Homework 4

Submission 2

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Second submission of homework 4.

Link to Github

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?

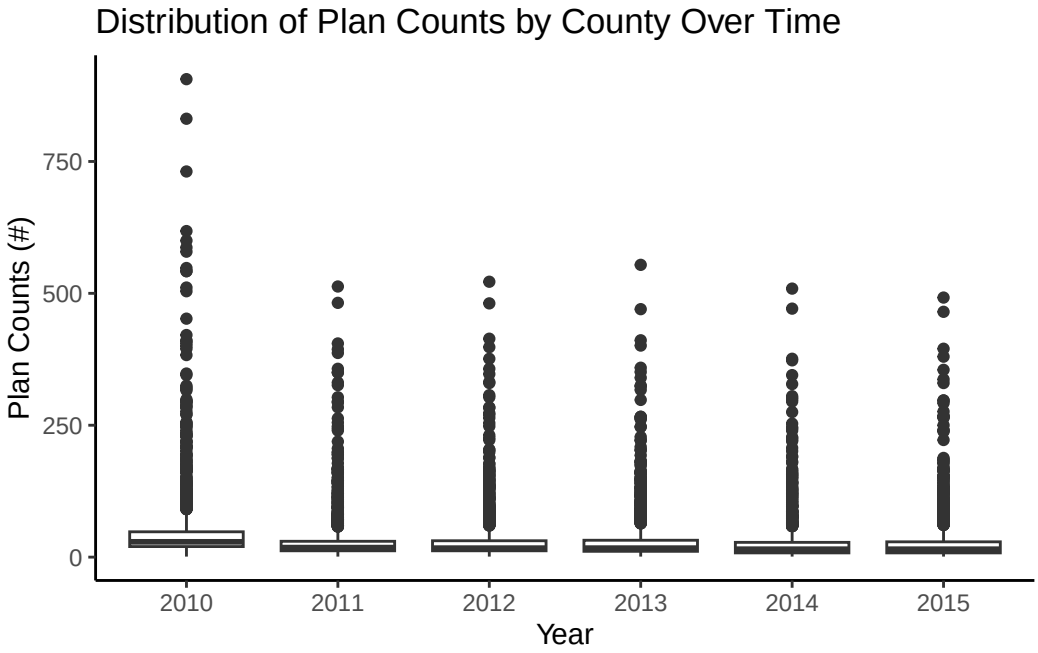

Figure 1: Distribution of Plan Counts Over Time (By County)

This box and whisker plot shows the distribution of plan counts by county. Some outliers can be seen in the data, particularly around years like 2010. It may be wise to remove these, but otherwise the number of plans seems sufficient, as the general box for each plan is around the same.

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

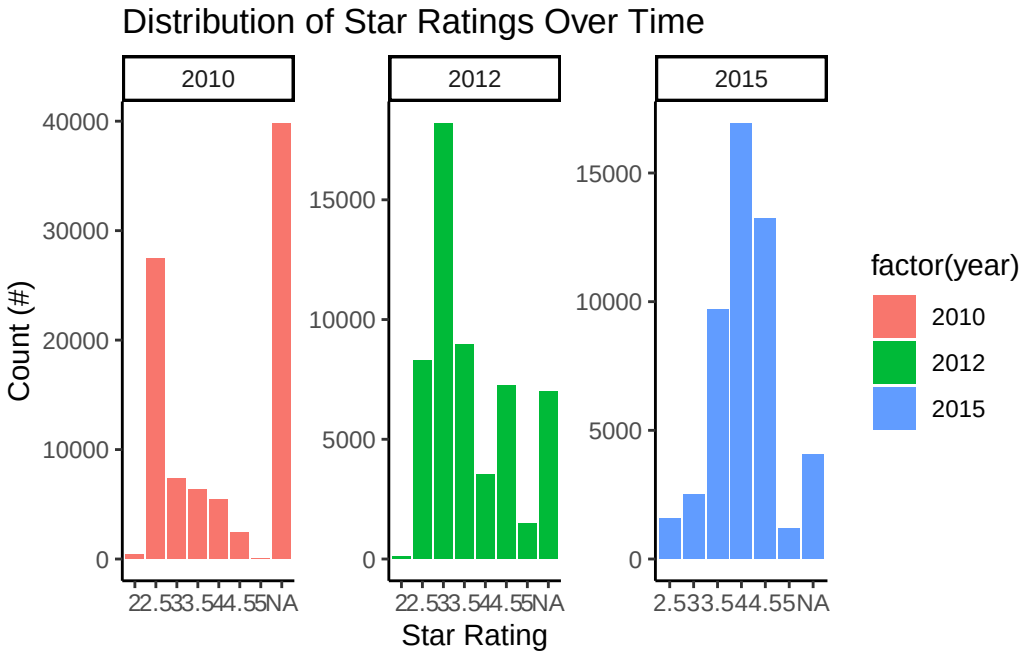

Figure 2: Distribution of Star Ratings: 2010, 2012 and 2015

This graph displays a shift towards higher star ratings over time. The distribution seems fairly even across all star ratings in 2010. In the 2015 area of the graph, there are far more ratings for 4 stars and 5 stars; subsequent years also show a decrease in lower star ratings.

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

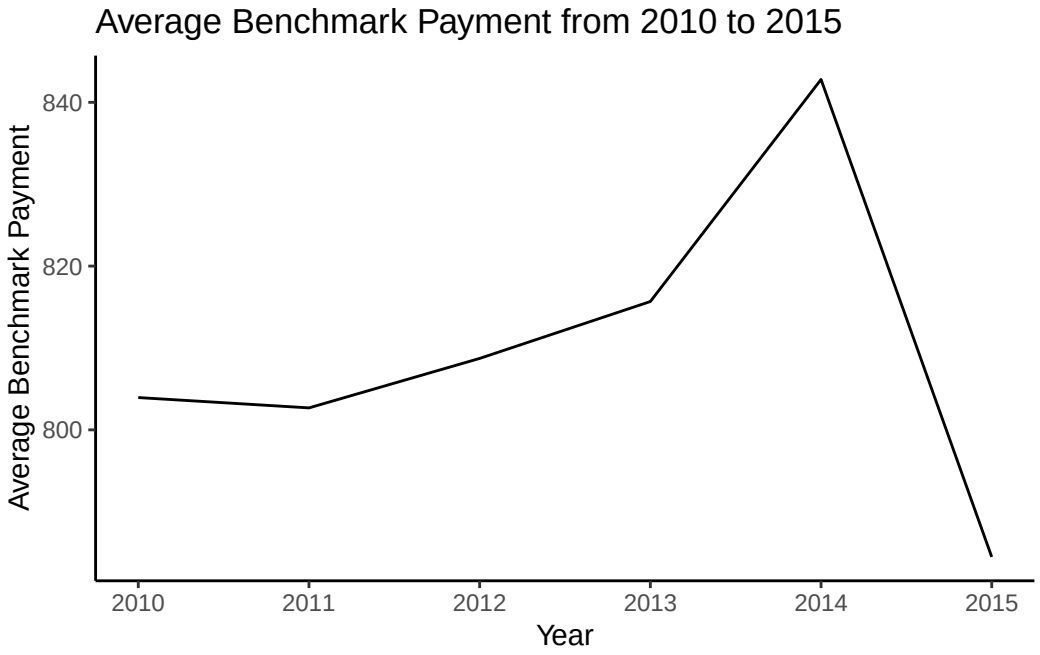

Figure 3: Average Benchmark Payment From 2010 to 2015

This graph shows the average benchmark payment rising before falling again over time.

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?

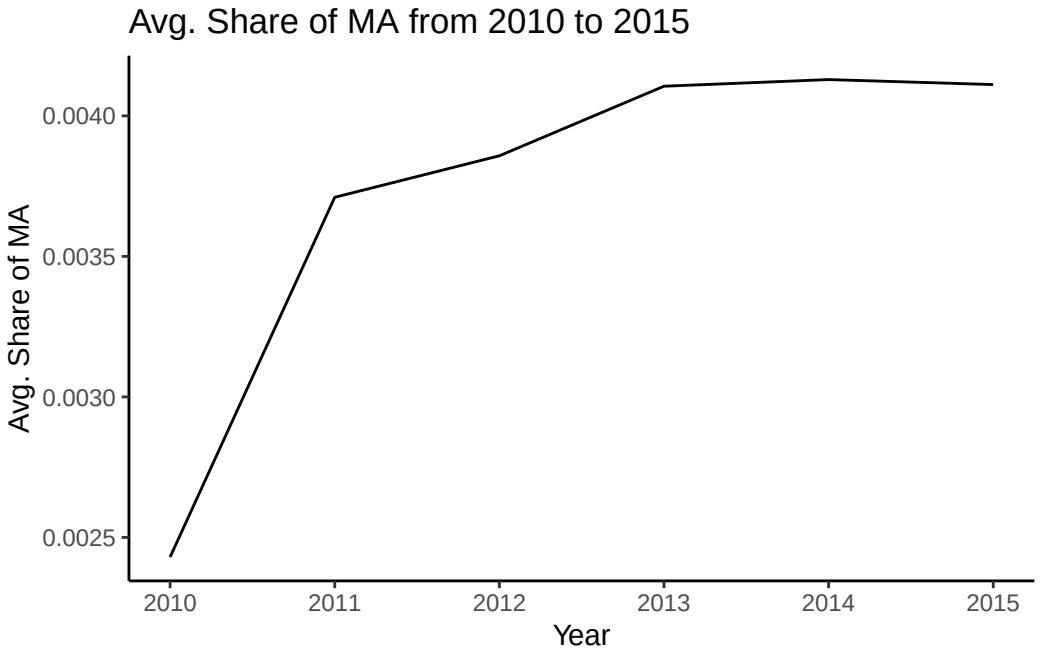

Figure 4: Average Share of Medicare Advantage From 2010 to 2015

This graph shows that the average share of Medicare Advantage enrollees increased from 2010 to 2015. It follows a similar trend to the previous graph, suggesting a possible correlation between two. It does not dip at the 2015 mark like the previous graph however, which is interesting.

Estimate ATEs

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.

```
Loading required package: knitr
```

Table 1: Count of Plans Rounded into Nearest Half Ratings

raw_rating	three	three_five	four	four_five	five
2.9	4962	3611	1935	50	14352

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.

Table 2: Estimate of Receiving 3-Star vs. 2.5-Star

	Coeff
Conventional	-0.0075367
Bias-Corrected	0.0070187
Robust	0.0070187
	1.0000000
Conventional	-1.5904336
Bias-Corrected	1.4811294
Robust	0.5992535
Conventional	0.0047387
Bias-Corrected	0.0047387
Robust	0.0117124

Table 3: Estimate of Receiving 3.5-Star vs. 3-Star

	Coeff
Conventional	-0.0050337
Bias-Corrected	-0.0621078
Robust	-0.0621078
	1.0000000
Conventional	-1.9444365
Bias-Corrected	-23.9911857
Robust	-7.4442666
Conventional	0.0025888
Bias-Corrected	0.0025888
Robust	0.0083430

7. Repeat your results for bandwidths 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?

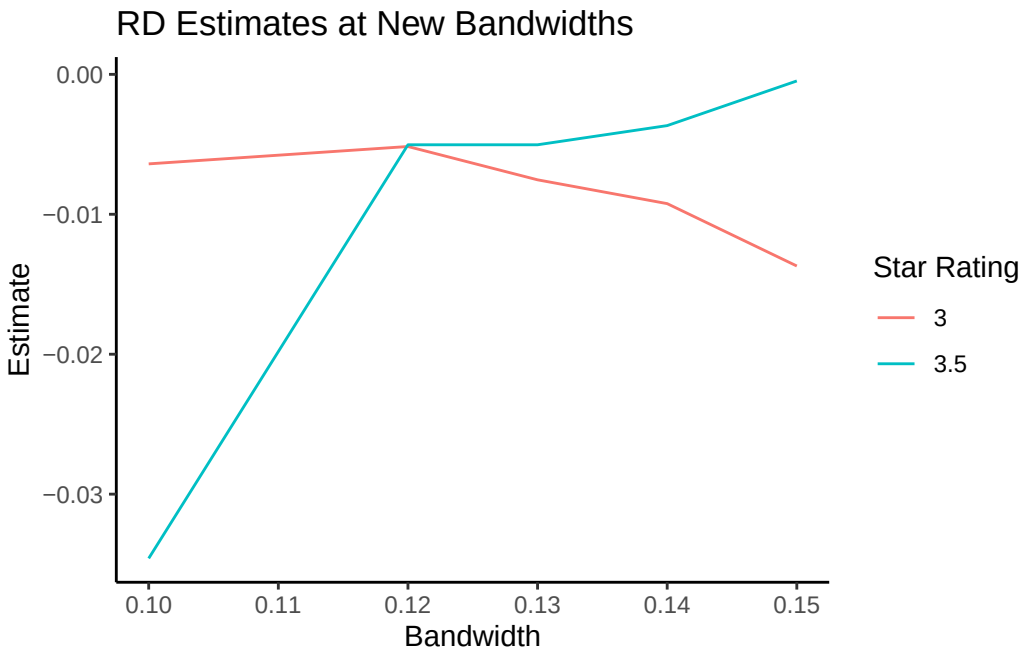

Figure 5: Star Ratings with New Bandwidths

This graph shows the RD estimate for the effect of a 3-star rating compared to a 2.5-star rating as positive; the same is true for the 3.5 vs. 3 star ratings. This would indicate higher ratings are correlated with higher enrollment. The flatness of the lines suggests relatively low sensitivity.

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?

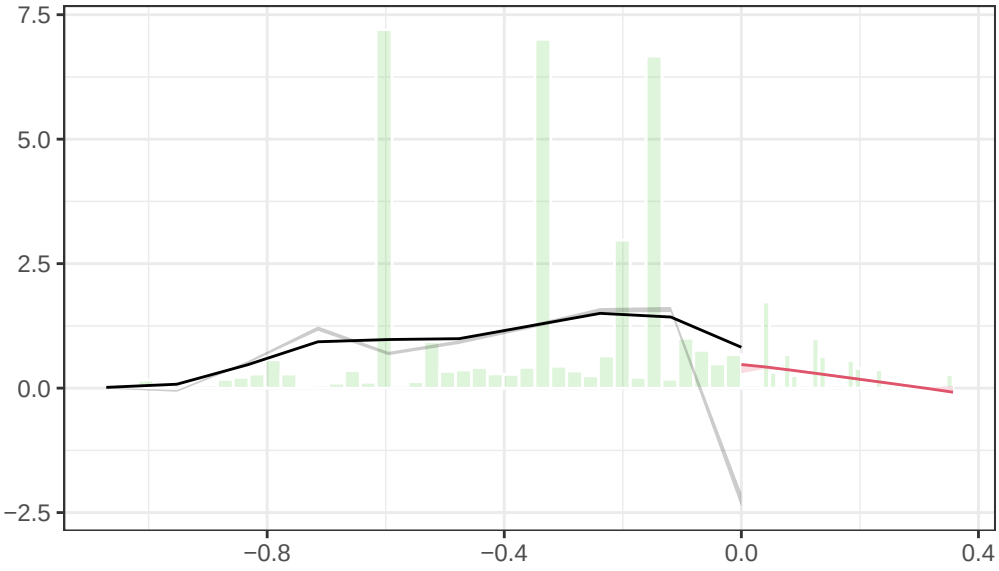

Figure 6: Density Plots

```
$Estl
Call: lpdensity

Sample size                                        9259
Polynomial order for point estimation    (p=)      2
Order of derivative estimated            (v=)      1
Polynomial order for confidence interval (q=)      3
Kernel function                                    triangular
Scaling factor                                     0.926263131565783
Bandwidth method                                   user provided

Use summary(...) to show estimates.

$Estr
Call: lpdensity

Sample size                                        917
```

```
Polynomial order for point estimation    (p=)    2
Order of derivative estimated            (v=)    1
Polynomial order for confidence interval (q=)    3
Kernel function                                  triangular
Scaling factor                                   0.0916458229114557
Bandwidth method                                 user provided

Use summary(...) to show estimates.

$Estplot
```

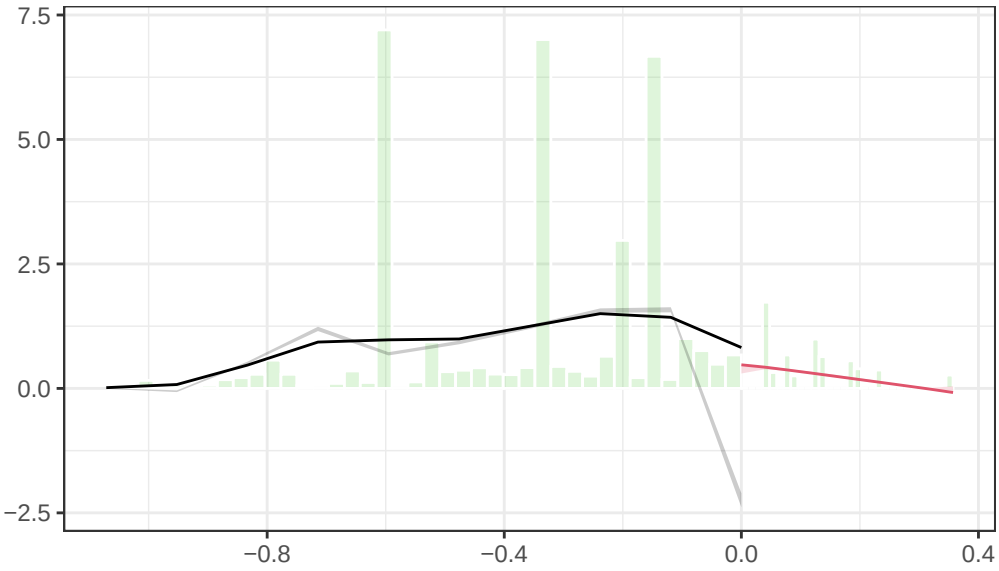

Figure 7: Density Plots

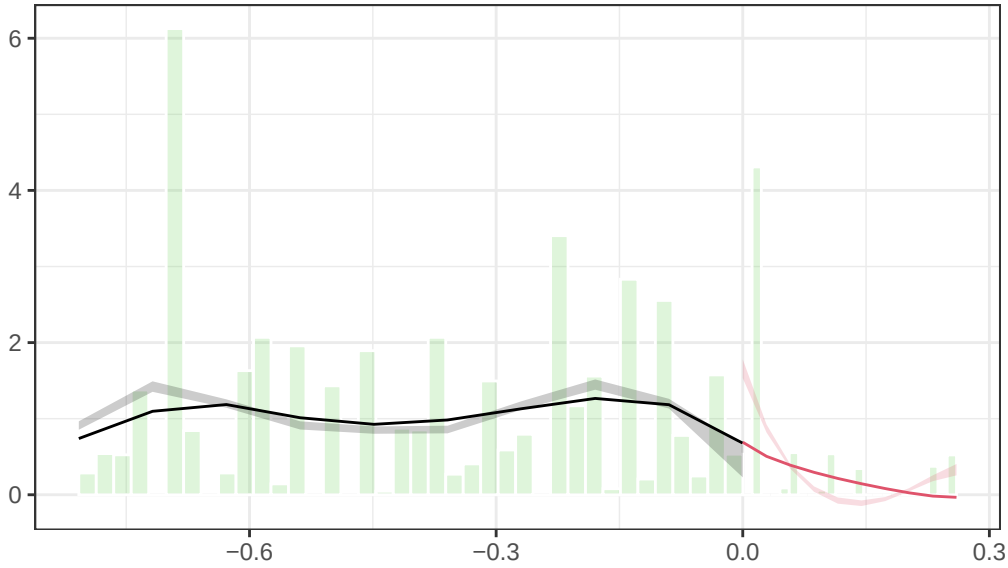

Figure 8: Density Plots

```
$Estl
Call: lpdensity

Sample size                                        5459
Polynomial order for point estimation    (p=)      2
Order of derivative estimated            (v=)      1
Polynomial order for confidence interval (q=)      3
Kernel function                                    triangular
Scaling factor                                     0.923207036535859
Bandwidth method                                   user provided

Use summary(...) to show estimates.

$Estr
Call: lpdensity

Sample size                                        485
Polynomial order for point estimation    (p=)      2
Order of derivative estimated            (v=)      1
Polynomial order for confidence interval (q=)      3
Kernel function                                    triangular
```

```
Scaling factor                                  0.0818673883626522
Bandwidth method                                user provided

Use summary(...) to show estimates.

$Estplot
```

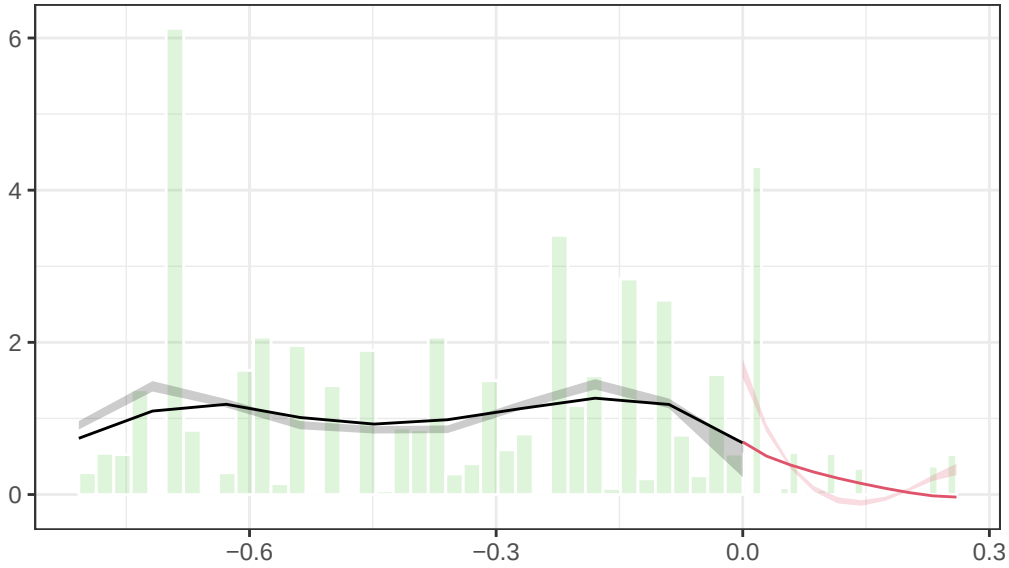

Figure 9: Density Plots

I now have a graph but it seems to be lacking in any sort of labels or clarity. Based on what is here there seems to be more of a concentration towards higher rated plans, but the graphs are unclear.

9. Similar to question 4, 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.

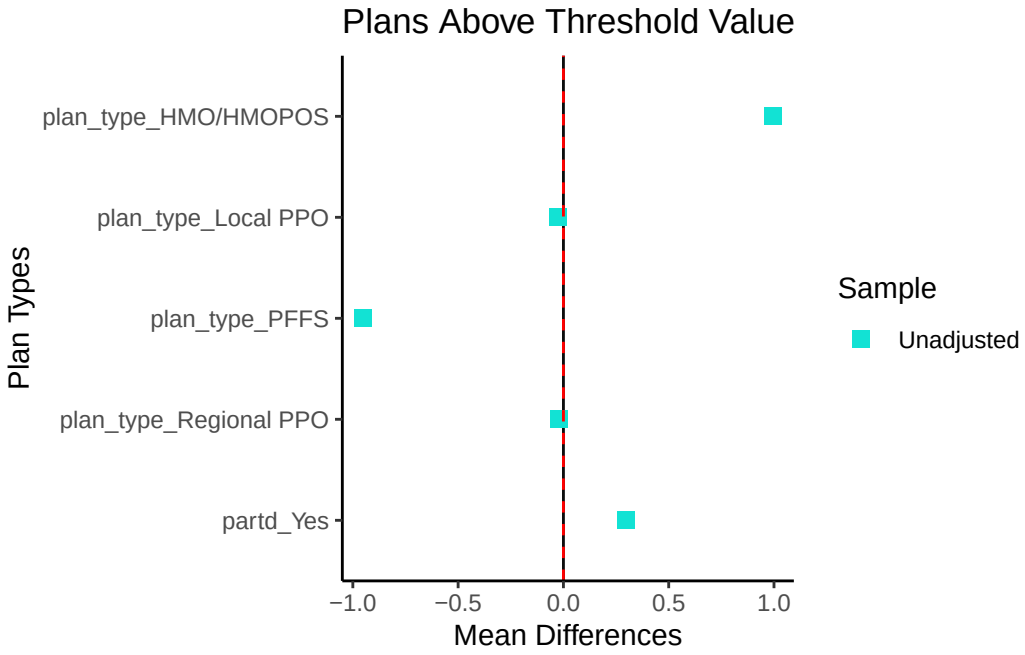

Figure 10: Comparison Below and Above 3-Star Threshold

For this question, I was only able to get the correct graph to display for my 3-star ratings (above and below). I will need to edit my code for the 3.5 star one to include.

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

Overall, there seems to be a positive correlation between higher star ratings and increased enrollment in Medicare Advantage plans. High star ratings tend to have more enrollees versus plans with low star ratings. The two graphs showing trends of increasing star ratings over time and increased enrollments supports this notion. This holds true as years move from 2010 to 2015.