

RESPONSIBLE
Ethical
Science that is
Evidence based
AND above all
Reproducible
Challenging and
Honest

RESEARCH INTEGRITY **FOR THE BIOSCIENCES:** **What you need to know**

Nikki Osborne BSc. PhD

UKRIO Annual Conference

5th May 2016

**Responsible Research
In Practice**



Research - definition

- *creative work undertaken in a systematic way to increase the stock of knowledge and use it to devise new applications*
1. asking a question or proposing a hypothesis
 2. generating or collating data/information
 3. analysing and interpreting the data/information
 4. reflecting on the research question or hypothesis and what the data/information tells you

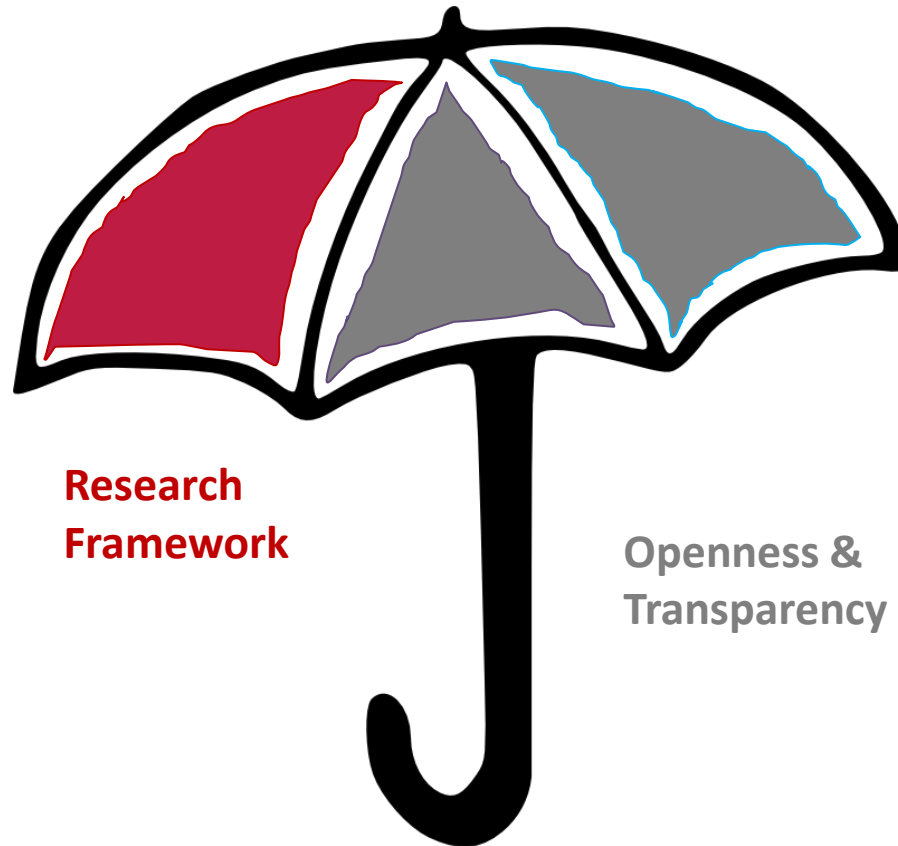
Integrity - Definition

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- *a concept of consistency of actions, values, methods, measures, principles, expectations and outcomes*
- *acting in an honest, accurate and truthful way*



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**Research
Framework**

Openness &
Transparency

Research Outputs

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Research Framework

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Legislation

STATUTORY INSTRUMENTS

2012 No. 3039

ANIMALS

The Animals (Scientific Procedures) Act 1986
Amendment Regulations 2012

Made: 18th December 2012

Home Office

Guidance on the
Operation of the
Animals (Scientific
Procedures) Act 1986

December 2015
<https://www.gov.uk/guidance/research-and-testing-using-animals>

Identification and management of
patterns of low-level concerns at
licensed establishments

Animals in Science Research unit

December 2015

Home Office

The Harm-Benefit Analysis Process
New Project Licence Applications

Advice Note: 05/2015
Animals in Science Regulation Unit
December 2015

Home Office

Code of Practice for the Housing and
Care of Animals Bred, Supplied
or Used for Scientific Purposes



December 2014

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Nuffield Council on Bioethics

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We acknowledge that the UK has the most detailed legislative framework concerning research on animals in the world. But proper attention to the welfare of animals involved in research and the accountability of scientists who conduct research on animals cannot be achieved merely by having detailed regulations. Regulation can act as an emotional screen between the researcher and an animal, possibly encouraging researchers to believe that simply to conform to regulations is to act in a moral way. It is therefore crucial to promote best practice more actively and to improve the culture of care in establishments licensed to conduct experiments on animals.



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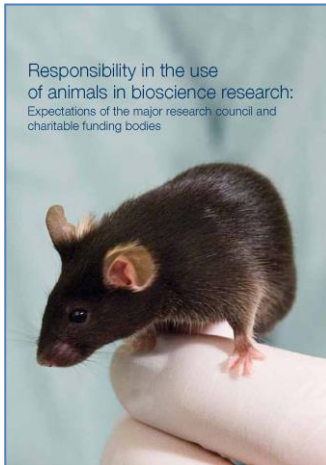


Research Framework

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Responsibility in the use
of animals in bioscience research:
Expectations of the major research council and
charitable funding bodies



Concordat On Open Research Data

Version 10

July 17th 2015

This document contains the substantive text of the Concordat On Open Research Data that has been developed by a UK multi-stakeholder group. This concordat will help to ensure that the research data gathered and generated by members of the UK research community is made openly available for use by others wherever possible in a manner consistent with relevant legal, ethical and regulatory frameworks and norms.

In this concordat, the following definition has been adopted:

Research Data are quantitative information or qualitative statements collected by researchers in the course of their work by experimentation, observation, interview or other methods. Data may be raw or primary (e.g. direct from measurement or collection) or derived from primary data for subsequent analysis or interpretation (e.g. cleaned up or as an extract from a larger data set). The purpose of open research data is to provide the information necessary to support or validate a research project's observations, findings or outputs. Data may include, for example, statistics, collections of digital images, sound recordings, transcripts of interviews, survey data and fieldwork observations with appropriate annotations.

Policies

ARRIVE



CONSORT



equator
network

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http://www.biosharing.org

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← → ↻ <https://biosharing.org/standards/> ☆ ☰

biosharing.org
Information Resources

🔍 Search all of BioSharing

Standards Databases Policies Collections Add/Claim Content Stats Log in or Register

Collections and Recommendations

Contribute by adding a collection or recommendation Any problems? Please tell us!

Collections group together one or more types of resource (standard, database or policy) by domain, project or organisation. Recommendations are a core-set of resources that are selected and recommended by a group or organisation or for a particular domain.

🔍 Search Search Reset

17 records in view

View as Grid View as Table

Sort by
Best Match ▼

View Recommendations Only

Record Type
Project 6

Domain	Standards	Policies	Databases
Clinical Research DOMAIN	12	0	0
Computational Modeling DOMAIN	6	0	0
DNA Microarray DOMAIN	3	0	2

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Concordat on
Openness on
Animal Research
in the UK



14 MAY 2014

Policies

The concordat to support research integrity



Guidance

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Signatories



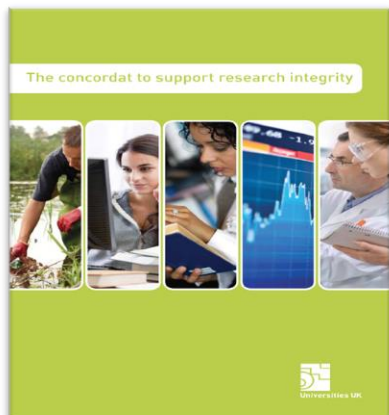
wellcometrust



Cyngor Cyllido Addysg
Uwch Cymru
Higher Education Funding
Council for Wales

hefcw

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Honesty

COMMITMENT #1:

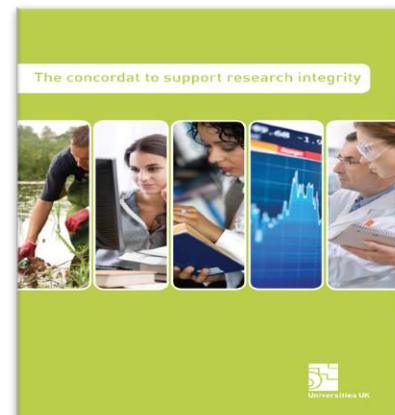
We are committed to maintaining the highest standards of rigour and integrity in all aspects of research.

Rigour

**Care &
Respect**

**Openness &
Transparency**

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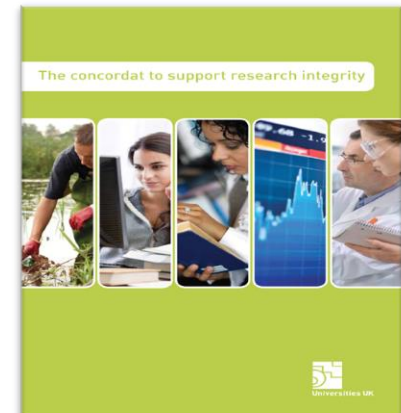
Policies

COMMITMENT #2:

We are committed to ensuring that research is conducted according to appropriate ethical, legal and professional frameworks, obligations and standards.

Guidance

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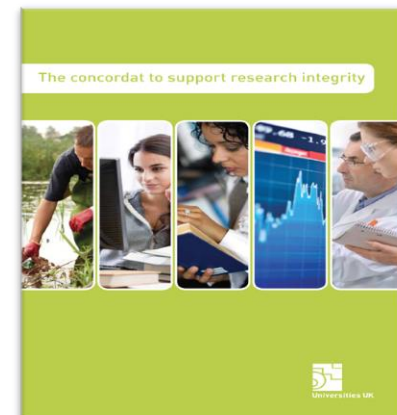
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COMMITMENT #3:

We are committed to supporting a research environment that is underpinned by a culture of integrity and based on good governance, best practice and support for the development of researchers.

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'Culture' is the product of...

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Image Credit: RSPCA

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fabrication

falsification

COMMITMENT #4:

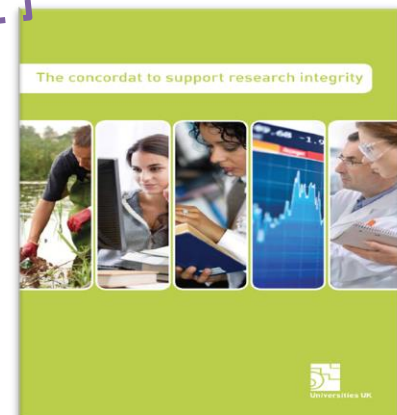
We are committed to using transparent, robust and fair processes to deal with allegations of research misconduct should they arise.

improper

failure

plagerism

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In Practice



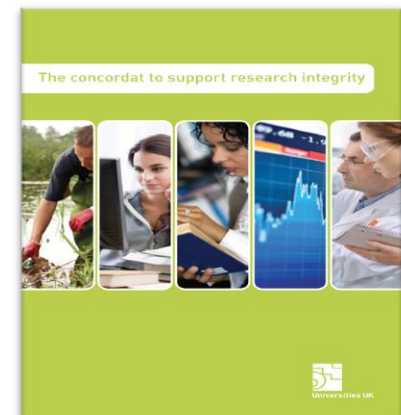
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COMMITMENT #5:

We are committed to working together to strengthen the integrity of research and to reviewing progress regularly and openly.

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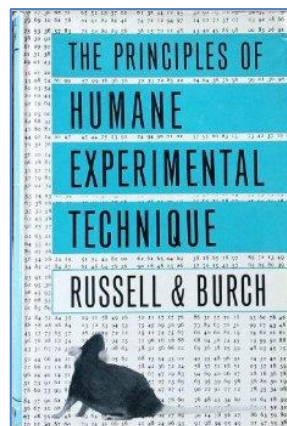




Research Framework

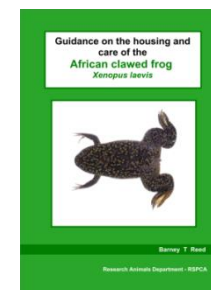
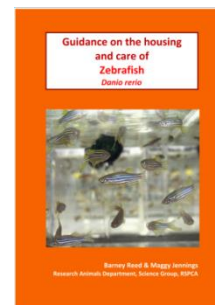
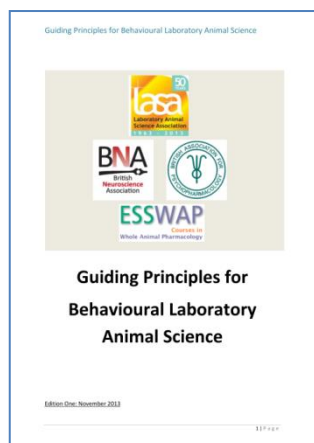
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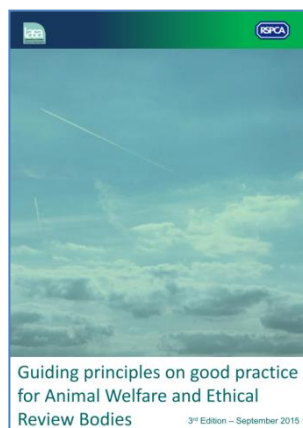
Policies

Others

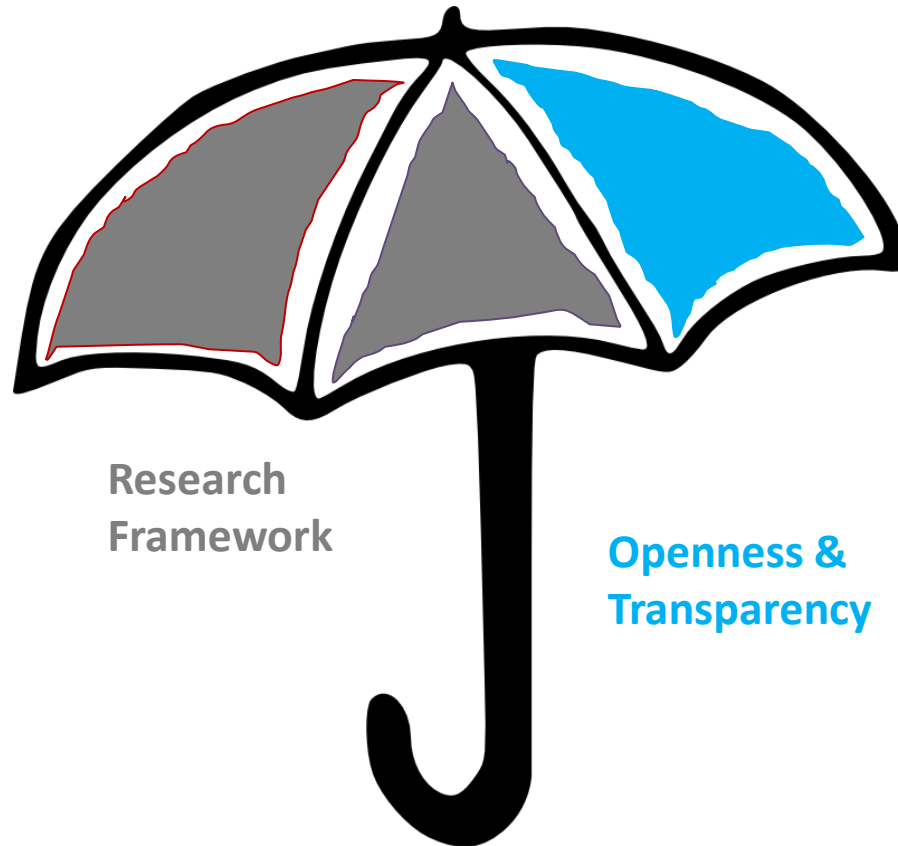


Guidance

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Openness & Transparency

Public Engagement

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“..the embedding of public engagement in institutional cultures is best understood as a *work in progress*.”

“..the projects suggests that public engagement is more firmly embedded in the context of arts, humanities and social sciences than it is among researchers in science, technology, engineering and mathematics.”

Responsible Research
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TNS-BMRB & PSI ‘Factors Affecting Public Engagement by Researchers: A study on behalf of a Consortium of UK public research funders.’ Wellcome Trust;
2015 www.wellcome.ac.uk/PERSurvey

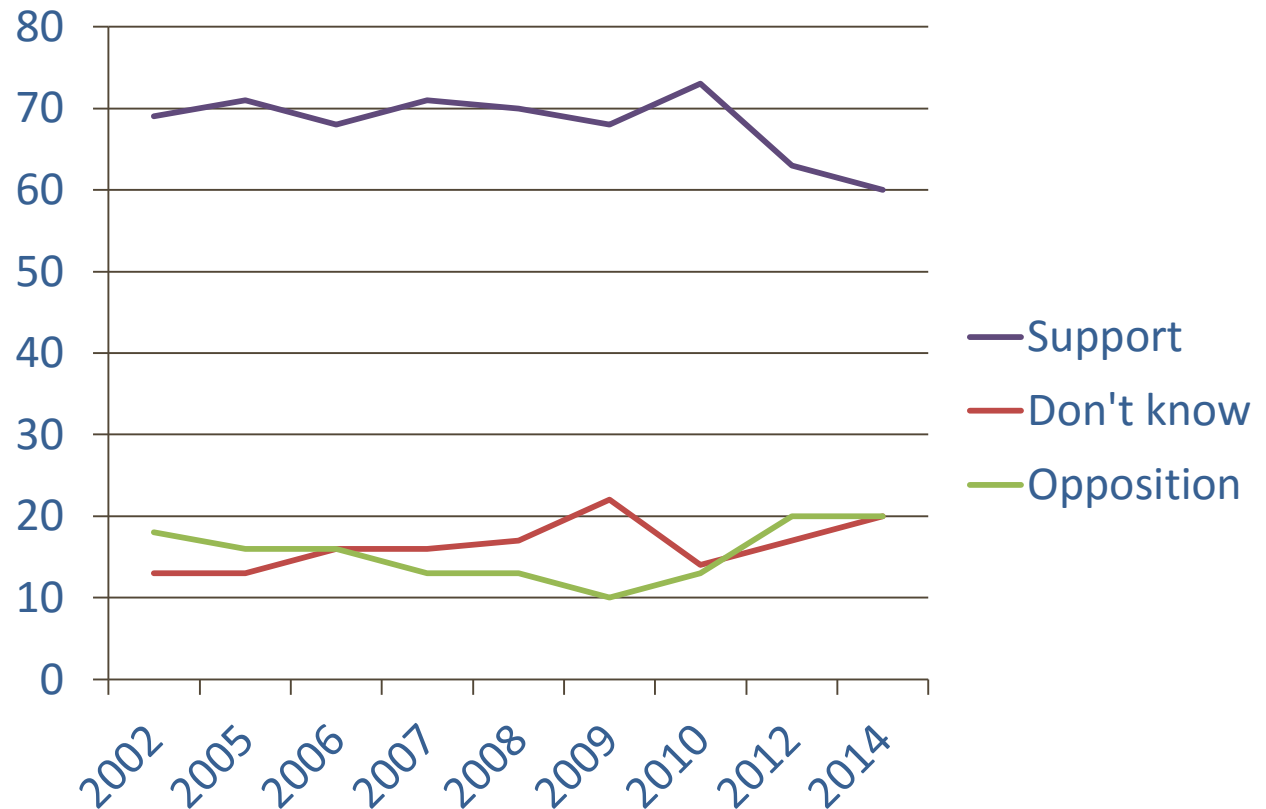


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Why is this important?

“I agree with animal experimentation for all types of medical research, where there is no alternative”





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Commitment 1: We will be clear about when, how and why we use animals in research

Commitment 2: We will enhance our communications with the media and the public about our research using animals

Commitment 3: We will be proactive in providing opportunities for the public to find out about research using animals

Commitment 4: We will report on progress annually and share our experiences

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Research Outputs

Houston, we have a problem.....

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Open access, freely available online

Essay

Why Most Published Research Findings Are False

John P.A. Ioannidis

Summary

There is increasing concern that most current published research findings are false. The probability that a research claim is true may depend on study power and bias, the number of other studies on the same question, and, importantly, the ratio of true to no relationships among the relationships probed in each scientific field. In this framework, a research finding is less likely to be true when the studies conducted in a field are smaller; when effect sizes are smaller; when there is a greater number and lesser preselection of tested relationships; where there is greater flexibility in designs, definitions, outcomes, and analytical modes; when there is greater financial and other interest and prejudice; and when more teams are involved in a scientific field in chase of statistical significance. Simulations show that for most study designs and settings, it is more likely for a research claim to be false than true. Moreover, for many current scientific fields, claimed research findings may often be simply accurate measures of the prevailing bias. In this essay, I discuss the implications of these problems for the conduct and interpretation of research.

factors that influence this problem and some corollaries thereof.

Modeling the Framework for False Positive Findings

Several methodologists have pointed out [9–11] that the high rate of nonreplication (lack of confirmation) of research discoveries is a consequence of the convenient, yet ill-founded strategy of claiming conclusive research findings solely on the basis of a single study assessed by formal statistical significance, typically for a p -value less than 0.05. Research is not most appropriately represented and summarized by p -values, but, unfortunately, there is a widespread notion that medical research articles

It can be proven that most claimed research findings are false.

should be interpreted based only on p -values. Research findings are defined here as any relationship reaching formal statistical significance, e.g., effective interventions, informative predictors, risk factors, or associations. "Negative" research is also very useful. "Negative" is actually a misnomer, and

is characteristic of the field and can vary a lot depending on whether the field targets highly likely relationships or searches for only one or a few true relationships among thousands and millions of hypotheses that may be postulated. Let us also consider, for computational simplicity, circumscribed fields where either there is only one true relationship (among many that can be hypothesized) or the power is similar to find any of the several existing true relationships. The pre-study probability of a relationship being true is $R/(R+1)$. The probability of a study finding a true relationship reflects the power $1 - \beta$ (one minus the Type II error rate). The probability of claiming a relationship when none truly exists reflects the Type I error rate, α . Assuming that c relationships are being probed in the field, the expected values of the 2×2 table are given in Table 1. After a research finding has been claimed based on achieving formal statistical significance, the post-study probability that it is true is the positive predictive value, PPV. The PPV is also the complementary probability of what Wacholder et al. have called the false positive report probability [10]. According to the 2×2 table, one gets $PPV = (1 - \beta)R/(R$

Key issues:

- lack of reproducibility
- bias
- competition

Conclusions:

- most research findings are false for most research designs and for most fields.
- research findings may often be simply accurate measures of prevailing bias.

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Research Outputs

Reflecting current practice....

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Research: increasing value, reducing waste 1



How to increase value and reduce waste when research priorities are set

Research: increasing value, reducing waste 2



Increasing value and reducing waste in research design, conduct, and analysis

Research: increasing value, reducing waste 3



Increasing value and reducing waste in biomedical research regulation and management

Research: increasing value, reducing waste 4



Increasing value and reducing waste: addressing inaccessible research

Research: increasing value, reducing waste 5



Reducing waste from incomplete or unusable reports of biomedical research

Paul Glasziou, Douglas G Altman, Patrick Bossuyt, Isabelle Boutron, Mike Clarke, Steven Julious, Susan Michie, David Moher, Elizabeth Wager

Research publication can both communicate and miscommunicate. Unless research is adequately reported, the time and resources invested in the conduct of research is wasted. Reporting guidelines such as CONSORT, STARD, PRISMA, and ARRIVE aim to improve the quality of research reports, but all are much less adopted and adhered to than they should be. Adequate reports of research should clearly describe which questions were addressed and why, what was done, what was shown, and what the findings mean. However, substantial failures occur in each of these elements. For example, studies of published trial reports showed that the poor description of interventions meant that 40–89% were non-replicable; comparisons of protocols with publications showed that most studies had at least one primary outcome changed, introduced, or omitted; and investigators of new trials rarely set their findings in the context of a systematic review, and cited a very small and biased selection of previous relevant trials. Although best documented in reports of controlled trials, inadequate reporting occurs in all types of studies—animal and other preclinical studies, diagnostic studies, epidemiological studies, clinical prediction research, surveys, and qualitative studies. In this report, and in the Series more generally, we point to a waste at all stages in medical research. Although a more nuanced understanding of the complex systems involved in the conduct, writing, and publication of research is desirable, some immediate action can be taken to improve the reporting of research. Evidence for some recommendations is clear: change the current system of research rewards and regulations to encourage better and more complete reporting, and fund the development and maintenance of infrastructure to support better reporting, linkage, and archiving of all elements of research. However, the high amount of waste also warrants future investment in the monitoring of and research into reporting of research, and active implementation of the findings to ensure that research reports better address the needs of the range of research users.

Introduction

In 2006, Lang and Secic¹ warned that “The problem of poor research documentation and statistical reporting in the biomedical literature is long-standing, worldwide,

new requirement for inclusion of relevant details about several elements of experimental and analytical design.

Although concern about research fraud and misconduct is appropriate (a pooled estimate of

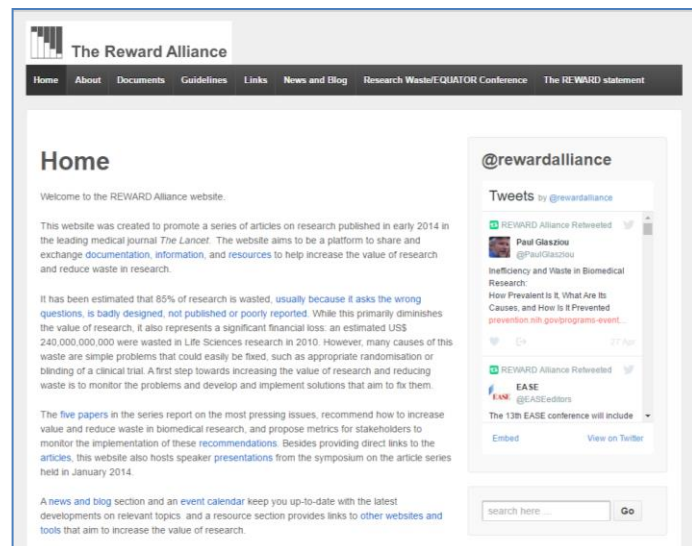
Published Online
January 8, 2014
[http://dx.doi.org/10.1016/S0140-6736\(13\)62228-X](http://dx.doi.org/10.1016/S0140-6736(13)62228-X)
This is the fifth in a Series of five papers about research
Centre for Research in Evidence Based Practice, Bond University, Robina, QLD, Australia
(Prof P Glasziou FRACGP, Centre for Statistics in Medicine, University of Oxford, Oxford, UK (Prof D G Altman DSc); Department of Clinical Epidemiology and Biostatistics, Academic Medical Centre, University of Amsterdam, Amsterdam, Netherlands (Prof P Bossuyt PhD); INSERM, U738, Paris, France (Prof I Boutron PhD); Centre for Public Health, Queen's University Belfast, Belfast, UK (Prof M Clarke PhD); Medical Statistics Group, University of Sheffield, Sheffield, UK (Prof S Julious PhD); Centre for



Research Outputs

Reflecting current practice....

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The REWARD Statement

We recognise that, while we strive for excellence in research, there is much that needs to be done to reduce waste and increase the value of our contributions. We maximise our research potential when:

- we set the right research priorities;
- we use robust research design, conduct and analysis;
- regulation and management are proportionate to risks;
- all information on research methods and findings are accessible;
- reports of research are complete and usable.

We believe we have a responsibility not just to seek to advance knowledge, but also to advance the practice of research itself. This will contribute to improvement in the health and lives of all peoples, everywhere. As funders, regulators, commercial organisations, publishers, editors, researchers, research users and others – we commit to playing our part in increasing value and reducing waste in research.”

If your organisation would like to sign up to *The Lancet's* REWARD campaign, and you endorse and support the statement above, [click here](#) to send your logo and URL to Sabine Kleinert and Tamara Lucas, for display on *The Lancet's* REWARD campaign page. In addition, please consider providing content for the campaign pages to give examples of the measures your organisation has taken, is taking, and will take to increase value and reduce waste in research.

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Problems and possible solutions



Reproducibility and the conduct of research



Data dredging
Also known as p-hacking, this involves repeatedly searching a dataset or trying alternative analyses until a 'significant' result is found.



Omitting null results
When scientists or journals decide not to publish studies unless results are statistically significant.



Underpowered study
Statistical power is the ability of an analysis to detect an effect, if the effect exists – an underpowered study is too small to reliably indicate whether or not an effect exists.

Issues



Errors
Technical errors may exist within a study, such as misidentified reagents or computational errors.



Underspecified methods
A study may be very robust, but its methods not shared with other scientists in enough detail, so others cannot precisely replicate it.



Weak experimental design
A study may have one or more methodological flaws that mean it is unlikely to produce reliable or valid results.

Possible strategies

Open data

Openly sharing results and the underlying data with other scientists.



Pre-registration

Publicly registering the protocol before a study is conducted.



Collaboration

Working with other research groups, both formally and informally.



Automation

Finding technological ways of standardising practices, thereby reducing the opportunity for human error.



Open methods

Publicly publishing the detail of a study protocol.



Post-publication review

Continuing discussion of a study in a public forum after it has been published (most are reviewed before publication).



Reporting guidelines

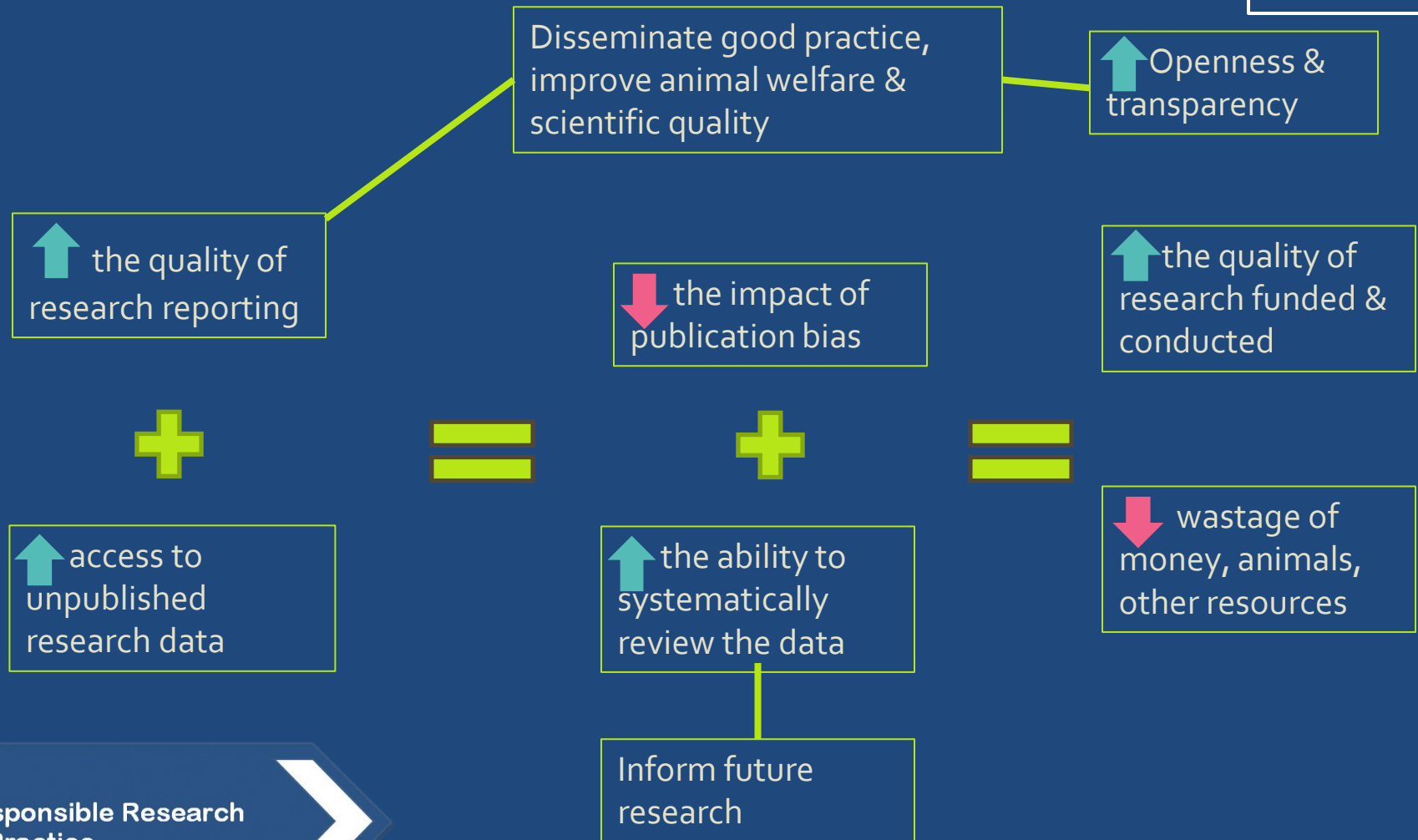
Guidelines and checklists that help researchers meet certain criteria when publishing studies.



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Why does any of this matter?

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ANY QUESTIONS?

nikki@responsibleresearchinpractice.co.uk

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