Appendix: Further Stata meta-analysis commands

Stata users have written meta-analysis commands that have not, so far, been accepted for publication in the *Stata Journal*. Here are brief descriptions of commands known to the editor at the time of publishing this collection. Readers should note that these commands have not undergone the review process required for publication in the *Stata Journal*. This list is likely to be incomplete, and the editor apologizes to authors of any commands that have been overlooked. For the most up-to-date information on these and other meta-analysis commands, readers are encouraged to check the Stata frequently asked question on meta-analysis:

http://www.stata.com/support/faqs/stat/meta.html

- `metannt` is intended to aid interpretation of meta-analyses of binary data by presenting intervention effect sizes in absolute terms, as the number needed to treat (NNT) and the number of events avoided (or added) per 1,000. The user inputs design parameters, and `metannt` uses the `metan` command to calculate the required statistics. This command is available as part of the `metan` package.

  The NNT is the number of individuals required to experience the intervention in order to expect there to be one additional event to be observed. It is defined as the reciprocal of the absolute value of the risk difference (risk of the outcome in the intervention group minus risk in control).

  $$\text{NNT} = \frac{1}{|\text{risk difference}|}$$

  Assuming the event is undesirable, this is termed the *number needed to treat to benefit*. If the intervention arm experiences more events, this is commonly referred to as the *number needed to treat to harm*. Because most meta-analyses are based on ratio measures, the risk difference is calculated based on an assumed value of the risk in the control group. The `metannt` command calculates this by deriving an estimate of the intervention effect (e.g., a risk ratio), applying it to a population with a given outcome event risk, and deriving from this a projected event risk if

the population were to receive the intervention. The number of avoided or excess events (respectively) per 1,000 population is the difference between the two event risks multiplied by 1,000. Optionally, a confidence interval is also presented, using the confidence limits for the estimated intervention effect applied to the control group event rate.

- `metaninf` investigates the influence of one study on the overall meta-analysis estimate and shows graphically the results when the meta-analysis estimates are computed, omitting one study in each turn. This command makes repeated calls to the `metan` command for its analyses. It was released in 2001 and was last updated in 2004. It requires the user to provide input in the form needed by `metan`. To install the package, type `ssc install metaninf` in Stata. Articles describing `metainf`, a previous version of the command, were published in the *Stata Technical Bulletin* (Tobias 1999, 2000).

- `midas` provides statistical and graphical routines for undertaking meta-analysis of diagnostic test performance in Stata. Primary data synthesis is performed within the bivariate mixed-effects binary regression modeling framework. Model specification, estimation, and prediction are carried out with `xtmelogit` in Stata 10 or the `gllamm` command in Stata 9 by adaptive quadrature. Using the estimated coefficients and variance–covariance matrices, `midas` calculates summary operating sensitivity and specificity (with confidence and prediction contours in summary receiver operating characteristic space), summary likelihood, and odds ratios. Global and relevant test performance metric-specific heterogeneity statistics are provided. `midas` facilitates extensive statistical and graphical data synthesis and exploratory analyses of heterogeneity, covariate effects, publication bias, and influence. Bayes' nomograms and likelihood-ratio matrices can be obtained and used to guide clinical decision making. The minimum required input data are variables containing the elements of the 2×2 contingency tables (true positives, false positives, false negatives, and true negatives) of test results from each study. To install the package, type `ssc install midas` in Stata.

  Further information on the comprehensive suite of facilities provided by `midas` is available at http://www.sitemaker.umich.edu/metadiagnosis/midas_home. In particular, two presentations given at Stata Users Group meetings are available at http://www.sitemaker.umich.edu/metadiagnosis/presentations and via RePEc at http://econpapers.repec.org/paper/bocasug07/4.htm and http://ideas.repec.org/p/boc/wsug07/1.html.

- `meta_lr` graphs positive and negative likelihood ratios in diagnostic tests. It can do stratified meta-analysis of individual estimates. The user must provide the effect estimates (log positive likelihood ratio and log negative likelihood ratio) and their standard errors. Commands `meta` and `metareg` are used for internal calculations. This is a version 8 command released in 2004. To install the package, type `ssc install meta_lr` in Stata.

- `metaparm` performs meta-analyses and calculates confidence intervals and p-values for differences or ratios between parameters for different subpopulations, for data

stored in the `parmest` format (Newson 2003). To install the package, type `ssc install metaparm` in Stata.

11 References

Newson, R. 2003. Confidence intervals and p-values for delivery to the end user. *Stata Journal* 3: 245–269.

Tobias, A. 1999. sbe26: Assessing the influence of a single study in the meta-analysis estimate. *Stata Technical Bulletin* 47: 15–17. Reprinted in *Stata Technical Bulletin Reprints*, vol. 8, pp. 108–110. College Station, TX: Stata Press.

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