1.

a.

Using the 725 available datapoints (of which 131 died during the study time and 594 who survived for the duration of the study), robust proportional hazards regression analysis was performed to examine the instantaneous risk of death over the time period of observation across groups defined by serum LDL modeled as a continuous variable.

From proportional hazards regression analysis, we estimate that for each 1 mg/dL increase in mean serum LDL level, the risk of relapse is 0.738% lower in the group with the higher mean serum LDL. This estimate is highly statistically significant (P < .009). A 95% CI suggests that this observation is not unusual if a group that has a 1 mg/dL higher LDL might have risk of relapse that was anywhere from 1.29% to .182% lower than the group with the higher mean LDL.

b.



The hazard ratios compared to a group with a serum LDL level of 160 mg/dL of groups defined by their serum LDL decreases as serum LDL increases.

2.

a.

Using the 725 available datapoints (of which 131 died during the study time and 594 who survived for the duration of the study), robust proportional hazards regression analysis was performed to examine the instantaneous risk of death over the time period of observation across groups defined by serum LDL modeled as a continuous logarithmically transformed variable.

From proportional hazards regression analysis, we estimate that for each 1 mg/dL increase in mean serum LDL level, the risk of relapse is 56.248% lower in the group with the higher mean serum LDL. This estimate is highly statistically significant (P < .000). A 95% CI suggests that this observation is not unusual if a group that has a 1 mg/dL higher LDL might have risk of relapse that was anywhere from 70.34% to 35.47% lower than the group with the higher mean LDL.

b.





The log transformed hazard ratios compared to a group with a serum LDL level of 160 mg/dL of groups defined by their serum LDL decreases as serum LDL increases.

3.

Using the 725 available datapoints (of which 131 died during the study time and 594 who survived for the duration of the study), robust proportional hazards regression analysis was performed to examine the instantaneous risk of death over the time period of observation across groups defined by serum LDL modeled as a continuous variable and a quadratically transformed variable

From proportional hazards regression analysis, we estimate that for each 1 mg/dL increase in mean serum LDL level, the risk of relapse is .0076% higher in the group with the higher mean serum LDL. This estimate is not statistically significant (P = .089). A 95% CI suggests that this observation is not unusual if a group that has a 1 mg/dL higher LDL might have risk of relapse that was anywhere from .00116% lower to .0164% higher than the group with the lower mean LDL. From this p value of .089 when not accounting for any relationship between untransformed LDL and risk of death, we cannot be certain if there is a linear association between quadratically transformed LDL and a risk of death.

b.





The quadratic transformed hazard ratios compared to a group with a serum LDL level of 160 mg/dL of groups defined by their serum LDL increases as serum the quadratically transformed variable of LDL increases.

4.



The untransformed and log transformed hazard ratios compared to a group with a serum LDL level of 160 mg/dL of groups defined by their serum LDL decreases as serum LDL increases. However, the quadratically transformed hazard ratio compared to a group with a serum LDL level of 160 mg/dL is constant as all levels of serum LDL. On this scale, it appears that there is a linear relationship between the quadratically transformed hazard ratio and serum LDL level. Notably, in problem 3, we found that this relationship is not statistically significant (p = .089) when we ignore any association between the untransformed Hazard ratio and LDL level. However, if we were to change the Y axis (as shown in question 3), you can see that the quadratically transformed hazard ratios exponentially increase as LDL increases. Overall, while the untransformed and log transformed hazard ratios decrease as serum LDL increases, the quadratically transformed hazard ratios increase slightly as LDL increases.