Homework 4

Submission 3

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Third 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?

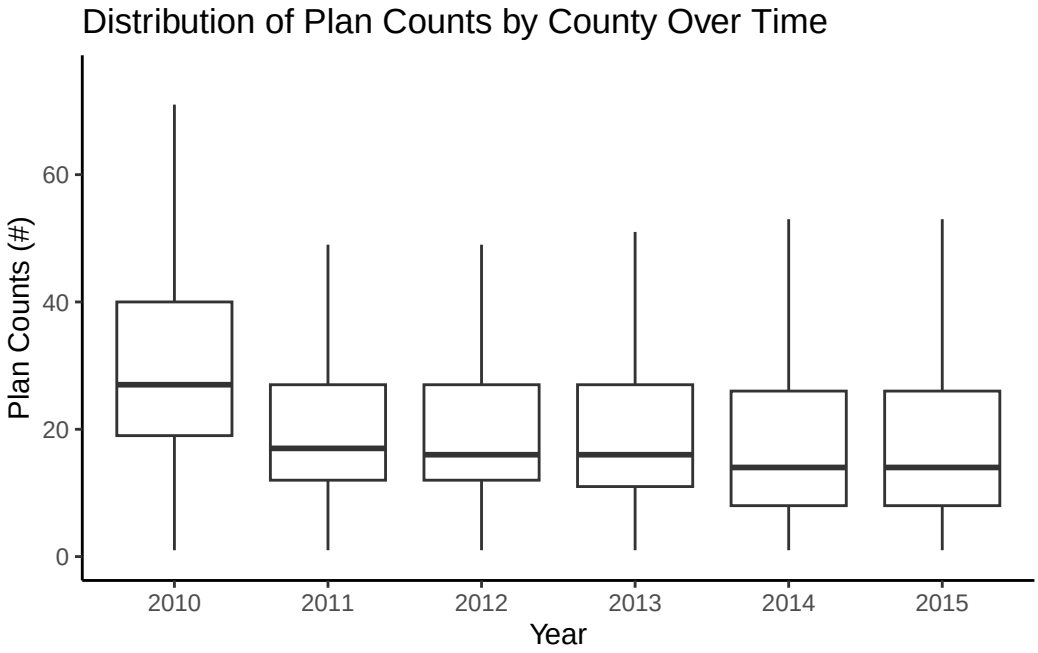

Figure 1: Distribution of Plan Counts Over Time (By County)

This box and whisker plot shows the distribution of plan counts by county. The general box for each plan is around the same, although there is a dip after 2010 to the later years; the median plan count appears to be around 25 for most years, so I would say the count is sufficient.

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

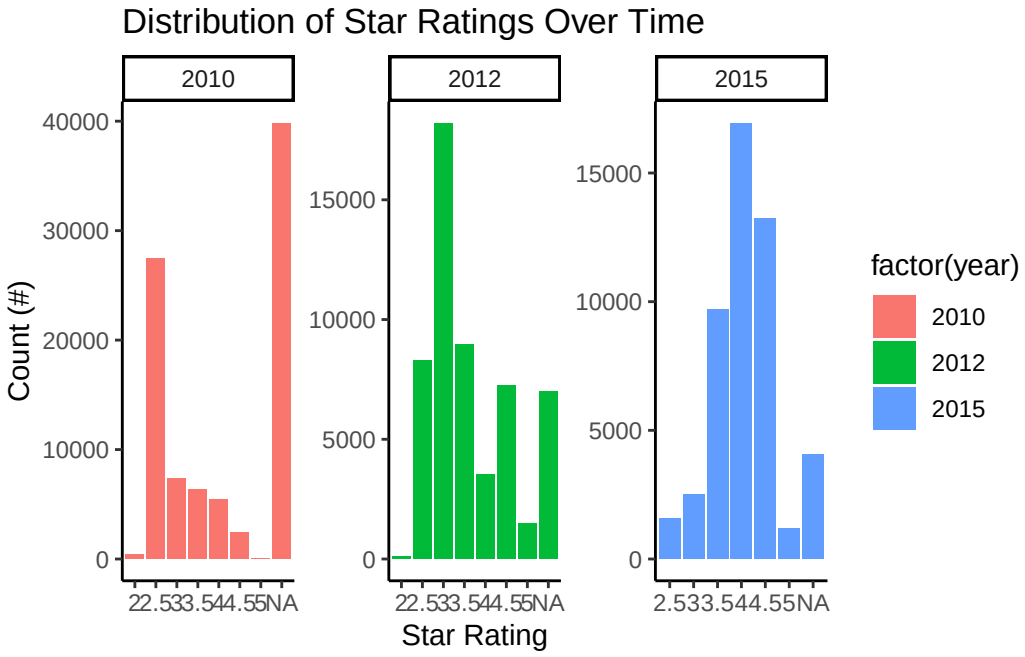

Figure 2: Distribution of Star Ratings: 2010, 2012 and 2015

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?

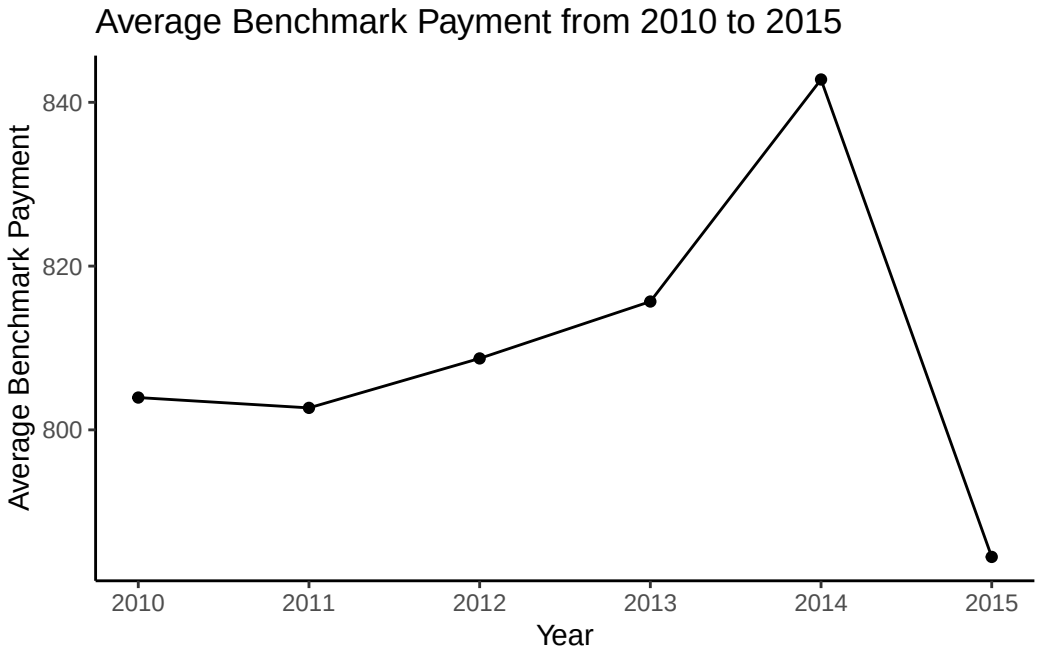

Figure 3: Average Benchmark Payment From 2010 to 2015

This graph shows the average benchmark payment rising before falling again over time. Policy changes most likely account for this falloff, which appears more drastic given the scale of the graph than it actually is.

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?

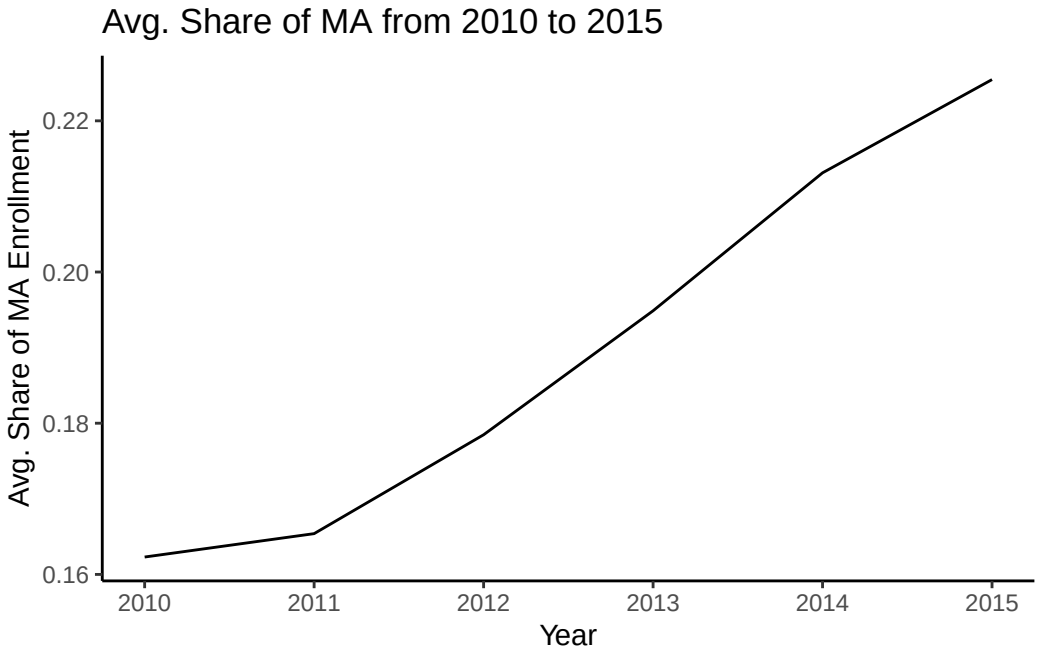

Figure 4: Average Share of Medicare Advantage From 2010 to 2015

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 the 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.

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Table 1: Count of Plans Rounded into Nearest Half Ratings

3-star	3.5-star	4-star	4.5-star	5-star
1734	1815	606	0	0

As expected, there are no plans in the 4.5 and 5 star ratings for this given count, which should be the case given there were not really many high star rating plans during the time the count is set at (2010).

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		z	Std. Err.
Conventional	-0.0049040	1	-1.462718	0.0033526
Bias-Corrected	-0.0337209	1	-10.058014	0.0033526
Robust	-0.0337209	1	-6.109645	0.0055193

This first table shows the estimated difference in enrollment between 3 and 2.5 star-rating groups. The coefficient of -0.049 suggests that a 3-star rating is correlated with a lower enrollment probability, which does not make sense intuitively, but the P value of 1 (unnamed column; couldn't get name to load) suggests this may not be a significant result.

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

	Coeff		z	Std. Err.
Conventional	0.0013883	1	0.4699752	0.0029540
Bias-Corrected	-0.0106484	1	-3.6047154	0.0029540
Robust	-0.0106484	1	-2.1581298	0.0049341

The second table shows the estimated difference in enrollment between 3 and 3.5 star-rating groups. The coefficient of 0.00138 suggests that a 3.5-star rating is correlated with a higher enrollment probability than a 3-star plan. This makes sense intuitively, but as before the the P value of 1 suggests this may not be a significant result.

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?

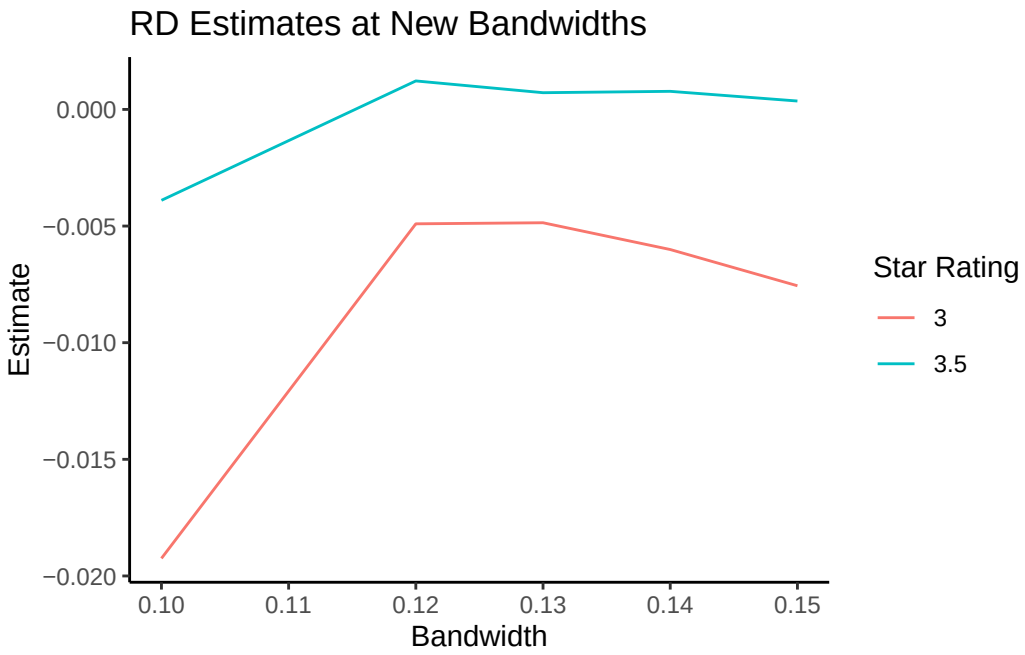

Figure 5: Star Ratings with New Bandwidths

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?

```
$Estl
Call: lpdensity

Sample size                                     5617
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                                  0.561880940470235
Bandwidth method                                user provided

Use summary(...) to show estimates.

$Estr
Call: lpdensity

Sample size                                     4415
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                                  0.441620810405203
Bandwidth method                                user provided

Use summary(...) to show estimates.

$Estplot
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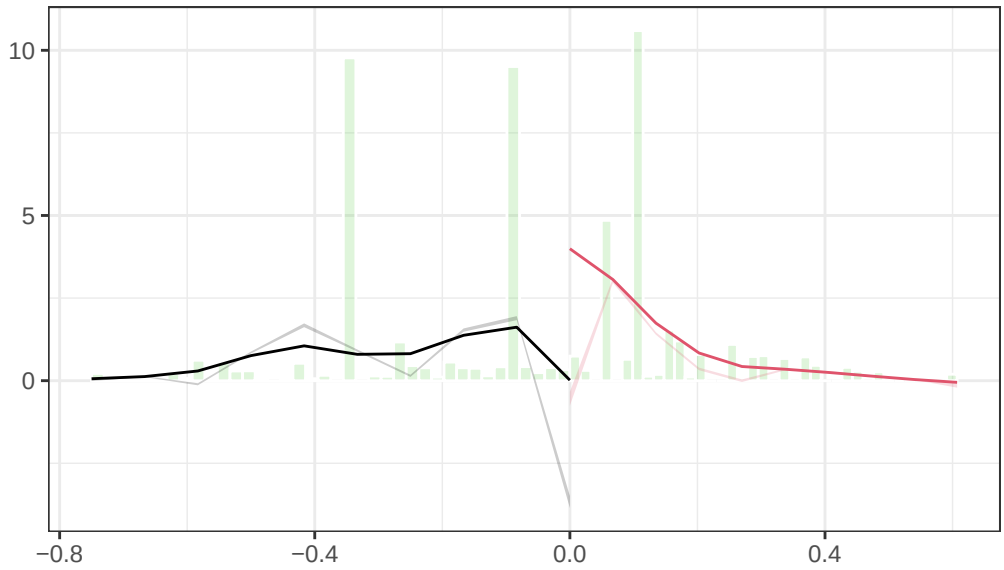

Figure 6: Density Plots

```
$Estl
Call: lpdensity

Sample size                                        3581
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                                     0.605548037889039
Bandwidth method                                   user provided

Use summary(...) to show estimates.

$Estr
Call: lpdensity

Sample size                                        2332
Polynomial order for point estimation    (p=)      2
Order of derivative estimated            (v=)      1
Polynomial order for confidence interval (q=)      3
Kernel function                                    triangular
```

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Scaling factor                                  0.394282814614344
Bandwidth method                                user provided

Use summary(...) to show estimates.

$Estplot
```

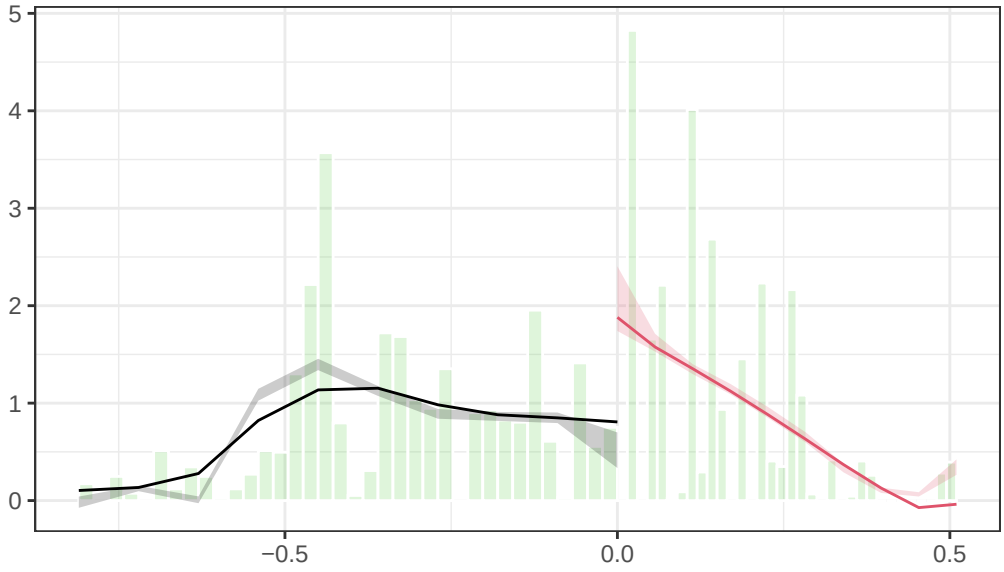

Figure 7: Density Plots

The density of scores around 3.5 appears to be slightly greater (second graph) than in the first graph, which suggests a shift towards greater star plans consistent with the changes in plans over time.

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.

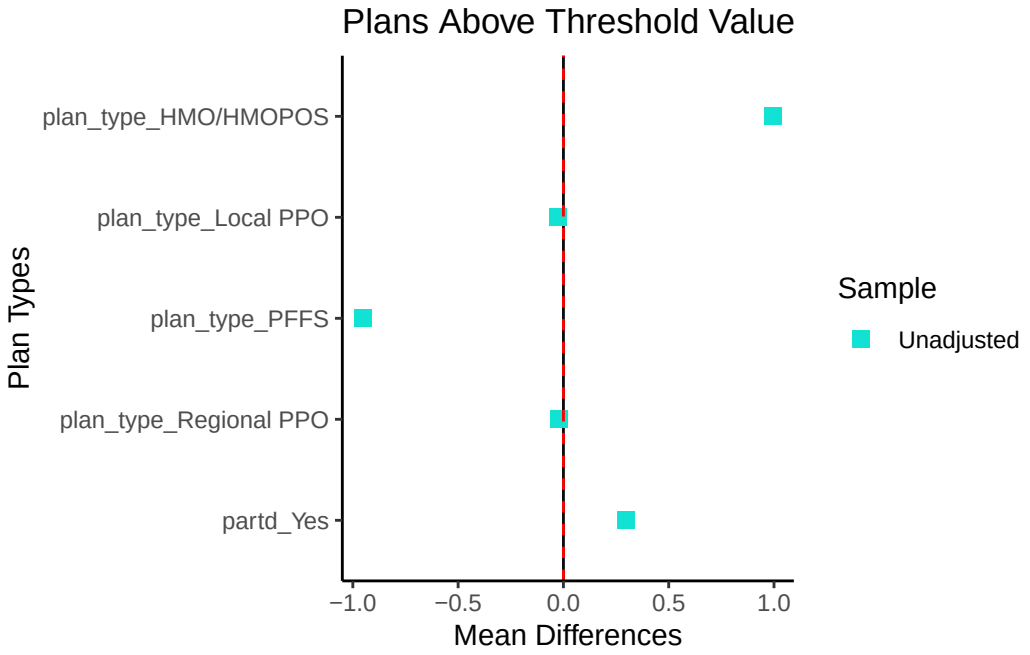

Figure 8: Comparison Below and Above 3-Star Threshold

There appears to be a very small difference between Part D and HMO plans in this first 3-star rating graph.

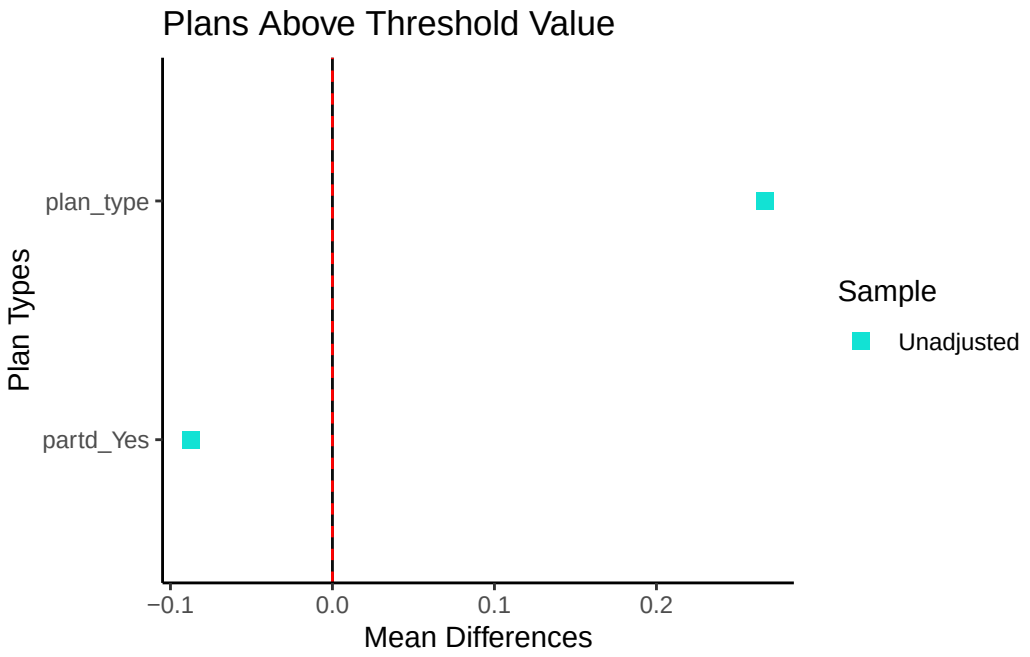

Figure 9: Comparison Below and Above 3.5-Star Threshold

There are also relatively small differences when the star rating is around the 3.5-star threshold.

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. Most graphs show trends of increasing star ratings over time and increasing enrollments to support this notion. This holds true as years move from 2010 to 2015. The cutoff appears to mostly be around 3-stars as there is not much difference when reachiing this seemingly critical rating.