CDC 500 Cities: Healthcare Access, Behaviors, and Health Outcomes

Stat 198 Final Project

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Description of Data

(Include description of how you edited the data)

Research Questions

1) Do cities with a greater lack of healthcare access have poorer mental health and/or physical health outcomes?

2)Does healthcare access, mental health, and/or physical health outcomes vary by state?

Variables of Interest

Explanatory Variables:

1) Healthcare Access for Adults (18+): Percent of City Population that Lacks Insurance, Percent of City Population with visits to doctor for routine checkup within the past year, Percent of City Population who have high blood pressure and are taking medicine for high blood pressure control.
2) Geographic Distribution by State

Response Variables:

1) Behavior for Adults (18+): Percent of city population currently smoking, percent of city population currently reporting binge drinking habits, percent of city population reporting No leisure-time physical activity
2) Health Outcomes for Adults (18+): Percent of city population with coronary heart disease, percent of population diagnosed with diabetes, percent of city population with kidney disease

Linear Regressions

Regressions for Healthcare Access and Behaviors Variables

Fit with Interaction Variables

1) Access Variables vs. Smoking

```
int_access_smoking_fit <- linear_reg() %>%
  set_engine("lm") %>%
  fit(smoking ~ insurance + visits_to_doctor + medicine_high_bp + (insurance * visits_to_doctor) + (insu
int_access_smoking_fit_aug <- augment(int_access_smoking_fit$fit)
tidy(int_access_smoking_fit) %>%
  print()
```

```
## # A tibble: 7 x 5
##   term                              estimate std.error statistic  p.value
##   <chr>                                <dbl>     <dbl>     <dbl>    <dbl>
## 1 (Intercept)                         88.9     24.0          3.70 2.41e- 4
## 2 insurance                            0.872    0.417        2.09 3.71e- 2
## 3 visits_to_doctor                    -2.13     0.362       -5.90 6.95e- 9
## 4 medicine_high_bp                    -0.756    0.463       -1.63 1.03e- 1
## 5 insurance:visits_to_doctor           0.0227   0.00634      3.59 3.69e- 4
## 6 insurance:medicine_high_bp          -0.0414   0.00628     -6.58 1.25e-10
## 7 visits_to_doctor:medicine_high_bp    0.0299   0.00667      4.48 9.60e- 6
```

```
glance(int_access_smoking_fit)$adj.r.squared %>%
  print()
```

```
## [1] 0.5691301
```

2) Access Variables vs. Binge Drinking

```
int_access_binge_drinking_fit <- linear_reg() %>%
  set_engine("lm") %>%
  fit(binge_drinking ~ insurance + visits_to_doctor + medicine_high_bp + (insurance * visits_to_doctor)
int_access_binge_drinking_fit_aug <- augment(int_access_binge_drinking_fit$fit)
tidy(int_access_binge_drinking_fit) %>%
  print()
```

```
## # A tibble: 7 x 5
##   term                                estimate std.error statistic  p.value
##   <chr>                                  <dbl>     <dbl>     <dbl>    <dbl>
## 1 (Intercept)                         -132.       17.8        -7.40  6.26e-13
## 2 insurance                             -0.125     0.309      -0.406 6.85e- 1
## 3 visits_to_doctor                       2.41      0.268       8.98  6.70e-18
## 4 medicine_high_bp                       2.54      0.344       7.38  7.12e-13
## 5 insurance:visits_to_doctor            -0.00655   0.00470    -1.39  1.64e- 1
## 6 insurance:medicine_high_bp             0.00686   0.00466     1.47  1.42e- 1
## 7 visits_to_doctor:medicine_high_bp     -0.0401    0.00495    -8.10  4.93e-15
```

```
glance(int_access_binge_drinking_fit)$adj.r.squared %>%
  print()
```

```
## [1] 0.3488416
```

3) Access Variables vs. Physical Activity

```
int_access_physical_activity_fit <- linear_reg() %>%
  set_engine("lm") %>%
  fit(physical_activity ~ insurance + visits_to_doctor + medicine_high_bp + (insurance * visits_to_docto
int_access_physical_activity_fit_aug <- augment(int_access_physical_activity_fit$fit)
tidy(int_access_physical_activity_fit) %>%
  print()
```

```
## # A tibble: 7 x 5
```

```
##   term                                estimate std.error statistic      p.value
##   <chr>                                  <dbl>     <dbl>     <dbl>        <dbl>
## 1 (Intercept)                          55.1       20.8       2.64  0.00845
## 2 insurance                             1.96       0.361     5.42  0.0000000972
## 3 visits_to_doctor                     -1.47       0.313    -4.69  0.00000361
## 4 medicine_high_bp                     -0.744      0.402    -1.85  0.0646
## 5 insurance:visits_to_doctor            0.000790   0.00549   0.144 0.886
## 6 insurance:medicine_high_bp           -0.0257     0.00545  -4.72  0.00000317
## 7 visits_to_doctor:medicine_high_bp     0.0271     0.00578   4.68  0.00000373
```

```
glance(int_access_physical_activity_fit)$adj.r.squared %>%
  print()
```

```
## [1] 0.8488063
```

Regressions for Healthcare Access and Health Outcomes

Fit with Interaction Variables

4) Access Variables vs. Heart Disease

```
int_access_heart_disease_fit <- linear_reg() %>%
  set_engine("lm") %>%
  fit(heart_disease ~ insurance + visits_to_doctor + medicine_high_bp + (insurance * visits_to_doctor) +
int_access_heart_disease_fit_aug <- augment(int_access_heart_disease_fit$fit)
tidy(int_access_heart_disease_fit) %>%
  print()
```

```
## # A tibble: 7 x 5
##   term                                estimate std.error statistic  p.value
##   <chr>                                  <dbl>     <dbl>     <dbl>    <dbl>
## 1 (Intercept)                          23.9       4.94       4.84 1.74e- 6
## 2 insurance                             0.352     0.0857     4.10 4.79e- 5
## 3 visits_to_doctor                     -0.480     0.0743    -6.46 2.70e-10
## 4 medicine_high_bp                     -0.289     0.0952    -3.04 2.52e- 3
## 5 insurance:visits_to_doctor            0.00239   0.00130    1.84 6.67e- 2
## 6 insurance:medicine_high_bp           -0.00780   0.00129   -6.04 3.19e- 9
## 7 visits_to_doctor:medicine_high_bp     0.00767   0.00137    5.59 3.80e- 8
```

```
glance(int_access_heart_disease_fit)$adj.r.squared %>%
  print()
```

```
## [1] 0.6667498
```

5) Access Variables vs. Diabetes

```
int_access_diabetes_fit <- linear_reg() %>%
  set_engine("lm") %>%
  fit(diabetes ~ insurance + visits_to_doctor + medicine_high_bp + (insurance * visits_to_doctor) + (ins
int_access_diabetes_fit_aug <- augment(int_access_diabetes_fit$fit)
tidy(int_access_diabetes_fit) %>%
  print()
```

```
## # A tibble: 7 x 5
##   term                                estimate std.error statistic  p.value
##   <chr>                                  <dbl>     <dbl>     <dbl>    <dbl>
## 1 (Intercept)                          69.9      11.4       6.12  1.97e- 9
## 2 insurance                             0.975     0.198     4.92  1.22e- 6
```

```
## 3 visits_to_doctor                  -1.07      0.172      -6.25  9.40e-10
## 4 medicine_high_bp                  -1.40      0.220      -6.36  4.72e-10
## 5 insurance:visits_to_doctor        -0.00935   0.00301    -3.10  2.03e- 3
## 6 insurance:medicine_high_bp        -0.00147   0.00299    -0.493 6.22e- 1
## 7 visits_to_doctor:medicine_high_bp  0.0230    0.00317     7.24  1.87e-12
```

```
glance(int_access_diabetes_fit)$adj.r.squared %>%
  print()
```

```
## [1] 0.7110294
```

6) Access Variables vs. Kidney Disease

```
int_access_kidney_disease_fit <- linear_reg() %>%
  set_engine("lm") %>%
  fit(kidney_disease ~ insurance + visits_to_doctor + medicine_high_bp + (insurance * visits_to_doctor)
int_access_kidney_disease_fit_aug <- augment(int_access_kidney_disease_fit$fit)
tidy(int_access_kidney_disease_fit) %>%
  print()
```

```
## # A tibble: 7 x 5
##   term                              estimate std.error statistic  p.value
##   <chr>                                <dbl>     <dbl>     <dbl>    <dbl>
## 1 (Intercept)                       22.9       2.50         9.16  1.63e-18
## 2 insurance                          0.198     0.0435       4.56  6.44e- 6
## 3 visits_to_doctor                  -0.361     0.0377      -9.57  6.10e-20
## 4 medicine_high_bp                  -0.372     0.0483      -7.70  8.53e-14
## 5 insurance:visits_to_doctor         0.000243  0.000661     0.368 7.13e- 1
## 6 insurance:medicine_high_bp        -0.00297   0.000655    -4.53  7.40e- 6
## 7 visits_to_doctor:medicine_high_bp  0.00646   0.000696     9.28  6.23e-19
```

```
glance(int_access_kidney_disease_fit)$adj.r.squared %>%
  print()
```

```
## [1] 0.6193093
```

Regression With Most Correlated Variables

ANOVA Testing

Initial Visualizations

Does (Insert Variable) Have Variation Across States?