baggr: Bayesian evidence aggregation in R

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What it is, what it does

Baggr is an open-source, free to use statistical inference package which helps researchers conduct Bayesian meta-analyses. It is designed to be easy to use for people with no Bayesian computation skills to make the methods more accessible for applied economists, government and the nonprofit sector. Our documentation guides users through Bayesian meta-analysis workflow: choice of models, choice of priors, model checking and visualization of results.

The package has been created by Rachael Meager, PhD and Witold Więcek, PhD back in 2018 and the current release is a stable beta version, v0.6.21. Witold is the software developer for the package and focuses on applications in health, while Rachael works on applications in economics, especially development economics.

Activities Supported by this Grant

A grant would cover development up to about v1.0, at which point baggr could be considered a mature software. We plan to do the following before reaching v1.0:

- Develop new functions to encourage better workflow for meta-analysis, potentially with new default approach to priors; this will be in collaboration with other Bayesian statisticians who use the package and non-technical end users.

- Implement specific models for common but non-standard aggregation problems including: “spike and slab”/zero-inflated data (e.g. the microcredit quantiles analysis), survival models (necessary for modeling e.g. child mortality data), network meta-analysis models (typical in comparing drugs) and difference-in-difference modeling (typical in economics quasi-experiments, natural experiments and some RCTs)

- Develop methods for mixing individual-level data with summary-level data; this occurs when only some studies make “micro” data available (a common issue in evidence synthesis) or when decision-makers have substantial information not encoded in published studies.

- Improve integration with other R packages, with a focus on visualisations, interpretation of results and accessibility to non-Bayesian or non-technical audiences.

The above list is aspirational and we will continue to make development decisions based on feedback we receive from users. In parallel to continuing core development of the package, we will continue to collaborate with researchers on particular use cases (for which we are not seeking any extra funding).

A grant would also cover some aspects of maintenance: the issues page in our code repository lists another 30+ features and bugs that need work, with new ones constantly added based on user feedback.

Work that baggr has previously been used to support

We have been supporting researchers and implementers in conducting meta-analyses primarily for program evaluations. The following is a non-exhaustive list of 8 notable projects that have used baggr:

- A new working paper on meta-analysis of under-5 mortality and water interventions (Michael Kremer, Witold Więcek and others), which has been used by GiveWell's recent CEA of DSW and ILC, uses baggr to fit Bayesian models.

- Digital Agricultural Advice (Raissa Fabregas, Michael Kremer, Frank Schilbach); we were able to provide some bespoke modelling for them on top of the standard baggr models, and this is now published in Science with baggr cited

- Financial education in developing countries (Tim Kaiser, Annamaria Lusardi, Lukas Menkhoff, Carly J. Urban); correspondence with Tim Kaiser indicates they were dissatisfied with their current approach and are using baggr for the next version. Tim tweeted about it here.

- Teaching at the Right Level (TARL; Noam Angrist at Young1ove, Botswana, joint with Rachael), uses baggr's basic hierarchical models to aggregate evidence across countries, this forms the first set of deliverables on the CEDIL / DIFD grant to Young1ove, and informs Young1ove's strategy for scaling up TARL in Botswana and Namibia.

- BRAC Ultra Poor Graduation Program (Dean Karlan, Chris Udry, Rachael, Witold, and Andrew Gelman), uses baggr's models to initially assess heterogeneity across countries in average effects; finding large heterogeneity motivates further work on individual effect estimation.

- "Meta-Analysis and Public Policy: Reconciling the Evidence on Deworming" (Michael Kremer, Ted Miguel, Witold Więcek and others; in submission) uses baggr for Bayesian robustness checks

- MDMA for treatment of PTSD (Scott Cunningham, Priyasmita Ghosh and Rebecca Thornton), uses baggr's basic hierarchical models to aggregate Phase 2 trial data (work in progress). Scott tweeted about it here.

- Early prototypes of baggr's core hierarchical models developed by Rachael Meager were used to assist with Vitamin A supplementation meta-analysis for Andrew Martin with GiveWell.

Potential Future Use Cases of baggr

Here are potential use cases. Once again we emphasise that we are not looking for funding to engage in particular collaborations but only to develop the core features and continue maintaining the package.

- Witold is working with Development Innovation Lab at UChicago to incorporate baggr as the default choice for all meta-analyses produced by the lab, including follow up work on water interventions and child mortality.

- Young1ove expressed interest for greater meta-regression capacity within baggr, as their focus for the future will be understanding correlates of higher treatment effects rather than absolute quantification of averages or variances across settings.

- Eventually we hope that organizations such as GiveWell and Open Philanthropy may be able to incorporate some aspect of baggr into their workflow or general approach.

Grant request and routing information

We are asking for a **50,000 GBP** grant to be made to WAW Statistical Consulting Ltd (which is the one-person company through which Witold does all of his research; WAW was the recipient of previous baggr grants as well) which covers software development costs for 2 calendar years. The package was funded initially through LSE and subsequently by a Schmidt Futures grant, but as of January 2022 we do not have any funding for development available.