Fairness Analysis Figures and Tables

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Data Editing

Important Values

#Wilcoxon rank sum between proportion of black constituent quartiles

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  quart_1_mae and quart_2_mae
## W = 178316, p-value < 2.2e-16
## alternative hypothesis: true location shift is not equal to 0
```

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  quart_1_mae and quart_3_mae
## W = 102559, p-value < 2.2e-16
## alternative hypothesis: true location shift is not equal to 0
```

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  quart_1_mae and quart_4_mae
## W = 126617, p-value < 2.2e-16
## alternative hypothesis: true location shift is not equal to 0
```

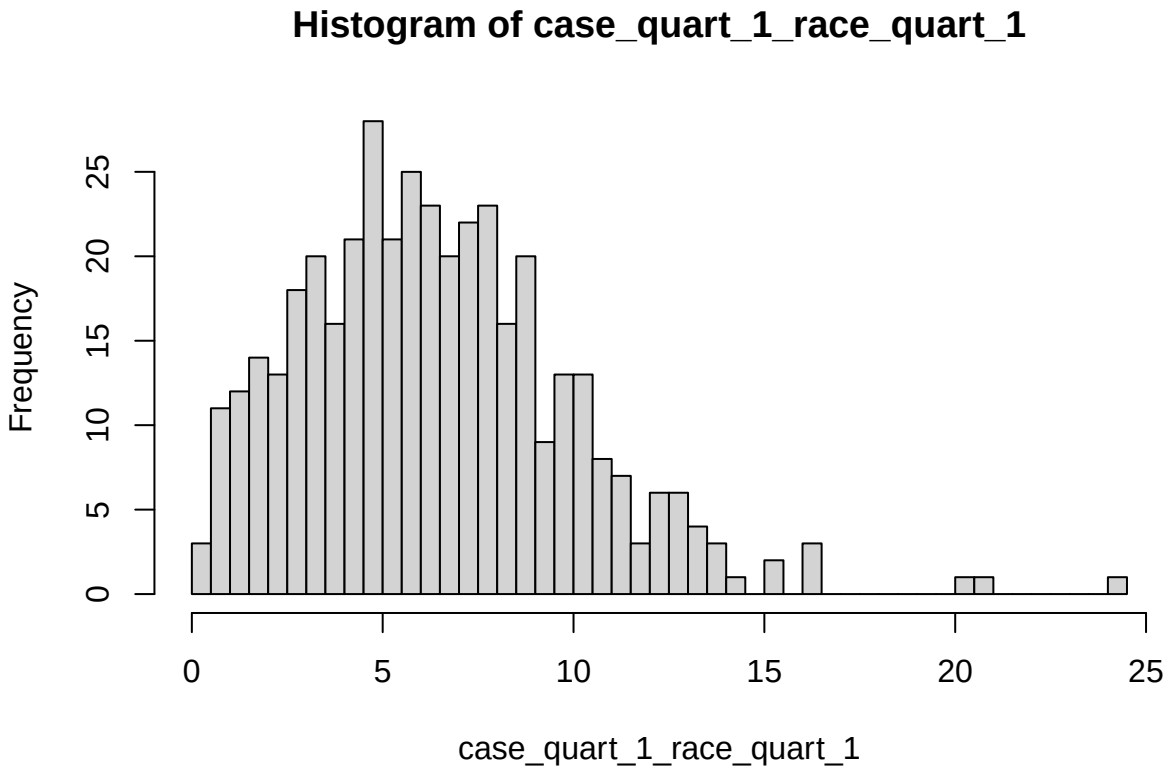
```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  quart_3_mae and quart_4_mae
## W = 326137, p-value = 0.01052
## alternative hypothesis: true location shift is not equal to 0
```

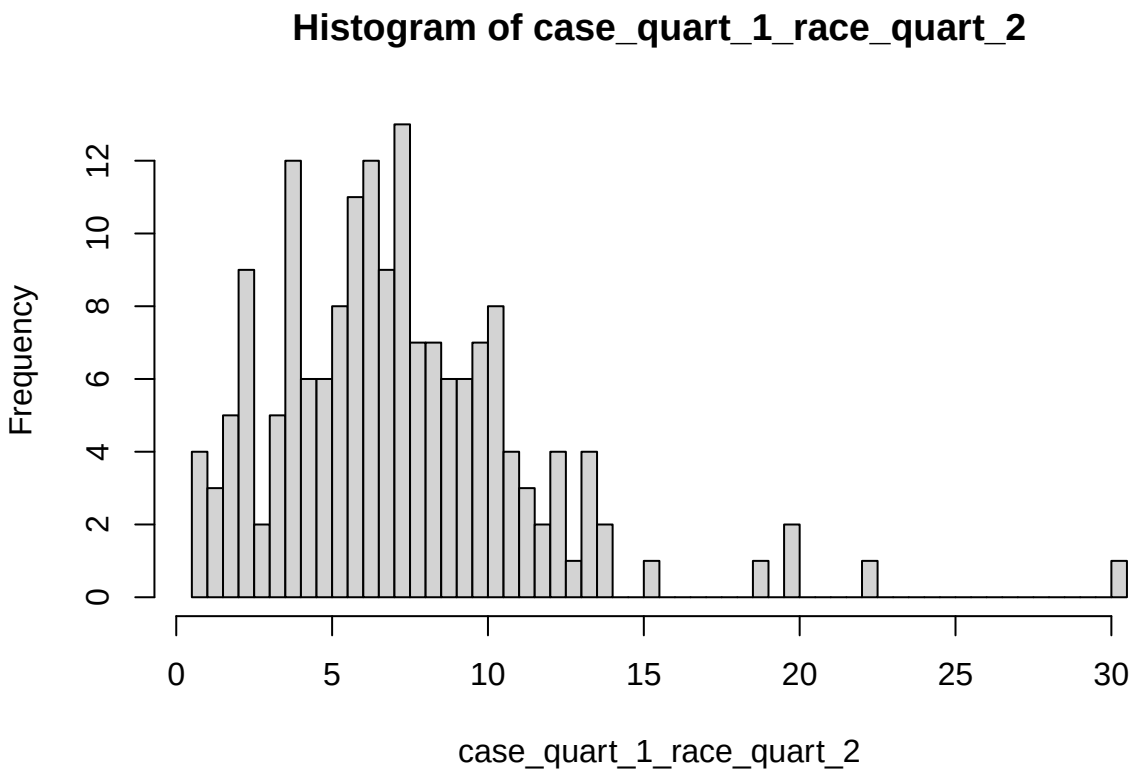
Within Covid Case Quartile 1 Compare Across Race Quartiles

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  case_quart_1_race_quart_1 and case_quart_1_race_quart_2
## W = 31550, p-value = 0.06056
## alternative hypothesis: true location shift is not equal to 0
```

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  case_quart_1_race_quart_1 and case_quart_1_race_quart_3
## W = 14316, p-value = 8.157e-05
## alternative hypothesis: true location shift is not equal to 0
```

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  case_quart_1_race_quart_1 and case_quart_1_race_quart_4
## W = 16146, p-value = 6.584e-05
## alternative hypothesis: true location shift is not equal to 0
```





Within Covid Case Quartile 2 Compare Across Race Quartiles

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  case_quart_2_race_quart_1 and case_quart_2_race_quart_2
## W = 21654, p-value = 0.03436
## alternative hypothesis: true location shift is not equal to 0
```

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  case_quart_2_race_quart_1 and case_quart_2_race_quart_3
## W = 9685, p-value = 3.063e-08
## alternative hypothesis: true location shift is not equal to 0
```

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  case_quart_2_race_quart_1 and case_quart_2_race_quart_4
## W = 17708, p-value = 0.003986
## alternative hypothesis: true location shift is not equal to 0
```

Within Covid Case Quartile 3 Compare Across Race Quartiles

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  case_quart_3_race_quart_1 and case_quart_3_race_quart_2
## W = 12882, p-value = 0.01097
## alternative hypothesis: true location shift is not equal to 0
```

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  case_quart_3_race_quart_1 and case_quart_3_race_quart_3
## W = 11604, p-value = 0.002071
## alternative hypothesis: true location shift is not equal to 0
```

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  case_quart_3_race_quart_1 and case_quart_3_race_quart_4
## W = 10542, p-value = 0.05698
## alternative hypothesis: true location shift is not equal to 0
```

Within Covid Case Quartile 4 Compare Across Race Quartiles

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  case_quart_4_race_quart_1 and case_quart_4_race_quart_2
## W = 2195.5, p-value = 0.6978
## alternative hypothesis: true location shift is not equal to 0
```

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  case_quart_4_race_quart_1 and case_quart_4_race_quart_3
## W = 4235, p-value = 0.2756
## alternative hypothesis: true location shift is not equal to 0
```

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  case_quart_4_race_quart_1 and case_quart_4_race_quart_4
## W = 3159, p-value = 0.01546
## alternative hypothesis: true location shift is not equal to 0
```

All 16 quartile quartile breakdowns for RMAE comparison

Summary Statistics Case Quartile

Summary Statistics By Race Quartile

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   0.118   5.912  10.279  17.038  17.890 574.088
```

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
##    1.882   14.721   29.500   86.246   81.926 2559.765
```

Counts by Quartile Quartile Breakdown

```
##              Prop. Black Quartile
## Case Quartile lowest 25%  Q2  Q3 highest 25% Overall
##   lowest 25%         407 172  95         106     780
##   Q2                 214 229 139         198     780
##   Q3                 129 238 224         187     778
##   highest 25%         30 140 321         288     779
##   Overall            780 779 779         779    3117
```

Median MAE and RMAE tables

```
##              Prop. Black Quartile
## Case Quartile lowest 25%     Q2     Q3 highest 25% Overall
##   lowest 25%       6.059  6.559  7.794       7.632   6.647
##   Q2              14.103 14.882 17.706      15.147  14.912
##   Q3              25.853 29.088 29.603      28.912  28.515
##   highest 25%     79.059 73.368 91.324     111.779  93.353
##   Overall         10.279 19.588 35.618      29.500  20.735
```

MAE table generated by LaTex

	Prop. Black Quartile				
Case Quartile	lowest 25%	Q2	Q3	highest 25%	Overall
lowest 25%	6.059	6.559	7.794	7.632	6.647
Q2	14.103	14.882	17.706	15.147	14.912
Q3	25.853	29.088	29.603	28.912	28.515
highest 25%	79.059	73.368	91.324	111.779	93.353
Overall	10.279	19.588	35.618	29.500	20.735

Table 1: Pink for statistically significant at $\alpha = 0.05$ and red for statistically significant at $\alpha = 0.00333$ (from the Bonferroni Correction over 15 tests) when comparing to Quartile 1 of Prop. Black. across the case quartiles and overall

```
##              Prop. Black Quartile
## Case Quartile lowest 25%    Q2    Q3 highest 25% Overall
##   lowest 25%       0.898 0.901 0.910       0.885   0.898
##   Q2               0.906 0.887 0.902       0.887   0.897
##   Q3               0.911 0.899 0.905       0.879   0.898
##   highest 25%      0.923 0.890 0.889       0.894   0.891
##   Overall          0.903 0.896 0.897       0.887   0.896
```

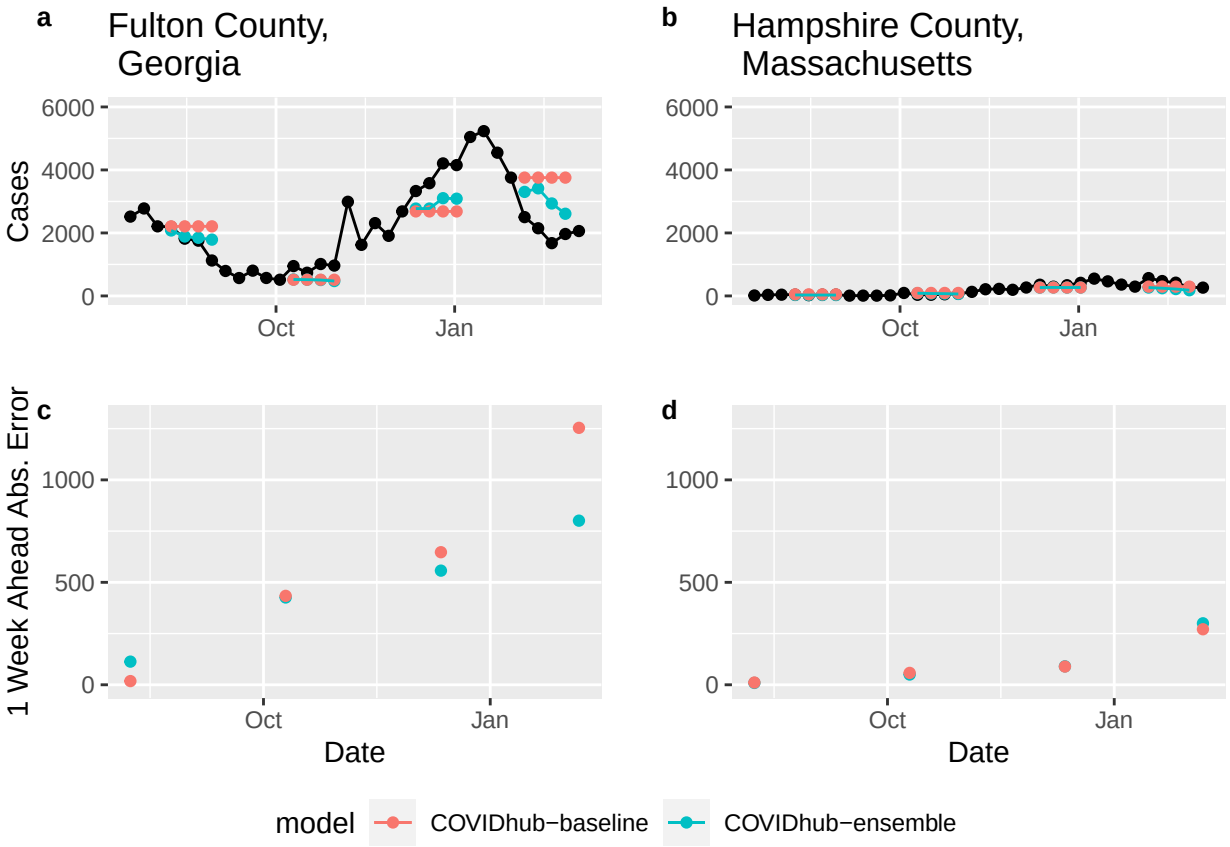
RMAE Table from LaTex

Figures

	Prop. Black Quartile				
Case Quartile	lowest 25%	Q2	Q3	highest 25%	Overall
lowest 25%	0.898	0.901	0.910	0.885	0.898
Q2	0.906	0.887	0.902	0.887	0.897
Q3	0.911	0.899	0.905	0.879	0.898
highest 25%	0.923	0.890	0.889	0.894	0.891
Overall	0.903	0.896	0.897	0.887	0.896

Table 2: text

Figure 1



or

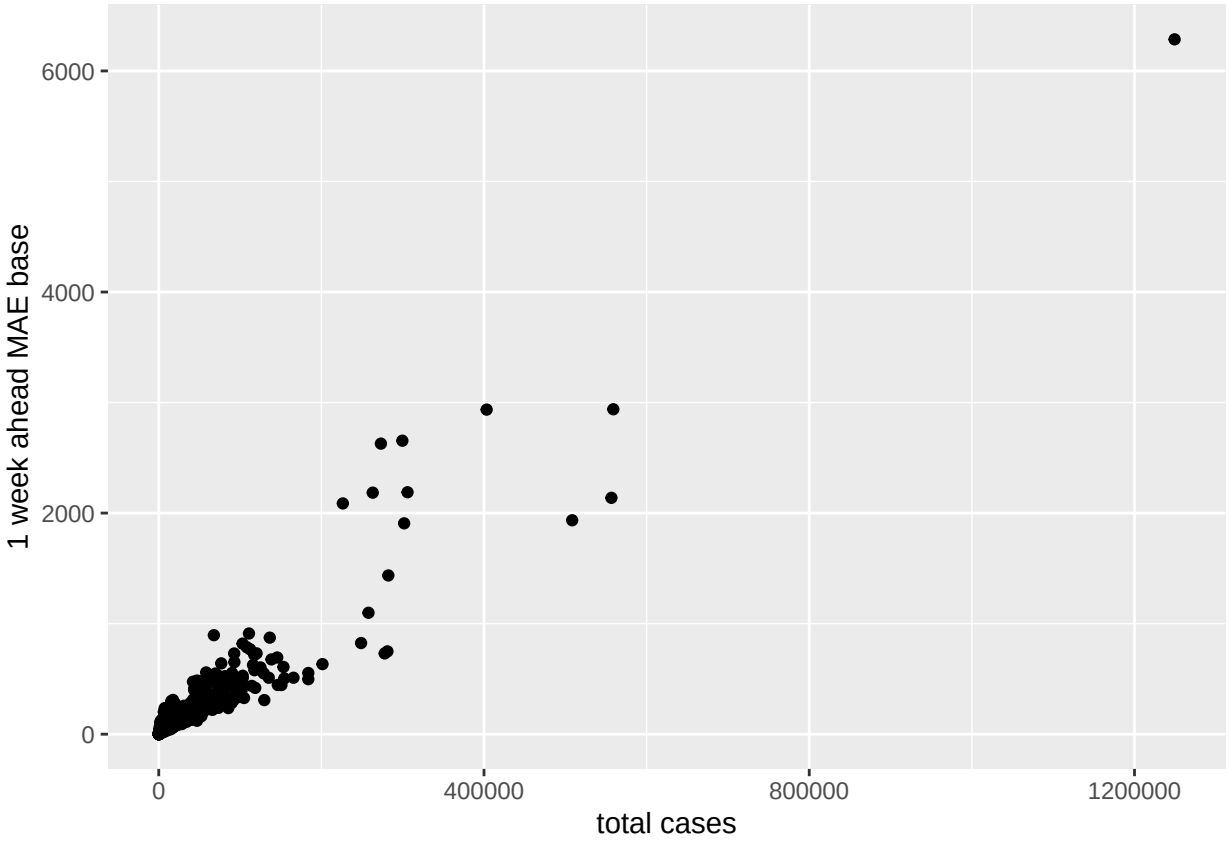

6000
4000
2000
0
1 week ahead MAE base
0
400000
800000
1200000
total cases

Figure 2

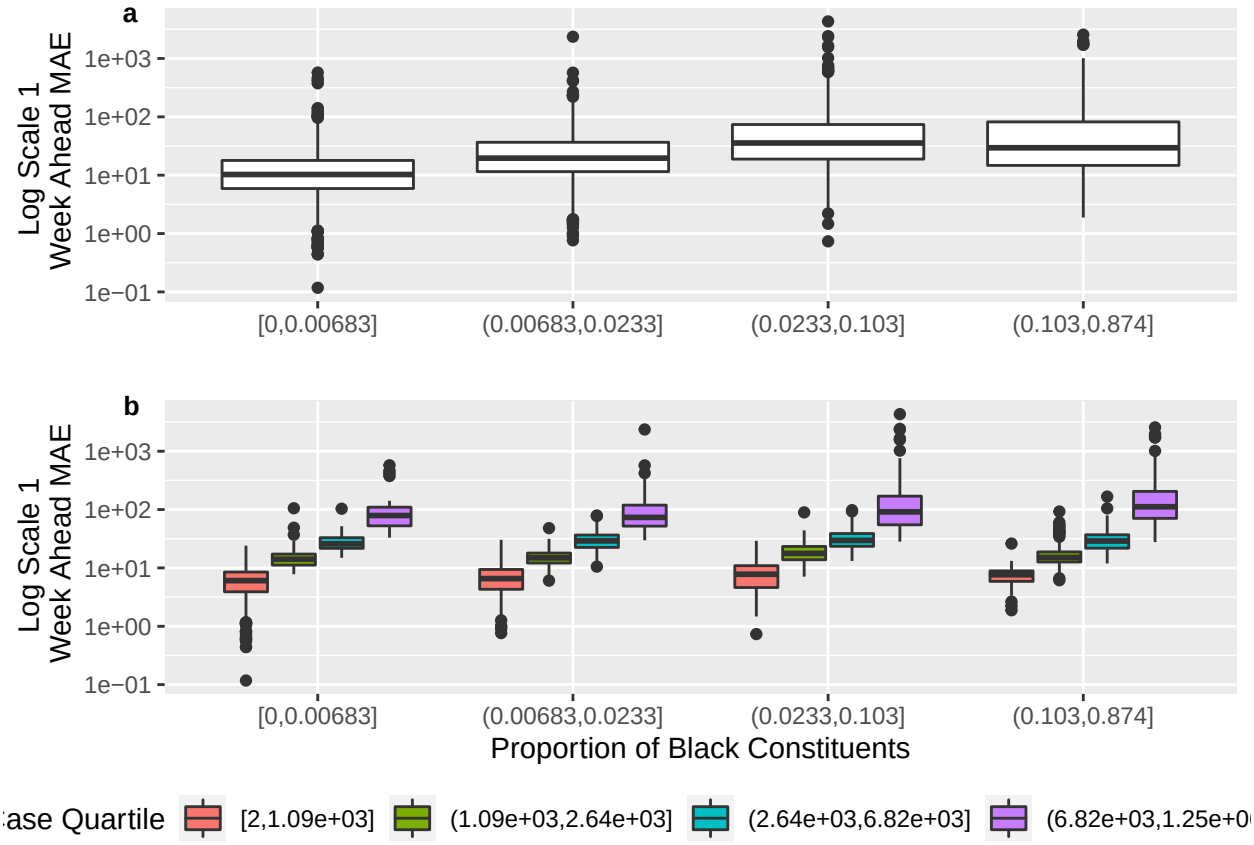


Figure 2 just highest case quartile

```
all_the_data_pull_cutoff %>%
  filter(`Case Quartile`==4) %>%
  ggplot()+
  geom_boxplot(aes(x=as.factor(`black_prop_quart`),
      y=`total cases`)) +
  xlab("Race Quartile amongst Case Quartile 4") +
  ylab("Log Scale Cases") +
  scale_y_log10()
```

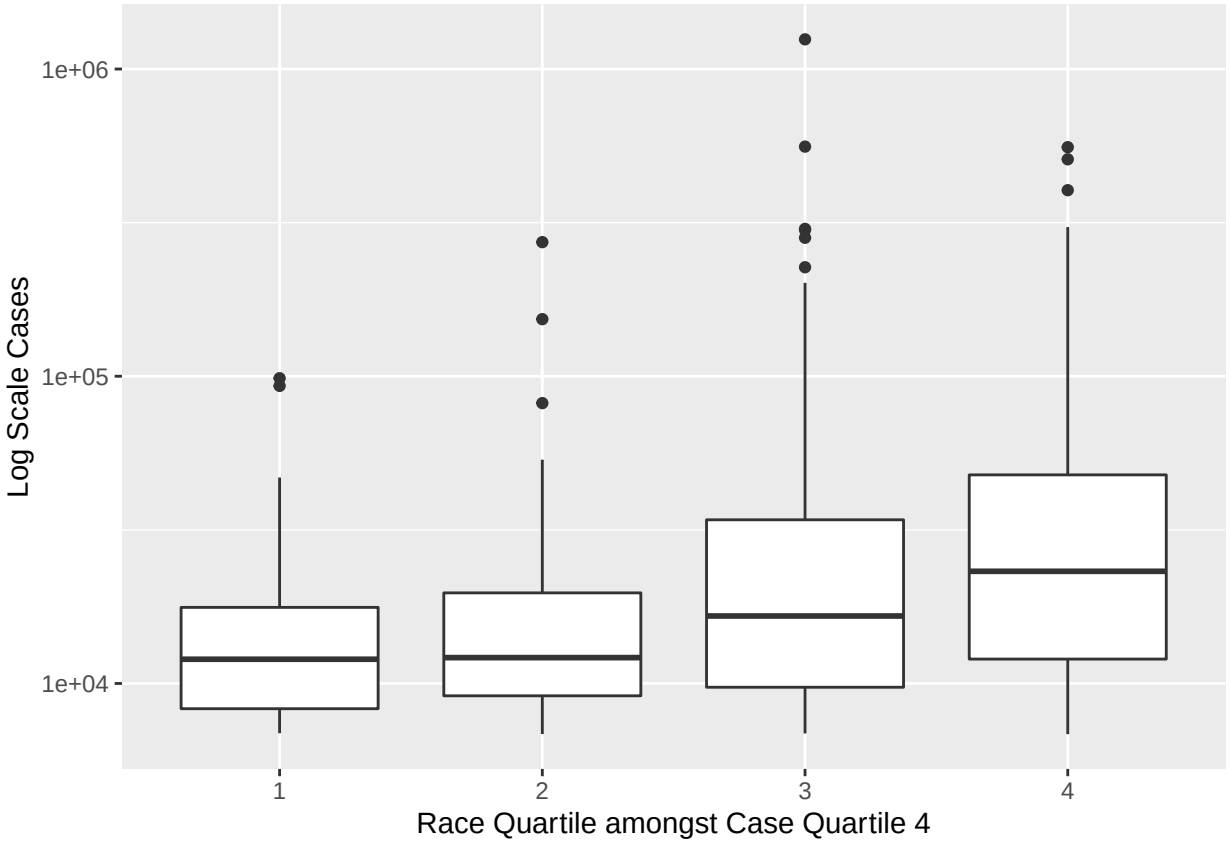

1e+06
1e+05
1e+04
Log Scale Cases
1
2
3
4
Race Quartile amongst Case Quartile 4

Figure 3: 1 and 4 week MAE and RMAE for Racial Demographics

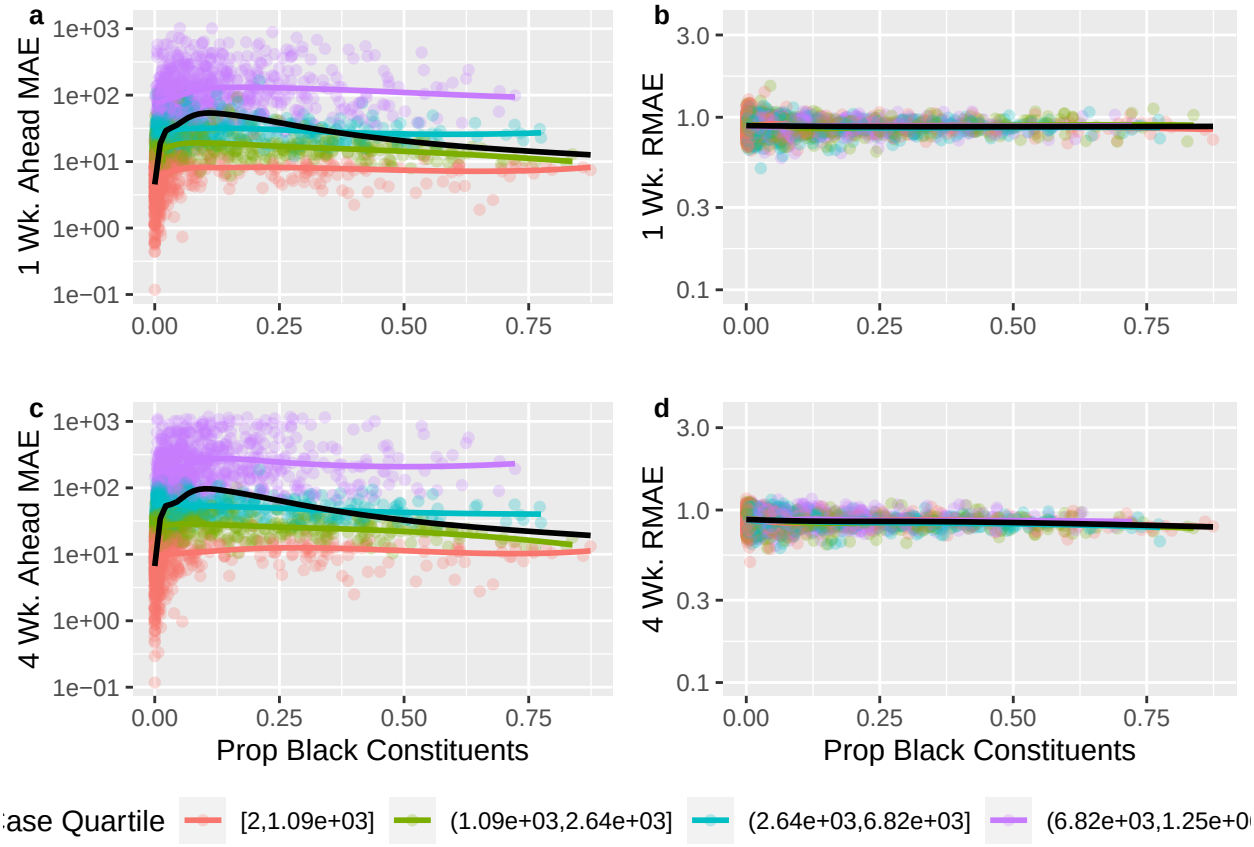


Figure 3 option 2: 1 and 4 week MAE and RMAE for Racial Demographics

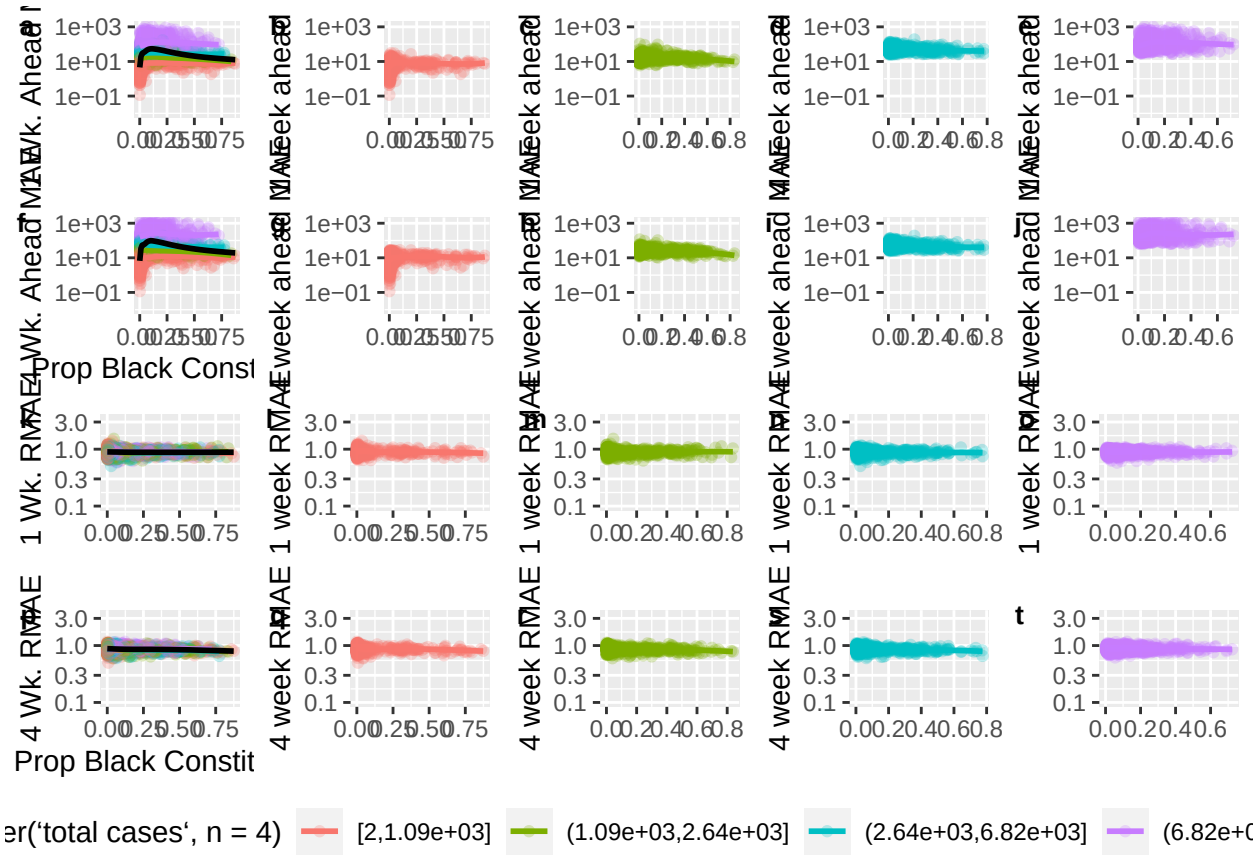
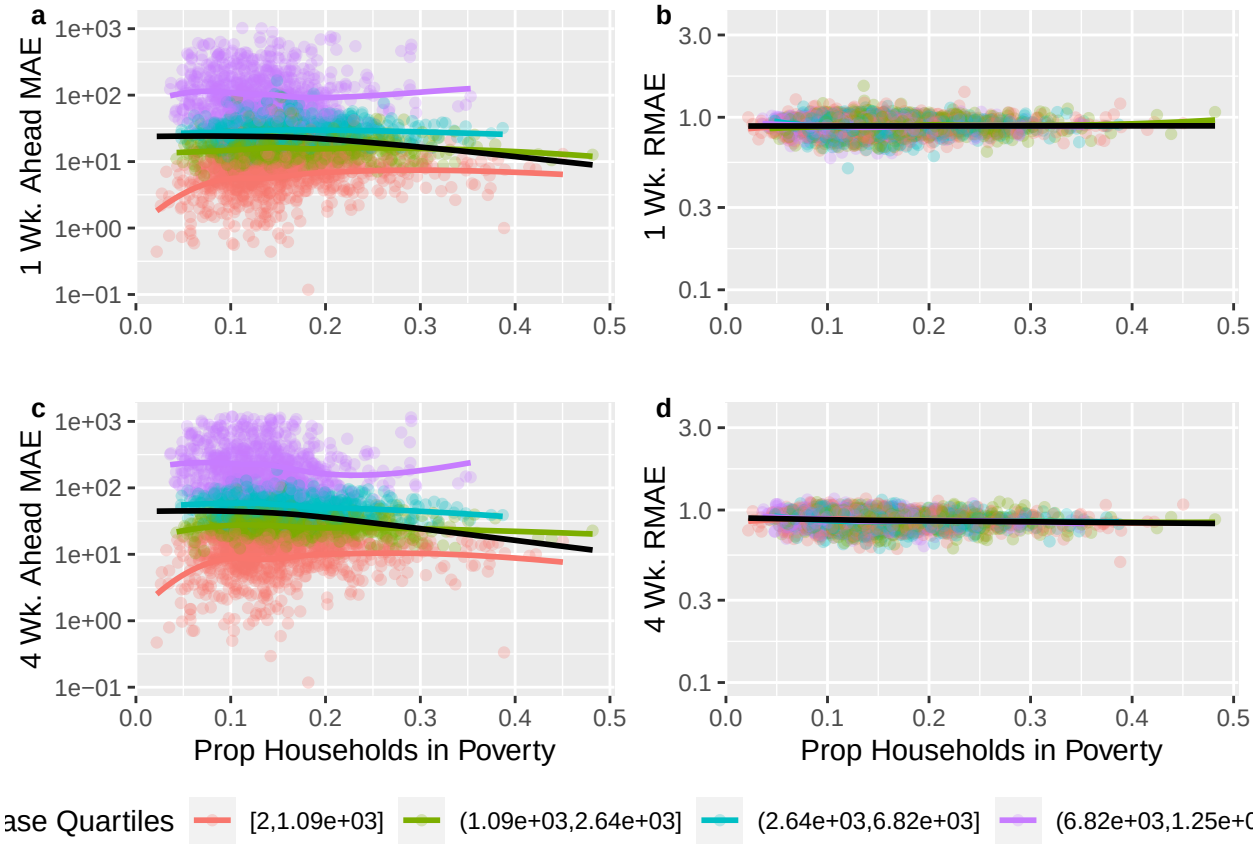


Figure 4: 1 and 4 week MAE and RMAE for Poverty



Tables

Table 1

	R squared
1 wk Ahead MAE as a funct. of Prop. Black and Prop. Pov	0.0309
1 wk Ahead MAE as a funct. of Total Population	0.8712
1 wk Ahead MAE as a funct. of Total Cases	0.8862
1 wk Ahead MAE as a funct. of Cases and Minority Prop.	0.8863
4 wk Ahead MAE as a funct. of Prop. Black and Prop. Pov	0.0239
4 wk Ahead MAE as a funct. of Total Population	0.9108
4 wk Ahead MAE as a funct. of Total Cases	0.9543
4 wk Ahead MAE as a funct. of Cases and Minority Prop.	0.9554
## Regression Equations	

```
summary(lm(One_Week_MAE~Tot_Cases,data = regressionData))
```

```
##
## Call:
```

```
## lm(formula = One_Week_MAE ~ Tot_Cases, data = regressionData)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -752.72   -9.19   -5.67    1.31 1238.92
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 1.330e+01  1.015e+00   13.11   <2e-16 ***
## Tot_Cases   4.046e-03  2.598e-05  155.74   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 54.53 on 3115 degrees of freedom
## Multiple R-squared:  0.8862, Adjusted R-squared:  0.8862
## F-statistic: 2.425e+04 on 1 and 3115 DF,  p-value: < 2.2e-16
```