**1. For each of the situations below, identify the response and explanatory variables, variable types, and the generalized linear model that is well-suited to model the data. Make sure to justify your answer. Write down the linear predictor as well as the link function**

* **The effect of age, sex, height, daily food intake and minutes of daily exercise on a person’s weight.**

Response Variable: *weight* (numerical, continuous)

Explanatory Variable: *age* (numerical, continuous/discrete), *sex* (categorical, binary), *height* (numerical, continuous), *daily food intake* (numerical, continuous), *minutes of daily exercise* (numerical, continuous)

GLM: A normal linear model because the response variable *weight* is continuous and l likely to be normal distributed

Linear Predictors:

Link Function:

* **The effect of sex, age, GPA, major, prior years of work experience, and prior income levels on whether a full-time graduate student finds employment upon graduation**

Response Variable: employment status upon graduation (categorical, binary)

Explanatory Variable: *sex* (categorical, binary), *age* (numerical, continuous/discrete), *GPA* (numerical, continuous), *major* (categorical, nominal), *prior years of work experience* (numerical, continuous), *income level* (categorical, nominal)

GLM: A logistic regression model because the response variable is categorical and binary

Linear Predictors:

Link Function:

* **The number of mortgage loan defaults in a given year by different counties across the United States. For each household/borrower information on income, loan interest rate, age, debt, loan to value at origination are available.**

Response Variable: the number of mortgage loan defaults (numerical, discrete)

Explanatory Variable: *income* (numerical, continuous), *loan interest rate* (numerical, continuous), *age* (numerical, continuous/discrete), *debt* (numerical, continuous), *loan to value at origination* (numerical, continuous).

GLM: A binomial regression model because the response variable is numerical and discrete making sure it’s greater than 0.

Linear Predictors:

Link Function:

**2. Assume that the linear predictor, , takes the values between and equally spaced by . If the link function is the natural logarithm, , then compute and plot the mean response, , against the linear predictor,.**

A graph with a line

Description automatically generated

**3. Assume that the linear predictor, , takes the values between and equally spaced by . If the link function is logit, , then compute and plot the mean response, , against the linear predictor,.**

A graph with a blue line

Description automatically generated

**4. Assume that the linear predictor, , takes the values between and equally spaced by . If the link function is negative inverse, , then compute and plot the mean response, , against the linear predictor,.**

A graph with a blue line

Description automatically generated