MS COMPREHENSIVE EXAM

Stat 505-506 Take Home

August 20, 2013

Due: to Josie Powell by noon August 21, 2013.

Instructions: Unlike the homeworks in Stat 505 and 506, we expect you to do this exam on your own. You may use any notes and books and may check internet resources, but don't discuss the exam with anyone except Jim Robison-Cox. Bring any questions to him in person or via email.

The Data are here ready to be loaded into R with

```
load("http://www.math.montana.edu/~jimrc/MScomp/vision.RData")
```

after which you should have the `armd1` data.

Age-related macular degeneration (see the Wikipedia article for more info) affects about 12% of whites who reach an age of 80 or more (only 2% of blacks). It results in progressive deterioration of the retina with resulting loss of vision.
Our data are part of the data from a randomized clinical trial which used 45 ophthamlic centers world-wide. Patients were assigned at random to either get a placebo or interferon alfa-2a at one of three different doses. These data contain the placebo group and only one of the treatment groups. The basic question is whether or not the treatment was effective, which in this case would mean that it slows the decline in visual acuity. Researchers would be very happy if patients vision does not get worse, so we're wondering if vision deteriorates more slowly in the treatment group. Essential to the analysis is the tracking of patients over time, so we have up to four measurements on each patient and will use `visual0` as a baseline.
Source: Pharmacological Therapy for Macular Degeneration Study Group (1997). Interferon alpha-IIA is ineffective for patients with choroidal neovascularization secondary to age-related macular degeneration. Results of a prospective randomized placebo-controlled clinical trial. *Archives of Ophthalmology*, **115**}, 865-872
Write up a report suitable for an ophthamologist who is quite knowledgeable about statistics. We expect these steps in some reasonable order:

- Show initial plots of the data. (5 pts)
- Describe of the model you recommend including fixed, and random effects. (15 pts)
- Justify the model. (10 pts)
- Describe the correlation (or covariance) structure of the responses from an individual. (10 pts)
- Do we need a different variance for each testing time, or is there a simpler time-based model we could use for variance? (5 pts)
- Provide inference about size of the treatment effect. (10 pts)
- Discuss the scope of the inference. Assume that the patients available at each center are a convenience sample of people with the condition of interest. (15 pts)
- The missingness pattern is coded for you. Discuss the impact of these miising data points on your results. (10 pts)
- As an appendix, provide the computer code you used and the relevant output. Do not dump in everything you tried, just give the parts you used in the end and all essential steps along the way. (5 pts)

Use knitR and LaTeX to produce the report and email a copy of the knitR file to Jim Robison-Cox. Also turn

in a hard copy to Josie by noon on August 21, 2013.