

# On the use of a Pre-Analysis Plan: an Application to an Observational Study in Social Sciences

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ICSA 2025 - Measuring Change for a Resilient Future

Florence, January 9-11, 2025

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Lavoro svolto nell'ambito del progetto "A survey-based Impact Evaluation of NRRP on Italian municipalities" -PRIN 2022 PNRR (Codice Progetto P2022RR82F/CUP I53D23007340001) a valere sul bando Avviso MUR D.D. n. 1409 del 14-9-2022 finanziato dall'Unione europea – NextGenerationEU

## I. RESEARCH QUESTIONS

- ▶ Assessment on the use a Pre-Analysis Plan (PAP)
  - ▶ Pros and cons in the context of: “A survey-based Impact Evaluation of NRRP on Italian municipalities” -PRIN 2022 PNRR (Codice Progetto P2022RR82F/CUP I53D23007340001)

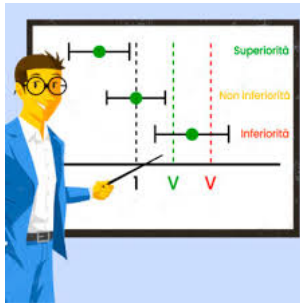
## II. MOTIVATION - PAP approach

- ▶ PAP is a protocol, an "ex-ante report", written within the framework of a research project, where the researchers declare in advance the object of the study and all the technical information about the research project
- ▶ largely used in medical research, in the case of randomized, experimental control trials ..



## II. MOTIVATION - PAP approach

- ▶ ... but recently adopted also in social science: is it worth??
- ▶ ... adopted to develop the EU funded project “A survey-based Impact Evaluation of NRRP on Italian municipalities”



## LITERATURE - PAP

Research work can be defined as a staged journey and like any true journey, it needs a plan, which guides the traveler in the right direction.

The Pre-Analysis Plan fulfills this purpose

(Chuang and Wykstra, 2015).

## LITERATURE - PAP

### PAP contents: A short checklist

<i>Item</i>	<i>Brief Description</i>
Primary outcome variable	The key variable of interest for the study. If multiple variables are to be examined, one should know how the multiple hypothesis testing will be done
Secondary outcome variable(s)	Additional variables of interest to be examined
Variable definitions	Precise variable definitions that specify how the raw data will be transformed into the actual variables to be used for the analysis
Inclusion/Exclusion rules	Rules for including or excluding observations and procedures for dealing with missing data
Statistical model specification	Specification of statistical models to be used, hypothesis and tests to be run
Covariates	List of any covariates to be included in analysis
Subgroup analysis	Description of any heterogeneity analysis to be performed on the data
Other issues	Other issues include data monitoring plans, stopping rules, and interim looks at the data

Source: Olken (2015)

## LITERATURE - PAP

### Why PAPs

- ▶ increase the **transparency** of the research project:
    - ▶ limit fishing and file-drawer (Christensen and Miguel, 2018; Ofosu and Posner, 2024)
    - ▶ limit p-hacking (Brodeur et al., 2020)
    - ▶ limit HARKing (Okum and Bowers, 2024; Ofosu and Posner, 2024)
  - ▶ minimizing data mining, a PAP produce more **rigorous and reliable results**
  - ▶ contrast **publication bias/specification search** as a distortion of research activity, according to which the statistical significance of the results influences the probability of publication (Brodeur et al., 2020)
  - ▶ increase overall **quality and clarity** of research: thinking in advance to all relevant research hypothesis and overall project development (Casey et al., 2012; Banerjee et al., 2020)
  - ▶ registration of the PAP reinforce all the above
- ⇒ **PAP ties the hands of researchers from cherry-pick**

## LITERATURE - PAP

### Limitations

- ▶ some hypotheses will likely prove to be noteworthy at a later time (Casey et al., 2012; Olken, 2015).
    - ▶ advancement of the literature or new data or new environment
    - ▶ hypotheses to be tested are almost always more than one, which are often conditional on the realization of others
  - ▶ the econometric model specification show up to be **not adequate for the data** that only showed up ex-post
  - ▶ the drafting of a PAP in advance **inhibits the explanatory capacity of a research work**: researchers may discover certain traits that they had not initially thought about but they predetermined research question (Olken, 2015; Coffman and Niederle, 2015)
    - ▶ limited incentive to explore else but PAP
  - ▶ mapping out all analysis in details is time consuming (especially when project duration is limited)
- ⇒ **PAP has cognitive and temporal effort**



## CASE STUDY

### A survey-based Impact Evaluation of NRRP on Italian municipalities

- ▶ refers to an observational study based on data that are not yet known as they will be collected through an ad-hoc survey
- ▶ even if this PAP has not undergone a pre-registration procedure, there is a commitment not only to the PAP drafting with the Ministry but also to its validation by a Board of experts
- ▶ defined research hypotheses of impact of NRRP at municipality level:
  - ▶ H1: NRRP has intensified the digitalization and modernization process of Italian public administration
  - ▶ H2: NRRP has fueled territorial development
  - ▶ H3: NRRP has increased citizens' well-being
  - ▶ H4: analysis difficulties and/or delays in the NRRP implementation

## CASE STUDY

### A survey-based Impact Evaluation of NRRP on Italian municipalities

- ▶ complex concepts
  - ▶ composite indicators of H1-H3
  - ▶ procedure to construct indicators: Beta Bernoulli Composite index (Mariani et al., 2024; Polinesi et al., 2024)
- ▶ collection of sub-indicators  $\Rightarrow$  ad-hoc survey
- ▶ econometric approach: Aucejo et al. (2020) which build on subjective expectations (beliefs) to evaluate decision-making under uncertainty

## Critical assessment - pros

### The PAP of "A survey-based Impact Evaluation of NRRP on Italian municipalities"

- ▶ PAP increases robustness: The overall project development is validated by an expert advisory board.
  - ▶ it works like a pre-registration commitment
  - ▶ it increases the credibility and appropriateness of the research
  - ▶ positive effects not only on readers but also on journal editors and reviewers who can trust that the findings stem from a rigorous and unbiased methodology rather than the most convenient selection of data or hypotheses
- ▶ PAP increases the level of transparency and reliability of the research outcomes & limiting critical issues such as publication bias or specification search
  - ▶ PAP explicitly defines research hypotheses and analysis frameworks, in advance to any empirical treatment of data, thereby minimizing the risk of subjective choices that could distort results

## Critical assessment - pros

### The PAP of "A survey-based Impact Evaluation of NRRP on Italian municipalities"

- ▶ PAP enhances the overall quality of research: from the very beginning, meticulous reasoning applied in the drafting process: detailed development of the project and anticipation of potential challenges
    - ▶ a lack of variables necessary to properly define the impact of NRRP
      - ▶ ad-hoc survey
      - ▶ a clear focus on meaningful outcomes, reducing ambiguity and aligning their work with the broader goals of the NRRP
  - ▶ PAP ensures consistency in data collection across municipalities
    - ▶ uniformity is crucial for drawing meaningful comparisons and identifying the differential impacts of NRRP projects
    - ▶ establishes a clear protocol for defining data and indexes, enabling both the verifiability and replication of results
- ⇒ PAP provides policymakers with a valuable tool (transparent, rigorous) to assess their actions and benchmark against other municipalities

## Critical assessment - cons

### The PAP of "A survey-based Impact Evaluation of NRRP on Italian municipalities"

- ▶ political environment was not stable: revision of Italy's NRRP
- ▶ responses to the survey
- ▶ statistical and econometric approach could be unable to adequately represent the realized data
  - ▶ the penalized power mean and Beta-Bernoulli methods for constructing composite indicators could overlook unanticipated correlations or dynamics present in the realized data
  - ▶ the innovative econometric approach of using municipalities' expectations to construct a counterfactual is additional layer of uncertainty regarding the reliability of ex-ante beliefs compared to realized outcomes
  - ▶ can hinder the researcher's ability to learn and/or certain traits are not evident in the beginning

⇒ a trade-off: predefining models ensures transparency and replicability vs. constraint to adapt to new insights with loss of explanatory power of the analysis