```matlab
% SUPPLEMENTARY FILE TO "BMI and dementia: a complex association"
% The association between weight loss and dementia: A simulation experiment
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% Please note that for this simulation to work the "Statistics Toolbox" has
% to be installed in MATLAB.

N = 100000; % Size of the cohort
pw= 0.1; % The percentage of people with weight loss
p0= 0.002; % The basal rate of dementia per person year
X = 10; % The relative risk ratio (rate ratio) for developing dementia once
weight loss occurs
px = p0*X;
time = 10; % The follow-up time
dt =1; % Measurements at yearly intervals
mu = 26 ; % mean BMI
sd = 4; % standard deviation of BMI
wd =0.5; % the amount of weight decline in units BMI per year in those who
lose weight


%The subject array matrix wtih 4 layers:
subject = zeros(N,time,4);

% Initialize the random number generator to make the results repeatable.
rng(0,'twister');

subject(:,:,2)=p0; % The basal risk of developing dementia

% Select a random sample of people who experience weight loss
for i=1:N;
    id(i,1)=i; % subject id
    if rand(1,1)<=0.1
        subject(i,1:time,1)=1; % Layer 1 represents the subjects who
experience weight loss
        subject(i,1:time,2)=px; % The risk of dementia is increased in those
who experience weight loss
    end
        subject(i,1,3)=normrnd(mu,sd); % Layer 3 represents the body mass
indices (normally distributed)
  end

for s=1:N  % s is the subject number

  for t=1:dt:time-1
  if subject(s,1,1)==1
      subject(s,t+1,3)=subject(s,t,3)-wd; % Calculate the BMI for those who
experience weight loss
  elseif subject(s,1,1)==0
      subject(s,t+1,3)=subject(s,t,3);  % Calculate the BMI for those who do
not experience weight loss
  end
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    lambdad=subject(s,t,2); % The probability of getting dementia
    wtd = -log(rand (1, 1))/lambdad; % Poisson waiting times follow an
exponential distribution.

    if (wtd<dt)    % If the time till dementia is within dt than this individual
has
        subject(s,t+1:time,4)=1; % dementia
    end

    end
end

% Perform Poisson regression with the index BMI and a constant as
% predictors and dementia at the end of follow-up as the outcome
i2=5;
bmi=subject(:,i2+1,3);
dementia=subject(:,time,4);
mdl =  fitglm(bmi,dementia,'linear','Distribution','poisson')

% Save the data in the current folder
save('Simulation_BMI_Dementia');
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