Homework 4

Research Methods, Spring 2024

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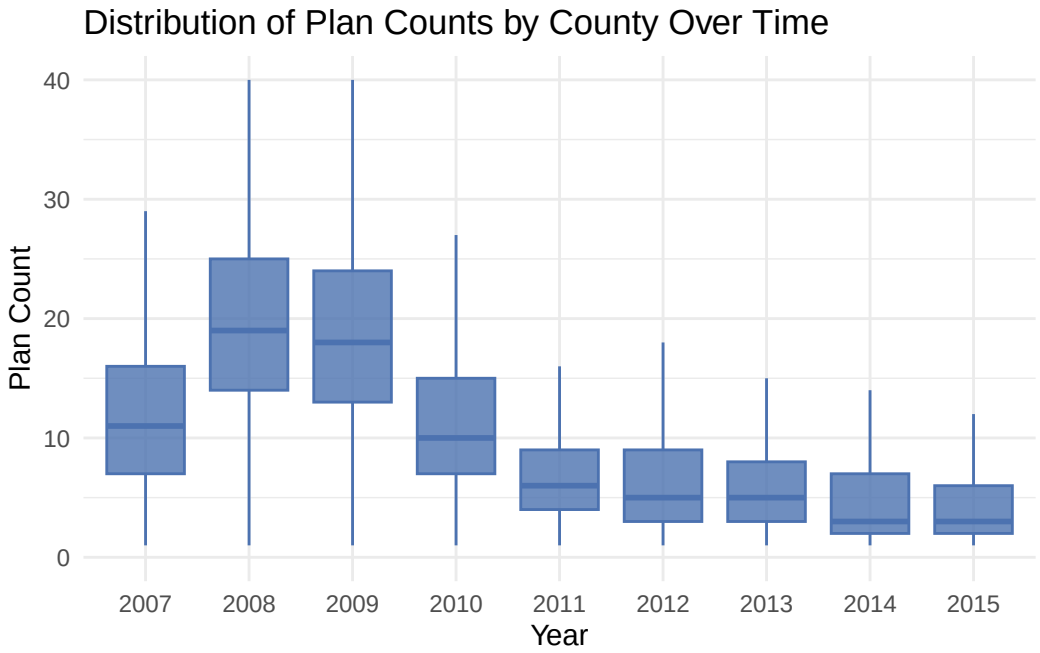
Summarize the Data

1. Remove all SNPs, 800-series plans, and prescription drug only plans (i.e., plans that do not offer Part C benefits). Provide a box and whisker plot showing the distribution of plan counts by county over time. Do you think that the number of plans is sufficient, too few, or too many?

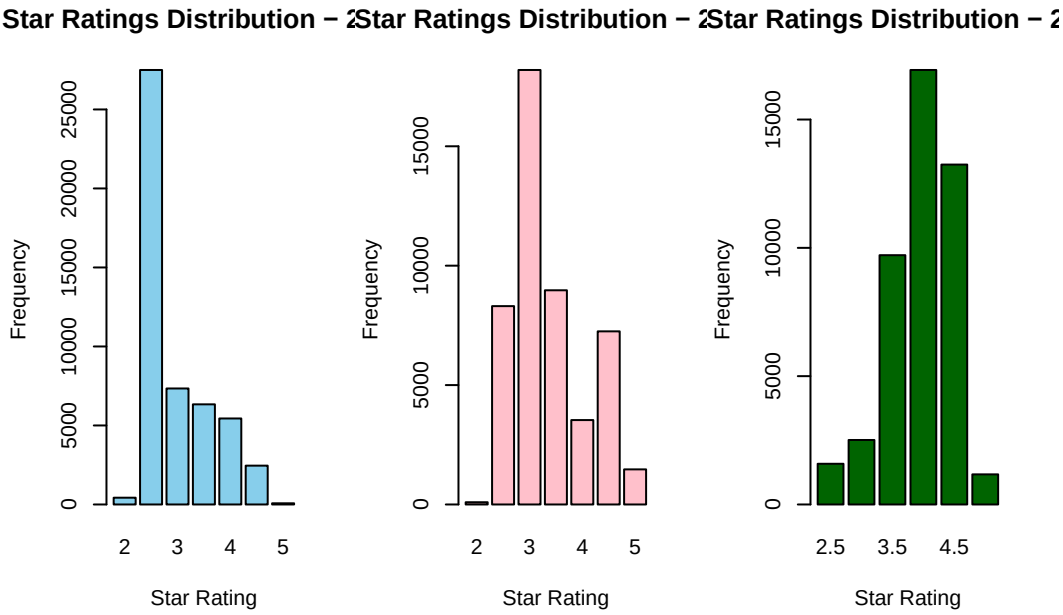
```
`summarise()` has grouped output by 'county'. You can override using the
`.groups` argument.
```

```
Warning: Removed 907 rows containing non-finite values (`stat_boxplot()`).
```



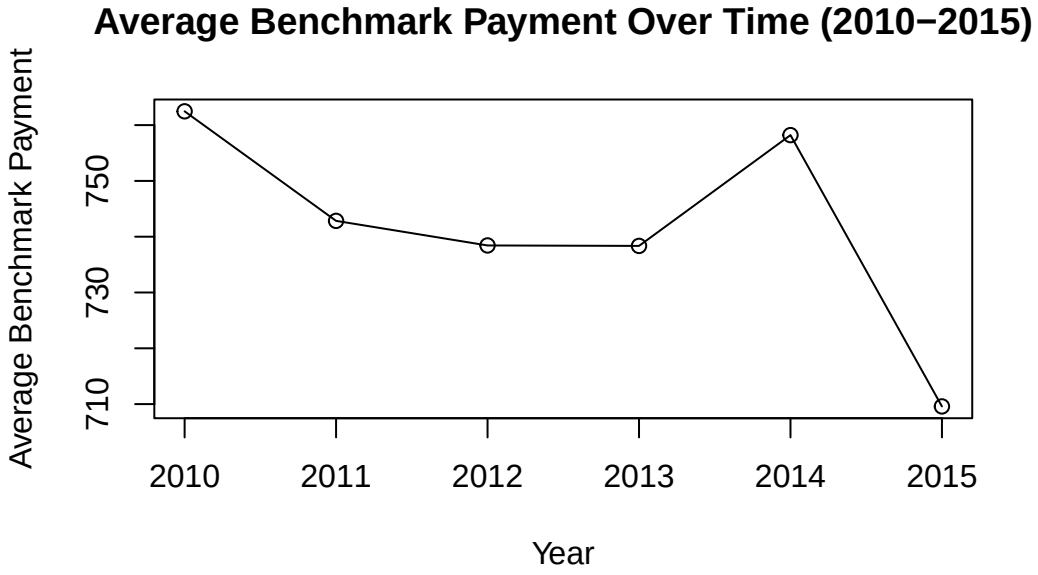
I think there are too few plans. When focusing on 2015 boxplot, the median is very low and the range is very narrow. I think this tends to limit the option for many people.

2. Provide bar graphs showing the distribution of star ratings in 2010, 2012, and 2015. How has this distribution changed over time?



The mean start ratings seems to increase over time.

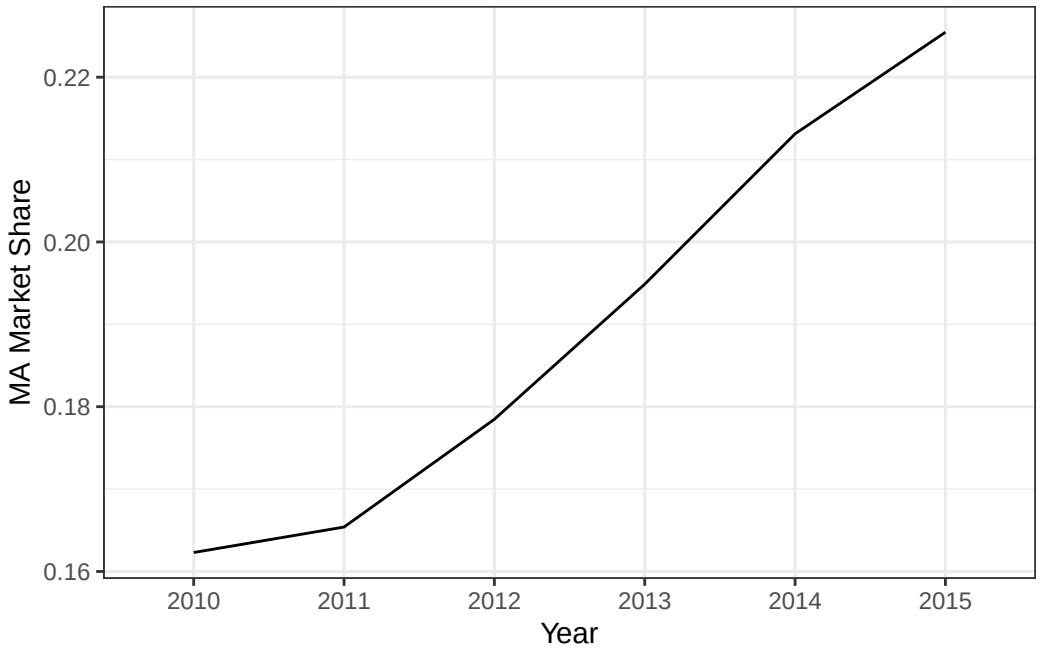
3.Plot the average benchmark payment over time from 2010 through 2015. How much has the average benchmark payment risen over the years?.




```
The average benchmark payment has risen by -52.89 over the years (2010-2015).
```

4.Plot the average share of Medicare Advantage (relative to all Medicare eligibles) over time from 2010 through 2015. Has Medicare Advantage increased or decreased in popularity? How does this share correlate with benchmark payments?

```
`summarise()` has grouped output by 'fips'. You can override using the
`.groups` argument.
```



Except for 2014, I think two graphs are negatively correlated. The overall trend for both graph tends to head to the opposite direction.

Estimate ATEs

For the rest of the assignment, we'll use a regression discontinuity design to estimate the average treatment effect from receiving a marginally higher rating. We'll focus only on 2010. 5.Calculate the running variable underlying the star rating. Provide a table showing the

number of plans that are rounded up into a 3-star, 3.5-star, 4-star, 4.5-star, and 5-star rating.

```
# A tibble: 8 x 2
  rounded_rating count
           <dbl> <int>
1            2     428
2            2.5 27498
3            3    7341
4            3.5  6337
5            4    5442
6            4.5  2457
7            5      74
8           NA   39808
```

6.Using the RD estimator with a bandwidth of 0.125, provide an estimate of the effect of receiving a 3-star versus a 2.5 star rating on enrollments. Repeat the exercise to estimate the effects at 3.5 stars, and summarize your results in a table.

```
[1] "Star 3.0"



Call:
lm(formula = avg_enrollment ~ score + treat + treat_score, data = star30_data_2010)

Residuals:
   Min     1Q Median     3Q    Max
  -727   -132   -115    -53  41766

Coefficients: (2 not defined because of singularities)
            Estimate Std. Error t value Pr(>|t|)
(Intercept)   442.69      16.73   26.45   <2e-16 ***
score        1190.82      66.94   17.79   <2e-16 ***
treat             NA         NA      NA       NA
treat_score       NA         NA      NA       NA
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1538 on 9994 degrees of freedom
  (24843 observations deleted due to missingness)
Multiple R-squared:  0.0307,    Adjusted R-squared:  0.0306
F-statistic: 316.5 on 1 and 9994 DF,  p-value: < 2.2e-16

[1] "Star 3.5"



Call:
lm(formula = avg_enrollment ~ score + treat + treat_score, data = star35_data_2010)

Residuals:
   Min     1Q Median     3Q    Max
  -727   -650   -389   -227  41228

Coefficients: (2 not defined because of singularities)
            Estimate Std. Error t value Pr(>|t|)
(Intercept)   579.67      26.72  21.696  < 2e-16 ***
```

```
score        -642.91     106.87  -6.016  1.9e-09 ***
treat             NA         NA      NA       NA
treat_score       NA         NA      NA       NA
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 2054 on 5911 degrees of freedom
  (7765 observations deleted due to missingness)
Multiple R-squared:  0.006085,  Adjusted R-squared:  0.005917
F-statistic: 36.19 on 1 and 5911 DF,  p-value: 1.898e-09
```

7.Repeat your results for bandwidhts of 0.1, 0.12, 0.13, 0.14, and 0.15 (again for 3 and 3.5 stars). Show all of the results in a graph. How sensitive are your findings to the choice of bandwidth?

```
Warning in data.frame(Bandwidth = names(results), Coefficients =
x$coefficients[, : row names were found from a short variable and have been
discarded

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x$coefficients[, : row names were found from a short variable and have been
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x$coefficients[, : row names were found from a short variable and have been
discarded
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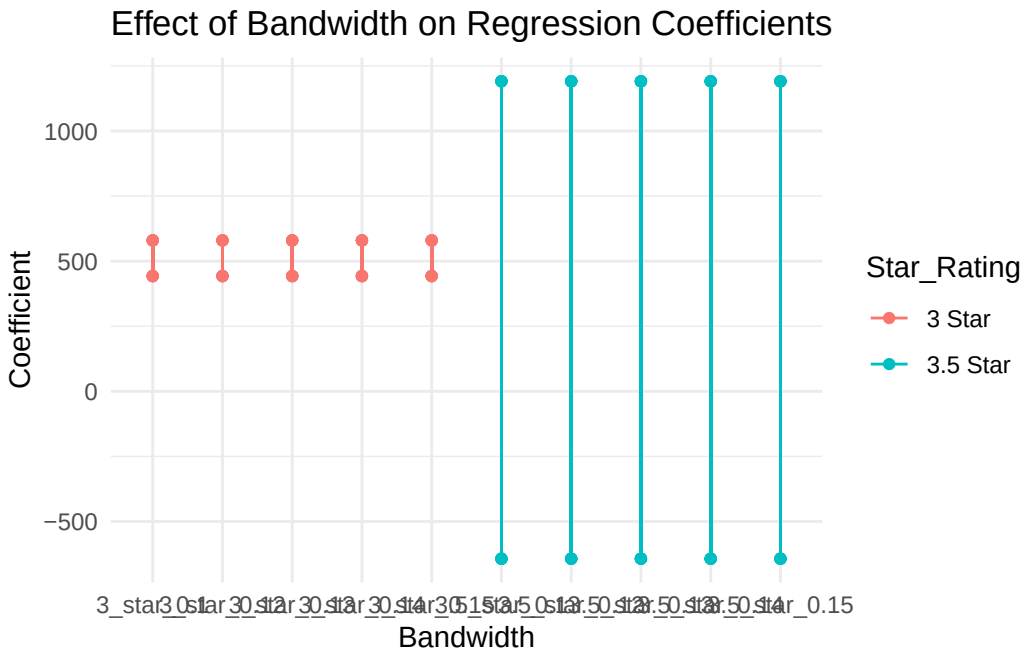
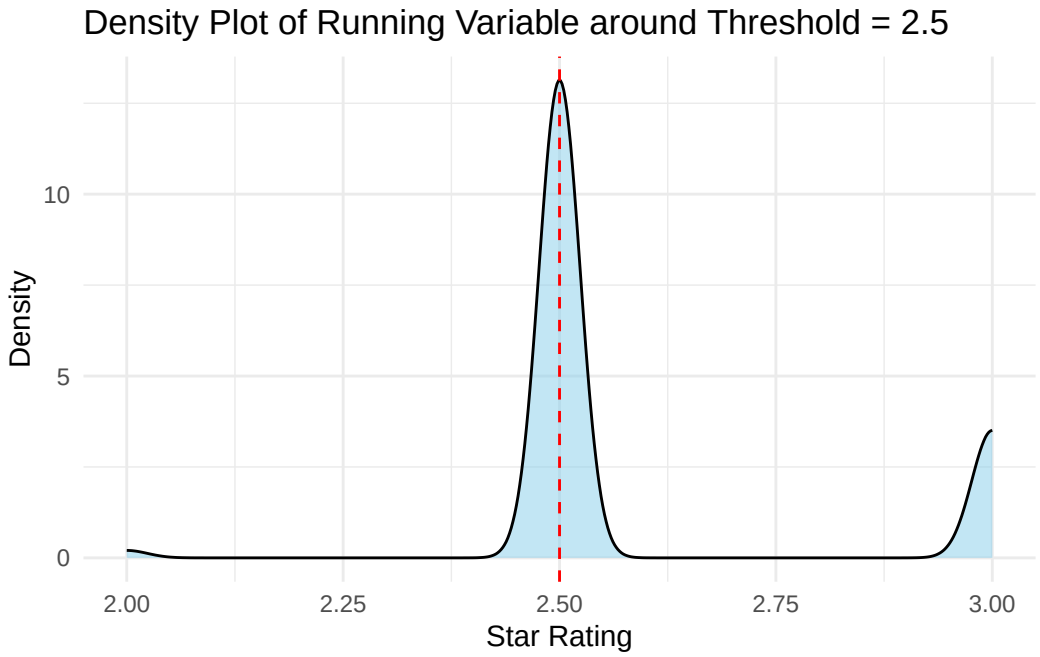
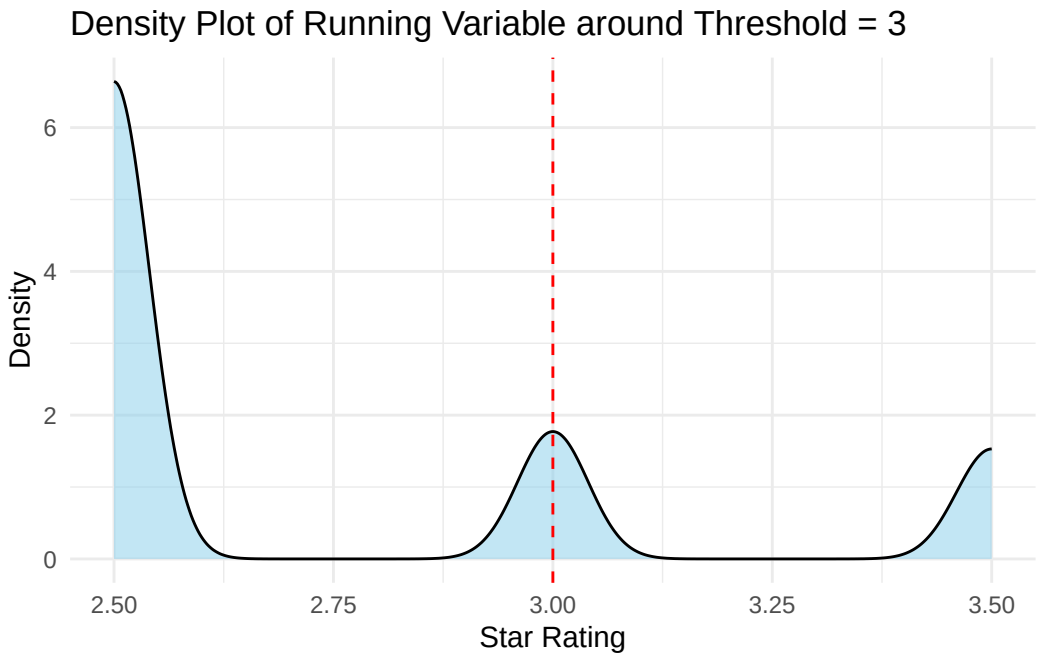
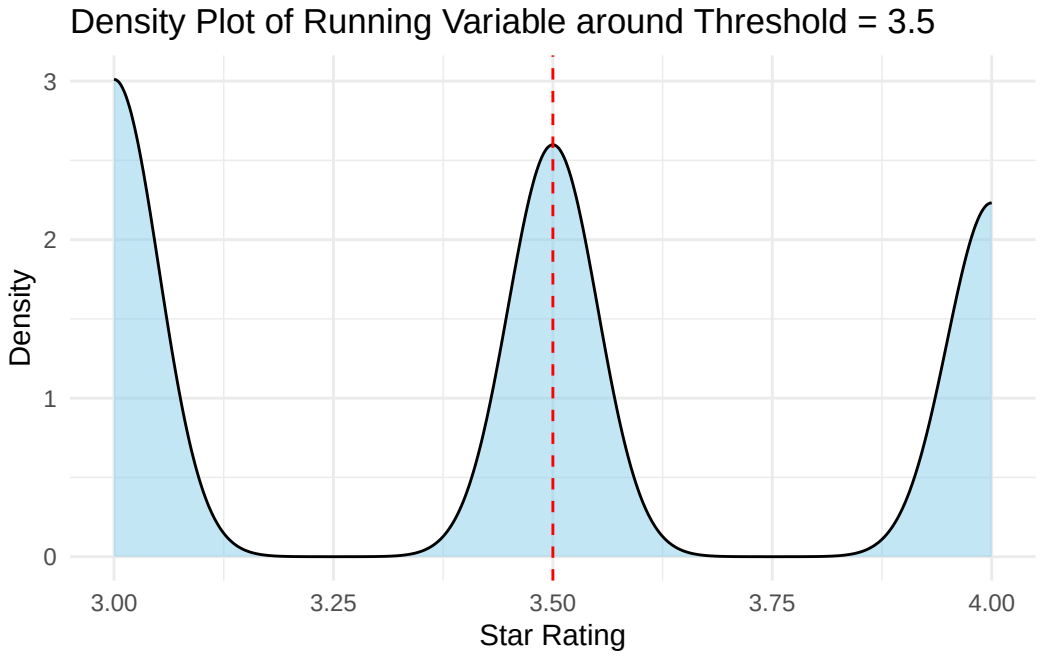


I think it is stable. The range of coefficient is constant comparing different bandwidth.

8.Examine (graphically) whether contracts appear to manipulate the running variable. In other words, look at the distribution of the running variable before and after the relevent threshold values. What do you find?.

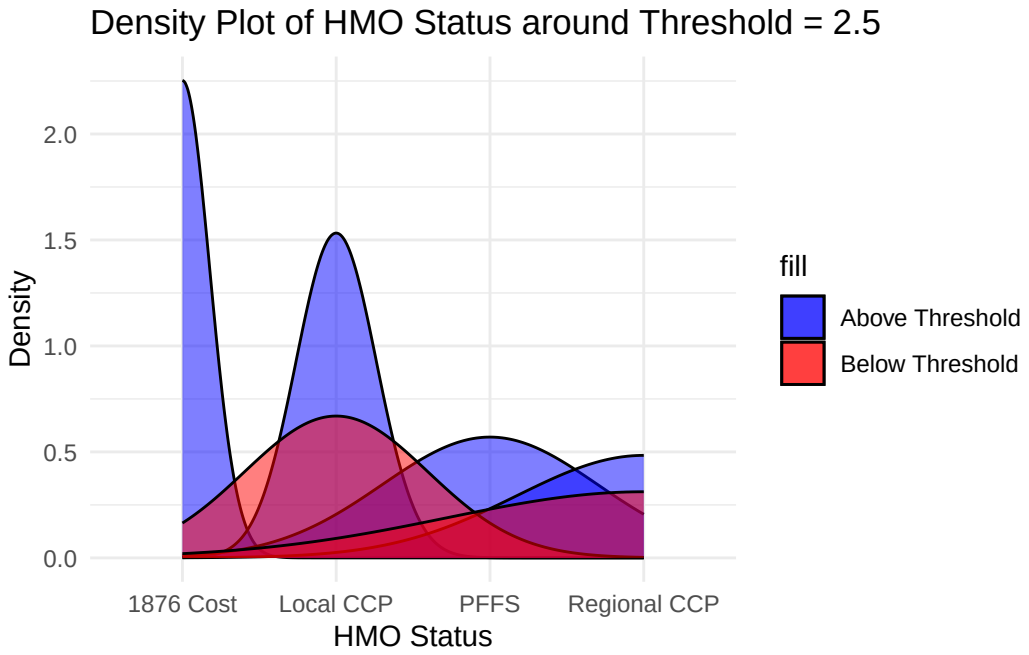


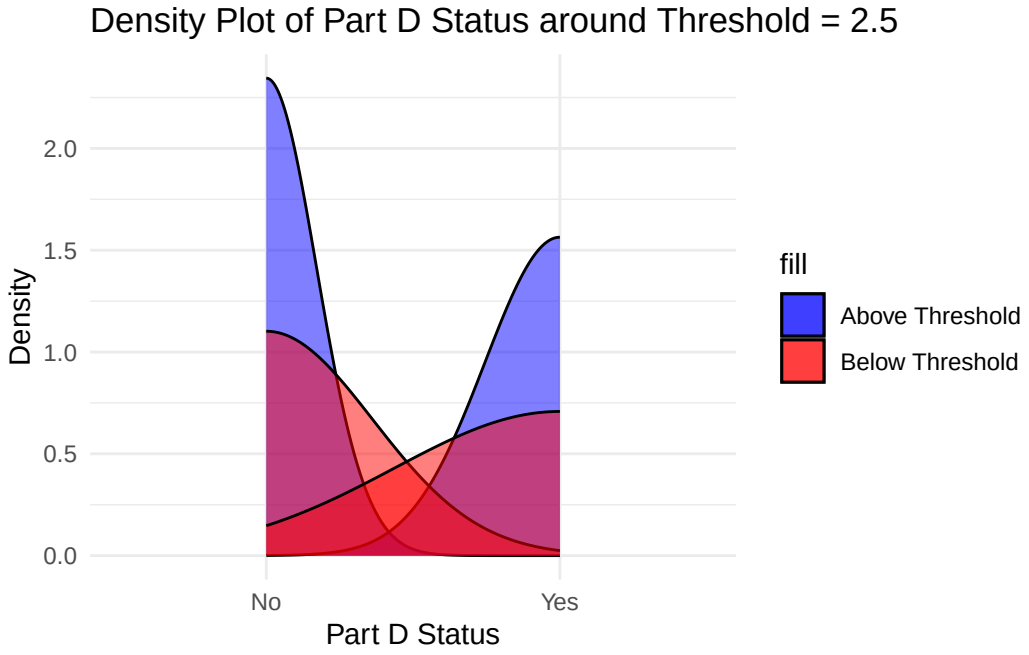


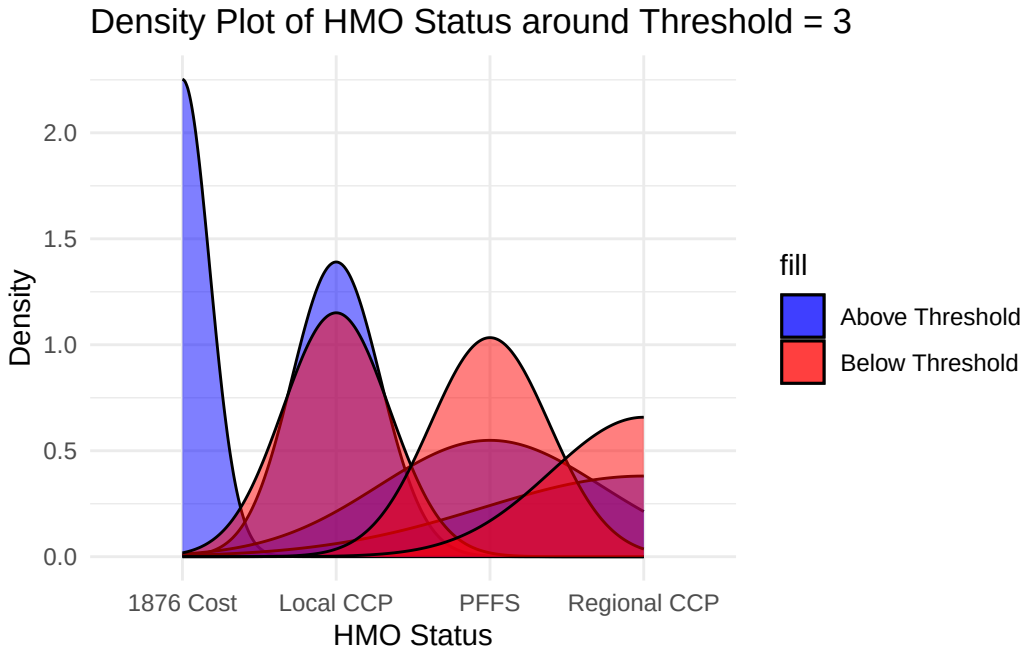


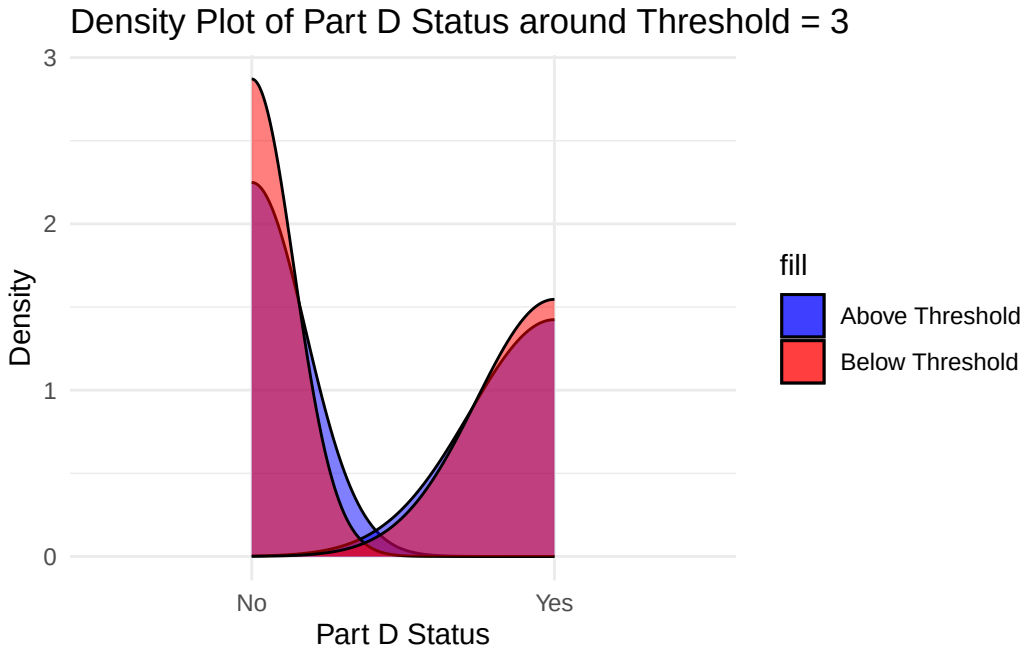
Before and after the threshold value, the density tends to be low. When it is the threshold value, the density peaks.

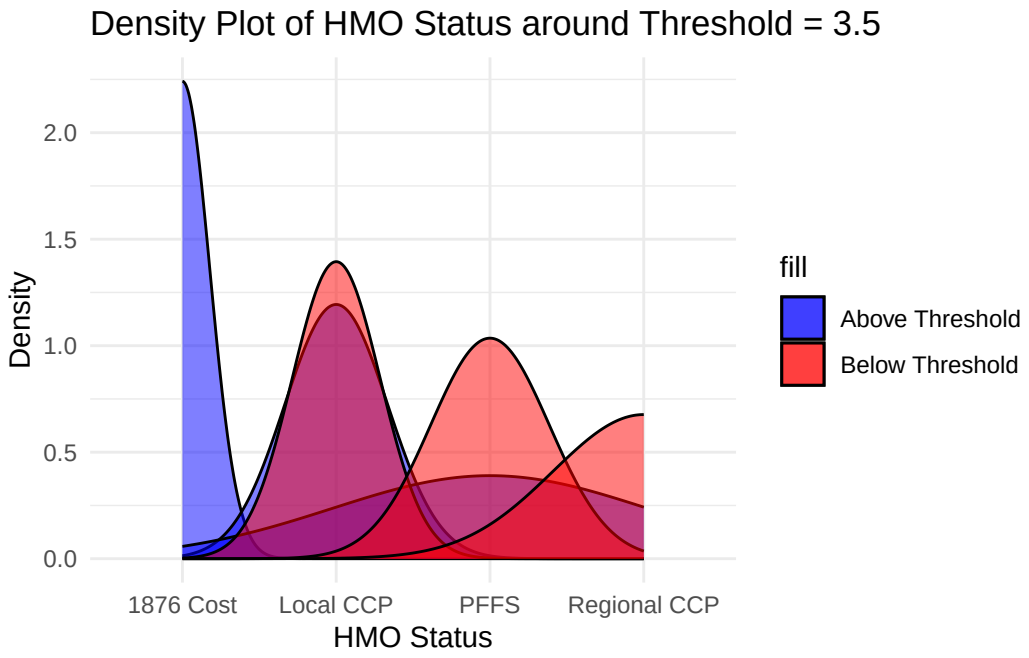
9.Similar to question 8, examine whether plans just above the threshold values have different characteristics than contracts just below the threshold values. Use HMO and Part D status as your plan characteristics.

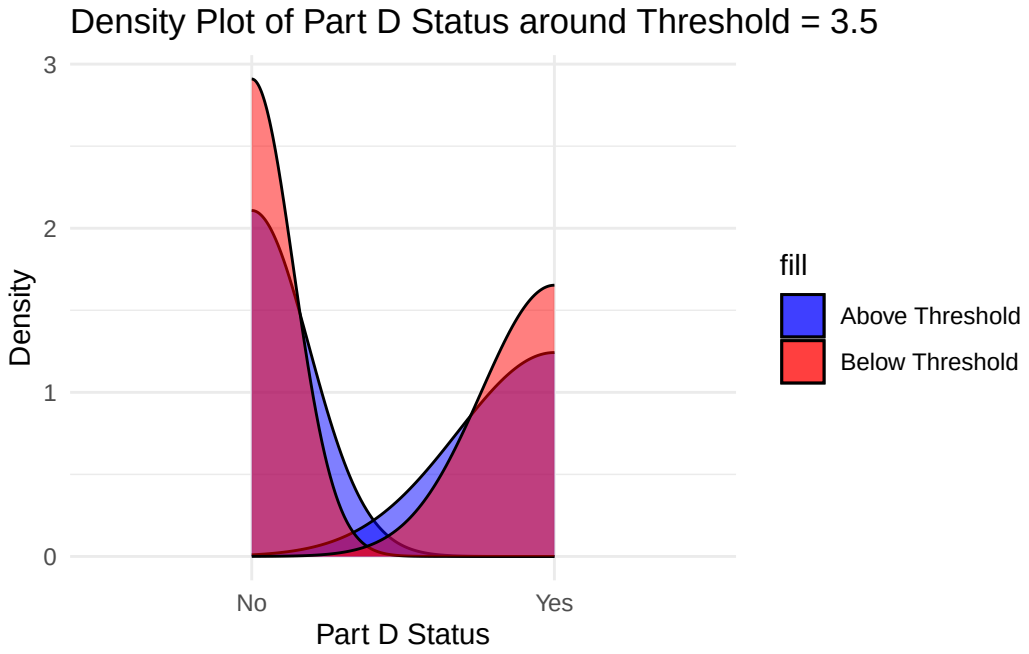





Density Plot of HMO Status around Threshold = 3
Density
2.0
1.5
1.0
0.5
0.0
1876 Cost
Local CCP
PFFS
Regional CCP
HMO Status
fill
Above Threshold
Below Threshold


Density Plot of Part D Status around Threshold = 3
Density
3
2
1
0
No
Yes
Part D Status
fill
Above Threshold
Below Threshold


Density Plot of HMO Status around Threshold = 3.5
Density
2.0
1.5
1.0
0.5
0.0
1876 Cost
Local CCP
PFFS
Regional CCP
HMO Status
fill
Above Threshold
Below Threshold


Density Plot of Part D Status around Threshold = 3.5
Density
3
2
1
0
No
Yes
Part D Status
fill
Above Threshold
Below Threshold

10.Summarize your findings from 5-9. What is the effect of increasing a star rating on enrollments? Briefly explain your results.

From 5, I can know the distribution of enrollment based on different ratings. Here, it does not seem that more people enroll in plans with higer star rating.From 6, I can know that there is a relationship between enrollment and star rating. However, the effect seems minimal.From 7, I can know that the coefficient is not sensitive. From 9, it can be discovered that when the threshold is low, "above threshold" tends to have high density, and when the threshold is high, "below threshold" tends to have high density.This shows that the manipulation of threshold values may affect the observed effects. Overall, the relationship between enrollment and star rating is small, and other factors also play a role other than the star rating.