Description for Each Model \*(Also did these all for Lactulose, Final\_Lactulose\_Models\_code.R)

Survival Models

Code: Final\_Survival\_Models.R

Type: Cox proportional Hazards model

Done for: After first cirrhosis event, after first HE event, after first discharge after first HE event

Outcome: Death, Censored at Time of Liver Transplant or at End of Study

Variables: (Bold is Time Dependent)

|  |
| --- |
| **Have or Develop Ascites** |
| **Have or Develop Varices** |
| **Have or Develop Tips** |
| **Have or Develop HECC** |
| Age |
| Region, Northwest |
| Region, South |
| Region, West |
| Urban |
| Race, Black |
| Race, Other |
| Male |
| ESRD |
| Comorbidity, 1 |
| Comorbidity, 2 |
| Comorbidity, 3 and Up |
| Hepatitis C |
| Hepatitis B |
| Alcoholic Cirrhosis |
| Non-Alcoholic Cirrhosis |
| Gastrointestinal Consult |
| Rifaximin Use |

Main Issue: For the models, they do not meet the proportionality assumption. For our study, we just mention as limitation and don’t try to address it. Future work could try other models or adjusting variables to address proportionality.

Hospital Days Models:

Code: Final\_Hospital\_Days\_Models.R

Type: Zero-Truncated Negative Binomial

Done For: After first HE event, After First Discharge

Outcome: Hospital Days

Variables:

|  |
| --- |
| Have or Develop Ascites |
| Have or Develop Varices |
| Have or Develop Tips |
| Have or Develop HECC |
| Age |
| Region, Northwest |
| Region, South |
| Region, West |
| Urban |
| Race, Black |
| Race, Other |
| Male |
| ESRD |
| Comorbidity, 1 |
| Comorbidity, 2 |
| Comorbidity, 3 and Up |
| Hepatitis C |
| Hepatitis B |
| Alcoholic Cirrhosis |
| Non-Alcoholic Cirrhosis |
| Gastrointestinal Consult |
| Rifaximin Use |

Reason for using: If patient has no hospital records, then better to use truncated distribution that adjusts for zero records without having to alter the data. Negative binomial instead of regular Poisson is needed since the distribution is over dispersed. The checking of assumption is not included in the code but did look at it in the past codes. Here is good article about checking assumptions: <https://stats.stackexchange.com/questions/70558/diagnostic-plots-for-count-regression>

Readmission Model:

Code: Final\_Readmission\_Models.R

Type: Zero-Inflated Negative Binomial

Done For: After First HE event

Outcome: Readmissions After First Hospital Discharge

Variables:

|  |
| --- |
| Have or Develop Ascites |
| Have or Develop Varices |
| Have or Develop Tips |
| Have or Develop HECC |
| Age |
| Region, Northwest |
| Region, South |
| Region, West |
| Urban |
| Race, Black |
| Race, Other |
| Male |
| ESRD |
| Comorbidity, 1 |
| Comorbidity, 2 |
| Comorbidity, 3 and Up |
| Hepatitis C |
| Hepatitis B |
| Alcoholic Cirrhosis |
| Non-Alcoholic Cirrhosis |
| Gastrointestinal Consult |
| Rifaximin Use |

Reasons for Using: Do have record for zero, so found that there was high number of zeros. Also found that the data was overdispersed for regular Poisson data. The lower AIC and the graphs support using a zero-inflated negative binomial model. In this type of you model, you get two outputs. It’s kind of like the models work together. You have the one part, which models the odds of having no record of readmission. Then you have the other part, that model the distribution of the number of readmissions if not zero. They are not supposed to be interpreted apart from each other, more as if they are working together.

Landmark Models:

Code: Final\_Models\_and\_Curves\_with\_Landmark.R

Type: Cox Proportional Hazards with Landmark of 6 months

Done for: After first event of HE

Outcome: Death, Censored at Time of Liver Transplant or at End of Study

Variables: (Bold is Time Dependent)

|  |
| --- |
| **Have or Develop Ascites** |
| **Have or Develop Varices** |
| **Have or Develop Tips** |
| **Have or Develop HECC** |
| Age |
| Region, Northwest |
| Region, South |
| Region, West |
| Urban |
| Race, Black |
| Race, Other |
| Male |
| ESRD |
| Comorbidity, 1 |
| Comorbidity, 2 |
| Comorbidity, 3 and Up |
| Hepatitis C |
| Hepatitis B |
| Alcoholic Cirrhosis |
| Non-Alcoholic Cirrhosis |
| Gastrointestinal Consult |
| Rifaximin Use |

Reason: In first submission of paper, one reviewer suggested using landmark analysis since those who died early may not have chance to receive either gastrointestinal consult or rifaximin. Additionally, the effect of rifaximin seems too strong, which supports that the effect isn’t modeled correctly. After landmark, did show much less effect. Could mean that there is a landmark effect that needs to be accounted for. Future work should apply it to Hospital days and readmission. Additionally, there is proportional hazards that I did not check and most likely is not met.

Fine-Gray Models

Code: Final\_Fine\_Gray\_Models.R

Type: Cox Proportional Hazards with Fine-Gray

Done for: After first event of HE: Death and Liver Transplant

Outcome: Death and Liver Transplant

Variables:

|  |
| --- |
| ESRD |
| Age |
| Gender, Male |
| Urban |
| Hepatitis C |
| Hepatitis B |
| Alcoholic Cirrhosis |
| Not Alcoholic Cirrhosis |
| Comorbidity, 1 |
| Comorbidity, 2 |
| Comorbidity, 3 and Up |
| Region, Northeast |
| Region, South |
| Region, West |
| Gastrointestinal Consult |
| Rifaximin |
| Race, Black |
| Race, Other |
| Have or Develop Ascites |
| Have or Develop Varices |
| Have or Develop Tips |
| Have or Develop HECC |

Description: Looks at each risk within own distribution, separate from other competing risks. These were done to look at death separate from liver transplant. Takes long time to run (about 10-15 minutes).