Rigor and Reproducibility in Science

Failed attempts to verify published findings have created concern about a "reproducibility crisis" in science.

WHY ARE RIGOR AND REPRODUCIBILITY IMPORTANT?

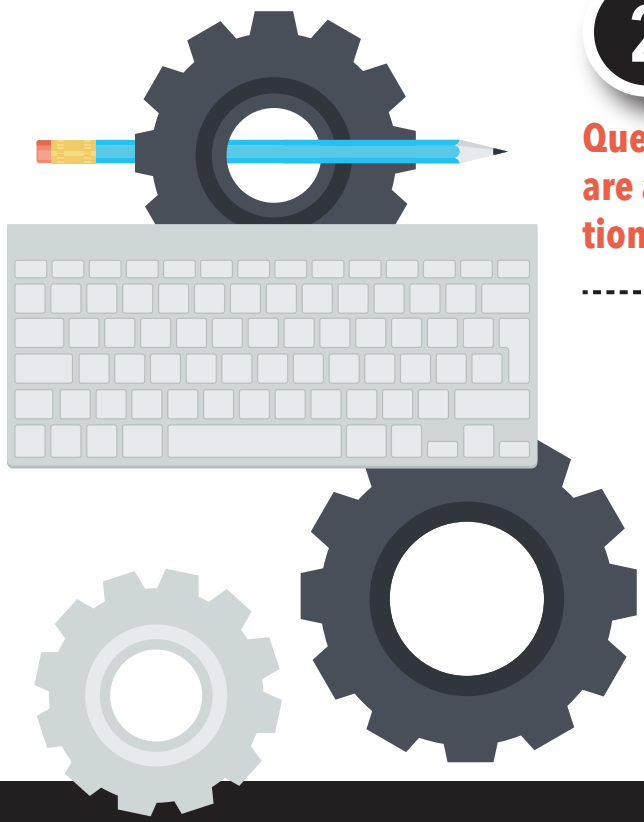
Without adequate rigor and reproducibility, funding, resources, and time are wasted and public trust is undermined. Treatments and public health recommendations can be misguided, and in some cases harmful.

Scientific rigor: Design, methods, analysis, interpretation, and reporting of results are robust and unbiased.

Reproducibility: Existing findings can be corroborated.[1]

HOW CAN YOU SUPPORT RIGOROUS AND REPRODUCIBLE RESEARCH?[2-5]

1. **Look for evidence to disprove yourself, not just to prove your hypothesis.**
2. **Question whether there are alternative explanations of your findings.**
3. **Be open and transparent: provide citation for data and materials, share data, analytic code, and materials in a repository, and preregister studies and analysis plans.**
4. **Follow research reporting guidelines and checklists (e.g., CONSORT, ARRIVE, and *Nature*).**



RESOURCES: Rigor and Reproducibility in NIH Applications: Resource Chart https://grants.nih.gov/grants/RigorandReproducibilityChart508.pdf | *Nature* Special Collection on Irreproducibility. https://www.nature.com/collections/prbfkwmwvz | *PLOS* Collection on Meta-Research. https://collections.plos.org/s/meta-research

REFERENCES: 1) Goodman SN, Fanelli D, Ioannidis JP. 2016. What does research reproducibility mean? *Science Translational Medicine*, 8:341-343. | 2) Nuzzo R. 2015. How scientists fool themselves - and how they can stop. *Nature*. 526:182-185. | 3) Munafò M, Nosek BA, Bishop DVM,...Ioannidis JP. 2017. A manifesto for reproducible science. *Nature Human Behaviour*. 1:1-9. | 4) Nosek BA, Alter G, Banks GC,...Yarkoni WT. 2015. Promoting an open research culture. *Science*. 348:1422-1425. | 5) Nature Editorial. 18 April 2018. *Checklists work to improve science*. https://www.nature.com/articles/d41586-018-04590-7

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