Project 1: Texas Health

Introduction

The facilities dataset is the Texas Acute Care Hospitals in 2018 dataset found on the Texas Department of State Health Services (DSHS) website. The health dataset is the 2018 Texas Data found on the County Health Ranking website. Each row represents a county in Texas in 2018. Both datasets contain numeric and categorical variables. I plan to join the datasets with the County variable.

Research Question

How does facility ownership and uninsured rate affect the average rate of potential years of life lost in a Texas county in 2018?

Hypothesis

Lack of health insurance coverage can mean that a patient will delay medical care, which may worsen their health. Public hospitals might have a slightly worse standard of care, which may affect patient outcomes. Therefore, I expect to see that high levels of uninsurance and public hospital ownership to contribute to higher levels of years lost. These datasets intrigued me because I was interested in how quality and access to healthcare can affect health, which in turn can affect the longevity of people's lives.

Loading Datasets

```
# upload texas facilities dataset
facilities <- read_csv("~/sds 322e/texas facilities 2018.csv", show_col_types = FALSE)

 # upload texas county health dataset
health <- read_csv("~/sds 322e/new tx health.csv", show_col_types=FALSE)

# view datasets
glimpse(facilities)
```

```
## Rows: 529
## Columns: 7
## $ County         <chr> "Anderson", "Andrews", "Angelina", "Angelina", "Angelin…
## $ Facility       <chr> "Palestine Regional Medical Center", "Permian Regional …
## $ City           <chr> "Palestine", "Andrews", "Lufkin", "Lufkin", "Lufkin", "…
## $ Ownership      <chr> "For-Profit", "Public", "Non-Profit", "Non-Profit", "Fo…
## $ `Metro Status` <chr> "NON-METRO", "NON-METRO", "NON-METRO", "NON-METRO", "NO…
## $ `License Type` <chr> "Acute", "Acute", "Acute", "Acute", "Acute", "Acute", "…
## $ Acute          <dbl> 156, 34, 271, 26, 149, 67, 30, 25, 8, 49, 69, 232, 48, …
```

```
glimpse(health)
```

```
## Rows: 255
## Columns: 165
## $ FIPS                                          <dbl> 48000, 48001, 48003, 48…
## $ State                                         <chr> "Texas", "Texas", "Texa…
## $ County                                        <chr> NA, "Anderson", "Andrew…
## $ `Years of Potential Life Lost Rate`           <dbl> 6675, 10119, 8133, 8802…
## $ `95% CI - Low...5`                            <dbl> 6641, 9289, 6666, 8111,…
## $ `95% CI - High...6`                           <dbl> 6708, 10949, 9600, 9494…
## $ `Z-Score...7`                                 <dbl> NA, 0.98, -0.10, 0.26, …
## $ `Years of Potential Life Lost Rate (Black)`   <dbl> NA, 10233, NA, 13478, N…
## $ `Years of Potential Life Lost Rate (Hispanic)` <dbl> NA, 12461, 7129, 4706, …
## $ `Years of Potential Life Lost Rate (White)`   <dbl> NA, 9707, 10359, 9058, …
## $ `% Fair/Poor`                                 <dbl> 18, 20, 17, 23, 20, 13,…
## $ `95% CI - Low...12`                           <dbl> 17, 19, 17, 23, 19, 13,…
## $ `95% CI - High...13`                          <dbl> 20, 20, 18, 24, 20, 14,…
## $ `Z-Score...14`                                <dbl> NA, -0.07, -0.50, 0.65,…
## $ `Physically Unhealthy Days`                   <dbl> 3.5, 3.9, 3.3, 4.2, 3.9…
## $ `95% CI - Low...16`                           <dbl> 3.3, 3.8, 3.2, 4.1, 3.7…
## $ `95% CI - High...17`                          <dbl> 3.8, 4.1, 3.4, 4.4, 4.0…
## $ `Z-Score...18`                                <dbl> NA, 0.24, -1.19, 0.92, …
## $ `Mentally Unhealthy Days`                     <dbl> 3.4, 3.6, 3.2, 4.1, 3.7…
## $ `95% CI - Low...20`                           <dbl> 3.1, 3.5, 3.1, 3.9, 3.6…
## $ `95% CI - High...21`                          <dbl> 3.7, 3.8, 3.3, 4.2, 3.9…
## $ `Z-Score...22`                                <dbl> NA, -0.02, -1.94, 1.82,…
## $ Unreliable                                    <chr> NA, NA, NA, NA, NA, NA,…
## $ `% LBW`                                       <dbl> 8, 8, 6, 9, 10, 8, 8, 8…
## $ `95% CI - Low...25`                           <dbl> 8, 7, 5, 8, 9, 5, NA, 8…
## $ `95% CI - High...26`                          <dbl> 8, 8, 8, 9, 12, 10, NA,…
## $ `Z-Score...27`                                <dbl> NA, -0.42, -1.23, 0.33,…
## $ `% LBW (Black)`                               <dbl> NA, 12, NA, 14, NA, NA,…
## $ `% LBW (Hispanic)`                            <dbl> NA, 5, 6, 8, 9, NA, NA,…
## $ `% LBW (White)`                               <dbl> NA, 7, 8, 7, 11, NA, NA…
## $ `% Smokers`                                   <dbl> 14, 18, 13, 18, 16, 14,…
## $ `95% CI - Low...32`                           <dbl> 13, 18, 13, 18, 15, 13,…
## $ `95% CI - High...33`                          <dbl> 15, 19, 14, 19, 16, 15,…
## $ `Z-Score...34`                                <dbl> NA, 1.71, -1.45, 1.59, …
## $ `% Obese`                                     <dbl> 28, 33, 29, 40, 30, 27,…
## $ `95% CI - Low...36`                           <dbl> NA, 27, 21, 36, 24, 21,…
## $ `95% CI - High...37`                          <dbl> NA, 40, 37, 44, 37, 35,…
## $ `Z-Score...38`                                <dbl> NA, 1.47, -0.35, 4.33, …
## $ `Food Environment Index`                      <dbl> 6.0, 5.7, 8.2, 6.1, 5.9…
## $ `Z-Score...40`                                <dbl> NA, 1.19, -1.03, 0.84, …
## $ `% Physically Inactive`                       <dbl> 24, 27, 27, 33, 28, 25,…
## $ `95% CI - Low...42`                           <dbl> NA, 21, 20, 29, 20, 18,…
## $ `95% CI - High...43`                          <dbl> NA, 33, 35, 36, 36, 33,…
## $ `Z-Score...44`                                <dbl> NA, -0.26, -0.16, 1.88,…
## $ `% With Access`                               <dbl> 81, 34, 71, 73, 90, 23,…
## $ `Z-Score...46`                                <dbl> NA, 1.01, -0.52, -0.63,…
## $ `% Excessive Drinking`                        <dbl> 19, 19, 21, 18, 16, 20,…
## $ `95% CI - Low...48`                           <dbl> 18, 18, 20, 18, 16, 19,…
## $ `95% CI - High...49`                          <dbl> 21, 19, 22, 19, 17, 21,…
## $ `Z-Score...50`                                <dbl> NA, 0.36, 1.75, 0.15, -…
```

```
## $ `# Alcohol-Impaired Driving Deaths`          <dbl> 5013, 12, 22, 18, 2, 11…
## $ `# Driving Deaths`                           <dbl> 17691, 57, 53, 91, 17, …
## $ `% Alcohol-Impaired`                         <dbl> 28, 21, 42, 20, 12, 58,…
## $ `95% CI - Low...54`                          <dbl> 28, 14, 35, 15, 2, 48, …
## $ `95% CI - High...55`                         <dbl> 29, 28, 48, 25, 27, 66,…
## $ `Z-Score...56`                               <dbl> NA, -0.28, 1.36, -0.39,…
## $ `# Chlamydia Cases`                          <dbl> 141158, 205, 69, 482, 1…
## $ `Chlamydia Rate`                             <dbl> 524, 356, 395, 549, 637…
## $ `Z-Score...59`                               <dbl> NA, -0.18, 0.02, 0.80, …
## $ `Teen Birth Rate`                            <dbl> 41, 54, 72, 50, 51, 28,…
## $ `95% CI - Low...61`                          <dbl> 41, 50, 64, 47, 44, 21,…
## $ `95% CI - High...62`                         <dbl> 41, 59, 80, 53, 58, 36,…
## $ `Z-Score...63`                               <dbl> NA, 0.29, 1.37, 0.01, 0…
## $ `Teen Birth Rate (Black)`                    <dbl> NA, 58, NA, 51, NA, NA,…
## $ `Teen Birth Rate (Hispanic)`                 <dbl> NA, 67, 85, 58, 68, 60,…
## $ `Teen Birth Rate (White)`                    <dbl> NA, 48, 51, 46, 40, 25,…
## $ `# Uninsured`                                <dbl> 4536765, 6917, 3177, 15…
## $ `% Uninsured`                                <dbl> 19, 19, 20, 22, 22, 18,…
## $ `95% CI - Low...69`                          <dbl> 19, 17, 17, 20, 19, 16,…
## $ `95% CI - High...70`                         <dbl> 19, 21, 22, 24, 24, 19,…
## $ `Z-Score...71`                               <dbl> NA, -0.43, -0.33, 0.23,…
## $ `# Primary Care Physicians`                  <dbl> 16447, 20, 7, 55, 15, N…
## $ `PCP Rate`                                   <dbl> 60, 35, 39, 62, 59, NA,…
## $ `PCP Ratio`                                  <chr> "1670:1", "2879:1", "25…
## $ `Z-Score...75`                               <dbl> NA, 0.32, 0.16, -0.78, …
## $ `# Dentists`                                 <dbl> 15562, 21, 4, 40, 8, NA…
## $ `Dentist Rate`                               <dbl> 56, 36, 23, 46, 31, NA,…
## $ `Dentist Ratio`                              <chr> "1790:1", "2749:1", "44…
## $ `Z-Score...79`                               <dbl> NA, -0.22, 0.46, -0.68,…
## $ `# Mental Health Providers`                  <dbl> 27523, 24, 2, 108, 19, …
## $ `MHP Rate`                                   <dbl> 99, 42, 11, 123, 74, 11…
## $ `MHP Ratio`                                  <chr> "1012:1", "2406:1", "88…
## $ `Z-Score...83`                               <dbl> NA, 0.23, 0.89, -1.56, …
## $ `# Medicare Enrollees...84`                  <dbl> 1497806, 3689, 989, 681…
## $ `Preventable Hosp. Rate`                     <dbl> 53, 57, 58, 53, 36, 52,…
## $ `95% CI - Low...86`                          <dbl> 53, 49, 43, 48, 28, 42,…
## $ `95% CI - High...87`                         <dbl> 54, 65, 73, 59, 43, 61,…
## $ `Z-Score...88`                               <dbl> NA, -0.36, -0.30, -0.56…
## $ `# Diabetics`                                <dbl> 250904, 766, 155, 1262,…
## $ `% Receiving HbA1c`                          <dbl> 84, 84, 77, 81, 90, 87,…
## $ `95% CI - Low...91`                          <dbl> 83, 78, 63, 76, 81, 70,…
## $ `95% CI - High...92`                         <dbl> 84, 91, 91, 86, 98, 100…
## $ `Z-Score...93`                               <dbl> NA, -0.38, 1.15, 0.27, …
## $ `% Receiving HbA1c (Black)`                  <dbl> 1, 74, NA, 79, NA, NA, …
## $ `% Receiving HbA1c (White)`                  <dbl> 1, 86, NA, 81, NA, NA, …
## $ `# Medicare Enrollees...96`                  <dbl> 164920, 455, 103, 725, …
## $ `% Mammography`                              <dbl> 57.9, 58.7, 50.5, 62.2,…
## $ `95% CI - Low...98`                          <dbl> 57.6, 51.6, 36.8, 56.5,…
## $ `95% CI - High...99`                         <dbl> 58.3, 65.7, 64.2, 67.9,…
## $ `Z-Score...100`                              <dbl> NA, -0.73, 0.30, -1.17,…
## $ `% Mammography (Black)`                      <dbl> 57.4, 67.7, NA, 54.2, N…
## $ `% Mammography (White)`                      <dbl> 58.0, 58.0, NA, 62.9, N…
```

```
## $ `Cohort Size`                          <lgl> NA, NA, NA, NA, NA, NA,…
## $ `Graduation Rate`                      <dbl> 89, 91, 96, 92, 91, 99,…
## $ `Z-Score...105`                        <dbl> NA, 0.29, -0.48, 0.07, …
## $ `# Some College`                       <dbl> 4564201, 7168, 1913, 11…
## $ Population                             <dbl> 7558237, 18741, 4594, 2…
## $ `% Some College`                       <dbl> 60.4, 38.2, 41.6, 53.8,…
## $ `95% CI - Low...109`                   <dbl> 60.1, 35.1, 33.1, 49.7,…
## $ `95% CI - High...110`                  <dbl> 60.6, 41.4, 50.1, 57.9,…
## $ `Z-Score...111`                        <dbl> NA, 1.19, 0.86, -0.33, …
## $ `# Unemployed`                         <dbl> 612837, 1018, 417, 2198…
## $ `Labor Force`                          <dbl> 13284651, 23751, 8639, …
## $ `% Unemployed`                         <dbl> 4.6, 4.3, 4.8, 6.0, 5.7…
## $ `Z-Score...115`                        <dbl> NA, -0.50, -0.22, 0.38,…
## $ `% Children in Poverty`                <dbl> 22, 24, 15, 27, 33, 14,…
## $ `95% CI - Low...117`                   <dbl> 22, 18, 11, 21, 24, 11,…
## $ `95% CI - High...118`                  <dbl> 23, 31, 20, 33, 42, 18,…
## $ `Z-Score...119`                        <dbl> NA, -0.12, -1.24, 0.16,…
## $ `% Children in Poverty (Black)`        <dbl> NA, 39, NA, 49, NA, NA,…
## $ `% Children in Poverty (Hispanic)`     <dbl> NA, 44, 14, 38, 22, 22,…
## $ `% Children in Poverty (White)`        <dbl> NA, 15, 5, 19, 33, 7, N…
## $ `80th Percentile Income`               <dbl> 111803, 82783, 122272, …
## $ `20th Percentile Income`               <dbl> 22757, 18618, 29636, 18…
## $ `Income Ratio`                         <dbl> 4.9, 4.4, 4.1, 4.6, 5.3…
## $ `Z-Score...126`                        <dbl> NA, -0.41, -0.90, -0.22…
## $ `# Single-Parent Households`           <dbl> 2358262, 3809, 1059, 91…
## $ `# Households`                         <dbl> 7076774, 11135, 5206, 2…
## $ `% Single-Parent Households`           <dbl> 33, 34, 20, 40, 29, 14,…
## $ `95% CI - Low...130`                   <dbl> 33, 28, 13, 36, 18, 7, …
## $ `95% CI - High...131`                  <dbl> 34, 40, 28, 45, 39, 21,…
## $ `Z-Score...132`                        <dbl> NA, 0.25, -1.45, 0.99, …
## $ `# Associations`                       <dbl> 20998, 61, 12, 98, 20, …
## $ `Association Rate`                     <dbl> 7.6, 10.6, 6.6, 11.1, 7…
## $ `Z-Score...135`                        <dbl> NA, 0.48, 1.10, 0.40, 0…
## $ `# Violent Crimes`                     <dbl> 107963, 187, 96, 304, 7…
## $ `Violent Crime Rate`                   <dbl> 408, 320, 579, 344, 314…
## $ `Z-Score...138`                        <dbl> NA, 0.38, 1.96, 0.53, 0…
## $ `# Injury Deaths`                      <dbl> 73926, 218, 76, 293, 13…
## $ `Injury Death Rate`                    <dbl> 55, 75, 88, 67, 106, 89…
## $ `95% CI - Low...141`                   <dbl> 54, 65, 69, 59, 88, 64,…
## $ `95% CI - High...142`                  <dbl> 55, 85, 110, 74, 124, 1…
## $ `Z-Score...143`                        <dbl> NA, -0.02, 0.54, -0.40,…
## $ `Average Daily PM2.5`                  <dbl> 8.0, 9.2, 7.2, 9.3, 7.7…
## $ `Z-Score...145`                        <dbl> NA, 0.71, -0.83, 0.79, …
## $ `Presence of violation`                <chr> NA, "No", "Yes", "Yes",…
## $ `Z-Score...147`                        <dbl> NA, -1.32, 0.75, 0.75, …
## $ `# Households with Severe Problems`    <dbl> 1653220, 2550, 615, 513…
## $ `% Severe Housing Problems`            <dbl> 18, 15, 11, 17, 16, 10,…
## $ `95% CI - Low...150`                   <dbl> 18, 13, 8, 15, 12, 7, 3…
## $ `95% CI - High...151`                  <dbl> 18, 18, 15, 18, 20, 13,…
## $ `Z-Score...152`                        <dbl> NA, 0.27, -0.70, 0.58, …
## $ `% Drive Alone`                        <dbl> 80, 85, 78, 82, 81, 87,…
## $ `95% CI - Low...154`                   <dbl> 80, 82, 74, 80, 76, 84,…
```

```
## $ `95% CI - High...155`                <dbl> 80, 88, 82, 84, 86, 90,…
## $ `Z-Score...156`                      <dbl> NA, 0.95, -0.42, 0.32, …
## $ `% Drive Alone (Black)`              <dbl> NA, 76, NA, 77, NA, NA,…
## $ `% Drive Alone (Hispanic)`           <dbl> NA, 84, 73, 80, 82, NA,…
## $ `% Drive Alone (White)`              <dbl> NA, 87, 84, 85, 77, NA,…
## $ `# Workers who Drive Alone`          <dbl> 9830530, 16394, 6113, 2…
## $ `% Long Commute - Drives Alone`      <dbl> 37, 24, 26, 15, 27, 21,…
## $ `95% CI - Low...162`                 <dbl> 37, 21, 20, 13, 21, 17,…
## $ `95% CI - High...163`                <dbl> 37, 28, 33, 17, 33, 25,…
## $ `Z-Score...164`                      <dbl> NA, -0.39, -0.23, -1.13…
## $ ...165                               <lgl> NA, NA, NA, NA, NA, NA,…
```

Within the facilities dataset, there are 529 observations and 7 variables. Within the health dataset, there are 255 observations and 165 columns. Each row in each dataset corresponds to a county in Texas.

Joining Datasets

First, I created a dataset to answer the research question. To do this, I joined together the health and facilities datasets.

```
# create texas dataset
texas <- facilities %>%
  inner_join(health, by = "County") %>%
  select(contains(c("Facility", "Ownership", "County", "Years", "Uninsured", "Metro", "Une
mploy")), -contains(c("White", "Black", "Hispanic", "#"))) %>%
  pivot_wider(names_from = `Metro Status`, values_from = `% Unemployed`)

head(texas)
```

```
## # A tibble: 6 × 7
##   Facility                          Owner…¹ County Years…² % Uni…³ NON-M…⁴ METRO
##   <chr>                             <chr>   <chr>    <dbl>   <dbl>   <dbl> <dbl>
## 1 Palestine Regional Medical Center For-Pr… Ander…   10119      19     4.3  NA
## 2 Permian Regional Medical Center   Public  Andre…    8133      20     4.8  NA
## 3 CHI St. Luke's Health Memorial L… Non-Pr… Angel…    8802      22     6    NA
## 4 PAM Specialty Hospital of Lufkin  Non-Pr… Angel…    8802      22     6    NA
## 5 Woodland Heights Medical Center   For-Pr… Angel…    8802      22     6    NA
## 6 Methodist Hospital South          For-Pr… Atasc…    8908      19    NA     5.3
## # … with abbreviated variable names ¹Ownership,
## #   ²`Years of Potential Life Lost Rate`, ³`% Uninsured`, ⁴`NON-METRO`
```

Visualize the Data

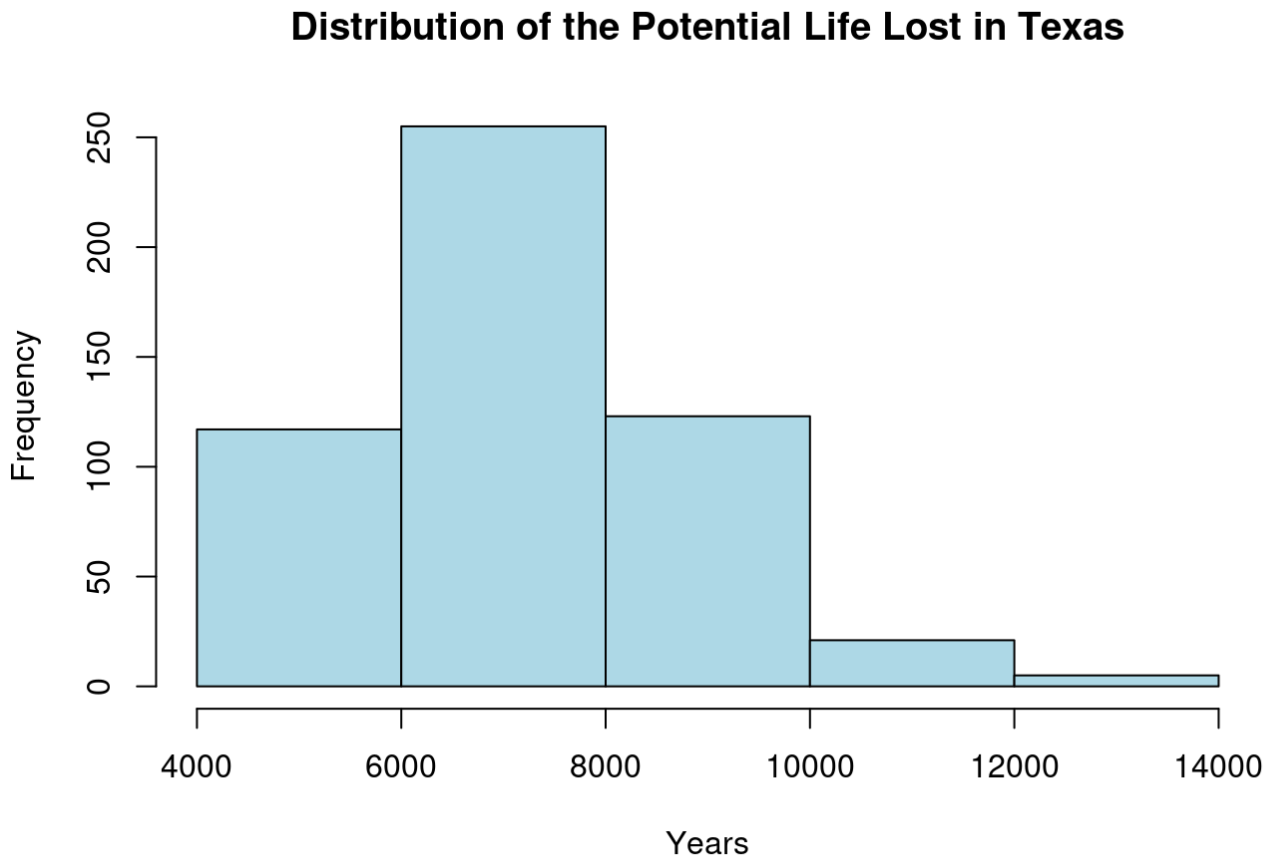
Years Lost

Distribution of the variable: **Years of Potential Life Lost Rate**.

```
# summary statistics
summary(texas$`Years of Potential Life Lost Rate`)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
##    4038    6240    6827    7094    8323   13115       4
```

```
# visualize distribution with histogram
hist(texas$`Years of Potential Life Lost Rate`,
     xlab = "Years",
     main = "Distribution of the Potential Life Lost in Texas",
     breaks = 5,
     col = "lightblue")
```



The median number of years of life lost is 6,827 years, and the mean is 7,094 years lost. The histogram is right-skewed.

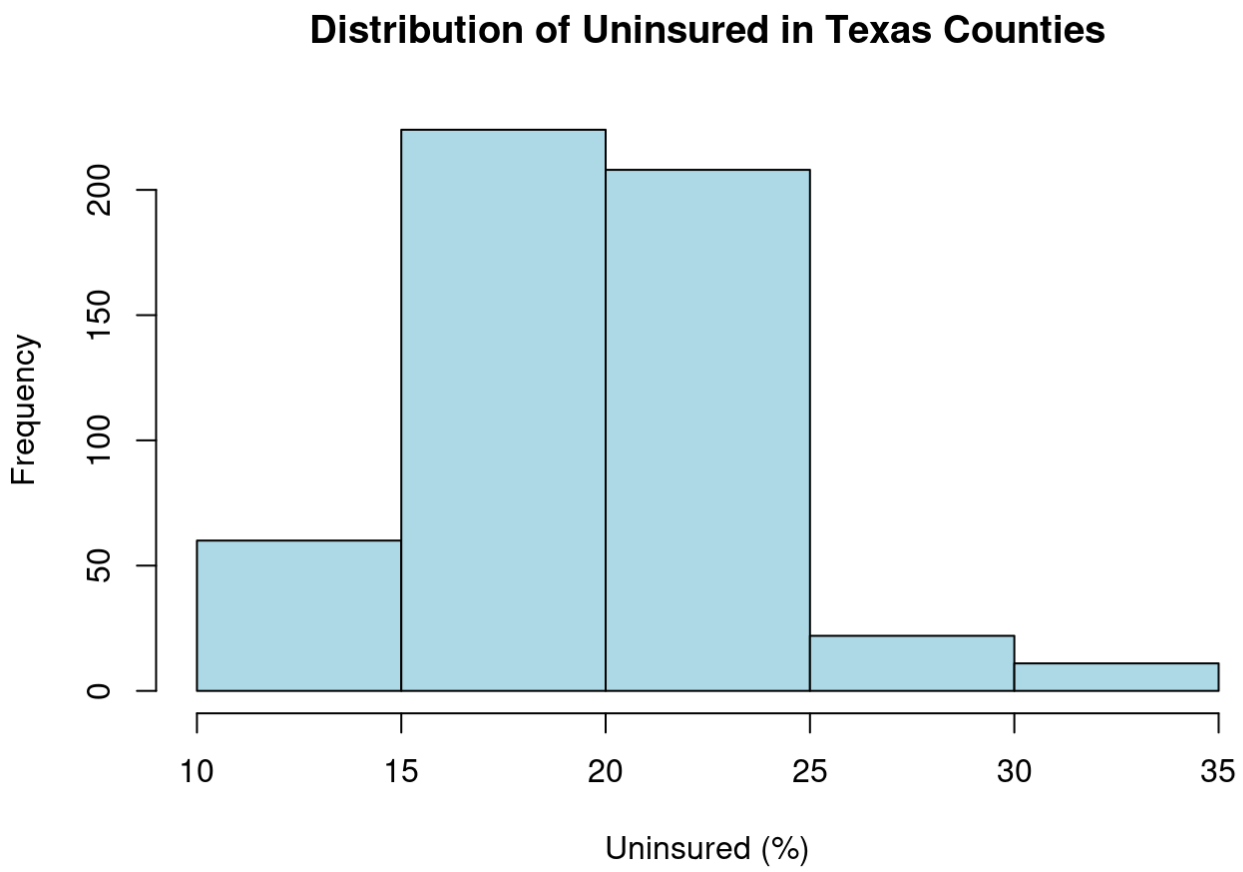
Uninsured Rate

Distribution of the **uninsured rate** in each county.

```
# summary statistics
summary(texas$`% Uninsured`)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   11.00   17.00   20.00   19.55   22.00   33.00
```

```
# visualize distribution with histogram
hist(texas$`% Uninsured`,
     xlab = "Uninsured (%)",
     main = "Distribution of Uninsured in Texas Counties",
     col="lightblue",
     breaks = 5,
     xlim = c(10,35))
```



The median percent of uninsured in a county is 19.5%, and the mean is 19.46%. The histogram indicates a mostly symmetric distribution, which is further supported by the close equivalence between the median and the mean.

Facility Ownership

Distribution of **facility ownership**.

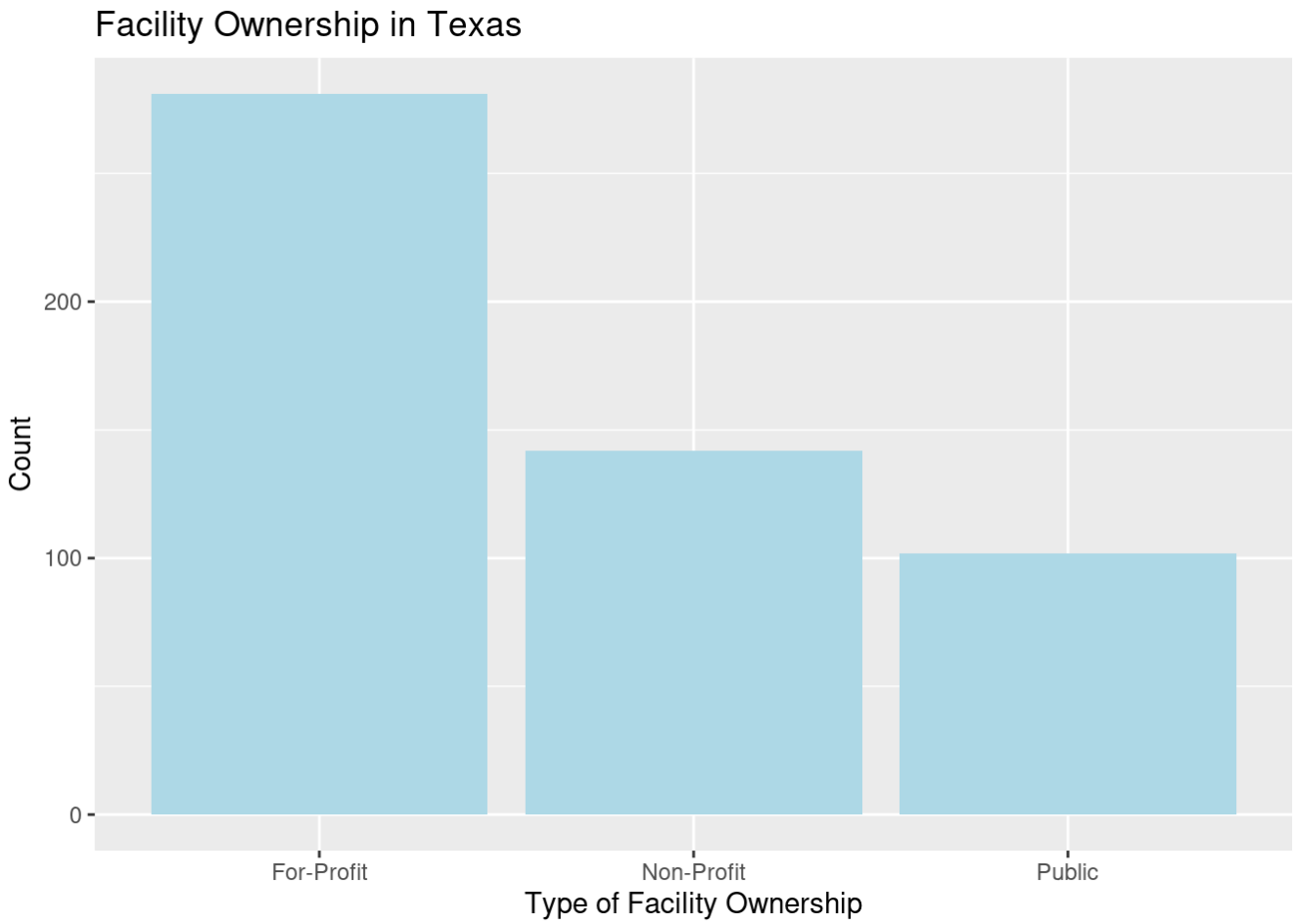
```
# frequency table for facility ownership
freq <- table(texas$Ownership)
freq
```

```
##
## For-Profit Non-Profit     Public
##        281        142        102
```

```
# percentages for facility ownership
percent <- prop.table(freq)*100
percent
```

```
##
## For-Profit Non-Profit     Public
##   53.52381   27.04762   19.42857
```

```
# visualize distribution of facility ownership
ggplot(texas, aes(x=Ownership)) +
  geom_bar(fill="lightblue") +
  labs(x="Type of Facility Ownership", y="Count", title="Facility Ownership in Texas")
```

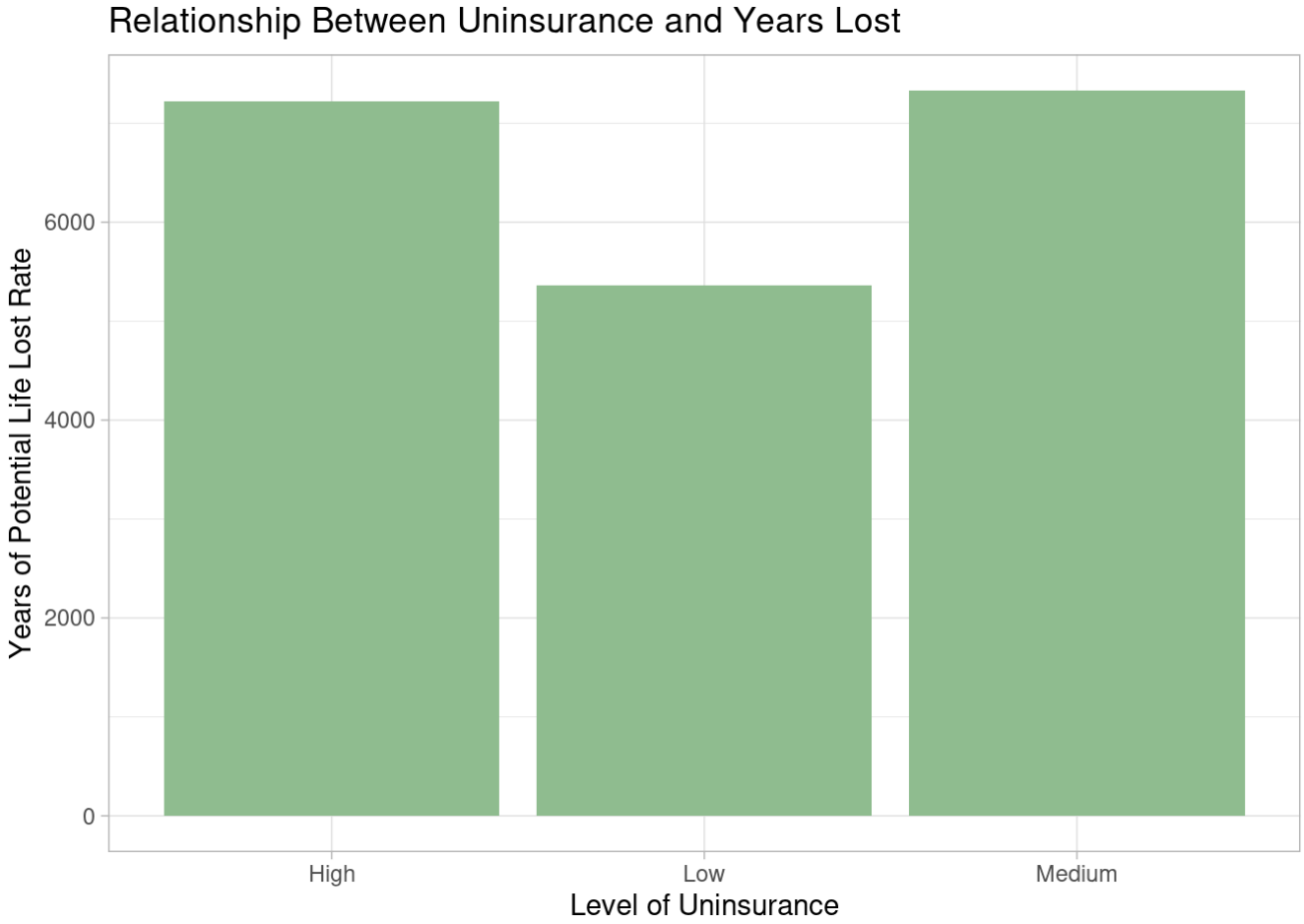


The percentage (proportion) table indicates that the healthcare facilities in Texas are 53.5% for-profit, 27.04% non-profit, and 19.43% public. The bar graph reflects this distribution, with for-profit facilities being the most common type of ownership.

Bar Graph

Explore how level of uninsurance in a county can affect the number of years of life potentially lost.

```
# ggplot to visualize relationship between uninsurance and years lost
texas %>%
  filter(Ownership != "Public") %>%
  group_by(Ownership) %>%
  arrange(`% Uninsured`) %>%
  mutate("Level of Uninsurance" = case_when(`% Uninsured` < 16.76 ~ 'Low',
                                            (`% Uninsured` > 16.76 & `% Uninsured` < 21.91)
~ 'Medium',
                                            (`% Uninsured` > 21.91) ~ 'High')) %>%
  ggplot(aes(x=`Level of Uninsurance`, y=`Years of Potential Life Lost Rate`)) +
  geom_bar(stat="summary", fun=mean, fill="darkseagreen") +
  labs(title = "Relationship Between Uninsurance and Years Lost") +
  theme_light()
```

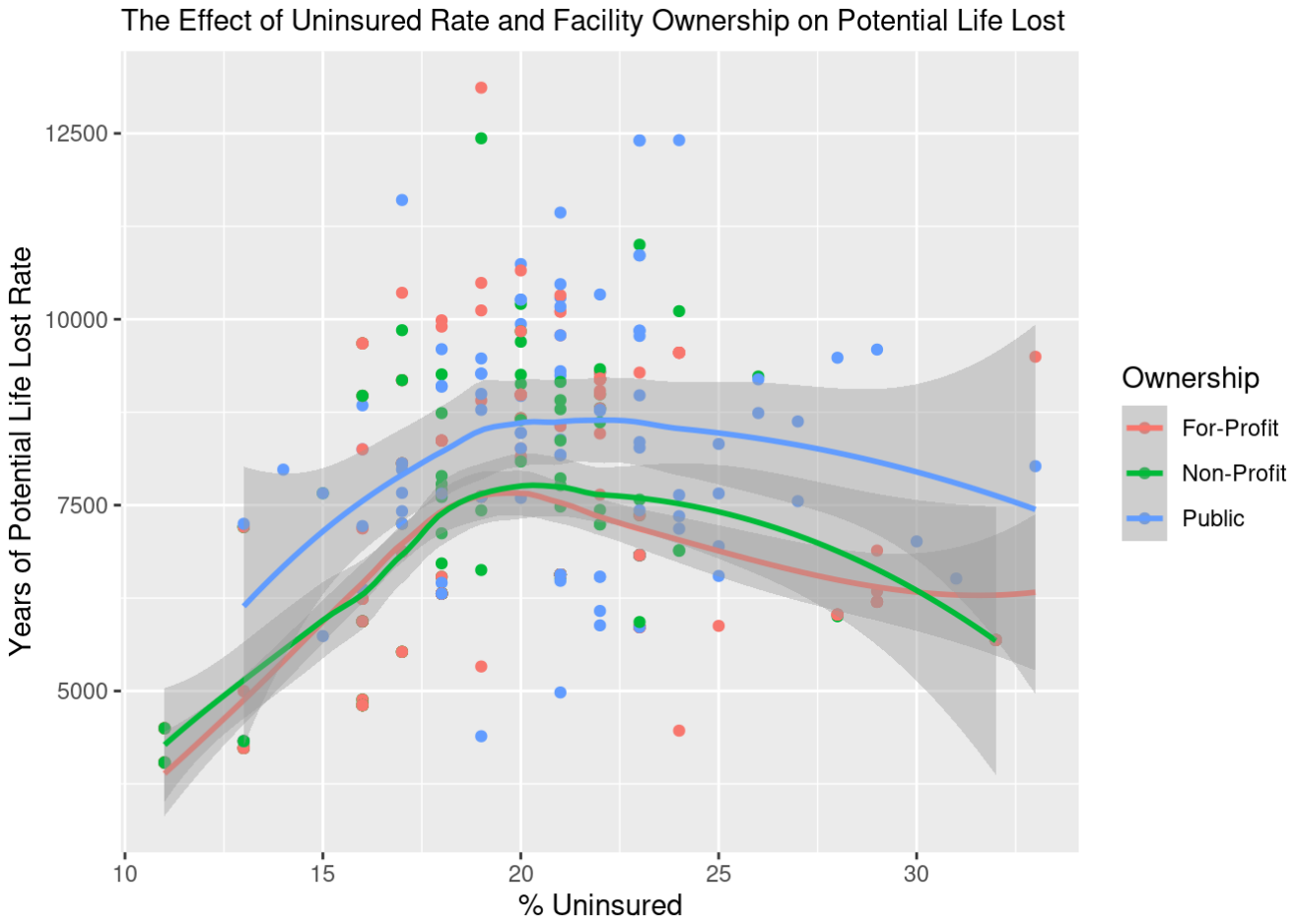


The bar graph above visualizes how the level of uninsurance affects the years of potential life lost. Counties with medium level of uninsurance (between 16.76% and 21.91%) have higher rates of loss than counties with low or high levels of uninsurance.

Scatterplot

Utilize a scatterplot to answer the research question: how uninsured rate and type of facility ownership affect the years of potential life lost rate.

```
# scatterplot for the research question
texas %>%
  group_by(Ownership) %>%
  ggplot(aes(x=`% Uninsured`, y=`Years of Potential Life Lost Rate`, color=Ownership)) +
  geom_point() +
  geom_smooth() +
  labs(subtitle="The Effect of Uninsured Rate and Facility Ownership on Potential Life Los
t")
```



This scatterplot indicates how public ownership of healthcare facilities generally has a much higher rate of loss than for-profit and non-profit ownership. For counties with less than approxiamately 20% uninsured rate, the uninsured rate and rate of loss generally have a positive correlation. Counties with greater than 20% uninsurance rate observe less loss with higher uninsurance rates. Moreover, these counties in this particular uninsurance range exhibit greater loss with of life with non-profit ownership compared to for-profit facilities.

Discussion

A county's healthcare facilities' ownership type and uninsured rate can affect health outcomes, which in turn affects the rate of years of potential life lost. According to the scatterplot, public facilities, compared to for-profit and non-profit facilities, are associated with higher rates of loss. This may indicate that the quality of healthcare given at public facilities may be of lower quality than for-profit and non-profit facilities. The bar graph counties in Texas with a medium level of uninsurance have the highest average rate of years lost. Lack of health insurance coverage can prevent patients from seeking necessary medical care, which may

negatively impact their health outcomes. Since counties with medium level of uninsurance have a higher rate of loss than counties with a high level, the counties with medium uninsurance may not have policies in place to adequately address those without coverage. Counties with high level of uninsurance may have policies or programs implemented that may correct for the effects of uninsurance such as free-healthcare clinics. This project was interesting in that the results, particularly the effect of uninsurance on years lost, contradicted my hypothesis. Determining a possible explanation required some further research. I believe more research is needed to understand all the contributing factors for the rate of years of potential life lost or to possibly consider other variables instead.

Acknowledgements: Dr. Guyot