A guide to preparing an effective pre-analysis plan (PAP)

Some fields, such as economics, occasionally distinguish between preregistrations and pre-analysis plans. We use the term pre-analysis plan (PAP) in this document.

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What is a PAP?

A pre-analysis plan (PAP) is a publicly documented, time-stamped plan summarizing a study's design and hypotheses before the data are collected (e.g. for first-hand data such as experimental) or getting access to the final dataset (e.g. panel studies). It establishes an unalterable record, promoting transparency in research by allowing others to evaluate a study's final report in light of the intended research plan.

Why consider preparing a PAP?

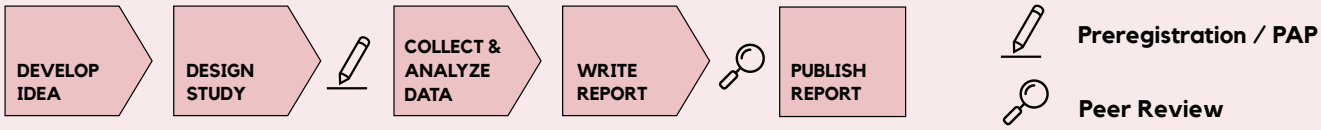
A PAP helps strengthen research integrity by reducing unintended flexibility throughout the research process.

A PAP clarifies research intentions, outlines key outcomes and statistical methods, and reduces the potential for unplanned adjustments.

Key benefits:

- Improved transparency and reduced Type I errors.
- Clearer evidential value of findings
- Refined research questions and study designs
- Establishing priority for ideas by securing the initial research plan

Path for a preregistered study



Credits: Adapted from Henderson, E. L. (2022)

What to include in your PAP?

We suggest researchers include the following elements in their PAP to enhance transparency and limit research degrees of freedom:

- ☐ **Research Questions & Hypotheses:** Clearly defined research questions and hypotheses.
- ☐ **Sample:** Sample selection, a priori power calculation, justification of sample size, population, and key mediation paths.
- ☐ **Sequencing of Analyses:** Describe the order of analyses (e.g., primary vs. secondary tests), including subgroup analyses, heterogeneity, and robustness checks.
- ☐ **Design Details:** Balance tests (if applicable), data cleaning steps, handling of outliers, and transformations.
- ☐ **Data Sources & Variables:** Outline outcomes, the target sample size, data collection methods, stopping rules (i.e. opportunistic stopping of data collection in experiments), and variable construction.
- ☐ **Statistical Approach - Outcomes:** Define variable construction and scoring methods, and the significance threshold used to evaluate test results.
- ☐ **Timeline & Milestones:** Provide a timeline for your research project including milestones for data collection, analysis, and reporting.
- ☐ **Pilot and existing data:** Performed and planned pilot data collections, and existing data (e.g., use of secondary data, existing panel studies)
- ☐ **Ethics:** Address consent, data governance, and ethical principles such as Beneficence and Justice.
- ☐ **Statistical Methods:** Explain the statistical models and methods. Include details of estimators and their implementation. Specify any control variables, moderators, or adjustments.

Registered Reports (RR)

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What is a Registered Report (RR)?

RRs build on the idea of PAPs (or preregistration) by combining early study planning with a journal's commitment to publish. In this two-stage article format, the study protocol—including the research question, rationale, methods, and analysis plan—is reviewed before data collection begins. If the study protocol is approved through a peer review, journals may offer "in-principle acceptance," which can help ensure publication based on adherence to the planned protocol, regardless of study results.

Why Registered Reports (RR)?

RRs emphasize rigorous planning over study outcomes, addressing common research challenges:

Preventing Publication Bias: The decision to publish is based on the quality of the research question and methods, not results.

Appropriate Statistical Power: RRs typically require justified sample sizes and a-priori power analysis.

Preventing p-Hacking: Pre-specified statistical tests and methods can reduce the influence of data-driven analyses.

Mitigating HARKing: Pre-established hypotheses may help prevent "hypothesizing after results are known."

Path for a RR-based study

Credits: Adapted from Henderson, E. L. (2022)

Links & Resources

Journals accepting RRs

Scan QR for more information

or visit www.labsquare.net /materials/journals

More educational materials

Scan QR to find more educational materials

or visit www.labsquare.net /materials/educational

FAQ for Writing Pre-Analysis Plans (PAP) for Economists and Social Scientists

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1 On which **platform** can I **register** my studies? Which is the "best"?

The Open Science Framework (OSF) is one of the most commonly used platforms, offering flexibility in formatting. Economists also frequently use the AEA RCT Registry and AsPredicted.

2 What should I do if **unforeseen issues** occur before, during, or after data collection?

We recommend registering the PAP right before data collection begins to minimize errors in the time-stamped PAP. Any deviations from the original plan must be reported in the paper. If changes are significant and require major updates to the PAP, you can register a newer version. However, the first version should remain accessible and cited in the updated PAP. As a rule of thumb, studies should closely follow the PAP, making it crucial to prepare a detailed and well-thought-out plan. Transparency is key: clearly report any deviations from the original plan.

3 Can I still run **exploratory analyses** or **robustness checks**?

Yes! You can run exploratory analyses and robustness checks as long as pre-registered hypotheses remain intact. Any unregistered tests, such as unregistered hypothesis tests, should be explicitly reported as such.

4 What if a referee asks us to **deviate from the plan** (e.g., use a different analysis or alter the order of the hypotheses)?

In such cases, document the deviations from the original PAP and the reasons for these changes in the published study. Transparency in reporting is crucial.

5 How can I plan the **whole analysis**? It is too difficult to "imagine" how the dataset will look.

This is a common challenge. One approach is to use a pilot or artefactual dataset to help you plan your analysis. This can provide a clearer idea of the structure and potential issues in your data

6 Aren't PAPs only for **experimental** research?

No, PAPs are not limited to experimental research. Almost any type of empirical study can benefit from a PAP, especially if the authors did not have access to the final dataset before the study began.

7 Will having a PAP improve my paper's chances of **publication**?

We do not have empirical evidence on this yet. However, PAPs enhance the reliability of studies. By encouraging researchers to plan their papers at an early stage, PAPs can also help avoid unexpected challenges later on.

8 How do I handle **multiple hypotheses** or **testing concerns**?

You should specify in the PAP how you plan to address multiple testing issues, such as using corrections for multiple comparisons or focusing on a limited set of primary hypotheses. This approach demonstrates careful planning and reduces concerns about data dredging. Further, Journals like JPE Microeconomics explicitly require a PAP to consider manuscripts for publication.

9 Are there any **legal or ethical issues** related to PAPs?

PAPs are generally a best practice but don't override ethical requirements like informed consent or data privacy. Ensure your study complies with institutional review board (IRB) or ethics committee standards alongside PAP registration.

11

How can I **encourage co-authors** to adopt PAP practices?

Highlight the benefits, such as increased transparency, credibility, and replicability of results. Sharing examples of well-regarded studies that successfully used PAPs can also help build buy-in.

What should I do if a collaborator **disagrees** with the PAP?

10

Resolve disagreements before finalizing the PAP. A clear consensus ensures alignment on goals and methods. If disputes persist, document them and consider noting alternate approaches as exploratory analyses.

13

Can you recommend other **resources or websites?**

Yes. Please visit the Lab² website for additional resources and helpful tools.

Can you recommend **example PAPs or templates?**

12

Yes. Please visit the Lab² website for examples and templates of PAPs.

Increasing the Quality of your PAPs and RRs

PAPs and RRs are designed to increase research transparency. They may be especially effective if they are specific, precise, and exhaustive (Bakker, Marjan, et al., 2020). In this way, researchers can reduce unintended flexibility, supporting the credibility of findings.

Specific

Being specific about study components can help ensure that key elements are pre-determined, which may reduce the risk of selective reporting.

Without specificity, PAPs, and RRs might lack important details, potentially resulting in vague hypotheses or methods.

Precise

Precision allows other researchers to reproduce the study, enhancing transparency and trust in the methods used.

If steps are not described precisely, they may be open to interpretation, which could lead to variability in analysis.

Exhaustive

An exhaustive approach closes off potential loopholes, helping prevent additional analyses that weren't originally planned and minimizing hindsight bias.

Without being exhaustive, there may be a greater chance of added exploratory analyses, which can sometimes risk inflating results.

Examples

"We will use the general risk question (Dohmen et al., 2011) to measure risk preferences."

specific, but not precise and exhaustive

"We will use the general risk question (Dohmen et al., 2011), which asks respondents to state their willingness to take risks on an 11-point Likert scale, to measure risk preferences."

specific and precise, but not exhaustive

"We will use the general risk question (Dohmen et al., 2011), which asks respondents to state their willingness to take risks on an 11-point Likert scale, and treat the chosen value as the continuous measure of risk preferences (i.e., the response ranges from 0 to 10, with higher values indicating higher risk tolerance)."

specific, precise, and exhaustive