BIOS 902: Bayesian Statistics
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Homework #2

1. Gelman et al.: Exercise 2.11

2.

An experiment was performed to estimate the effect of beta-blockers on mortality of cardiac pa-
tients. A group of patients were randomly assigned to treatment and control groups: out of 674
patients receiving the control, 39 died, and out of 680 receiving the treatment, 22 died. Assume
that the outcomes are independent and binomially distributed, with probabilities of death of p_0 and
p_1 under the control and treatment, respectively. Set up a noninformative or weakly informative
prior distribution on (p_0, p_1).

   a) Summarize the posterior distribution for the odds ratio, $(p_1/(1-p_1))/(p_0/(1-p_0))$.

   b) Discuss the sensitivity of your inference to your choice of prior density.

3.

Consider a case where the same factory has two production lines for manufacturing car wind-
shields. Independent samples from the two production lines were tested for hardness. The hard-
ness measurements for the two samples y_1 and y_2 are given in the files windshieldy1.txt
and windshieldy2.txt.

We assume that the samples have unknown standard deviations σ_1 and σ_2. Use uninformative or
weakly informative priors and answer the following questions:

   a) What can you say about $\mu_d = \mu_1 - \mu_2$?. Summarize your results using Bayesian point and
   interval estimates.

   b) Are the means the same?

windshieldy1	windshieldy2
13.357	15.98
14.928	14.206
14.896	16.011
15.297	17.25
14.82	15.993
12.067	15.722
14.824	17.143
13.865	15.23
17.447	15.125
	16.609
	14.735
	15.881
	15.789

4. Gelman et al.: Exercise 3.10