribute the benefits and burdens of research fairly.

There are many other activities that the government does not define as "misconduct" but which are still regarded by most researchers as unethical. These are sometimes referred to as "other deviations" (<https://www.ncbi.nlm.nih.gov/pubmed/14577424>) from acceptable research practices and include:

\* Adapted from Shamoo A and Resnik D. 2015. Responsible Conduct of Research, 3rd ed. (New York: Oxford University Press).

- Publishing the same paper in two different journals without telling the editors
- Submitting the same paper to different journals without telling the editors
- Not informing a collaborator of your intent to file a patent in order to make sure that you are the sole inventor
- Including a colleague as an author on a paper in return for a favor even though the colleague did not make a serious contribution to the paper
- Discussing with your colleagues confidential data from a paper that you are reviewing for a journal
- Using data, ideas, or methods you learn about while reviewing a grant or a papers without permission
- Trimming outliers from a data set without discussing your reasons in paper
- Using an inappropriate statistical technique in order to enhance the significance of your research
- Bypassing the peer review process and announcing your results through a press conference without giving peers adequate information to review your work
- Conducting a review of the literature that fails to acknowledge the contributions of other people in the field or relevant prior work

- Stretching the truth on a grant application in order to convince reviewers that your project will make a significant contribution to the field
- Stretching the truth on a job application or curriculum vita
- Giving the same research project to two graduate students in order to see who can do it the fastest
- Overworking, neglecting, or exploiting graduate or post-doctoral students
- Failing to keep good research records
- Failing to maintain research data for a reasonable period of time
- Making derogatory comments and personal attacks in your review of author's submission
- Promising a student a better grade for sexual favors
- Using a racist epithet in the laboratory
- Making significant deviations from the research protocol approved by your institution's Animal Care and Use Committee or Institutional Review Board for Human Subjects Research without telling the committee or the board
- Not reporting an adverse event in a human research experiment
- Wasting animals in research
- Exposing students and staff to biological risks in violation of your institution's biosafety rules
- Sabotaging someone's work
- Stealing supplies, books, or data
- Rigging an experiment so you know how it will turn out
- Making unauthorized copies of data, papers, or computer programs

## Case 03

Dr. Wexford is the principal investigator of a large, epidemiological study on the health of 10,000 agricultural workers. She has an impressive dataset that includes information on

demographics, environmental exposures, diet, genetics, and various disease outcomes such as cancer, Parkinson's disease (PD), and ALS. She has just published a paper on the relationship

between pesticide exposure and PD in a prestigious journal. She is planning to publish many other papers from her dataset. She receives a request from another research team that wants

access to her complete dataset. They are interested in examining the relationship between pesticide exposures and skin cancer. Dr. Wexford was planning to conduct a study on this topic. government classifies as research misconduct. Indeed, there has been considerable debate

about the definition of "research misconduct" and many researchers and policy makers are not satisfied with the government's narrow definition that focuses on FFP. However, given the huge

list of potential offenses that might fall into the category "other serious deviations," and the practical problems with defining and policing these other deviations, it is understandable why government officials have chosen to limit their focus. recognition and priority. It seems that there are good arguments on both sides of this issue and

Dr. Wexford needs to take some time to think about what she should do. One possible option is to share data with the other research team. Her funding agency may also have rules that

define allowable uses of the data, publication plans, authorship, etc. Another option would be to offer to collaborate with the researchers. In these situations, there may be good arguments on both sides of the issue and different ethical

principles may conflict. These situations create difficult decisions for research known as **ethical or moral dilemmas**. (<https://plato.stanford.edu/entries/moral-dilemmas/>) Consider the following case:

The following are some steps that researchers, such as Dr. Wexford, can take to deal with ethical dilemmas in research:



### What is the problem or issue?

It is always important to get a clear statement of the problem. In this case, the issue is whether to share information with the other research team.

### What is the relevant information?

Many bad decisions are made as a result of poor information. To know what to do, Dr. Wexford needs to have more information concerning such matters as university or [funding agency](https://grants.nih.gov/grants/about_grants.htm) (https://grants.nih.gov/grants/about\_grants.htm) or journal policies that may apply to this situation, the team's intellectual property interests, the possibility of negotiating some kind of agreement with the other team, whether the other team also has some information it is willing to share, the impact of the potential publications, etc.

### What are the different options?

People may fail to see different options due to a limited imagination, bias, ignorance, or fear. In this case, there may be other choices besides 'share' or 'don't share,' such as 'negotiate an agreement' or 'offer to collaborate with the researchers.'

### How do ethical codes or policies as well as legal rules apply to these different options?

## Promoting Ethical Conduct in Science

The university or funding agency may have policies on data management that apply to this case. Broader ethical rules, such as openness and respect for credit and intellectual property, may also apply to this case. Laws relating to intellectual property may be relevant.

Read about U.S. research institutions follow federal mandates for ethics in research

### Are there any people who can offer ethical advice?

Learn more (https://www.niehs.nih.gov/health/topics/science/syaccvnm/index.cfm) about NIH's research ethics or compliance officer, or anyone else you can trust. In the case, Dr. Wexford might want to talk to her supervisor and research team before making a decision.

Most academic institutions in the US require undergraduate, graduate, or postgraduate students to have some education in the [responsible conduct of research \(RCR\)](https://www.ncbi.nlm.nih.gov/pubmed/22836835) (https://www.ncbi.nlm.nih.gov/pubmed/22836835). The NIH (https://grants.nih.gov/grants/guide/notice-files/NOT-OD-18-079.html) and NSF (https://www.nsf.gov/bfa/bos/policy/rcr.jsp) have both mandated training in research ethics for students and trainees. Many academic institutions on the other side of the US have also developed educational curricula in research ethics (https://www.ncbi.nlm.nih.gov/pubmed/23535198). However, at some point he or she will have to make a decision and then take action. Ideally, a person who makes a decision in an ethical dilemma should be able to **justify** his or her decision to himself or herself, as well as colleagues, administrators, and other people who might be affected by the decision. He or she should be able to articulate **reasons** for his or her decision and should consider the following questions in order to explain how he or she arrived at his or her decision:

Those of you who are taking or have taken courses in research ethics may be wondering why you are required to have education in research ethics. You may believe that you are highly ethical and know the difference between right and wrong. You would never fabricate or falsify data or plagiarize. Indeed, you also may believe that most of your colleagues are highly ethical and that there is no ethics problem in research..

If you feel this way, relax. No one is accusing you of acting unethically. Indeed, the evidence produced so far shows that misconduct is a very rare event in research publishing and there is no considerable variation among various estimates. The rate of misconduct has been estimated to be as low as 0.01% of researchers per year (based on confirmed cases of misconduct in federally funded research) to as high as 1% of researchers per year (based on self-reports of misconduct on anonymous surveys). See Shamoo and Resnik (2015), [cited above](#).

- Which choice will probably have the best overall consequences for science and society?
- Which choice are you most sure of?
- Which choice could you not live with?
- Think of the wisest person you know. What would he or she do in this situation?
- Which choice would be the most just, fair, or responsible?

Clearly, it would be useful to have more data on this topic, but so far there is no evidence that science has become ethically corrupt, despite some highly publicized scandals. Even if misconduct is only a rare occurrence, it can still have a tremendous impact on science and society because it can compromise the integrity of research, erode the public's trust in science, and waste time and resources. Will education in research ethics help reduce the rate of misconduct in science? It is too early to tell. The answer to this question depends, in part, on how one understands the causes of misconduct. There are two main theories about why researchers commit misconduct. According to the "bad apple" theory, most scientists are highly ethical. Only researchers who are morally corrupt, economically desperate, or psychologically disturbed commit misconduct. Moreover, only a fool would commit misconduct because science's peer review system and self-correcting mechanisms will eventually catch those who try to cheat the system. In any case, a course in research ethics will have little impact on "bad apples," one might argue.

ethical decision-making but there are limits to its ability to solve all ethical dilemmas in a finite amount of time. According to the "stressful or imperfect" environment theory, misconduct occurs because various institutional pressures, incentives, and constraints encourage people to commit misconduct, such as pressures to publish or obtain grants or contracts, career ambitions, the pursuit of profit or fame, poor supervision of students and trainees, and poor oversight of researchers (see Shamoo and Resnik 2015). Moreover, defenders of the stressful environment theory point out that science's peer review system is far from perfect and that it is relatively easy to cheat the system. Erroneous or fraudulent research often enters the public record without being detected for years. Misconduct probably results from environmental and individual causes, i.e. when people who are morally weak, ignorant, or insensitive are placed in stressful or imperfect environments. In any case, a course in research ethics can be useful in helping to prevent deviations from norms even if it does not prevent misconduct. Education in research ethics can help people get a better understanding of ethical standards, policies, and issues and improve ethical judgment and decision making. Many of the deviations that occur in research may occur because researchers simply do not know or have never thought seriously about some of the ethical norms of research. For example, some unethical authorship practices probably reflect traditions and practices that have not been questioned seriously until recently. If the director of a lab is named as an author on every paper that comes from his lab, even if he does not make a significant contribution, what could be wrong with that? That's just the way it's done, one might argue. Another example where there may be some ignorance or mistaken traditions is conflicts of interest in research. A researcher may think that a "normal" or "traditional" financial relationship, such as accepting stock or a consulting fee from a drug company that sponsors her research, raises no serious ethical issues. Or perhaps a university administrator sees no ethical problem in taking a large gift with strings attached from a pharmaceutical company. Maybe a physician thinks that it is perfectly appropriate to receive a \$300 finder's fee for referring patients into a clinical trial.

If "deviations" from ethical conduct occur in research as a result of ignorance or a failure to reflect critically on problematic traditions, then a course in research ethics may help reduce the rate of serious deviations by improving the researcher's understanding of ethics and by sensitizing him or her to the issues.

Finally, education in research ethics should be able to help researchers grapple with the ethical dilemmas they are likely to encounter by introducing them to important concepts, tools, principles, and methods that can be useful in resolving these dilemmas. Scientists must deal with a number of different controversial topics, such as human embryonic stem cell research, cloning, genetic engineering, and research involving animal or human subjects, which require ethical reflection and deliberation.

**David B. Resnik, J.D., Ph.D.**  
**Bioethicist**  
 Tel 984-287-4208  
[resnikd@niehs.nih.gov](mailto:resnikd@niehs.nih.gov)