Reviewer's report

Title: Tuning multiple imputation by predictive mean matching and local residual draws

Version: 2
Date: 9 April 2014

Reviewer: Juned Siddique

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General Comments

This is a well written and interesting manuscript which provides an overview of—and insight into—multiple imputation by predictive mean matching (PMM) and local residual draws (LRD). The manuscript is likely to be of interest to readers of BMC Medical Research Methodology.

Major Compulsory Revisions

1. I think more needs to be written about the difference between PMM and LRD. Specifically, PMM will impute plausible values for binary variables, ordinal variables, scaled variables, etc. while LRD will not (unless some kind of rounding occurs afterwards). The simulations all deal with continuous data so that PMM, LRD, and a parametric model can all be compared. But I see one of the benefits of PMM being that in settings where many variables are to be imputed, which are of different type, PMM can often handle them all. LRD may not do as well, and imputation using parametric models often requires a different model specification for each variable to be imputed.

2. There is no mention of an Approximate Bayesian Bootstrap (ABB) (Rubin and Schenker, 1986; Demirtas et al. 2007) in the article which is a notable omission. Using an ABB allows for imputations to be proper, in the sense that uncertainty in the imputation model parameters is incorporated into the imputations themselves. This can be thought of as a nonparametric approach to drawing the regression coefficients (\alpha in the text) from a parametric model. An ABB is used in MIDAS as well as in aregimpute.

3. “Some settings where PMM and LRD may fail” section: The comment on the distribution of \alpha^{obs}z_{h} not being uniform is not clear to me. Please elaborate.

4. Simulation design: misspecified imputation model" section: If the analysis model includes a quadratic term, wouldn’t an imputer also include this term in the imputation model so that the two models are congenial?

Minor Essential Revisions

1. Background Section, 3rd to last paragraph: This could be a little more general. “Observed values close to the linear predicted value are selected as the donor
pool.”

2. “Defining the donor pool” section: Remove “one” from the sentence, “The notion of selecting one from a pool…”

3. “Sampling from the donor pool” section, last paragraph: Sas should be all caps.

4. Results section, first paragraph: The layout of the figures is different from what is described here.

5. Table 1: This table does not stand alone. It needs footnotes describing notation and what “match type” means.

Discretionary Revisions

1. “Defining the donor pool” section: Sometimes the second approach is described as “caliper matching

**Level of interest:** An article whose findings are important to those with closely related research interests

**Quality of written English:** Acceptable

**Statistical review:** Yes, and I have assessed the statistics in my report.

**Declaration of competing interests:**

I declare that I have no competing interests