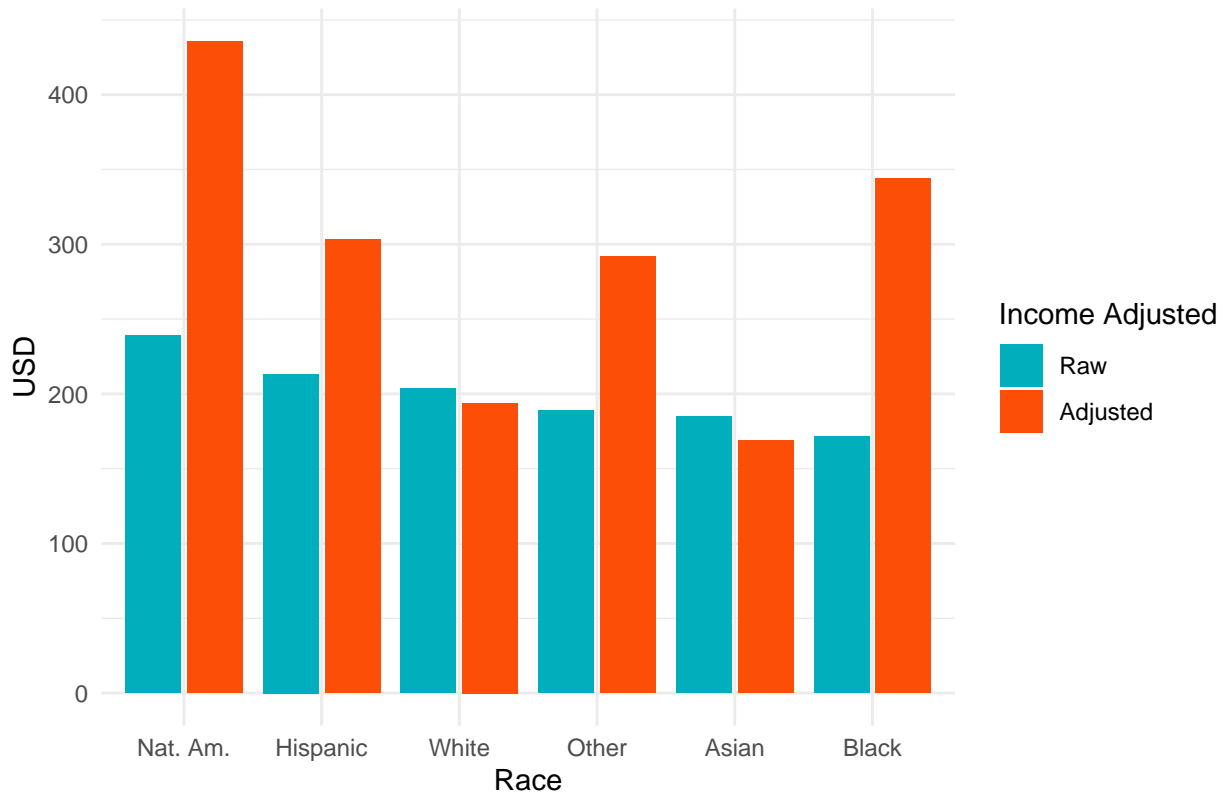# SEM Preliminary

Ryan Larson - UMN

01/21/2020

```r
#bar graph - median household income comes from ACS 2017 5-year estimates
adj <- data.frame(Race = c("Asian", "Black", "Hispanic", "Nat. Am.", "Other", "White"),
                  race_med_inc = c(71865, 32743, 46232, 36017, 42476, 69069),
                  ovr_med_inc = rep(65699, 6))

monsanc.short %>%
  select(race_impute, total_ff) %>%
  filter(!is.na(race_impute)) %>%
  mutate(Race = case_when(
    race_impute=="asian"~"Asian",
    race_impute=="black"~"Black",
    race_impute=="hispanic"~"Hispanic",
    race_impute=="nat. am."~"Nat. Am.",
    race_impute=="other"~"Other",
    race_impute=="white"~"White"
  )) %>%
  select(-race_impute) %>%
  left_join(adj, by = "Race")%>%
  mutate(race_adj = 1/(race_med_inc/ovr_med_inc)) %>%
  group_by(Race) %>%
  summarize(
    `Raw_USD`= mean(total_ff, na.rm = T),
    `Adjusted_USD` = mean(total_ff*race_adj, na.rm = T),
    `Raw_sd` = sd(total_ff, na.rm = T),
    `Adjusted_sd` = sd(total_ff*race_adj, na.rm=T)
  ) %>%
  gather(key = "variable", value= "value", -Race) %>%
  separate(variable, into = c("adjusted", "stat"), sep = "_") %>%
  spread(key = "stat", value = "value") %>%
  mutate(Race = factor(Race, levels =
                         c("Nat. Am.", "Hispanic", "White",
                           "Other", "Asian", "Black")),
         `Income Adjusted` = factor(adjusted, levels = c("Raw", "Adjusted"))) %>%
  select(-adjusted) %>%
ggplot()+
  geom_bar(aes(x=Race, y=USD, fill=`Income Adjusted`),
           stat="identity",
           position = position_dodge2())+
  labs(title = "Figure 1: Fine/Fee Orders by Race")+
  scale_fill_manual(values = c("#00AFBB", "#FC4E07"))+
  theme_minimal()
```

```
## Warning: Column `Race` joining character vector and factor, coercing into
## character vector
```

Figure 1: Fine/Fee Orders by Race


```r
#Multivariate Regression - when all predictors are identical across models
  #equivalent to separate OLS, but more efficient and takes into account error covariance


mv <- lm(cbind(total_ff_log, conf_days)~black+hispanic+asian+nativeam+other.race+
         male+log(age)+priors+trial_flag+felony+gross.mis+mis+drug+alcohol.dui+hunt.fish+othe
       data = monsanc.short)
summary(mv)
```

```
## Response total_ff_log :
##
## Call:
## lm(formula = total_ff_log ~ black + hispanic + asian + nativeam +
##     other.race + male + log(age) + priors + trial_flag + felony +
##     gross.mis + mis + drug + alcohol.dui + hunt.fish + other.offense,
##     data = monsanc.short)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -5.8284 -0.3779  0.1639  0.5443  3.1625
##
## Coefficients:
##                  Estimate Std. Error  t value Pr(>|t|)
```

```
## (Intercept)      5.246e+00  7.888e-03  665.048  < 2e-16 ***
## black            -2.216e-01  1.559e-03 -142.177  < 2e-16 ***
## hispanic         -3.171e-02  2.549e-03  -12.442  < 2e-16 ***
## asian            -7.035e-02  3.222e-03  -21.832  < 2e-16 ***
## nativeam         -1.194e-01  3.726e-03  -32.034  < 2e-16 ***
## other.race       -9.357e-02  4.617e-03  -20.266  < 2e-16 ***
## male              3.292e-02  1.383e-03   23.810  < 2e-16 ***
## log(age)         -2.134e-01  1.883e-03 -113.328  < 2e-16 ***
## priors           -9.095e-03  7.585e-05 -119.903  < 2e-16 ***
## trial_flagTRUE   -3.469e-01  7.715e-02   -4.496 6.93e-06 ***
## felony            7.958e-03  3.824e-03    2.081   0.0374 *
## gross.mis         6.318e-01  3.647e-03  173.237  < 2e-16 ***
## mis               5.782e-01  1.458e-03  396.454  < 2e-16 ***
## drug              4.177e-01  5.391e-03   77.470  < 2e-16 ***
## alcohol.dui       5.434e-01  4.838e-03  112.319  < 2e-16 ***
## hunt.fish         5.534e-02  1.076e-02    5.145 2.67e-07 ***
## other.offense     2.360e-01  4.297e-03   54.932  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.08 on 2877545 degrees of freedom
##   (2684421 observations deleted due to missingness)
## Multiple R-squared:  0.1022, Adjusted R-squared:  0.1022
## F-statistic: 2.047e+04 on 16 and 2877545 DF,  p-value: < 2.2e-16
##
##
## Response conf_days :
##
## Call:
## lm(formula = conf_days ~ black + hispanic + asian + nativeam +
##     other.race + male + log(age) + priors + trial_flag + felony +
##     gross.mis + mis + drug + alcohol.dui + hunt.fish + other.offense,
##     data = monsanc.short)
##
## Residuals:
##    Min     1Q Median     3Q    Max
##  -1510     -8     -1      5  43567
##
## Coefficients:
##                Estimate Std. Error  t value Pr(>|t|)
## (Intercept)    100.39923    1.59715   62.862   <2e-16 ***
## black            6.74728    0.31555   21.383   <2e-16 ***
## hispanic         4.78489    0.51600    9.273   <2e-16 ***
## asian            1.31279    0.65243    2.012   0.0442 *
## nativeam        12.36508    0.75439   16.391   <2e-16 ***
## other.race       1.16735    0.93481    1.249   0.2118
## male             7.32325    0.27991   26.163   <2e-16 ***
## log(age)         7.59680    0.38130   19.923   <2e-16 ***
```

```
## priors             0.51144   0.01536   33.301   <2e-16 ***
## trial_flagTRUE  983.61134  15.62130   62.966   <2e-16 ***
## felony           380.86411   0.77415  491.974   <2e-16 ***
## gross.mis        176.02999   0.73844  238.381   <2e-16 ***
## mis                6.33222   0.29529   21.444   <2e-16 ***
## drug            -153.91101   1.09160 -140.996   <2e-16 ***
## alcohol.dui      -94.19130   0.97961  -96.152   <2e-16 ***
## hunt.fish       -142.64866   2.17760  -65.507   <2e-16 ***
## other.offense   -137.76499   0.86999 -158.352   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 218.7 on 2877545 degrees of freedom
##   (2684421 observations deleted due to missingness)
## Multiple R-squared:  0.1609, Adjusted R-squared:  0.1609
## F-statistic: 3.449e+04 on 16 and 2877545 DF,  p-value: < 2.2e-16
```

```r
#multivariate fixed effects regression
mv.fe <- lm(cbind(total_ff_log, conf_days)~black+hispanic+asian+nativeam+other.race+
        male+log(age)+priors+trial_flag+felony+gross.mis+mis+drug+alcohol.dui+hunt.fish+othe
        as.factor(filed_county)+as.factor(sentence_year), data = monsanc.short)
summary(mv.fe)
```

```
## Response total_ff_log :
##
## Call:
## lm(formula = total_ff_log ~ black + hispanic + asian + nativeam +
##     other.race + male + log(age) + priors + trial_flag + felony +
##     gross.mis + mis + drug + alcohol.dui + hunt.fish + other.offense +
##     as.factor(filed_county) + as.factor(sentence_year), data = monsanc.short)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -6.4584 -0.3800  0.1062  0.5658  3.2661
##
## Coefficients:
##                                          Estimate Std. Error  t value
## (Intercept)                             5.473e+00  1.502e-02  364.366
## black                                  -9.478e-02  1.616e-03  -58.655
## hispanic                                1.339e-02  2.534e-03    5.285
## asian                                   6.475e-03  3.209e-03    2.018
## nativeam                               -1.920e-01  3.832e-03  -50.119
## other.race                             -1.482e-02  4.548e-03   -3.258
## male                                    2.485e-02  1.362e-03   18.251
## log(age)                               -1.595e-01  1.868e-03  -85.400
## priors                                 -7.718e-03  7.633e-05 -101.102
## trial_flagTRUE                         -2.880e-01  7.585e-02   -3.798
## felony                                 -1.376e-01  3.803e-03  -36.183
```

```
## gross.mis                                            5.202e-01  3.617e-03  143.841
## mis                                                  4.788e-01  1.493e-03  320.660
## drug                                                 3.972e-01  5.302e-03   74.918
## alcohol.dui                                          5.432e-01  4.758e-03  114.170
## hunt.fish                                           -4.428e-02  1.065e-02   -4.157
## other.offense                                        2.679e-01  4.226e-03   63.405
## as.factor(filed_county)Anoka County                -5.371e-01  1.317e-02  -40.768
## as.factor(filed_county)Becker County                1.981e-01  1.615e-02   12.269
## as.factor(filed_county)Beltrami County             -1.651e-01  1.484e-02  -11.131
## as.factor(filed_county)Benton County               -2.460e-01  1.721e-02  -14.296
## as.factor(filed_county)Big Stone County            -9.094e-02  3.537e-02   -2.571
## as.factor(filed_county)Blue Earth County           -1.934e-01  1.414e-02  -13.674
## as.factor(filed_county)Brown County                -1.523e-01  1.814e-02   -8.398
## as.factor(filed_county)Carlton County              -9.035e-02  1.566e-02   -5.770
## as.factor(filed_county)Carver County               -7.519e-02  1.451e-02   -5.182
## as.factor(filed_county)Cass County                 -3.508e-01  1.697e-02  -20.678
## as.factor(filed_county)Chippewa County             -6.991e-02  2.238e-02   -3.123
## as.factor(filed_county)Chisago County              -4.002e-01  1.540e-02  -25.994
## as.factor(filed_county)Clay County                 -1.689e-02  1.444e-02   -1.170
## as.factor(filed_county)Clearwater County           -1.490e-01  2.752e-02   -5.413
## as.factor(filed_county)Cook County                 -2.426e-01  2.840e-02   -8.544
## as.factor(filed_county)Cottonwood County           -1.281e-01  2.384e-02   -5.375
## as.factor(filed_county)Crow Wing County            -1.583e-01  1.462e-02  -10.830
## as.factor(filed_county)Dakota County               -2.661e-01  1.305e-02  -20.383
## as.factor(filed_county)Dodge County                -5.173e-01  2.006e-02  -25.782
## as.factor(filed_county)Douglas County              -7.632e-04  1.694e-02   -0.045
## as.factor(filed_county)Faribault County            -4.526e-02  2.164e-02   -2.092
## as.factor(filed_county)Fillmore County             -1.661e-01  2.117e-02   -7.848
## as.factor(filed_county)Freeborn County             -3.080e-01  1.626e-02  -18.946
## as.factor(filed_county)Goodhue County              -3.655e-01  1.450e-02  -25.206
## as.factor(filed_county)Grant County                -8.957e-02  3.007e-02   -2.979
## as.factor(filed_county)Hennepin County             -6.491e-01  1.283e-02  -50.584
## as.factor(filed_county)Houston County              -3.066e-01  2.011e-02  -15.247
## as.factor(filed_county)Hubbard County              -1.984e-01  1.849e-02  -10.730
## as.factor(filed_county)Isanti County               -2.748e-01  1.670e-02  -16.453
## as.factor(filed_county)Itasca County               -1.288e-01  1.513e-02   -8.517
## as.factor(filed_county)Jackson County              -9.315e-02  2.403e-02   -3.876
## as.factor(filed_county)Kanabec County              -1.794e-01  1.927e-02   -9.309
## as.factor(filed_county)Kandiyohi County            -1.272e-01  1.556e-02   -8.179
## as.factor(filed_county)Kittson County              -3.380e-02  4.471e-02   -0.756
## as.factor(filed_county)Koochiching County          -5.536e-01  2.254e-02  -24.560
## as.factor(filed_county)Lac qui Parle County        -1.325e-01  3.143e-02   -4.216
## as.factor(filed_county)Lake County                 -1.594e-01  2.335e-02   -6.828
## as.factor(filed_county)Lake of the Woods County    -3.057e-01  2.993e-02  -10.212
## as.factor(filed_county)LeSueur County              -2.187e-01  1.802e-02  -12.139
## as.factor(filed_county)Lincoln County              -4.125e-02  3.631e-02   -1.136
## as.factor(filed_county)Lyon County                 -1.690e-01  1.733e-02   -9.752
## as.factor(filed_county)Mahnomen County             -1.557e-01  2.213e-02   -7.036
```

```
## as.factor(filed_county)Marshall County            -7.820e-02  2.851e-02   -2.743
## as.factor(filed_county)Martin County              -2.936e-01  1.806e-02  -16.255
## as.factor(filed_county)McLeod County              -3.604e-01  1.613e-02  -22.337
## as.factor(filed_county)Meeker County              -2.875e-02  2.153e-02   -1.335
## as.factor(filed_county)Mille Lacs County           7.646e-02  1.638e-02    4.668
## as.factor(filed_county)Morrison County            -9.711e-02  1.686e-02   -5.759
## as.factor(filed_county)Mower County               -1.614e-01  1.582e-02  -10.198
## as.factor(filed_county)Murray County              -3.237e-03  3.143e-02   -0.103
## as.factor(filed_county)Nicollet County            -1.735e-01  1.621e-02  -10.702
## as.factor(filed_county)Nobles County              -1.328e-01  1.866e-02   -7.118
## as.factor(filed_county)Norman County              -6.907e-02  2.927e-02   -2.360
## as.factor(filed_county)Olmsted County             -4.255e-01  1.373e-02  -30.999
## as.factor(filed_county)Otter Tail County           7.012e-02  1.560e-02    4.495
## as.factor(filed_county)Pennington County          -3.749e-01  2.086e-02  -17.977
## as.factor(filed_county)Pine County                -3.154e-01  1.729e-02  -18.242
## as.factor(filed_county)Pipestone County           -6.872e-02  2.814e-02   -2.442
## as.factor(filed_county)Polk County                -8.738e-02  1.656e-02   -5.276
## as.factor(filed_county)Pope County                -1.140e-01  2.429e-02   -4.693
## as.factor(filed_county)Ramsey County              -4.649e-01  1.287e-02  -36.113
## as.factor(filed_county)Red Lake County            -4.584e-01  3.321e-02  -13.802
## as.factor(filed_county)Redwood County              1.165e-02  1.912e-02    0.609
## as.factor(filed_county)Renville County            -5.196e-01  1.938e-02  -26.811
## as.factor(filed_county)Rice County                -8.075e-02  1.500e-02   -5.385
## as.factor(filed_county)Rock County                -1.001e-01  2.947e-02   -3.399
## as.factor(filed_county)Roseau County              -1.016e-01  1.936e-02   -5.248
## as.factor(filed_county)Scott County               -1.818e-01  1.344e-02  -13.521
## as.factor(filed_county)Sherburne County           -2.462e-01  1.441e-02  -17.088
## as.factor(filed_county)Sibley County              -3.308e-01  1.992e-02  -16.604
## as.factor(filed_county)St. Louis County           -1.854e-01  1.335e-02  -13.884
## as.factor(filed_county)Stearns County             -6.067e-02  1.344e-02   -4.513
## as.factor(filed_county)Steele County              -4.839e-02  1.549e-02   -3.124
## as.factor(filed_county)Stevens County             -2.094e-01  2.738e-02   -7.649
## as.factor(filed_county)Swift County               -8.876e-02  2.307e-02   -3.847
## as.factor(filed_county)Todd County                 3.819e-02  1.943e-02    1.966
## as.factor(filed_county)Traverse County            -3.977e-01  4.157e-02   -9.566
## as.factor(filed_county)Wabasha County             -3.816e-01  1.837e-02  -20.778
## as.factor(filed_county)Wadena County              -1.387e-02  2.071e-02   -0.670
## as.factor(filed_county)Waseca County              -3.429e-01  2.055e-02  -16.687
## as.factor(filed_county)Washington County          -2.256e-01  1.334e-02  -16.915
## as.factor(filed_county)Watonwan County            -2.051e-02  2.146e-02   -0.956
## as.factor(filed_county)Wilkin County              -1.401e-01  2.361e-02   -5.931
## as.factor(filed_county)Winona County              -3.755e-01  1.556e-02  -24.131
## as.factor(filed_county)Wright County              -4.412e-01  1.409e-02  -31.318
## as.factor(filed_county)Yellow Medicine County     -5.576e-03  2.325e-02   -0.240
## as.factor(sentence_year)2011                      -7.229e-03  2.084e-03   -3.469
## as.factor(sentence_year)2012                      -3.300e-02  2.109e-03  -15.645
## as.factor(sentence_year)2013                      -3.429e-02  2.194e-03  -15.632
## as.factor(sentence_year)2014                      -1.893e-02  2.147e-03   -8.815
```

```
## as.factor(sentence_year)2015                          2.251e-02  2.195e-03  10.252
## as.factor(sentence_year)2016                          1.132e-01  3.610e-03  31.342
## as.factor(sentence_year)2017                          3.459e-01  7.748e-03  44.649
## as.factor(sentence_year)2018                          5.087e-01  1.195e-02  42.582
##                                                        Pr(>|t|)
## (Intercept)                                            < 2e-16 ***
## black                                                  < 2e-16 ***
## hispanic                                               1.26e-07 ***
## asian                                                  0.043636 *
## nativeam                                               < 2e-16 ***
## other.race                                             0.001121 **
## male                                                   < 2e-16 ***
## log(age)                                               < 2e-16 ***
## priors                                                 < 2e-16 ***
## trial_flagTRUE                                         0.000146 ***
## felony                                                 < 2e-16 ***
## gross.mis                                              < 2e-16 ***
## mis                                                    < 2e-16 ***
## drug                                                   < 2e-16 ***
## alcohol.dui                                            < 2e-16 ***
## hunt.fish                                              3.23e-05 ***
## other.offense                                          < 2e-16 ***
## as.factor(filed_county)Anoka County                    < 2e-16 ***
## as.factor(filed_county)Becker County                   < 2e-16 ***
## as.factor(filed_county)Beltrami County                 < 2e-16 ***
## as.factor(filed_county)Benton County                   < 2e-16 ***
## as.factor(filed_county)Big Stone County                0.010143 *
## as.factor(filed_county)Blue Earth County               < 2e-16 ***
## as.factor(filed_county)Brown County                    < 2e-16 ***
## as.factor(filed_county)Carlton County                  7.94e-09 ***
## as.factor(filed_county)Carver County                   2.19e-07 ***
## as.factor(filed_county)Cass County                     < 2e-16 ***
## as.factor(filed_county)Chippewa County                 0.001788 **
## as.factor(filed_county)Chisago County                  < 2e-16 ***
## as.factor(filed_county)Clay County                     0.242056
## as.factor(filed_county)Clearwater County               6.18e-08 ***
## as.factor(filed_county)Cook County                     < 2e-16 ***
## as.factor(filed_county)Cottonwood County               7.66e-08 ***
## as.factor(filed_county)Crow Wing County                < 2e-16 ***
## as.factor(filed_county)Dakota County                   < 2e-16 ***
## as.factor(filed_county)Dodge County                    < 2e-16 ***
## as.factor(filed_county)Douglas County                  0.964075
## as.factor(filed_county)Faribault County                0.036440 *
## as.factor(filed_county)Fillmore County                 4.24e-15 ***
## as.factor(filed_county)Freeborn County                 < 2e-16 ***
## as.factor(filed_county)Goodhue County                  < 2e-16 ***
## as.factor(filed_county)Grant County                    0.002893 **
## as.factor(filed_county)Hennepin County                 < 2e-16 ***
```

```
## as.factor(filed_county)Houston County           < 2e-16 ***
## as.factor(filed_county)Hubbard County           < 2e-16 ***
## as.factor(filed_county)Isanti County            < 2e-16 ***
## as.factor(filed_county)Itasca County            < 2e-16 ***
## as.factor(filed_county)Jackson County          0.000106 ***
## as.factor(filed_county)Kanabec County           < 2e-16 ***
## as.factor(filed_county)Kandiyohi County        2.87e-16 ***
## as.factor(filed_county)Kittson County          0.449666
## as.factor(filed_county)Koochiching County       < 2e-16 ***
## as.factor(filed_county)Lac qui Parle County    2.49e-05 ***
## as.factor(filed_county)Lake County             8.61e-12 ***
## as.factor(filed_county)Lake of the Woods County < 2e-16 ***
## as.factor(filed_county)LeSueur County           < 2e-16 ***
## as.factor(filed_county)Lincoln County          0.255868
## as.factor(filed_county)Lyon County              < 2e-16 ***
## as.factor(filed_county)Mahnomen County         1.98e-12 ***
## as.factor(filed_county)Marshall County         0.006096 **
## as.factor(filed_county)Martin County            < 2e-16 ***
## as.factor(filed_county)McLeod County            < 2e-16 ***
## as.factor(filed_county)Meeker County           0.181795
## as.factor(filed_county)Mille Lacs County       3.04e-06 ***
## as.factor(filed_county)Morrison County         8.47e-09 ***
## as.factor(filed_county)Mower County             < 2e-16 ***
## as.factor(filed_county)Murray County           0.917981
## as.factor(filed_county)Nicollet County          < 2e-16 ***
## as.factor(filed_county)Nobles County           1.10e-12 ***
## as.factor(filed_county)Norman County           0.018281 *
## as.factor(filed_county)Olmsted County           < 2e-16 ***
## as.factor(filed_county)Otter Tail County       6.96e-06 ***
## as.factor(filed_county)Pennington County        < 2e-16 ***
## as.factor(filed_county)Pine County              < 2e-16 ***
## as.factor(filed_county)Pipestone County        0.014588 *
## as.factor(filed_county)Polk County             1.32e-07 ***
## as.factor(filed_county)Pope County             2.69e-06 ***
## as.factor(filed_county)Ramsey County            < 2e-16 ***
## as.factor(filed_county)Red Lake County          < 2e-16 ***
## as.factor(filed_county)Redwood County          0.542417
## as.factor(filed_county)Renville County          < 2e-16 ***
## as.factor(filed_county)Rice County             7.24e-08 ***
## as.factor(filed_county)Rock County             0.000677 ***
## as.factor(filed_county)Roseau County           1.54e-07 ***
## as.factor(filed_county)Scott County             < 2e-16 ***
## as.factor(filed_county)Sherburne County         < 2e-16 ***
## as.factor(filed_county)Sibley County            < 2e-16 ***
## as.factor(filed_county)St. Louis County         < 2e-16 ***
## as.factor(filed_county)Stearns County          6.40e-06 ***
## as.factor(filed_county)Steele County           0.001786 **
## as.factor(filed_county)Stevens County          2.03e-14 ***
```

```
## as.factor(filed_county)Swift County              0.000119 ***
## as.factor(filed_county)Todd County               0.049345 *
## as.factor(filed_county)Traverse County            < 2e-16 ***
## as.factor(filed_county)Wabasha County             < 2e-16 ***
## as.factor(filed_county)Wadena County             0.503107
## as.factor(filed_county)Waseca County              < 2e-16 ***
## as.factor(filed_county)Washington County          < 2e-16 ***
## as.factor(filed_county)Watonwan County           0.339160
## as.factor(filed_county)Wilkin County             3.02e-09 ***
## as.factor(filed_county)Winona County              < 2e-16 ***
## as.factor(filed_county)Wright County              < 2e-16 ***
## as.factor(filed_county)Yellow Medicine County    0.810486
## as.factor(sentence_year)2011                     0.000523 ***
## as.factor(sentence_year)2012                      < 2e-16 ***
## as.factor(sentence_year)2013                      < 2e-16 ***
## as.factor(sentence_year)2014                      < 2e-16 ***
## as.factor(sentence_year)2015                      < 2e-16 ***
## as.factor(sentence_year)2016                      < 2e-16 ***
## as.factor(sentence_year)2017                      < 2e-16 ***
## as.factor(sentence_year)2018                      < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.061 on 2877451 degrees of freedom
##   (2684421 observations deleted due to missingness)
## Multiple R-squared:  0.1337, Adjusted R-squared:  0.1336
## F-statistic:  4036 on 110 and 2877451 DF,  p-value: < 2.2e-16
##
##
## Response conf_days :
##
## Call:
## lm(formula = conf_days ~ black + hispanic + asian + nativeam +
##     other.race + male + log(age) + priors + trial_flag + felony +
##     gross.mis + mis + drug + alcohol.dui + hunt.fish + other.offense +
##     as.factor(filed_county) + as.factor(sentence_year), data = monsanc.short)
##
## Residuals:
##    Min     1Q Median     3Q    Max
##  -1507    -10     -2      7  43562
##
## Coefficients:
##                                       Estimate Std. Error  t value
## (Intercept)                          111.30811    3.09271   35.991
## black                                  6.15171    0.33272   18.489
## hispanic                               5.46287    0.52175   10.470
## asian                                  1.75866    0.66084    2.661
## nativeam                               7.12361    0.78896    9.029
```

```
## other.race                                          1.10872   0.93651    1.184
## male                                                7.33467   0.28039   26.158
## log(age)                                            7.51858   0.38466   19.546
## priors                                              0.50743   0.01572   32.284
## trial_flagTRUE                                     975.81524  15.61712   62.484
## felony                                             380.04341   0.78298  485.381
## gross.mis                                          175.75999   0.74470  236.015
## mis                                                  6.32514   0.30744   20.574
## drug                                              -153.67047   1.09165 -140.769
## alcohol.dui                                        -94.28690   0.97963  -96.247
## hunt.fish                                         -143.67083   2.19374  -65.491
## other.offense                                     -137.68755   0.87016 -158.233
## as.factor(filed_county)Anoka County                 -8.75691   2.71262   -3.228
## as.factor(filed_county)Becker County                13.58327   3.32479    4.085
## as.factor(filed_county)Beltrami County               7.69595   3.05472    2.519
## as.factor(filed_county)Benton County                 5.72234   3.54394    1.615
## as.factor(filed_county)Big Stone County            -15.46305   7.28369   -2.123
## as.factor(filed_county)Blue Earth County           -28.24897   2.91254   -9.699
## as.factor(filed_county)Brown County                -14.55686   3.73436   -3.898
## as.factor(filed_county)Carlton County              -14.60754   3.22434   -4.530
## as.factor(filed_county)Carver County               -28.50001   2.98771   -9.539
## as.factor(filed_county)Cass County                  -0.13143   3.49357   -0.038
## as.factor(filed_county)Chippewa County             -13.74085   4.60885   -2.981
## as.factor(filed_county)Chisago County              -11.15767   3.16999   -3.520
## as.factor(filed_county)Clay County                   0.25196   2.97290    0.085
## as.factor(filed_county)Clearwater County             2.79717   5.66743    0.494
## as.factor(filed_county)Cook County                  -1.37104   5.84793   -0.234
## as.factor(filed_county)Cottonwood County            -1.68502   4.90824   -0.343
## as.factor(filed_county)Crow Wing County             -3.47308   3.00942   -1.154
## as.factor(filed_county)Dakota County               -22.23235   2.68796   -8.271
## as.factor(filed_county)Dodge County                -34.39507   4.13142   -8.325
## as.factor(filed_county)Douglas County               -8.80665   3.48903   -2.524
## as.factor(filed_county)Faribault County            -18.82738   4.45505   -4.226
## as.factor(filed_county)Fillmore County              -2.06891   4.35944   -0.475
## as.factor(filed_county)Freeborn County             -21.05428   3.34736   -6.290
## as.factor(filed_county)Goodhue County              -39.99666   2.98538  -13.398
## as.factor(filed_county)Grant County                -20.41937   6.19167   -3.298
## as.factor(filed_county)Hennepin County              -9.22386   2.64217   -3.491
## as.factor(filed_county)Houston County              -26.44885   4.14111   -6.387
## as.factor(filed_county)Hubbard County                3.29139   3.80762    0.864
## as.factor(filed_county)Isanti County                -9.96868   3.43944   -2.898
## as.factor(filed_county)Itasca County                 2.29388   3.11498    0.736
## as.factor(filed_county)Jackson County              -17.72716   4.94790   -3.583
## as.factor(filed_county)Kanabec County              -15.32627   3.96731   -3.863
## as.factor(filed_county)Kandiyohi County             -3.43868   3.20343   -1.073
## as.factor(filed_county)Kittson County              -29.87624   9.20561   -3.245
## as.factor(filed_county)Koochiching County           -9.92291   4.64110   -2.138
## as.factor(filed_county)Lac qui Parle County        -17.92744   6.47218   -2.770
```

```
## as.factor(filed_county)Lake County                 -10.08994    4.80796    -2.099
## as.factor(filed_county)Lake of the Woods County    -10.74312    6.16306    -1.743
## as.factor(filed_county)LeSueur County              -36.78036    3.71029    -9.913
## as.factor(filed_county)Lincoln County               10.48569    7.47614     1.403
## as.factor(filed_county)Lyon County                  10.55041    3.56822     2.957
## as.factor(filed_county)Mahnomen County              -9.10182    4.55738    -1.997
## as.factor(filed_county)Marshall County               5.42195    5.87093     0.924
## as.factor(filed_county)Martin County                -9.41515    3.71925    -2.531
## as.factor(filed_county)McLeod County               -32.82035    3.32208    -9.879
## as.factor(filed_county)Meeker County               -11.50394    4.43371    -2.595
## as.factor(filed_county)Mille Lacs County             1.18790    3.37277     0.352
## as.factor(filed_county)Morrison County              -6.81104    3.47208    -1.962
## as.factor(filed_county)Mower County                 -6.17540    3.25834    -1.895
## as.factor(filed_county)Murray County               -39.98942    6.47227    -6.179
## as.factor(filed_county)Nicollet County             -16.46866    3.33836    -4.933
## as.factor(filed_county)Nobles County                -8.79636    3.84155    -2.290
## as.factor(filed_county)Norman County                -6.40208    6.02693    -1.062
## as.factor(filed_county)Olmsted County              -22.39738    2.82645    -7.924
## as.factor(filed_county)Otter Tail County           -12.96294    3.21210    -4.036
## as.factor(filed_county)Pennington County             8.58909    4.29457     2.000
## as.factor(filed_county)Pine County                 -13.06693    3.56029    -3.670
## as.factor(filed_county)Pipestone County            -39.50197    5.79374    -6.818
## as.factor(filed_county)Polk County                  64.95312    3.40993    19.048
## as.factor(filed_county)Pope County                 -19.41124    5.00197    -3.881
## as.factor(filed_county)Ramsey County                -8.56580    2.65091    -3.231
## as.factor(filed_county)Red Lake County             -14.14584    6.83920    -2.068
## as.factor(filed_county)Redwood County               -0.78700    3.93747    -0.200
## as.factor(filed_county)Renville County             -16.76265    3.99054    -4.201
## as.factor(filed_county)Rice County                  -5.19605    3.08771    -1.683
## as.factor(filed_county)Rock County                 -31.48455    6.06724    -5.189
## as.factor(filed_county)Roseau County               -16.28021    3.98661    -4.084
## as.factor(filed_county)Scott County                -28.29504    2.76836   -10.221
## as.factor(filed_county)Sherburne County              6.08309    2.96715     2.050
## as.factor(filed_county)Sibley County               -37.22147    4.10265    -9.073
## as.factor(filed_county)St. Louis County             -2.96399    2.74987    -1.078
## as.factor(filed_county)Stearns County                8.80366    2.76825     3.180
## as.factor(filed_county)Steele County                -7.56358    3.19018    -2.371
## as.factor(filed_county)Stevens County              -19.07585    5.63691    -3.384
## as.factor(filed_county)Swift County                -16.98553    4.75016    -3.576
## as.factor(filed_county)Todd County                 -11.64844    4.00027    -2.912
## as.factor(filed_county)Traverse County             -31.01443    8.55982    -3.623
## as.factor(filed_county)Wabasha County              -37.74792    3.78155    -9.982
## as.factor(filed_county)Wadena County                -7.05284    4.26374    -1.654
## as.factor(filed_county)Waseca County                -9.83473    4.23126    -2.324
## as.factor(filed_county)Washington County            -3.95288    2.74633    -1.439
## as.factor(filed_county)Watonwan County             -18.29785    4.41777    -4.142
## as.factor(filed_county)Wilkin County               -16.03598    4.86248    -3.298
## as.factor(filed_county)Winona County               -34.92740    3.20374   -10.902
```

```
## as.factor(filed_county)Wright County              -6.71422    2.90077   -2.315
## as.factor(filed_county)Yellow Medicine County     -0.51502    4.78793   -0.108
## as.factor(sentence_year)2011                       -0.78905    0.42908   -1.839
## as.factor(sentence_year)2012                       -0.02371    0.43429   -0.055
## as.factor(sentence_year)2013                       -0.66297    0.45174   -1.468
## as.factor(sentence_year)2014                       -1.76636    0.44218   -3.995
## as.factor(sentence_year)2015                       -2.13511    0.45201   -4.724
## as.factor(sentence_year)2016                        4.68437    0.74338    6.301
## as.factor(sentence_year)2017                       19.40041    1.59530   12.161
## as.factor(sentence_year)2018                        5.49269    2.46007    2.233
##                                                 Pr(>|t|)
## (Intercept)                                      < 2e-16 ***
## black                                            < 2e-16 ***
## hispanic                                         < 2e-16 ***
## asian                                           0.007786 **
## nativeam                                         < 2e-16 ***
## other.race                                      0.236461
## male                                             < 2e-16 ***
## log(age)                                         < 2e-16 ***
## priors                                           < 2e-16 ***
## trial_flagTRUE                                   < 2e-16 ***
## felony                                           < 2e-16 ***
## gross.mis                                        < 2e-16 ***
## mis                                              < 2e-16 ***
## drug                                             < 2e-16 ***
## alcohol.dui                                      < 2e-16 ***
## hunt.fish                                        < 2e-16 ***
## other.offense                                    < 2e-16 ***
## as.factor(filed_county)Anoka County             0.001246 **
## as.factor(filed_county)Becker County            4.40e-05 ***
## as.factor(filed_county)Beltrami County          0.011757 *
## as.factor(filed_county)Benton County            0.106379
## as.factor(filed_county)Big Stone County         0.033757 *
## as.factor(filed_county)Blue Earth County         < 2e-16 ***
## as.factor(filed_county)Brown County             9.70e-05 ***
## as.factor(filed_county)Carlton County           5.89e-06 ***
## as.factor(filed_county)Carver County             < 2e-16 ***
## as.factor(filed_county)Cass County              0.969991
## as.factor(filed_county)Chippewa County          0.002869 **
## as.factor(filed_county)Chisago County           0.000432 ***
## as.factor(filed_county)Clay County              0.932459
## as.factor(filed_county)Clearwater County        0.621623
## as.factor(filed_county)Cook County              0.814636
## as.factor(filed_county)Cottonwood County        0.731370
## as.factor(filed_county)Crow Wing County         0.248470
## as.factor(filed_county)Dakota County             < 2e-16 ***
## as.factor(filed_county)Dodge County              < 2e-16 ***
## as.factor(filed_county)Douglas County           0.011600 *
```

```
## as.factor(filed_county)Faribault County        2.38e-05 ***
## as.factor(filed_county)Fillmore County         0.635085
## as.factor(filed_county)Freeborn County         3.18e-10 ***
## as.factor(filed_county)Goodhue County           < 2e-16 ***
## as.factor(filed_county)Grant County            0.000974 ***
## as.factor(filed_county)Hennepin County         0.000481 ***
## as.factor(filed_county)Houston County          1.69e-10 ***
## as.factor(filed_county)Hubbard County          0.387356
## as.factor(filed_county)Isanti County           0.003751 **
## as.factor(filed_county)Itasca County           0.461485
## as.factor(filed_county)Jackson County          0.000340 ***
## as.factor(filed_county)Kanabec County          0.000112 ***
## as.factor(filed_county)Kandiyohi County        0.283075
## as.factor(filed_county)Kittson County          0.001173 **
## as.factor(filed_county)Koochiching County      0.032513 *
## as.factor(filed_county)Lac qui Parle County    0.005607 **
## as.factor(filed_county)Lake County             0.035853 *
## as.factor(filed_county)Lake of the Woods County 0.081308 .
## as.factor(filed_county)LeSueur County           < 2e-16 ***
## as.factor(filed_county)Lincoln County          0.160750
## as.factor(filed_county)Lyon County             0.003109 **
## as.factor(filed_county)Mahnomen County         0.045808 *
## as.factor(filed_county)Marshall County         0.355734
## as.factor(filed_county)Martin County           0.011359 *
## as.factor(filed_county)McLeod County            < 2e-16 ***
## as.factor(filed_county)Meeker County           0.009469 **
## as.factor(filed_county)Mille Lacs County       0.724686
## as.factor(filed_county)Morrison County         0.049802 *
## as.factor(filed_county)Mower County            0.058058 .
## as.factor(filed_county)Murray County           6.47e-10 ***
## as.factor(filed_county)Nicollet County         8.09e-07 ***
## as.factor(filed_county)Nobles County           0.022033 *
## as.factor(filed_county)Norman County           0.288124
## as.factor(filed_county)Olmsted County          2.30e-15 ***
## as.factor(filed_county)Otter Tail County       5.44e-05 ***
## as.factor(filed_county)Pennington County       0.045502 *
## as.factor(filed_county)Pine County             0.000242 ***
## as.factor(filed_county)Pipestone County        9.23e-12 ***
## as.factor(filed_county)Polk County              < 2e-16 ***
## as.factor(filed_county)Pope County             0.000104 ***
## as.factor(filed_county)Ramsey County           0.001232 **
## as.factor(filed_county)Red Lake County         0.038608 *
## as.factor(filed_county)Redwood County          0.841579
## as.factor(filed_county)Renville County         2.66e-05 ***
## as.factor(filed_county)Rice County             0.092411 .
## as.factor(filed_county)Rock County             2.11e-07 ***
## as.factor(filed_county)Roseau County           4.43e-05 ***
## as.factor(filed_county)Scott County             < 2e-16 ***
```

```
## as.factor(filed_county)Sherburne County        0.040350 *
## as.factor(filed_county)Sibley County            < 2e-16 ***
## as.factor(filed_county)St. Louis County         0.281093
## as.factor(filed_county)Stearns County           0.001472 **
## as.factor(filed_county)Steele County            0.017745 *
## as.factor(filed_county)Stevens County           0.000714 ***
## as.factor(filed_county)Swift County             0.000349 ***
## as.factor(filed_county)Todd County              0.003592 **
## as.factor(filed_county)Traverse County          0.000291 ***
## as.factor(filed_county)Wabasha County           < 2e-16 ***
## as.factor(filed_county)Wadena County            0.098098 .
## as.factor(filed_county)Waseca County            0.020109 *
## as.factor(filed_county)Washington County        0.150057
## as.factor(filed_county)Watonwan County          3.44e-05 ***
## as.factor(filed_county)Wilkin County            0.000974 ***
## as.factor(filed_county)Winona County            < 2e-16 ***
## as.factor(filed_county)Wright County            0.020633 *
## as.factor(filed_county)Yellow Medicine County   0.914339
## as.factor(sentence_year)2011                    0.065924 .
## as.factor(sentence_year)2012                    0.956467
## as.factor(sentence_year)2013                    0.142217
## as.factor(sentence_year)2014                    6.48e-05 ***
## as.factor(sentence_year)2015                    2.32e-06 ***
## as.factor(sentence_year)2016                    2.95e-10 ***
## as.factor(sentence_year)2017                    < 2e-16 ***
## as.factor(sentence_year)2018                    0.025566 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 218.4 on 2877451 degrees of freedom
##   (2684421 observations deleted due to missingness)
## Multiple R-squared:  0.1626, Adjusted R-squared:  0.1625
## F-statistic:  5078 on 110 and 2877451 DF,  p-value: < 2.2e-16
```

```r
#descriptive stats for mv.fe model
monsanc.short$miss <- seq_len(nrow(monsanc.short)) %in% na.action(mv.fe)

#descriptive statistics for variables in analysis
ds <- monsanc.short %>%
  filter(miss==FALSE) %>%
  select(total_ff, conf_days,
         white,black,hispanic,asian,nativeam,other.race,
         male,age,priors,trial_flag,
         felony,gross.mis,mis, petty.mis,
         violent,drug,alcohol.dui,hunt.fish,other.offense) %>%
  gather() %>%
  group_by(key) %>%
  summarize(
```

```
    mean = round(mean(value),2),
    sd = round(sd(value),2),
    min = min(value),
    max = max(value)
  )

print(ds, n = Inf)
```

```
## # A tibble: 21 x 5
##    key            mean      sd   min    max
##    <chr>         <dbl>   <dbl> <dbl>  <dbl>
##  1 age            33.7   12.2     15    115
##  2 alcohol.dui     0.07   0.25     0      1
##  3 asian           0.04   0.2      0      1
##  4 black           0.25   0.43     0      1
##  5 conf_days      31.6  239.       0  44087
##  6 drug            0.03   0.17     0      1
##  7 felony          0.04   0.2      0      1
##  8 gross.mis       0.04   0.2      0      1
##  9 hispanic        0.07   0.26     0      1
## 10 hunt.fish       0      0.06     0      1
## 11 male            0.68   0.47     0      1
## 12 mis             0.33   0.47     0      1
## 13 nativeam        0.03   0.17     0      1
## 14 other.offense   0.87   0.33     0      1
## 15 other.race      0.02   0.14     0      1
## 16 petty.mis       0.59   0.49     0      1
## 17 priors          7.41   8.68     0    168
## 18 total_ff      198.   181.       0   1000
## 19 trial_flag      0      0.01     0      1
## 20 violent         0.03   0.17     0      1
## 21 white           0.59   0.49     0      1
```

```
#structural equation model
  #2SLS - uses pedicted value of conf days in LFO equation

#first stage
fs <- lm(conf_days~black+hispanic+asian+nativeam+other.race+
        male+log(age)+priors+trial_flag+felony+gross.mis+mis+drug+alcohol.dui+hunt.fish+othe
      data = monsanc.short)
summary(fs)
```

```
##
## Call:
## lm(formula = conf_days ~ black + hispanic + asian + nativeam +
##     other.race + male + log(age) + priors + trial_flag + felony +
##     gross.mis + mis + drug + alcohol.dui + hunt.fish + other.offense,
##     data = monsanc.short)
```

```
## 
## Residuals:
##    Min     1Q Median     3Q    Max 
##  -1510     -8     -1      5  43567 
## 
## Coefficients:
##                 Estimate Std. Error  t value Pr(>|t|)    
## (Intercept)    100.39923    1.59715   62.862   <2e-16 ***
## black            6.74728    0.31555   21.383   <2e-16 ***
## hispanic         4.78489    0.51600    9.273   <2e-16 ***
## asian            1.31279    0.65243    2.012   0.0442 *  
## nativeam        12.36508    0.75439   16.391   <2e-16 ***
## other.race       1.16735    0.93481    1.249   0.2118    
## male             7.32325    0.27991   26.163   <2e-16 ***
## log(age)         7.59680    0.38130   19.923   <2e-16 ***
## priors           0.51144    0.01536   33.301   <2e-16 ***
## trial_flagTRUE 983.61134   15.62130   62.966   <2e-16 ***
## felony         380.86411    0.77415  491.974   <2e-16 ***
## gross.mis      176.02999    0.73844  238.381   <2e-16 ***
## mis              6.33222    0.29529   21.444   <2e-16 ***
## drug          -153.91101    1.09160 -140.996   <2e-16 ***
## alcohol.dui    -94.19130    0.97961  -96.152   <2e-16 ***
## hunt.fish     -142.64866    2.17760  -65.507   <2e-16 ***
## other.offense -137.76499    0.86999 -158.352   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 
## Residual standard error: 218.7 on 2877545 degrees of freedom
##   (2684421 observations deleted due to missingness)
## Multiple R-squared:  0.1609, Adjusted R-squared:  0.1609 
## F-statistic: 3.449e+04 on 16 and 2877545 DF,  p-value: < 2.2e-16
```

```r
tsls <- tsls(total_ff_log~black+hispanic+asian+nativeam+other.race+
        male+log(age)+felony+gross.mis+mis+conf_days+drug+alcohol.dui+hunt.fish+other.offens
        ~black+hispanic+asian+nativeam+other.race+
        male+log(age)+priors+trial_flag+felony+gross.mis+mis+drug+alcohol.dui+hunt.fish+othe
        data = monsanc.short)

summary(tsls)
```

```
## 
##   2SLS Estimates
## 
## Model Formula: total_ff_log ~ black + hispanic + asian + nativeam + other.race +
##     male + log(age) + felony + gross.mis + mis + conf_days +
##     drug + alcohol.dui + hunt.fish + other.offense
## 
## Instruments: ~black + hispanic + asian + nativeam + other.race + male + log(age) +
```

```
##      priors + trial_flag + felony + gross.mis + mis + drug + alcohol.dui +
##      hunt.fish + other.offense
##
## Residuals:
##     Min.  1st Qu.   Median     Mean  3rd Qu.      Max.
##  -6.9050  -0.4398   0.1579   0.0000   0.5149  182.5777
##
##                    Estimate    Std. Error    t value   Pr(>|t|)
## (Intercept)     5.6810291864  0.0135889916   418.06113 < 2.22e-16 ***
## black          -0.2222711539  0.0021398834  -103.87069 < 2.22e-16 ***
## hispanic       -0.0119003100  0.0033366629    -3.56653 0.00036174 ***
## asian          -0.0566087816  0.0041823468   -13.53517 < 2.22e-16 ***
## nativeam       -0.0794875584  0.0049777929   -15.96843 < 2.22e-16 ***
## other.race     -0.0989833981  0.0059949665   -16.51108 < 2.22e-16 ***
## male            0.0534540342  0.0019314788    27.67519 < 2.22e-16 ***
## log(age)       -0.1932508550  0.0025561520   -75.60226 < 2.22e-16 ***
## felony          1.5805388269  0.0347805914    45.44313 < 2.22e-16 ***
## gross.mis       1.3536846199  0.0166088378    81.50387 < 2.22e-16 ***
## mis             0.5996876202  0.0019850039   302.10904 < 2.22e-16 ***
## conf_days      -0.0041759411  0.0000898968   -46.45261 < 2.22e-16 ***
## drug           -0.2340324916  0.0154805348   -15.11786 < 2.22e-16 ***
## alcohol.dui     0.1589615057  0.0106107247    14.98121 < 2.22e-16 ***
## hunt.fish      -0.5359793530  0.0189981214   -28.21223 < 2.22e-16 ***
## other.offense  -0.3507470771  0.0135400614   -25.90439 < 2.22e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.4020183 on 2877546 degrees of freedom
```

```
#2SLS Fixed Effects Model

#first stage
fs.fe <- lm(conf_days~black+hispanic+asian+nativeam+other.race+
            male+log(age)+priors+trial_flag+felony+gross.mis+mis+drug+alcohol.dui+hunt.fish+othe
            as.factor(filed_county)+as.factor(sentence_year), data = monsanc.short)
summary(fs.fe)
```

```
##
## Call:
## lm(formula = conf_days ~ black + hispanic + asian + nativeam +
##     other.race + male + log(age) + priors + trial_flag + felony +
##     gross.mis + mis + drug + alcohol.dui + hunt.fish + other.offense +
##     as.factor(filed_county) + as.factor(sentence_year), data = monsanc.short)
##
## Residuals:
##    Min     1Q Median     3Q    Max
##  -1507    -10     -2      7  43562
##
```

```
## Coefficients:
##                                                  Estimate Std. Error  t value
## (Intercept)                                     111.30811    3.09271   35.991
## black                                             6.15171    0.33272   18.489
## hispanic                                          5.46287    0.52175   10.470
## asian                                             1.75866    0.66084    2.661
## nativeam                                          7.12361    0.78896    9.029
## other.race                                        1.10872    0.93651    1.184
## male                                              7.33467    0.28039   26.158
## log(age)                                          7.51858    0.38466   19.546
## priors                                            0.50743    0.01572   32.284
## trial_flagTRUE                                  975.81524   15.61712   62.484
## felony                                          380.04341    0.78298  485.381
## gross.mis                                       175.75999    0.74470  236.015
## mis                                               6.32514    0.30744   20.574
## drug                                           -153.67047    1.09165 -140.769
## alcohol.dui                                     -94.28690    0.97963  -96.247
## hunt.fish                                      -143.67083    2.19374  -65.491
## other.offense                                  -137.68755    0.87016 -158.233
## as.factor(filed_county)Anoka County              -8.75691    2.71262   -3.228
## as.factor(filed_county)Becker County             13.58327    3.32479    4.085
## as.factor(filed_county)Beltrami County            7.69595    3.05472    2.519
## as.factor(filed_county)Benton County              5.72234    3.54394    1.615
## as.factor(filed_county)Big Stone County         -15.46305    7.28369   -2.123
## as.factor(filed_county)Blue Earth County        -28.24897    2.91254   -9.699
## as.factor(filed_county)Brown County             -14.55686    3.73436   -3.898
## as.factor(filed_county)Carlton County           -14.60754    3.22434   -4.530
## as.factor(filed_county)Carver County            -28.50001    2.98771   -9.539
## as.factor(filed_county)Cass County               -0.13143    3.49357   -0.038
## as.factor(filed_county)Chippewa County          -13.74085    4.60885   -2.981
## as.factor(filed_county)Chisago County           -11.15767    3.16999   -3.520
## as.factor(filed_county)Clay County                0.25196    2.97290    0.085
## as.factor(filed_county)Clearwater County          2.79717    5.66743    0.494
## as.factor(filed_county)Cook County               -1.37104    5.84793   -0.234
## as.factor(filed_county)Cottonwood County         -1.68502    4.90824   -0.343
## as.factor(filed_county)Crow Wing County          -3.47308    3.00942   -1.154
## as.factor(filed_county)Dakota County            -22.23235    2.68796   -8.271
## as.factor(filed_county)Dodge County             -34.39507    4.13142   -8.325
## as.factor(filed_county)Douglas County            -8.80665    3.48903   -2.524
## as.factor(filed_county)Faribault County         -18.82738    4.45505   -4.226
## as.factor(filed_county)Fillmore County           -2.06891    4.35944   -0.475
## as.factor(filed_county)Freeborn County          -21.05428    3.34736   -6.290
## as.factor(filed_county)Goodhue County           -39.99666    2.98538  -13.398
## as.factor(filed_county)Grant County             -20.41937    6.19167   -3.298
## as.factor(filed_county)Hennepin County           -9.22386    2.64217   -3.491
## as.factor(filed_county)Houston County           -26.44885    4.14111   -6.387
## as.factor(filed_county)Hubbard County             3.29139    3.80762    0.864
## as.factor(filed_county)Isanti County             -9.96868    3.43944   -2.898
```

```
## as.factor(filed_county)Itasca County              2.29388    3.11498    0.736
## as.factor(filed_county)Jackson County           -17.72716    4.94790   -3.583
## as.factor(filed_county)Kanabec County           -15.32627    3.96731   -3.863
## as.factor(filed_county)Kandiyohi County          -3.43868    3.20343   -1.073
## as.factor(filed_county)Kittson County           -29.87624    9.20561   -3.245
## as.factor(filed_county)Koochiching County        -9.92291    4.64110   -2.138
## as.factor(filed_county)Lac qui Parle County     -17.92744    6.47218   -2.770
## as.factor(filed_county)Lake County              -10.08994    4.80796   -2.099
## as.factor(filed_county)Lake of the Woods County -10.74312    6.16306   -1.743
## as.factor(filed_county)LeSueur County           -36.78036    3.71029   -9.913
## as.factor(filed_county)Lincoln County            10.48569    7.47614    1.403
## as.factor(filed_county)Lyon County               10.55041    3.56822    2.957
## as.factor(filed_county)Mahnomen County           -9.10182    4.55738   -1.997
## as.factor(filed_county)Marshall County            5.42195    5.87093    0.924
## as.factor(filed_county)Martin County             -9.41515    3.71925   -2.531
## as.factor(filed_county)McLeod County            -32.82035    3.32208   -9.879
## as.factor(filed_county)Meeker County            -11.50394    4.43371   -2.595
## as.factor(filed_county)Mille Lacs County          1.18790    3.37277    0.352
## as.factor(filed_county)Morrison County           -6.81104    3.47208   -1.962
## as.factor(filed_county)Mower County              -6.17540    3.25834   -1.895
## as.factor(filed_county)Murray County            -39.98942    6.47227   -6.179
## as.factor(filed_county)Nicollet County          -16.46866    3.33836   -4.933
## as.factor(filed_county)Nobles County             -8.79636    3.84155   -2.290
## as.factor(filed_county)Norman County             -6.40208    6.02693   -1.062
## as.factor(filed_county)Olmsted County           -22.39738    2.82645   -7.924
## as.factor(filed_county)Otter Tail County        -12.96294    3.21210   -4.036
## as.factor(filed_county)Pennington County          8.58909    4.29457    2.000
## as.factor(filed_county)Pine County              -13.06693    3.56029   -3.670
## as.factor(filed_county)Pipestone County         -39.50197    5.79374   -6.818
## as.factor(filed_county)Polk County               64.95312    3.40993   19.048
## as.factor(filed_county)Pope County              -19.41124    5.00197   -3.881
## as.factor(filed_county)Ramsey County             -8.56580    2.65091   -3.231
## as.factor(filed_county)Red Lake County          -14.14584    6.83920   -2.068
## as.factor(filed_county)Redwood County            -0.78700    3.93747   -0.200
## as.factor(filed_county)Renville County          -16.76265    3.99054   -4.201
## as.factor(filed_county)Rice County               -5.19605    3.08771   -1.683
## as.factor(filed_county)Rock County              -31.48455    6.06724   -5.189
## as.factor(filed_county)Roseau County            -16.28021    3.98661   -4.084
## as.factor(filed_county)Scott County             -28.29504    2.76836  -10.221
## as.factor(filed_county)Sherburne County           6.08309    2.96715    2.050
## as.factor(filed_county)Sibley County            -37.22147    4.10265   -9.073
## as.factor(filed_county)St. Louis County          -2.96399    2.74987   -1.078
## as.factor(filed_county)Stearns County             8.80366    2.76825    3.180
## as.factor(filed_county)Steele County             -7.56358    3.19018   -2.371
## as.factor(filed_county)Stevens County           -19.07585    5.63691   -3.384
## as.factor(filed_county)Swift County             -16.98553    4.75016   -3.576
## as.factor(filed_county)Todd County              -11.64844    4.00027   -2.912
## as.factor(filed_county)Traverse County          -31.01443    8.55982   -3.623
```

```
## as.factor(filed_county)Wabasha County          -37.74792   3.78155   -9.982
## as.factor(filed_county)Wadena County            -7.05284   4.26374   -1.654
## as.factor(filed_county)Waseca County            -9.83473   4.23126   -2.324
## as.factor(filed_county)Washington County        -3.95288   2.74633   -1.439
## as.factor(filed_county)Watonwan County         -18.29785   4.41777   -4.142
## as.factor(filed_county)Wilkin County           -16.03598   4.86248   -3.298
## as.factor(filed_county)Winona County           -34.92740   3.20374  -10.902
## as.factor(filed_county)Wright County            -6.71422   2.90077   -2.315
## as.factor(filed_county)Yellow Medicine County   -0.51502   4.78793   -0.108
## as.factor(sentence_year)2011                    -0.78905   0.42908   -1.839
## as.factor(sentence_year)2012                    -0.02371   0.43429   -0.055
## as.factor(sentence_year)2013                    -0.66297   0.45174   -1.468
## as.factor(sentence_year)2014                    -1.76636   0.44218   -3.995
## as.factor(sentence_year)2015                    -2.13511   0.45201   -4.724
## as.factor(sentence_year)2016                     4.68437   0.74338    6.301
## as.factor(sentence_year)2017                    19.40041   1.59530   12.161
## as.factor(sentence_year)2018                     5.49269   2.46007    2.233
##                                                Pr(>|t|)
## (Intercept)                                     < 2e-16 ***
## black                                           < 2e-16 ***
## hispanic                                        < 2e-16 ***
## asian                                          0.007786 **
## nativeam                                        < 2e-16 ***
## other.race                                     0.236461
## male                                            < 2e-16 ***
## log(age)                                        < 2e-16 ***
## priors                                          < 2e-16 ***
## trial_flagTRUE                                  < 2e-16 ***
## felony                                          < 2e-16 ***
## gross.mis                                       < 2e-16 ***
## mis                                             < 2e-16 ***
## drug                                            < 2e-16 ***
## alcohol.dui                                     < 2e-16 ***
## hunt.fish                                       < 2e-16 ***
## other.offense                                   < 2e-16 ***
## as.factor(filed_county)Anoka County            0.001246 **
## as.factor(filed_county)Becker County           4.40e-05 ***
## as.factor(filed_county)Beltrami County         0.011757 *
## as.factor(filed_county)Benton County           0.106379
## as.factor(filed_county)Big Stone County        0.033757 *
## as.factor(filed_county)Blue Earth County        < 2e-16 ***
## as.factor(filed_county)Brown County            9.70e-05 ***
## as.factor(filed_county)Carlton County          5.89e-06 ***
## as.factor(filed_county)Carver County            < 2e-16 ***
## as.factor(filed_county)Cass County             0.969991
## as.factor(filed_county)Chippewa County         0.002869 **
## as.factor(filed_county)Chisago County          0.000432 ***
## as.factor(filed_county)Clay County             0.932459
```

```
## as.factor(filed_county)Clearwater County       0.621623
## as.factor(filed_county)Cook County             0.814636
## as.factor(filed_county)Cottonwood County       0.731370
## as.factor(filed_county)Crow Wing County        0.248470
## as.factor(filed_county)Dakota County            < 2e-16 ***
## as.factor(filed_county)Dodge County             < 2e-16 ***
## as.factor(filed_county)Douglas County          0.011600 *
## as.factor(filed_county)Faribault County        2.38e-05 ***
## as.factor(filed_county)Fillmore County         0.635085
## as.factor(filed_county)Freeborn County         3.18e-10 ***
## as.factor(filed_county)Goodhue County           < 2e-16 ***
## as.factor(filed_county)Grant County            0.000974 ***
## as.factor(filed_county)Hennepin County         0.000481 ***
## as.factor(filed_county)Houston County          1.69e-10 ***
## as.factor(filed_county)Hubbard County          0.387356
## as.factor(filed_county)Isanti County           0.003751 **
## as.factor(filed_county)Itasca County           0.461485
## as.factor(filed_county)Jackson County          0.000340 ***
## as.factor(filed_county)Kanabec County          0.000112 ***
## as.factor(filed_county)Kandiyohi County        0.283075
## as.factor(filed_county)Kittson County          0.001173 **
## as.factor(filed_county)Koochiching County      0.032513 *
## as.factor(filed_county)Lac qui Parle County    0.005607 **
## as.factor(filed_county)Lake County             0.035853 *
## as.factor(filed_county)Lake of the Woods County 0.081308 .
## as.factor(filed_county)LeSueur County           < 2e-16 ***
## as.factor(filed_county)Lincoln County          0.160750
## as.factor(filed_county)Lyon County             0.003109 **
## as.factor(filed_county)Mahnomen County         0.045808 *
## as.factor(filed_county)Marshall County         0.355734
## as.factor(filed_county)Martin County           0.011359 *
## as.factor(filed_county)McLeod County            < 2e-16 ***
## as.factor(filed_county)Meeker County           0.009469 **
## as.factor(filed_county)Mille Lacs County       0.724686
## as.factor(filed_county)Morrison County         0.049802 *
## as.factor(filed_county)Mower County            0.058058 .
## as.factor(filed_county)Murray County           6.47e-10 ***
## as.factor(filed_county)Nicollet County         8.09e-07 ***
## as.factor(filed_county)Nobles County           0.022033 *
## as.factor(filed_county)Norman County           0.288124
## as.factor(filed_county)Olmsted County          2.30e-15 ***
## as.factor(filed_county)Otter Tail County       5.44e-05 ***
## as.factor(filed_county)Pennington County       0.045502 *
## as.factor(filed_county)Pine County             0.000242 ***
## as.factor(filed_county)Pipestone County        9.23e-12 ***
## as.factor(filed_county)Polk County              < 2e-16 ***
## as.factor(filed_county)Pope County             0.000104 ***
## as.factor(filed_county)Ramsey County           0.001232 **
```

```
## as.factor(filed_county)Red Lake County         0.038608 *
## as.factor(filed_county)Redwood County          0.841579
## as.factor(filed_county)Renville County         2.66e-05 ***
## as.factor(filed_county)Rice County             0.092411 .
## as.factor(filed_county)Rock County             2.11e-07 ***
## as.factor(filed_county)Roseau County           4.43e-05 ***
## as.factor(filed_county)Scott County             < 2e-16 ***
## as.factor(filed_county)Sherburne County        0.040350 *
## as.factor(filed_county)Sibley County            < 2e-16 ***
## as.factor(filed_county)St. Louis County        0.281093
## as.factor(filed_county)Stearns County          0.001472 **
## as.factor(filed_county)Steele County           0.017745 *
## as.factor(filed_county)Stevens County          0.000714 ***
## as.factor(filed_county)Swift County            0.000349 ***
## as.factor(filed_county)Todd County             0.003592 **
## as.factor(filed_county)Traverse County         0.000291 ***
## as.factor(filed_county)Wabasha County           < 2e-16 ***
## as.factor(filed_county)Wadena County           0.098098 .
## as.factor(filed_county)Waseca County           0.020109 *
## as.factor(filed_county)Washington County       0.150057
## as.factor(filed_county)Watonwan County         3.44e-05 ***
## as.factor(filed_county)Wilkin County           0.000974 ***
## as.factor(filed_county)Winona County            < 2e-16 ***
## as.factor(filed_county)Wright County           0.020633 *
## as.factor(filed_county)Yellow Medicine County  0.914339
## as.factor(sentence_year)2011                   0.065924 .
## as.factor(sentence_year)2012                   0.956467
## as.factor(sentence_year)2013                   0.142217
## as.factor(sentence_year)2014                   6.48e-05 ***
## as.factor(sentence_year)2015                   2.32e-06 ***
## as.factor(sentence_year)2016                   2.95e-10 ***
## as.factor(sentence_year)2017                    < 2e-16 ***
## as.factor(sentence_year)2018                   0.025566 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 218.4 on 2877451 degrees of freedom
##   (2684421 observations deleted due to missingness)
## Multiple R-squared:  0.1626, Adjusted R-squared:  0.1625
## F-statistic:  5078 on 110 and 2877451 DF,  p-value: < 2.2e-16
```

```r
tsls.fe <- tsls(total_ff_log~conf_days+black+hispanic+asian+nativeam+other.race+male+log(age)+
              felony+gross.mis+mis+drug+alcohol.dui+hunt.fish+other.offense+
              as.factor(filed_county)+as.factor(sentence_year),
          ~priors+trial_flag+black+hispanic+asian+nativeam+other.race+
            male+log(age)+felony+gross.mis+mis+drug+alcohol.dui+hunt.fish+other.offense+
            as.factor(filed_county)+as.factor(sentence_year),
          data = monsanc.short)
```

```r
summary(tsls.fe)
```

```
## 
##   2SLS Estimates
## 
## Model Formula: total_ff_log ~ conf_days + black + hispanic + asian + nativeam +
##      other.race + male + log(age) + felony + gross.mis + mis +
##      drug + alcohol.dui + hunt.fish + other.offense + as.factor(filed_county) +
##      as.factor(sentence_year)
## 
## Instruments: ~priors + trial_flag + black + hispanic + asian + nativeam +
##      other.race + male + log(age) + felony + gross.mis + mis +
##      drug + alcohol.dui + hunt.fish + other.offense + as.factor(filed_county) +
##      as.factor(sentence_year)
## 
## Residuals:
##     Min.   1st Qu.   Median    Mean  3rd Qu.     Max.
##  -7.0726   -0.4220   0.0885   0.0000   0.5545 150.3472
## 
##                                                   Estimate    Std. Error
## (Intercept)                                     5.880423e+00  2.040264e-02
## conf_days                                      -3.436750e-03  8.384545e-05
## black                                          -9.464288e-02  2.046590e-03
## hispanic                                        3.342636e-02  3.108502e-03
## asian                                           2.271028e-02  3.894043e-03
## nativeam                                       -1.790255e-01  4.697369e-03
## other.race                                     -1.725177e-02  5.522888e-03
## male                                            4.094614e-02  1.783176e-03
## log(age)                                       -1.407109e-01  2.366080e-03
## felony                                          1.152612e+00  3.236289e-02
## gross.mis                                       1.112444e+00  1.545828e-02
## mis                                             4.954174e-01  1.895843e-03
## drug                                           -1.376440e-01  1.438961e-02
## alcohol.dui                                     2.256061e-01  9.845804e-03
## hunt.fish                                      -5.381167e-01  1.769058e-02
## other.offense                                  -2.137521e-01  1.260646e-02
## as.factor(filed_county)Anoka County            -5.752527e-01  1.600811e-02
## as.factor(filed_county)Becker County            2.454554e-01  1.963719e-02
## as.factor(filed_county)Beltrami County         -1.385331e-01  1.802349e-02
## as.factor(filed_county)Benton County           -2.340198e-01  2.090288e-02
## as.factor(filed_county)Big Stone County        -1.401966e-01  4.296752e-02
## as.factor(filed_county)Blue Earth County       -2.943055e-01  1.733146e-02
## as.factor(filed_county)Brown County            -2.094544e-01  2.204954e-02
## as.factor(filed_county)Carlton County          -1.411290e-01  1.905092e-02
## as.factor(filed_county)Carver County           -1.758197e-01  1.777415e-02
## as.factor(filed_county)Cass County             -3.498263e-01  2.059936e-02
## as.factor(filed_county)Chippewa County         -1.189969e-01  2.719911e-02
```

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## as.factor(filed_county)Chisago County           -4.429483e-01  1.871289e-02
## as.factor(filed_county)Clay County              -8.519335e-03  1.752897e-02
## as.factor(filed_county)Clearwater County        -1.361578e-01  3.341786e-02
## as.factor(filed_county)Cook County              -2.428723e-01  3.448176e-02
## as.factor(filed_county)Cottonwood County        -1.337871e-01  2.894107e-02
## as.factor(filed_county)Crow Wing County         -1.740068e-01  1.774638e-02
## as.factor(filed_county)Dakota County            -3.474351e-01  1.595349e-02
## as.factor(filed_county)Dodge County             -6.392997e-01  2.452681e-02
## as.factor(filed_county)Douglas County           -3.117300e-02  2.058576e-02
## as.factor(filed_county)Faribault County         -1.138636e-01  2.631419e-02
## as.factor(filed_county)Fillmore County          -1.723850e-01  2.570545e-02
## as.factor(filed_county)Freeborn County          -3.846105e-01  1.981285e-02
## as.factor(filed_county)Goodhue County           -5.108174e-01  1.790751e-02
## as.factor(filed_county)Grant County             -1.589456e-01  3.654856e-02
## as.factor(filed_county)Hennepin County          -6.943545e-01  1.559108e-02
## as.factor(filed_county)Houston County           -3.881248e-01  2.452338e-02
## as.factor(filed_county)Hubbard County           -1.859967e-01  2.245273e-02
## as.factor(filed_county)Isanti County            -3.152778e-01  2.029524e-02
## as.factor(filed_county)Itasca County            -1.234065e-01  1.836826e-02
## as.factor(filed_county)Jackson County           -1.514215e-01  2.921308e-02
## as.factor(filed_county)Kanabec County           -2.351993e-01  2.342656e-02
## as.factor(filed_county)Kandiyohi County         -1.407597e-01  1.889050e-02
## as.factor(filed_county)Kittson County           -1.262871e-01  5.434033e-02
## as.factor(filed_county)Koochiching County       -5.851139e-01  2.737868e-02
## as.factor(filed_county)Lac qui Parle County     -1.943591e-01  3.819155e-02
## as.factor(filed_county)Lake County              -1.956147e-01  2.836159e-02
## as.factor(filed_county)Lake of the Woods County -3.440236e-01  3.635034e-02
## as.factor(filed_county)LeSueur County           -3.513000e-01  2.208628e-02
## as.factor(filed_county)Lincoln County           -7.222257e-04  4.409026e-02
## as.factor(filed_county)Lyon County              -1.331009e-01  2.105853e-02
## as.factor(filed_county)Mahnomen County          -1.853558e-01  2.688326e-02
## as.factor(filed_county)Marshall County          -5.673065e-02  3.461994e-02
## as.factor(filed_county)Martin County            -3.276204e-01  2.194352e-02
## as.factor(filed_county)McLeod County            -4.822179e-01  1.976995e-02
## as.factor(filed_county)Meeker County            -7.262262e-02  2.615933e-02
## as.factor(filed_county)Mille Lacs County         7.253549e-02  1.988726e-02
## as.factor(filed_county)Morrison County          -1.255192e-01  2.047943e-02
## as.factor(filed_county)Mower County             -1.828663e-01  1.921939e-02
## as.factor(filed_county)Murray County            -1.450329e-01  3.830687e-02
## as.factor(filed_county)Nicollet County          -2.325612e-01  1.973064e-02
## as.factor(filed_county)Nobles County            -1.578150e-01  2.266417e-02
## as.factor(filed_county)Norman County            -8.536117e-02  3.554151e-02
## as.factor(filed_county)Olmsted County           -5.059685e-01  1.676780e-02
## as.factor(filed_county)Otter Tail County         2.811905e-02  1.897187e-02
## as.factor(filed_county)Pennington County        -3.497357e-01  2.533341e-02
## as.factor(filed_county)Pine County              -3.640891e-01  2.102013e-02
## as.factor(filed_county)Pipestone County         -2.026364e-01  3.432306e-02
## as.factor(filed_county)Polk County               1.419526e-01  2.081888e-02
```

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## as.factor(filed_county)Pope County              -1.820042e-01  2.953758e-02
## as.factor(filed_county)Ramsey County            -5.084005e-01  1.564099e-02
## as.factor(filed_county)Red Lake County          -5.065776e-01  4.034382e-02
## as.factor(filed_county)Redwood County            2.955009e-03  2.321657e-02
## as.factor(filed_county)Renville County          -5.844674e-01  2.356796e-02
## as.factor(filed_county)Rice County              -1.065864e-01  1.820967e-02
## as.factor(filed_county)Rock County              -2.035553e-01  3.587373e-02
## as.factor(filed_county)Roseau County            -1.555495e-01  2.354656e-02
## as.factor(filed_county)Scott County             -2.846249e-01  1.648779e-02
## as.factor(filed_county)Sherburne County         -2.312480e-01  1.750396e-02
## as.factor(filed_county)Sibley County            -4.670272e-01  2.438249e-02
## as.factor(filed_county)St. Louis County         -1.990736e-01  1.621566e-02
## as.factor(filed_county)Stearns County           -3.636254e-02  1.634127e-02
## as.factor(filed_county)Steele County            -8.177985e-02  1.881920e-02
## as.factor(filed_county)Stevens County           -2.714317e-01  3.327646e-02
## as.factor(filed_county)Swift County             -1.495501e-01  2.804368e-02
## as.factor(filed_county)Todd County              -2.461737e-03  2.360704e-02
## as.factor(filed_county)Traverse County          -4.939787e-01  5.054246e-02
## as.factor(filed_county)Wabasha County           -5.144930e-01  2.251681e-02
## as.factor(filed_county)Wadena County            -3.807659e-02  2.514746e-02
## as.factor(filed_county)Waseca County            -3.842101e-01  2.496045e-02
## as.factor(filed_county)Washington County        -2.437104e-01  1.619588e-02
## as.factor(filed_county)Watonwan County          -8.494048e-02  2.609290e-02
## as.factor(filed_county)Wilkin County            -1.859516e-01  2.870482e-02
## as.factor(filed_county)Winona County            -4.929503e-01  1.911862e-02
## as.factor(filed_county)Wright County            -4.719099e-01  1.711098e-02
## as.factor(filed_county)Yellow Medicine County   -1.022398e-02  2.823134e-02
## as.factor(sentence_year)2011                    -1.741662e-02  2.527360e-03
## as.factor(sentence_year)2012                    -4.530699e-02  2.555086e-03
## as.factor(sentence_year)2013                    -5.398160e-02  2.650792e-03
## as.factor(sentence_year)2014                    -4.706295e-02  2.584707e-03
## as.factor(sentence_year)2015                    -1.147647e-02  2.632848e-03
## as.factor(sentence_year)2016                     1.012519e-01  4.414363e-03
## as.factor(sentence_year)2017                     3.851206e-01  9.606015e-03
## as.factor(sentence_year)2018                     4.946345e-01  1.451406e-02
##                                                   t value    Pr(>|t|)
## (Intercept)                                     288.21872 < 2.22e-16 ***
## conf_days                                       -40.98911 < 2.22e-16 ***
## black                                           -46.24417 < 2.22e-16 ***
## hispanic                                         10.75321 < 2.22e-16 ***
## asian                                             5.83206 5.4754e-09 ***
## nativeam                                        -38.11188 < 2.22e-16 ***
## other.race                                       -3.12369 0.00178603 **
## male                                             22.96247 < 2.22e-16 ***
## log(age)                                        -59.47006 < 2.22e-16 ***
## felony                                           35.61523 < 2.22e-16 ***
## gross.mis                                        71.96427 < 2.22e-16 ***
## mis                                             261.31776 < 2.22e-16 ***
```

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## drug                                             -9.56551 < 2.22e-16 ***
## alcohol.dui                                       22.91393 < 2.22e-16 ***
## hunt.fish                                        -30.41827 < 2.22e-16 ***
## other.offense                                    -16.95576 < 2.22e-16 ***
## as.factor(filed_county)Anoka County             -35.93507 < 2.22e-16 ***
## as.factor(filed_county)Becker County             12.49952 < 2.22e-16 ***
## as.factor(filed_county)Beltrami County           -7.68625 1.5099e-14 ***
## as.factor(filed_county)Benton County            -11.19557 < 2.22e-16 ***
## as.factor(filed_county)Big Stone County          -3.26285 0.00110299 **
## as.factor(filed_county)Blue Earth County        -16.98100 < 2.22e-16 ***
## as.factor(filed_county)Brown County              -9.49926 < 2.22e-16 ***
## as.factor(filed_county)Carlton County            -7.40799 1.2834e-13 ***
## as.factor(filed_county)Carver County             -9.89187 < 2.22e-16 ***
## as.factor(filed_county)Cass County              -16.98239 < 2.22e-16 ***
## as.factor(filed_county)Chippewa County           -4.37503 1.2142e-05 ***
## as.factor(filed_county)Chisago County           -23.67075 < 2.22e-16 ***
## as.factor(filed_county)Clay County               -0.48601 0.62695685
## as.factor(filed_county)Clearwater County         -4.07440 4.6134e-05 ***
## as.factor(filed_county)Cook County               -7.04350 1.8752e-12 ***
## as.factor(filed_county)Cottonwood County         -4.62274 3.7872e-06 ***
## as.factor(filed_county)Crow Wing County          -9.80520 < 2.22e-16 ***
## as.factor(filed_county)Dakota County            -21.77801 < 2.22e-16 ***
## as.factor(filed_county)Dodge County             -26.06534 < 2.22e-16 ***
## as.factor(filed_county)Douglas County            -1.51430 0.12995021
## as.factor(filed_county)Faribault County          -4.32708 1.5110e-05 ***
## as.factor(filed_county)Fillmore County           -6.70616 1.9984e-11 ***
## as.factor(filed_county)Freeborn County          -19.41217 < 2.22e-16 ***
## as.factor(filed_county)Goodhue County           -28.52532 < 2.22e-16 ***
## as.factor(filed_county)Grant County              -4.34889 1.3684e-05 ***
## as.factor(filed_county)Hennepin County          -44.53536 < 2.22e-16 ***
## as.factor(filed_county)Houston County           -15.82672 < 2.22e-16 ***
## as.factor(filed_county)Hubbard County            -8.28392 < 2.22e-16 ***
## as.factor(filed_county)Isanti County            -15.53457 < 2.22e-16 ***
## as.factor(filed_county)Itasca County             -6.71846 1.8368e-11 ***
## as.factor(filed_county)Jackson County            -5.18335 2.1795e-07 ***
## as.factor(filed_county)Kanabec County           -10.03986 < 2.22e-16 ***
## as.factor(filed_county)Kandiyohi County          -7.45135 9.2371e-14 ***
## as.factor(filed_county)Kittson County            -2.32400 0.02012541 *
## as.factor(filed_county)Koochiching County       -21.37115 < 2.22e-16 ***
## as.factor(filed_county)Lac qui Parle County      -5.08906 3.5986e-07 ***
## as.factor(filed_county)Lake County               -6.89717 5.3060e-12 ***
## as.factor(filed_county)Lake of the Woods County  -9.46411 < 2.22e-16 ***
## as.factor(filed_county)LeSueur County           -15.90580 < 2.22e-16 ***
## as.factor(filed_county)Lincoln County            -0.01638 0.98693074
## as.factor(filed_county)Lyon County               -6.32052 2.6072e-10 ***
## as.factor(filed_county)Mahnomen County           -6.89484 5.3935e-12 ***
## as.factor(filed_county)Marshall County           -1.63867 0.10128210
## as.factor(filed_county)Martin County            -14.93017 < 2.22e-16 ***
```

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## as.factor(filed_county)McLeod County                -24.39146 < 2.22e-16 ***
## as.factor(filed_county)Meeker County                 -2.77617 0.00550046 **
## as.factor(filed_county)Mille Lacs County              3.64734 0.00026498 ***
## as.factor(filed_county)Morrison County               -6.12904 8.8423e-10 ***
## as.factor(filed_county)Mower County                  -9.51468 < 2.22e-16 ***
## as.factor(filed_county)Murray County                 -3.78608 0.00015304 ***
## as.factor(filed_county)Nicollet County              -11.78680 < 2.22e-16 ***
## as.factor(filed_county)Nobles County                 -6.96320 3.3271e-12 ***
## as.factor(filed_county)Norman County                 -2.40173 0.01631773 *
## as.factor(filed_county)Olmsted County               -30.17501 < 2.22e-16 ***
## as.factor(filed_county)Otter Tail County              1.48214 0.13830206
## as.factor(filed_county)Pennington County            -13.80532 < 2.22e-16 ***
## as.factor(filed_county)Pine County                  -17.32097 < 2.22e-16 ***
## as.factor(filed_county)Pipestone County              -5.90380 3.5526e-09 ***
## as.factor(filed_county)Polk County                    6.81846 9.2042e-12 ***
## as.factor(filed_county)Pope County                   -6.16179 7.1939e-10 ***
## as.factor(filed_county)Ramsey County                -32.50436 < 2.22e-16 ***
## as.factor(filed_county)Red Lake County              -12.55651 < 2.22e-16 ***
## as.factor(filed_county)Redwood County                 0.12728 0.89871866
## as.factor(filed_county)Renville County              -24.79924 < 2.22e-16 ***
## as.factor(filed_county)Rice County                   -5.85328 4.8201e-09 ***
## as.factor(filed_county)Rock County                   -5.67421 1.3934e-08 ***
## as.factor(filed_county)Roseau County                 -6.60604 3.9480e-11 ***
## as.factor(filed_county)Scott County                 -17.26277 < 2.22e-16 ***
## as.factor(filed_county)Sherburne County             -13.21118 < 2.22e-16 ***
## as.factor(filed_county)Sibley County                -19.15421 < 2.22e-16 ***
## as.factor(filed_county)St. Louis County             -12.27663 < 2.22e-16 ***
## as.factor(filed_county)Stearns County                -2.22520 0.02606807 *
## as.factor(filed_county)Steele County                 -4.34555 1.3893e-05 ***
## as.factor(filed_county)Stevens County                -8.15687 4.4409e-16 ***
## as.factor(filed_county)Swift County                  -5.33276 9.6740e-08 ***
## as.factor(filed_county)Todd County                   -0.10428 0.91694735
## as.factor(filed_county)Traverse County               -9.77354 < 2.22e-16 ***
## as.factor(filed_county)Wabasha County               -22.84929 < 2.22e-16 ***
## as.factor(filed_county)Wadena County                 -1.51413 0.12999240
## as.factor(filed_county)Waseca County                -15.39275 < 2.22e-16 ***
## as.factor(filed_county)Washington County            -15.04768 < 2.22e-16 ***
## as.factor(filed_county)Watonwan County               -3.25531 0.00113270 **
## as.factor(filed_county)Wilkin County                 -6.47806 9.2923e-11 ***
## as.factor(filed_county)Winona County                -25.78378 < 2.22e-16 ***
## as.factor(filed_county)Wright County                -27.57936 < 2.22e-16 ***
## as.factor(filed_county)Yellow Medicine County        -0.36215 0.71723999
## as.factor(sentence_year)2011                         -6.89123 5.5325e-12 ***
## as.factor(sentence_year)2012                        -17.73208 < 2.22e-16 ***
## as.factor(sentence_year)2013                        -20.36433 < 2.22e-16 ***
## as.factor(sentence_year)2014                        -18.20823 < 2.22e-16 ***
## as.factor(sentence_year)2015                         -4.35896 1.3069e-05 ***
## as.factor(sentence_year)2016                         22.93692 < 2.22e-16 ***
```

```
## as.factor(sentence_year)2017                40.09161 < 2.22e-16 ***
## as.factor(sentence_year)2018                34.07967 < 2.22e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.2879916 on 2877452 degrees of freedom
```