

This sheet examines the dataset *zambia.raw* using the software BayesX (see Handout 1 provided on the course web page for a description of software and data). **Please work on this sheet on your own.**

Task 2.1: (Getting started with BayesX)

- (a) Open BayesX from *Programs/Academic Software/Mathematical Sciences*.
- (b) Create a `dataset` object `zambia` and load the data set *zambia.raw* from `T:/MATHS/DMA0JE/` into it (the 0 in DMA0JE it is a zero!).
- (c) Display the data, and produce summary statistics of variables `bmi` and `tpr`.

Task 2.2: (Linear regression)

- (a) Create a `bayesreg` model with name `b`, and fit a simple linear regression model of variable `hazstd` (stunting score) against `agc`, the age of the child in month. Note the estimated regression equation here:

- (c) Repeat the fit a couple of times (modify the MCMC parameters if you think that computation takes too long!). What do you observe?
- (d) Now fit a multiple linear regression model adding the variables `bmi`, `sex`, `rcw`, `tpr`, `edu1` and `edu2`.
- (e) Give a 95% Bayesian confidence ("credible") interval for the regression parameter for `tpr`:

Task 2.3: (Semiparametric regression)

- (a) Improve the fit by modelling the effect of `agc` and `bmi` with P-Splines, using a 2nd order random walk prior for the difference penalties (e.g., `agc(psplinerw2)`).
- (b) Look at the fitted smooth curves for the effect of `age` and `bmi` on stunting and at their 80% and 95% credible intervals. Is it justified to speak of nonlinear effects?

Task 2.4: (Spatial semiparametric regression / Geadditive models)

- (a) Load the map `zambia.bnd` into an object `m` and display it.
- (b) Reorder the neighborhood associations stored in this file using `m.reorder`. This will speed up future handling of this map.
- (c) Create a new `bayesreg` object `c`. Now fit a spatial regression model adding the structured spatial effect `district(spatial, map=m)` to the model, accounting for correlation between neighboring districts. Use the command `drawmap` to visualize it. Also look again at the smooth curves for `age` and `bmi` and compare them with those fitted in model `b`.