9.5 A Statins and Mortality

Lindenauer et al.(Lindenauer et al 2004) reported that perioperative use of lipid-lowering agents may decrease mortality following cardiac surgery by about 30-40%. They controlled for confounding by creating a propensity score.

a.) Describe in words what the propensity score for this study was.

The propensity score for each subject in the study was the *predicted probability* (from a multivariable model) that he or she would be treated perioperatively with lipid-lowering agents. This is to control for confounders that both make a patient more likely to receive therapy and affect mortality.

b.) Figure 1 from that paper (reprinted below) shows that mortality was lower among users of lipid-lowering drugs in all but the first quintile of propensity.
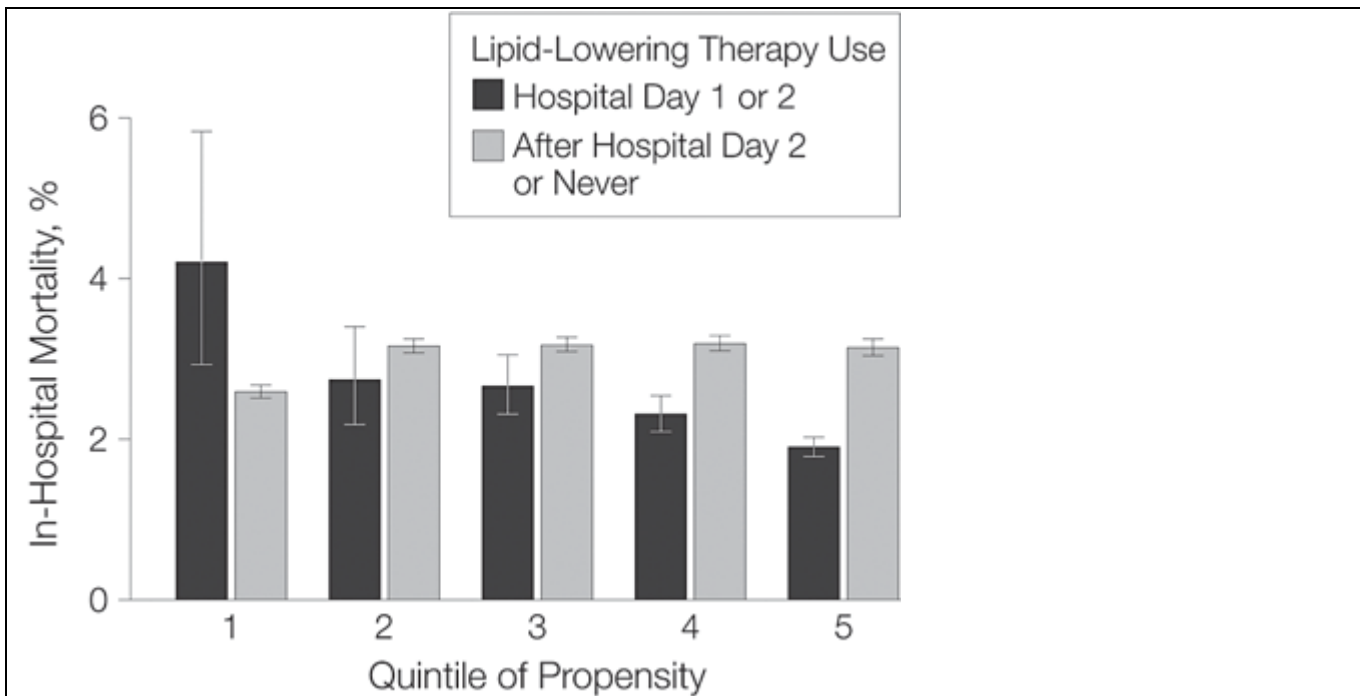

Figure 1. In-Hospital Mortality Associated With Lipid-Lowering Therapy in Propensity Based Quintiles

Error bars indicate 95% confidence intervals. Seventeen patients (0.002%) were excluded from multivariable analysis due to missing data; therefore, among 780 574 patients, mean lipid-lowering therapy use per quintile of propensity was 0.5% (quintile 1, n = 156 114), 1.9% (quintile 2, n = 156 115), 9.8% (quintile 3, n = 156 115), 10.9% (quintile 4, n = 156 115), and 31.3% (quintile 5, n = 156 115).

   i.) Why are the error bars for the mortality estimate for the left-most column of the graph so much longer than those for the other columns?

The left-most column is the mortality for people at lowest probability of receiving lipid-lowering therapy, who nonetheless did receive it, so there are not very many of them. In fact, the legend

to the figure tells you that only 0.5% of 156,114 (781 people) in that quintile were so treated! This leads to the wider confidence interval, reflected by that error bar.

       ii.) It appears that for subjects in the lowest propensity quintile, use of lipid lowering drugs on hospital day 1 or 2 appeared to be harmful rather than beneficial. Assume for this question that there is no random error and no confounding -- i.e. that the results in the figure are accurate and causal. What implication does this have for promoting increased use of such drugs to reduce perioperative mortality after noncardiac surgery?

The suggestion that people with the lowest propensity for treatment might be harmed should make you cautious about promoting perioperative lipid-lowering treatment in all patients not currently receiving it. The result suggests that perhaps people prescribing these medicines actually know some things that are not captured in the model, that allow them only infrequently to give medication to people who are do not appear to benefit. However, based on the footnote of the figure, since even subjects in the highest propensity quintile had low (~31%) use of these drugs, if the results are real and causal, there were still be plenty of people not getting the drugs now who might have benefitted from them.

REFERENCES

Lindenauer, P. K., P. Pekow, et al. (2004). "Lipid-lowering therapy and in-hospital mortality following major noncardiac surgery." <u>Jama</u> **291**(17): 2092-9.