



*National Institute for
Health Research*

Laboratory Studies Section

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Laboratory Studies

- NIHR statisticians felt ill-equipped to support basic scientists seeking statistical advice.
- Experimental processes difficult to understand.
- Scientists frequently reported unsatisfactory exchanges with statisticians.
- Lab scientists not familiar with talking to statisticians at design stage – stark contrast to statistical involvement in clinical research .

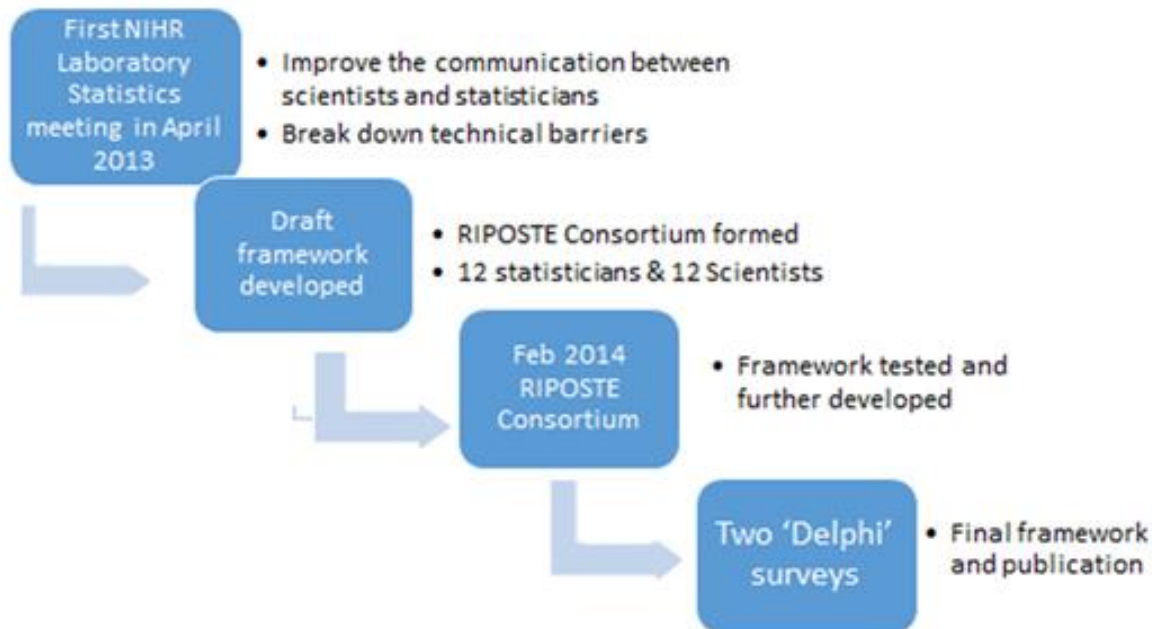
Laboratory Studies

“Experimental biologists, their reviewers and their publishers must grasp basic statistics, urges David L. Vaux, or sloppy science will continue to grow.”

Vaux DL, (2012) Nature, 492, 180-181



The development of RIPOSTE





SCIENCE FORUM

RIPOSTE: a framework for improving the design and analysis of laboratory-based research


Abstract Lack of reproducibility is an ongoing problem in some areas of the biomedical sciences. Poor experimental design and a failure to engage with experienced statisticians at key stages in the design and analysis of experiments are two factors that contribute to this problem. The RIPOSTE (Reducing Irreproducibility in labOratory STudiEs) framework has been developed to support early and regular discussions between scientists and statisticians in order to improve the design, conduct and analysis of laboratory studies and, therefore, to reduce irreproducibility. This framework is intended for use during the early stages of a research project, when specific questions or hypotheses are proposed. The essential points within the framework are explained and illustrated using three examples (a medical equipment test, a macrophage study and a gene expression study). Sound study design minimises the possibility of bias being introduced into experiments and leads to higher quality research with more reproducible results.

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The RIPOSTE Framework



- To support early and regular discussion of study design and analysis between scientists and statisticians with an aim to improve the design, analysis and reporting of laboratory based or preclinical studies
 - Consist a series of **Items**, followed by **prompts/considerations** and then list of **Details** to facilitate discussion
 - ‘laboratory studies’ covers a wide range of study types- some aspects of the framework will not always be relevant for discussion
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Outline of Framework



- Five sections
 - Research aims, objectives specific outcomes and hypotheses.
 - Study planning
 - Study design
 - Planned analysis
 - Reporting

The use of the key discussion points are illustrated using three example studies (a medical equipment test, a macrophage study and a gene expression study).


Using the Framework

- The framework can be used and referred to:
 - To think about experimental design considerations with a full research team with (or without) a statistician involved.
 - To help present and construct questions about stages in a project for statistical advice.
 - To support all stages of the development and conduct of research projects ensuring high levels of transparency and reproducibility.

The RIPOSTE framework can be referred to in grant proposals such as stating it has been followed to support discussion in the planning and design of all experimental studies.

Building on the framework



- Illustrate how using the RIPOSTE framework can lead to optimal designs through worked up examples/ scenarios.
 - repeated measures.
 - missing data
 - sample size and statistical power
 - multiple hypothesis testing
 - data display
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RIPOSTE in practice



- Two publications in progress drafted

‘unit of analysis/repeated measurements’

Alice Sitch, Nick Parsons and Dawn Teare

‘handling missing data due to limit of detection’.

Liz Hensor and Bethany Shinkins





Reproducible Research and Registered Reports.

Monday 20th March 12.00-17.00

Interested?

- Host a RIPOSTE seminar in your institution
- <https://statistics-group.nihr.ac.uk/>
 - ‘contact us’
 - ‘join as a researcher or statistician’