HW4

1a. **Methods**: Proportional hazards regression with robust SE was used to evaluate an association between the instantaneous risk of all-cause mortality over the entire period of observation and serum LDL (used as a continuous variable). The hazard ratio and 95% CI was computed using Cox proportional

hazards regression with the Huber-White sandwich estimator of the standard errors.

**Results**: Using proportional hazards regression, we estimate that for each 1 mg/dL increase in serum LDL, the risk of all-cause mortality decreases by 0.74%. This estimate is statistically significant (p=0.009). The 95% confidence interval suggests that this observation would not be unusual if a group with 1 mg/dL higher serum LDL had a risk of all-cause mortality that was between 1.29% and 0.18% lower than the group with the lower serum LDL.

1b. See part 4

2a. **Methods**: Proportional hazards regression with robust SE was used to evaluate an association between the instantaneous risk of all-cause mortality over the entire period of observation and serum LDL (used as a continuous logarithmically transformed variable). The hazard ratio and 95% CI was computed using Cox proportional hazards regression with the Huber-White sandwich estimator of the standard errors.

**Results**: Using proportional hazards regression, we estimate that for each doubling in serum LDL, the risk of all-cause mortality is 0.56 times the risk in the group with higher LDL compared to the group with lower LDL. This estimate is statistically significant (p<0.001). The 95% confidence interval suggests that this observation would not be unusual if a group with serum LDL twice as high as another group might have a risk of all-cause mortality that was between 0.43 and 0.74 times that of a group with the lower LDL.

2b. See part 4

3a. **Methods**: Proportional hazards regression with robust SE was used to evaluate an association between the instantaneous risk of all-cause mortality over the entire period of observation and serum LDL (modeled quadratically). Pearson’s chi square test was used to test for association and nonlinear trend with significance at 0.05.

**Results**: We found evidence of a significant association between serum LDL and all-cause mortality (p=0.0005). We did not find evidence of a nonlinear association between all cause-mortality and serum LDL modeled quadratically (p=0.055). However, we cannot be sure that the relationship is linear, as the relationship could be nonlinear in a way that a quadratic function could not detect.

3b. See part 4

4.



The overall shape of the fitted values is similar between the three fitted hazard ratios. The fitted values are similar when the hazard ratios are near 1. The further away from 1 the HR is, the larger the difference between logarithmically and quadratically modeled LDL HRs are relative to the continuous LDL HR.