(Handout to the Computer Lab II)

General

The BayesX working environment is structured into four windows

- a command window (to enter code),

- an output window (to display results),

- a review window (for easy access to past commands)

- an object browser (containing all available objects)

BayesX is object-oriented. New objects are generally created via
```
objecttype objectname
```
and any operation on objects is done by
```
objectname.command
```

Important objects and commands

- `dataset` d creates a dataset object called d.

- `bayesreg` b creates a bayesreg (regression) object called b.

- `map` m creates a map object called m.

- `d.infile using` *pathname* loads data;

- `m.infile using` *pathname* loads a map (*.bnd format).

- `d.describe` displays the data; `m.describe` displays the map.

- `d.tabulate` *variablename* and `d.descriptive` *variablename* give summary statistics
  for discrete or continuous variables, resp.

- `b.regress` *formula*, `family=gaussian [iterations=... burnin=... step=...]`
  `using` d launches a Bayesian semiparametric regression. The attributes within [ ]
  are optional and steer the total number of MCMC iterations, the length of the burnin
  period, and the degree of thinning.

- `b.plotnonp` i displays the smooth component #i graphically (find #i in output window!)

- `b.drawmap` i displays the the map #i.

Certainly, the names $b,$ $d,$ and m can be replaced by other names.

We consider data on undernutrition of children in Zambia, originally analyzed in Kandala et al (2001). Undernutrition on children is usually determined by assessing the anthropometric status of a child relative to a reference standard. In this example undernutrion is measured by "stunting", i.e insufficient height for age, indicating chronic undernutrition. Stuntimg for a child i is determined using a $Z-$score which is defined as

$$Z_i = \frac{AI_i - MAI}{\sigma}$$

where AI refers to the childs anthropologic indicator (here, height at a certain age), MAI refers to the median of the reference population and σ refers to its standard deviation. The main interest is on modelling the dependence of undernutrition on covariates including the age of the child, the body mass index of the child's mother, the district the child lives in, among others. See the following table for a list and description of variables:

Variable	Description
$hazstd$	standardized stunting Z-score (Z_i)
bmi	mother's body mass index
$district$	district where the child lives
rcw	mother's employment status with categories "working" $(= 1)$ and "not working" $(= -1)$
$edu1/2$	mother's educational status with $edu1 = 1$ and $edu2 = 1$ for complete primary and secondary education, respectively (and -1 otherwise).
tpr	locality of domicile with categories "urban" $(= 1)$ and "rural" $(= -1)$
sex	child's gender: male $= 1$, female $= -1$.

Literature

Kandala, N.B., Lang, S., Klasen, S., and Fahrmeir, L. (2001): Semiparametric analysis of the socio-demographic and spatial determinants of undernutrition in two African countries. *Research in Official Statistics* **1**, 81-100.

Kneib, T., Lang, S., and Brezger, A. (2005): Bayesian semiparametric regression based on MCMC techniques: A tutorial. *University of Munich, http://www.stat.uni-muenchen.de/~bayesx/bayesxtutorials.html*

Lang, S., and Brezger, A. (2004): Bayesian P-Splines. *Journal of Computational and Graphical Statistics* **13**, 183-212.

Where get BayesX?

BayesX is free software, and is available for download at

http://www.stat.uni-muenchen.de/~bayesx/