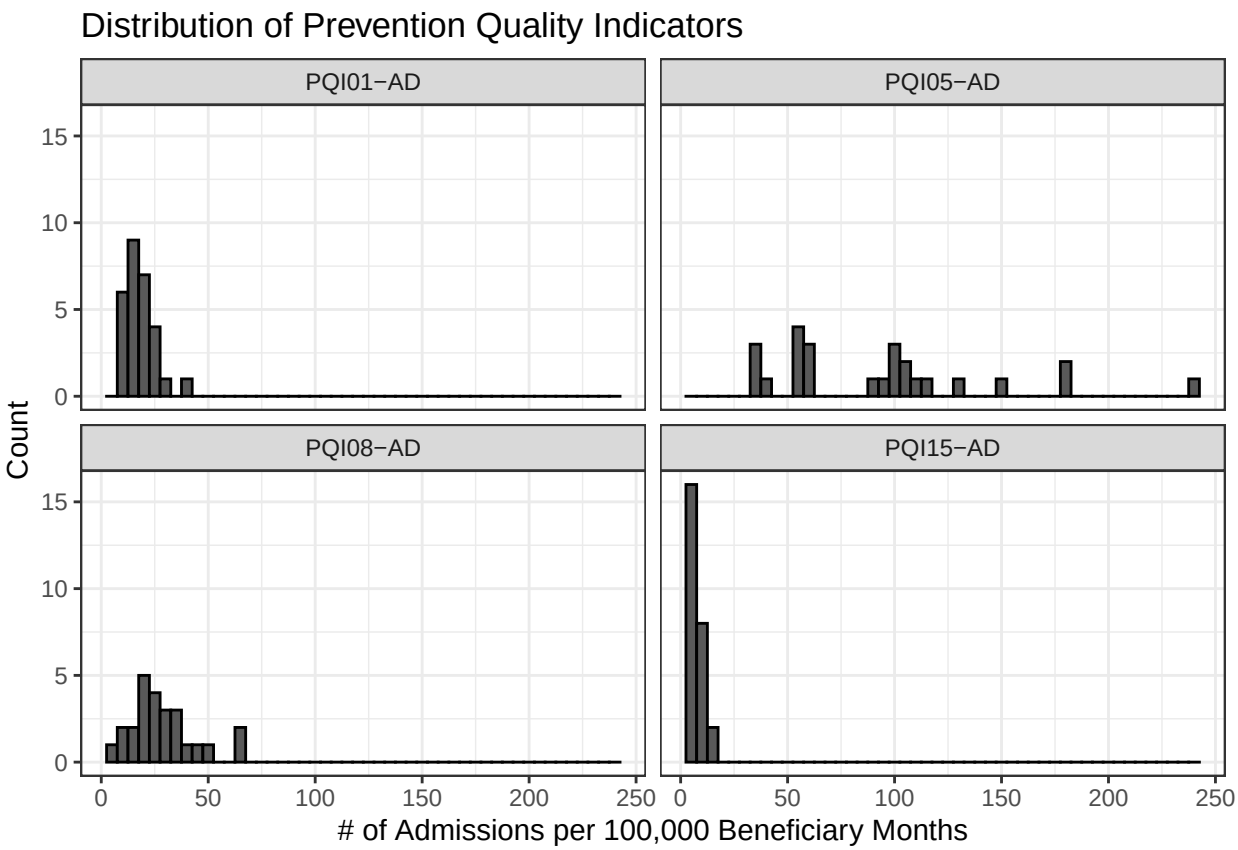
Exploratory Data Analysis - Medicaid 2018 Data

Distibutions of Our Potential Outcomes of Interest

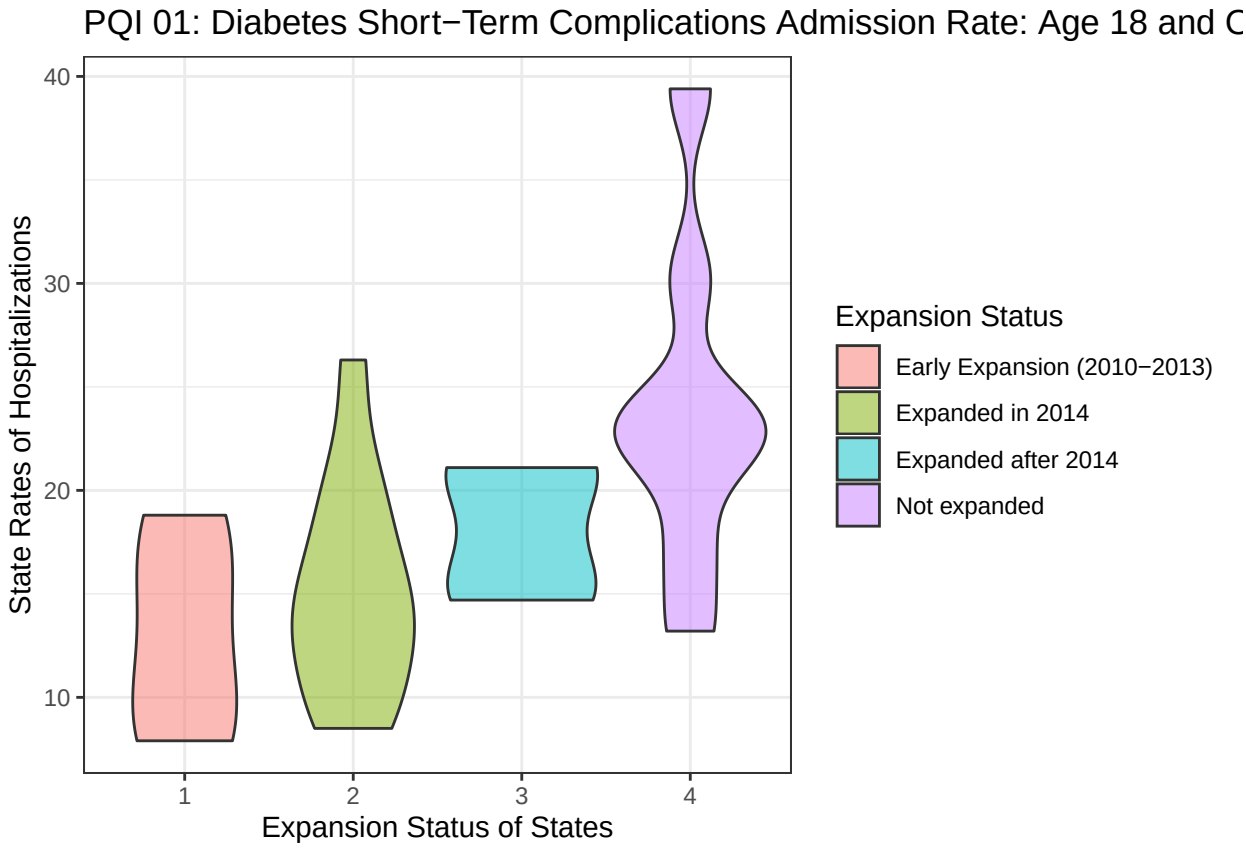
```
### Create PQI histograms
histo_data <- dat %>%
  filter(str_detect(measure_name, "PQI")) %>%
  select(state, measure_abbreviation, state_rate)

(plot_6 <- ggplot(histo_data, aes(x = state_rate)) +
  geom_histogram(binwidth = 5, color = "black") +
  scale_x_continuous(labels = comma) +
  xlab("# of Admissions per 100,000 Beneficiary Months") +
  ylab("Count") +
  facet_wrap(.~measure_abbreviation) +
  theme_bw() +
  ggtitle("Distribution of Prevention Quality Indicators"))
```

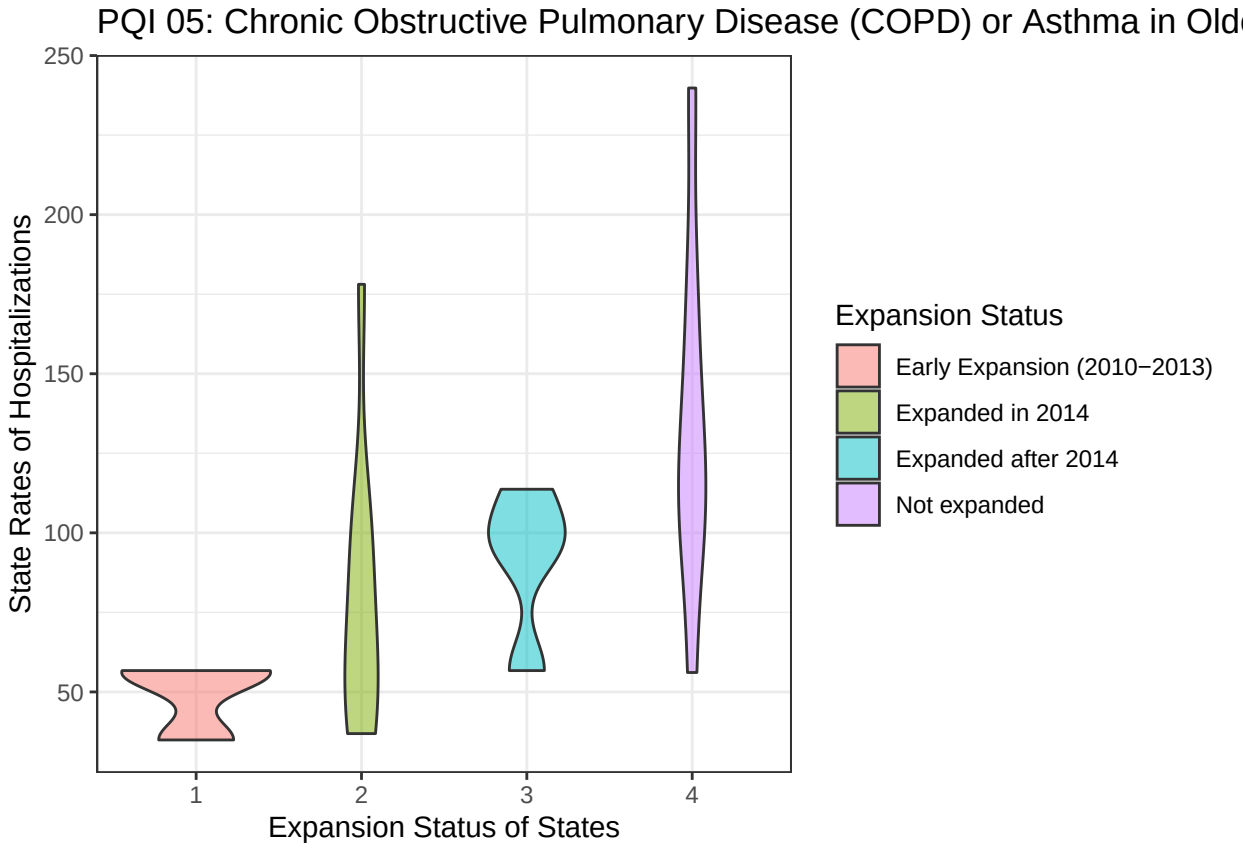


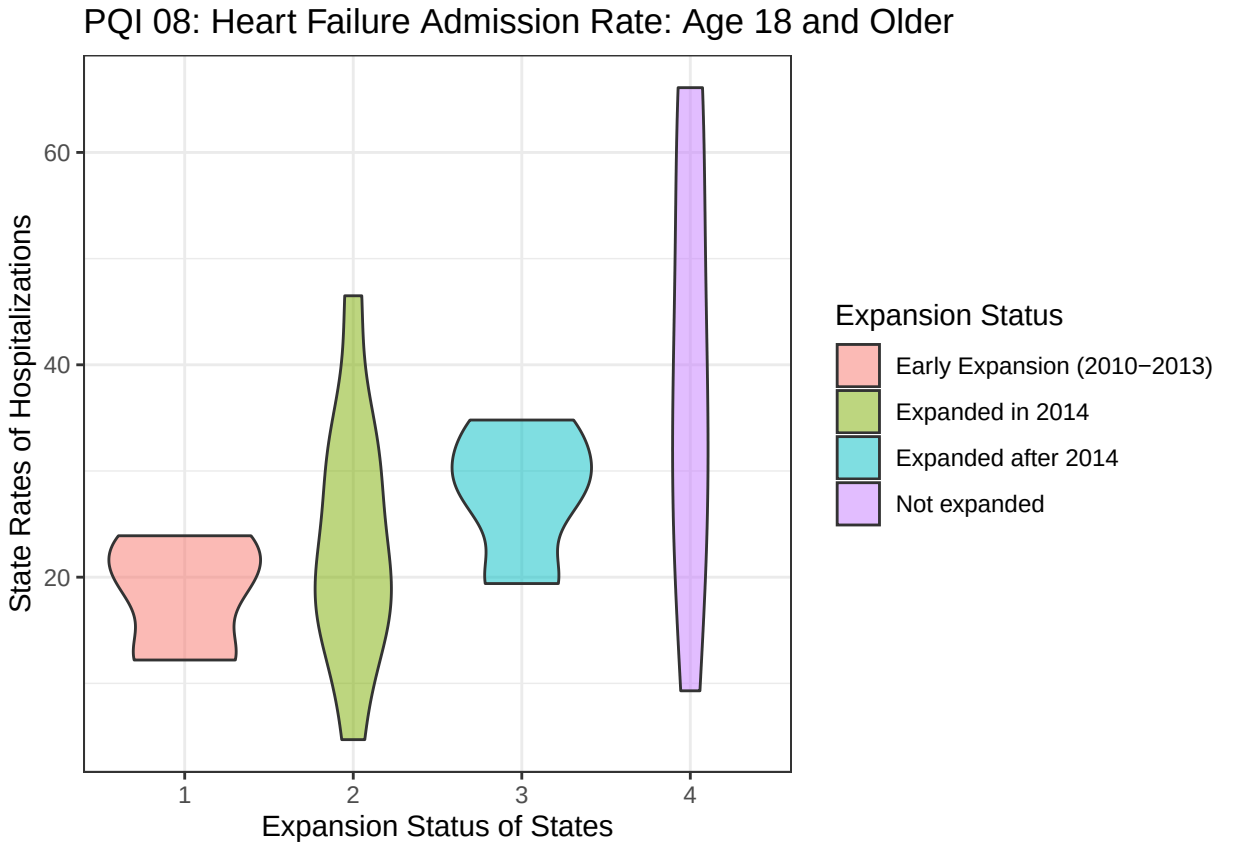
We see a fairly normal distribution in PQI-01 (Diabetes Short-Term Complications Admission Rate: Age 18 and Older) and PQI-08 (Heart Failure Admission Rate: Age 18 and Older) with the averages around 18 admissions per 100,000 beneficiary months and 28 admissions per 100,000 beneficiary months respectively.

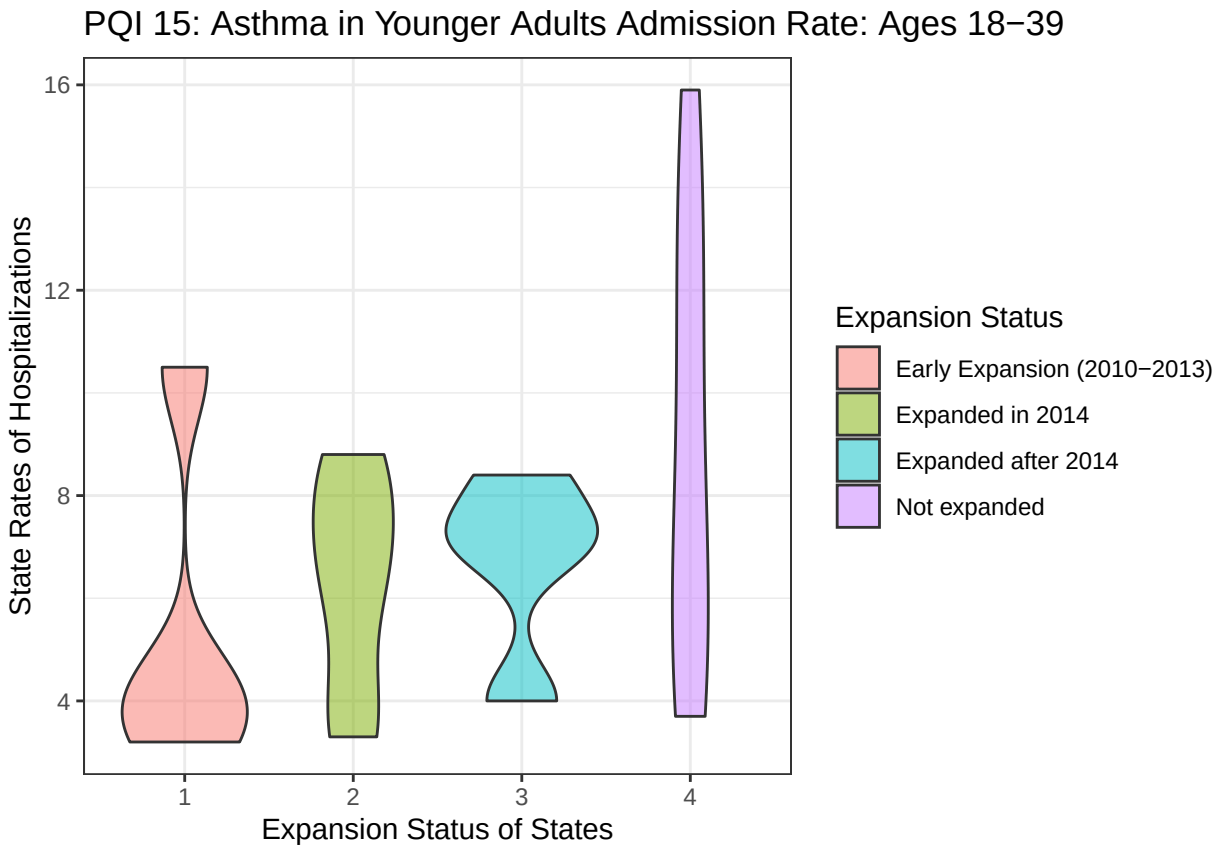
PQI-15 (PQI 15: Asthma in Younger Adults Admission Rate: Ages 18-39) has a very right skewed and narrow distribution, with the maximum value of 16 admissions per 100,000 beneficiary months.

```
dat <- quality %>% select(c('expansion_status', 'state', 'measure_name', 'state_rate')) %>%
                   filter(str_detect(measure_name, 'PQI.*'))
pqis = unique(dat$measure_name)

for (pqi in pqis){

  p <- dat %>% filter(measure_name == pqi) %>%
             ggplot() +
             geom_violin(aes(x=expansion_status, y=state_rate,
                             fill = expansion_status), alpha = 0.5) +
             ggtitle(pqi) +
             xlab('Expansion Status of States') +
             ylab('State Rates of Hospitalizations') +
             scale_fill_discrete(name = 'Expansion Status',
                                 labels = c('Early Expansion (2010-2013)',
                                            'Expanded in 2014',
                                            'Expanded after 2014',
                                            'Not expanded')) +
          theme_bw()

  print(p)


}
```




PQI 05: Chronic Obstructive Pulmonary Disease (COPD) or Asthma in Old
State Rates of Hospitalizations
250
200
150
100
50
1
2
3
4
Expansion Status of States
Expansion Status
Early Expansion (2010−2013)
Expanded in 2014
Expanded after 2014
Not expanded

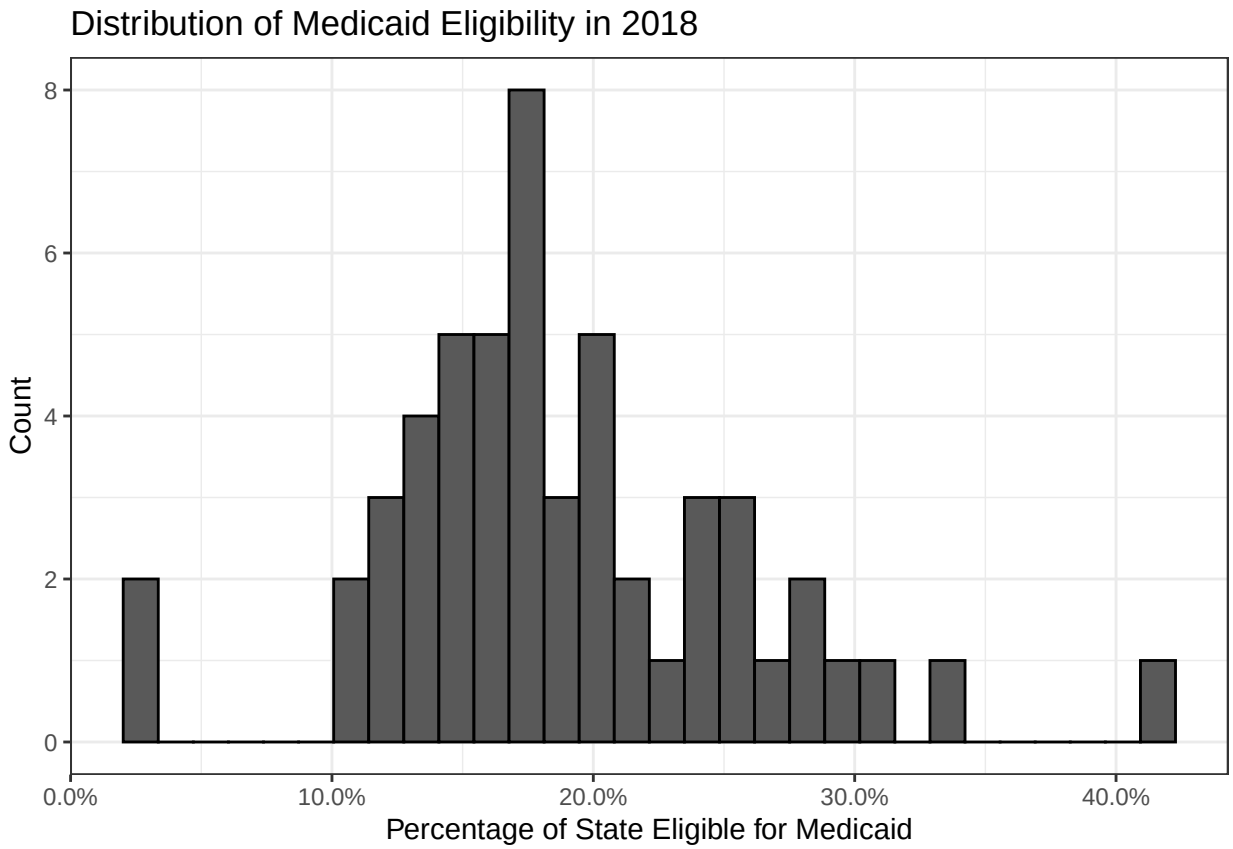

PQI 08: Heart Failure Admission Rate: Age 18 and Older
State Rates of Hospitalizations
60
40
20
1
2
3
4
Expansion Status of States
Expansion Status
Early Expansion (2010−2013)
Expanded in 2014
Expanded after 2014
Not expanded



In 2018, states that expanded Medicaid access early (2010-2013) seem to have lower rates of hospitalizations for preventable causes, such as diabetes, COPD, heart failure, and asthma compared to states that expanded later or not at all. States that have expanded Medicaid access also seem to provide more consistent care, and lower variances in PQIs are observed compared to states that did not expand health care access to adults.

Distributions of Potential Demographic Covariates

```
state1 <- state_demo %>%
  filter(county == "STATE TOTAL") %>%
  select(state, percent_eligible_for_medicaid) %>%
  mutate(
    percent_eligible_for_medicaid = as.numeric(str_replace(percent_eligible_for_medicaid, "[%]", ""))/1
  )

(plot_4 <- ggplot(state1, aes(x = percent_eligible_for_medicaid)) +
  geom_histogram(color = "black") +
  scale_x_continuous(labels = percent) +
  xlab("Percentage of State Eligible for Medicaid") +
  ylab("Count") +
  ggtitle("Distribution of Medicaid Eligibility in 2018") +
  theme_bw())
```

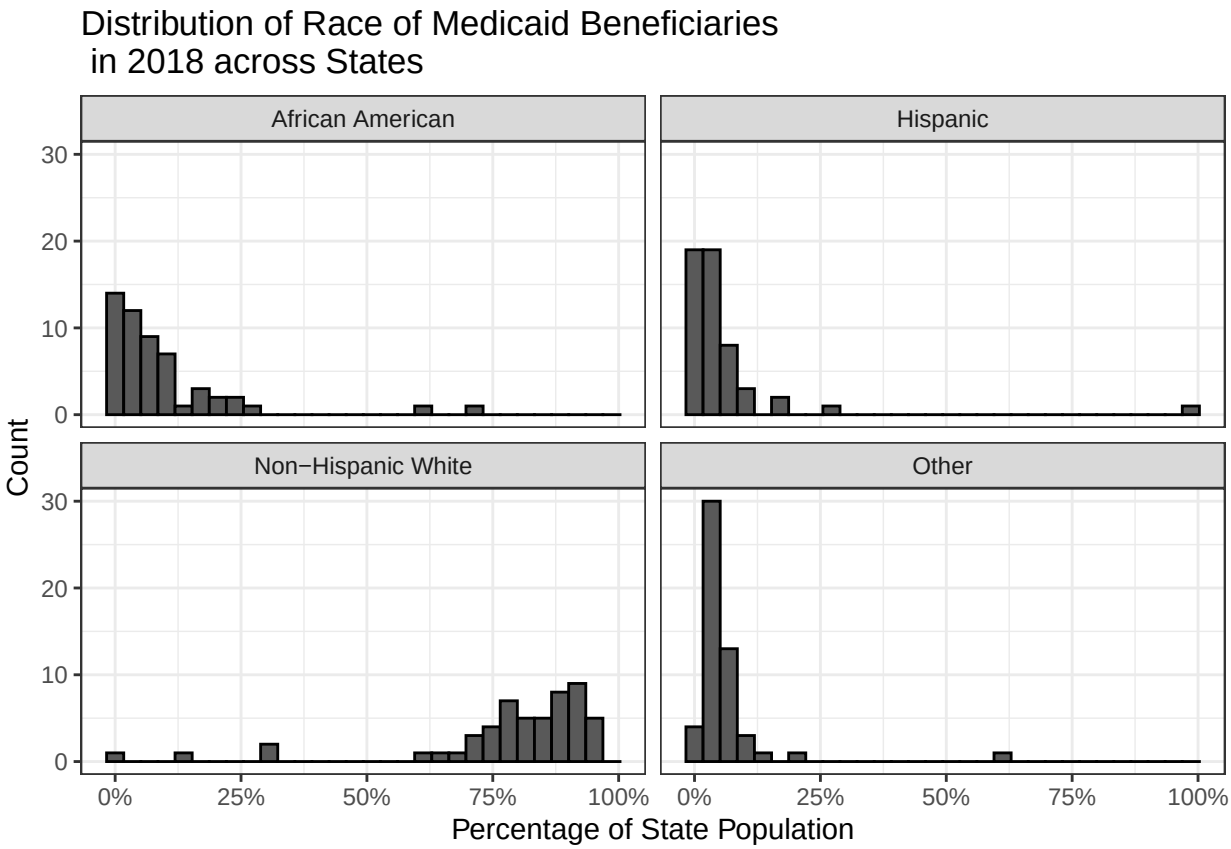



```
mean(state1$percent_eligible_for_medicaid)
```

```
## [1] 0.1889811
```

The percentage of state populations who are eligible for Medicaid is approximately normally distributed and centered around 19%.

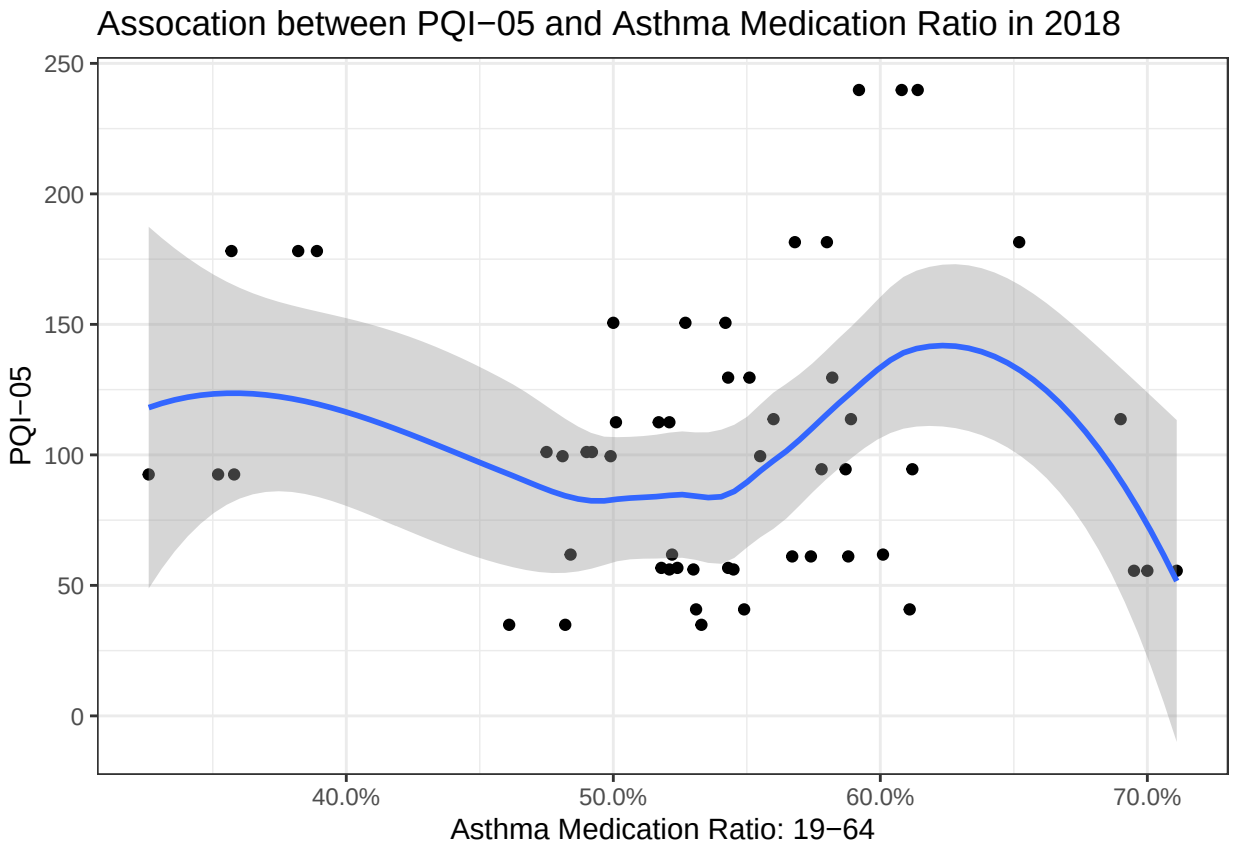
```
# racial characteristics
state_demo %>%
  filter(county == "STATE TOTAL") %>%
  select(state, `percent_non-hispanic_white`, percent_african_american, percent_hispanic, `percent_othe
  mutate(
    value = as.numeric(str_replace(value, "[%]", ""))/100,
    race = ifelse(race == "percent_non-hispanic_white", "Non-Hispanic White",
                  ifelse(race == "percent_african_american", "African American",
                         ifelse(race == "percent_hispanic", "Hispanic",
                                ifelse(race == "percent_other/unknown", "Other", NA))))
  ) %>%
  ggplot(aes(x = value)) +
  geom_histogram(color = "black") +
  scale_x_continuous(labels = percent) +
  xlab("Percentage of State Population") +
  ylab("Count") +
  ggtitle("Distribution of Race of Medicaid Beneficiaries\n in 2018 across States")+
  theme_bw()+
  facet_wrap(.~race)
```



Most states had predominantly white Medicaid beneficiary populations, although there are a few states that have large percentages of non-white Medicaid beneficiary populations. We will investigate how race effects the assocation between health care access and outcomes.

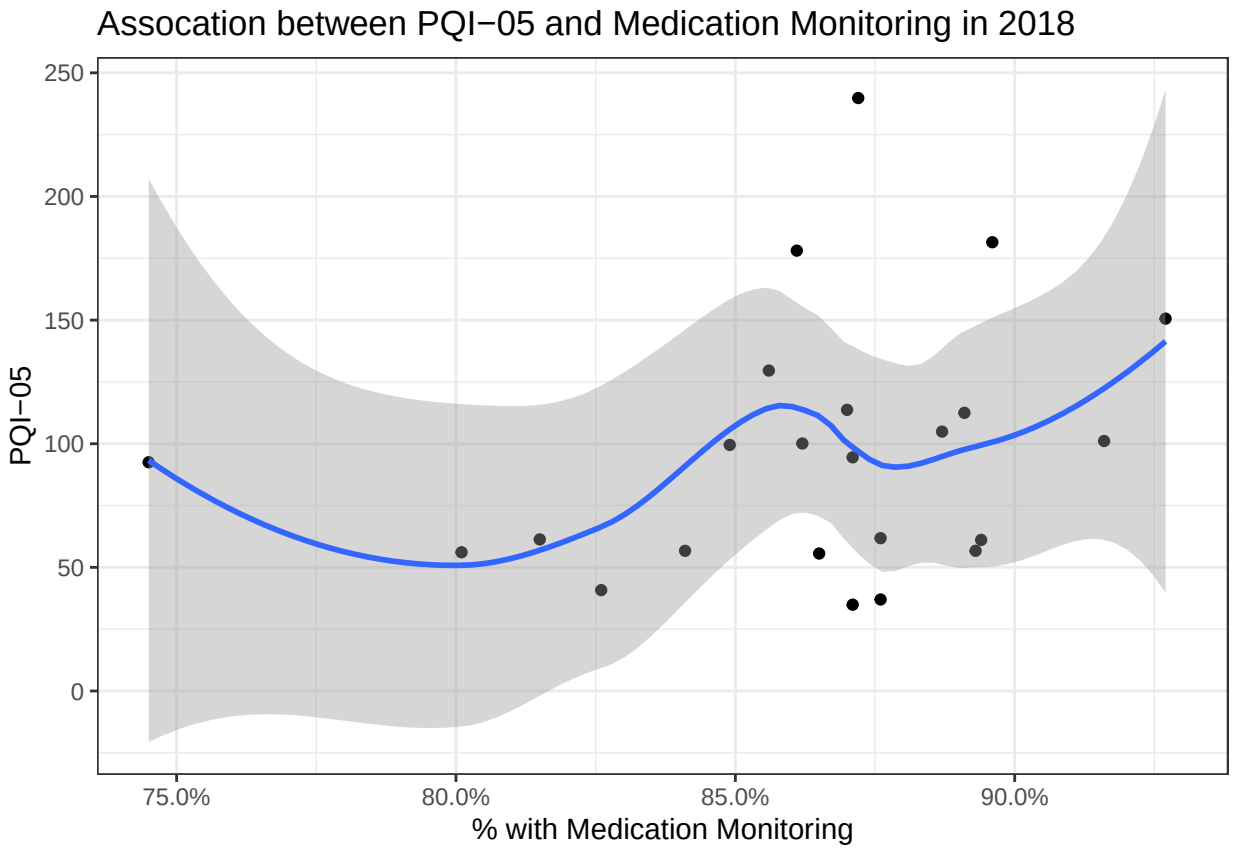
Relevant Scatter Plots

```
#### SCATTER PLOTS
p1_d <- plot_measures_data(dat_njp, "AMR-AD","PQI05-AD")
(plot_1 <- ggplot(p1_d, aes(x = state_rate_m1/100, y = state_rate_m2)) +
  geom_point()+
  geom_smooth()+
  scale_x_continuous(labels = percent) +
  xlab("Asthma Medication Ratio: 19-64")+
  ylab("PQI-05") +
  ggtitle("Assocation between PQI-05 and Asthma Medication Ratio in 2018")+
  theme_bw())
```



The relationship between the asthma medication ratio and PQI-05 (Chronic Obstructive Pulmonary Disease (COPD) or Asthma in Older Adults Admission Rate: Age 40 and Older) shows an potentially positive association where the ratio is between 50% and 60%, and a slight negative association where the association is greater than 60%.

```
p2_d <- plot_measures_data(dat_njp, "MPM-AD","PQI05-AD")
(plot_2 <- ggplot(p2_d, aes(x = state_rate_m1/100, y = state_rate_m2)) +
  geom_point()+
  geom_smooth()+
  scale_x_continuous(labels = percent) +
  xlab("% with Medication Monitoring")+
  ylab("PQI-05") +
  ggtitle("Assocation between PQI-05 and Medication Monitoring in 2018") +
  theme_bw())
```



There is potential positive association between the percentage of individuals who have medication monitoring (specificially, receiving at least 180 treatment days of ambulatory medication therapy and annual monitoring), and PQI 05 (Chronic Obstructive Pulmonary Disease (COPD) or Asthma in Older Adults Admission Rate: Age 40 and Older).