

Online Resource 4 Mathematical formulas for the generalized linear model and log transformation of livelihood variables

A generalized linear model was used to test the effect livelihood strategy, household characteristics, *kebele*, and survey data on the dependent variable HFIAS score (food security measure). The formula is as follow:

$$\log(\text{hfiasscore}_i) = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \beta_3 x_{3i} + \beta_4 x_{4i} + \beta_5 x_{5i} + \beta_6 x_{6i} + \beta_7 x_{7i} + \beta_8 x_{8i} + \beta_9 x_{9i} + \beta_{10} x_{10i} + \beta_{11} x_{11i} + \beta_{12} x_{12i} + \beta_{13} x_{13i} + \beta_{14} x_{14i} + \beta_{15} x_{15i} + \beta_{16} x_{16i} + \beta_{17} x_{17i}$$

with $x_1=1$ if livelihood strategy type is 2 (otherwise 0), $x_2=1$ if livelihood strategy type is 3 (otherwise 0), $x_3=1$ if livelihood strategy type is 4 (otherwise 0), $x_4=1$ if livelihood strategy type is 5 (otherwise 0), $x_5=1$ if sex=male (otherwise 0), $x_6=\text{date}$, $x_7=\text{age}$, $x_8=1$ if education cluster is 1 (otherwise 0), $x_9=1$ if education cluster is 2 (otherwise 0), $x_{10}=1$ if education cluster is 3 (otherwise 0), $x_{11}=\text{household size}$, $x_{12}=\text{number of ill household members}$, $x_{13}=1$ if kebele=GBW (otherwise 0), $x_{14}=1$ if kebele=GQH (otherwise 0), $x_{15}=1$ if kebele=GQQ (otherwise 0), $x_{16}=1$ if kebele=SDM (otherwise 0), $x_{17}=1$ if kebele=SGB (otherwise 0)

The variables used for the multivariate analysis were log-transformed to meet requirements of normality. The formula is shown below:

$$y_{ij} = w_{1i} * \text{gardendiversity}_j + w_{2i} * \text{milk}_j + w_{3i} * \text{honey}_j + w_{4i} * \log(\text{maizeyield}_j + 1) + w_{5i} * \log(\text{teffyield}_j + 1) + w_{6i} * \log(\text{sorghumyield}_j + 1) + w_{7i} * \log(\text{coffeeyield}_j + 1) + w_{8i} * \log(\text{wheatyield}_j + 1) + w_{9i} * \log(\text{barleyyield}_j + 1) + w_{10i} * \text{khat}_j + w_{11i} * \text{otherincome}_j + w_{12i} * \log(\text{legumes}_j + 1)$$

With w denoting weights and for $i=1, \dots, 12$ principal components and $j=1, \dots, 337$ households