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.

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. 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

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

Path for a preregistered study

Preregistration / PAP

Peer Review

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)

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

Stage 1: **Peer Review**

Stage 2: **Peer Review**

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

Journals accepting RRs

Scan QR for more information
or visit www.labsquare.net /materials/journals

More educational materials

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Increasing the Quality of your PAPs and RRs

Lab² Metalab for better science

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