MSc: Statistical Analysis (Spring Term)

Generalized Linear Models: Exercises 2

1. Numbers of deaths from leukemia and other cancers among survivors of the Hiroshima atom bomb are shown in the Table below, classified by the radiation dose received. The data refer to deaths during the period 1950-59 among survivors aged 25-64 years in 1950 (using data from Otake, 1979).

	Radiation dose (rads)					
Deaths	0	1-9	10-49	50-99	100-199	200+
Leukemia	13	5	5	3	4	18
Other cancers	378	200	151	47	31	33
Total Cancers	391	205	156	50	35	51

   Defining the dose as the lower limit of each dose interval, 0, 1, 10, ..., obtain a suitable model to describe the dose-response relationship between radiation and proportional mortality rates for leukaemia. How well does the model fit? Obtain a plot of the observed data and the fitted model.

2. Collet (1991) reports an experiment on the toxicity of the tobacco budworm *Heliothis virescens* of doses of the pyrethroid *trans*-cypermethrin to which the moths were beginning to show resistance. Batches of twenty moths of each sex were exposed for three days to the pyrthroid and the number in each batch which were dead or knocked down was recorded. The results were

	dose					
sex	1	2	4	8	16	32
Male	1	4	9	13	18	20
Female	0	2	6	10	12	16

   The doses were in μg. We want to fit a logistic regression using $\log_2$(dose), 0, 1, 2, ..., 5, since the doses are in powers of two.

   (a) Obtain a suitable model to describe the dose-response relationship between the pyrethroid and the proportions of moths killed (or knocked down).

   (b) Is there any evidence that the relationship is different for the male and female moths?