The University of Hong Kong
School of Public Health

Master of Public Health
Advanced Statistical Methods I

Applied regression

Assignment 1
(submit to Moodle by 11:55pm, Mar 17, 2022)

March 7, 2022

Association of invasive meningococcal disease and environmental and virologic exposure

Weekly counts of invasive meningococcal disease (IMD) reported cases from country A in 1997-2000 were collected and analyzed, to study associations between IMD and environmental and virologic exposure. The file 'IMD.csv' stored the following variables which were found to be significant factors from the literature in other places:

- *flu*: influenza isolation rate from laboratory
- *maxtemp*: weekly maximum temperature
- *IMD*: weekly number of IMD cases
- *pop: population size*

a) Fit a poisson regression model to predict weekly IMD cases using *flu* and *maxtemp*, accounting for the increasing population size in 1997-2000. Summarize your results in a table. [4 marks]

b) Assess the goodness of fit of the model. [1 marks]

c) Quote the mean and variance of the weekly IMD cases. Is there any evidence of overdispersion? [1 marks]

d) Fit a negative binomial regression model to predict weekly IMD cases and summarize your results in a table. [4 marks]

e) Assess the goodness of fit of the model. [1 marks]

f) Calculate the AIC for the poisson and negative binomial regression models and select the best model based on AIC and goodness of fit. [1 marks]

g) Assess if the linear effects for the variables *flu* and *maxtemp* are adequate. [2 marks]

h) Assess if there is any collinearity problem in your final model? [2 marks]

i) Assess if there is any unexplained serial correlation after fitting your final model. [2 marks]

j) Draw an overall conclusion on the findings. [3 marks]

k) Based on the final model, predict the number of IMD cases in a week, if the influenza isolation rate is 0.3, with a maximum temperature of 5^{o}C and a population of 110 million. [2 marks]

l) Based on the final model, which of the conditions below will have a higher population risk of IMD, so more attention should be paid to suspected IMD cases for earlier treatment? [2 marks]

1. Influenza isolation rate = 0.1, maximum temperature = 10^{o}C
2. Influenza isolation rate = 0.4, maximum temperature = -5^{o}C