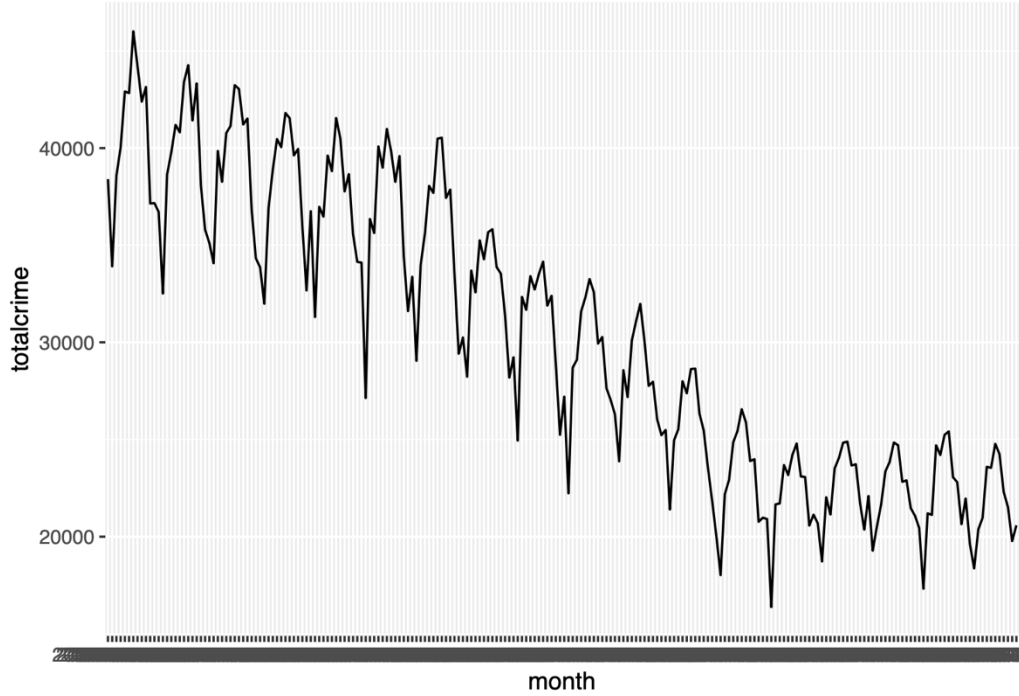


A3

Yuchen Xin

Exercise 2:



```
##      month period district tot_pop tot_white tot_black tot_hisp p50_inc
## 1 2005-01-01      1       1   38472   22608    4953    2543 91084.91
## 2 2005-01-01      1       1   38472   22608    4953    2543 91084.91
## 3 2005-01-01      1       1   38472   22608    4953    2543 91084.91
## 4 2005-01-01      1       1   38472   22608    4953    2543 91084.91
## 5 2005-01-01      1       1   38472   22608    4953    2543 91084.91
## 6 2005-01-01      1       1   38472   22608    4953    2543 91084.91
##   crime_type crimes
## 1      drug      1
## 2      drug    188
## 3     other     62
## 4     other    302
## 5  property    624
## 6  property    160
```

```
## # A tibble: 6 x 4
## # Groups:   month, district [2]
##   month      district crime_type total_crime
##   <chr>      <int> <chr>      <int>
## 1 2005-01-01      1 drug          189
## 2 2005-01-01      1 other          364
## 3 2005-01-01      1 property        784
## 4 2005-01-01      1 violent          212
## 5 2005-01-01      2 drug          209
## 6 2005-01-01      2 other          268
```

```
## # A tibble: 6 x 7
## # Groups:   month, district [6]
##   month      district drug other property violent `<NA>`
##   <chr>         <int> <int> <int>    <int>    <int>    <int>
## 1 2005-01-01         1   189   364     784     212     NA
## 2 2005-01-01         2   209   268     509     365     NA
## 3 2005-01-01         3   259   309     606     533     NA
## 4 2005-01-01         4   227   282     714     616     NA
## 5 2005-01-01         5   236   273     467     435     NA
## 6 2005-01-01         6   109   308     734     591     NA

##   month      district total_crime
##   <chr>         <int>    <int>
## 1 2005-01-01         1      1549
## 2 2005-01-01         2      1351
## 3 2005-01-01         3      1707
## 4 2005-01-01         4      1839
## 5 2005-01-01         5      1411
## 6 2005-01-01         6      1742

##   month      district median_income black_share hispanic_share white_share
##   <chr>         <int>         <dbl>    <dbl>         <dbl>         <dbl>
## 1 2005-01-01         1      91085.    0.129         0.0661         0.588
## 2 2005-01-01         2      29890.    0.947         0.0165         0.0166
## 3 2005-01-01         3      28048.    0.913         0.0174         0.0409
## 4 2005-01-01         4      39010.    0.621         0.284         0.0797
## 5 2005-01-01         5      33147.    0.942         0.0339         0.0113
## 6 2005-01-01         6      34672.    0.975         0.0101         0.00345

##   month      district property violent median_income black_share hispanic_share
##   <chr>         <int>    <int>    <int>         <dbl>    <dbl>         <dbl>
## 1 2005-01-01         1      784     212      91085.    0.129         0.0661
## 2 2005-01-01         2      509     365      29890.    0.947         0.0165
## 3 2005-01-01         3      606     533      28048.    0.913         0.0174
## 4 2005-01-01         4      714     616      39010.    0.621         0.284
## 5 2005-01-01         5      467     435      33147.    0.942         0.0339
## 6 2005-01-01         6      734     591      34672.    0.975         0.0101
## # ... with 2 more variables: white_share <dbl>, total_crime <int>
```

Exercise 3:

```
##
## Call:
## lm(formula = arrest ~ tenure + total_crime + median_income +
##      black_share + hispanic_share + white_share, data = panel2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.5017 -0.4993 -0.4981  0.5008  5.5025
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   5.067e-01  1.278e-02  39.644 <2e-16 ***
## tenure        -4.161e-06  8.354e-06  -0.498  0.618
## total_crime    2.229e-07  1.805e-06   0.124  0.902
## median_income  1.618e-08  9.186e-08   0.176  0.860
## black_share   -8.102e-03  1.340e-02  -0.604  0.546
## hispanic_share -5.363e-03  1.391e-02  -0.385  0.700
## white_share   -1.207e-02  1.632e-02  -0.740  0.460
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.7068 on 1077898 degrees of freedom
## Multiple R-squared:  2.032e-06, Adjusted R-squared:  -3.535e-06
## F-statistic: 0.365 on 6 and 1077898 DF, p-value: 0.9014
```

Exercise 4:

```
## c(month)2008-11-01 -1.542e-03  1.083e-02  -0.142  0.8868
## c(month)2008-12-01  1.093e-02  1.088e-02   1.005  0.3149
## c(month)2009-01-01 -6.007e-03  1.086e-02  -0.553  0.5801
## c(month)2009-02-01 -5.783e-03  1.092e-02  -0.530  0.5964
## c(month)2009-03-01 -8.894e-03  1.085e-02  -0.820  0.4124
## c(month)2009-04-01 -4.911e-03  1.087e-02  -0.452  0.6515
## c(month)2009-05-01 -1.545e-03  1.086e-02  -0.142  0.8869
## c(month)2009-06-01  4.206e-03  1.086e-02   0.387  0.6986
## c(month)2009-07-01  5.471e-03  1.087e-02   0.503  0.6147
## c(month)2009-08-01 -4.667e-03  1.087e-02  -0.429  0.6678
```

```
##
## Call:
## lm(formula = arrest ~ tenure + total_crime + median_income +
##      black_share + hispanic_share + white_share + c(month) + factor(district),
##      data = panel2, x = FALSE)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.5282 -0.5003 -0.4920  0.5008  5.5163
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    6.362e-01  1.061e-01   5.996 2.03e-09 ***
## tenure         -3.810e-06  8.525e-06  -0.447  0.6549
## total_crime     -6.320e-06  5.305e-06  -1.191  0.2335
## median_income  -4.910e-07  6.505e-07  -0.755  0.4504
## black_share     -9.201e-02  1.043e-01  -0.882  0.3775
## hispanic_share  -1.398e-01  2.028e-01  -0.690  0.4904
## white_share     -1.013e-01  1.818e-01  -0.557  0.5773
## c(month)2007-02-01  2.747e-03  1.112e-02   0.247  0.8049
## c(month)2007-03-01  5.425e-03  1.098e-02   0.494  0.6213
## c(month)2007-04-01 -4.433e-03  1.100e-02  -0.403  0.6868
## c(month)2007-05-01  9.642e-03  1.105e-02   0.872  0.3830
## c(month)2007-06-01 -1.518e-02  1.100e-02  -1.380  0.1675
## c(month)2007-07-01 -2.476e-03  1.107e-02  -0.224  0.8230
## c(month)2007-08-01 -9.283e-03  1.101e-02  -0.843  0.3992
## c(month)2007-09-01  2.832e-03  1.096e-02   0.258  0.7962
## c(month)2007-10-01  5.532e-03  1.098e-02   0.504  0.6145
## c(month)2007-11-01  3.270e-03  1.088e-02   0.300  0.7638
## c(month)2007-12-01 -8.522e-03  1.089e-02  -0.783  0.4339
## c(month)2008-01-01 -1.580e-02  1.090e-02  -1.450  0.1470
## c(month)2008-02-01 -7.936e-03  1.096e-02  -0.724  0.4691
## c(month)2008-03-01 -7.042e-03  1.090e-02  -0.646  0.5182
## c(month)2008-04-01  7.880e-03  1.089e-02   0.723  0.4695
## c(month)2008-05-01  1.890e-02  1.091e-02   1.732  0.0833 .
## c(month)2008-06-01  1.043e-03  1.088e-02   0.096  0.9237
## c(month)2008-07-01 -1.992e-05  1.092e-02  -0.002  0.9985
## c(month)2008-08-01  1.040e-03  1.093e-02   0.095  0.9242
## c(month)2008-09-01  9.368e-03  1.086e-02   0.863  0.3882
## c(month)2008-10-01 -3.356e-03  1.085e-02  -0.309  0.7571
```

##	c(month)2009-09-01	-4.795e-03	1.087e-02	-0.441	0.6592
##	c(month)2009-10-01	-1.586e-03	1.087e-02	-0.146	0.8840
##	c(month)2009-11-01	-5.210e-03	1.088e-02	-0.479	0.6322
##	c(month)2009-12-01	-9.886e-03	1.095e-02	-0.902	0.3668
##	c(month)2010-01-01	1.815e-03	1.094e-02	0.166	0.8682
##	c(month)2010-02-01	3.620e-03	1.116e-02	0.324	0.7457
##	c(month)2010-03-01	-8.878e-03	1.099e-02	-0.808	0.4192
##	c(month)2010-04-01	7.082e-03	1.100e-02	0.644	0.5198
##	c(month)2010-05-01	-3.414e-03	1.101e-02	-0.310	0.7565
##	c(month)2010-06-01	-5.868e-03	1.102e-02	-0.532	0.5944
##	c(month)2010-07-01	-1.353e-02	1.102e-02	-1.228	0.2196
##	c(month)2010-08-01	9.875e-03	1.103e-02	0.895	0.3708
##	c(month)2010-09-01	2.215e-03	1.103e-02	0.201	0.8408
##	c(month)2010-10-01	-2.548e-03	1.103e-02	-0.231	0.8172
##	c(month)2010-11-01	-9.175e-03	1.110e-02	-0.827	0.4084
##	c(month)2010-12-01	-4.759e-03	1.122e-02	-0.424	0.6715
##	c(month)2011-01-01	-8.207e-03	1.119e-02	-0.733	0.4633
##	c(month)2011-02-01	-5.389e-03	1.145e-02	-0.471	0.6378
##	c(month)2011-03-01	-4.549e-03	1.121e-02	-0.406	0.6849
##	c(month)2011-04-01	-1.189e-03	1.120e-02	-0.106	0.9154
##	c(month)2011-05-01	-5.307e-04	1.117e-02	-0.048	0.9621
##	c(month)2011-06-01	1.207e-04	1.115e-02	0.011	0.9914
##	c(month)2011-07-01	4.004e-03	1.113e-02	0.360	0.7191
##	c(month)2011-08-01	-1.043e-04	1.114e-02	-0.009	0.9925
##	c(month)2011-09-01	-1.135e-02	1.101e-02	-1.031	0.3027
##	c(month)2011-10-01	1.049e-02	1.100e-02	0.954	0.3399
##	c(month)2011-11-01	-6.974e-03	1.106e-02	-0.631	0.5283
##	c(month)2011-12-01	2.879e-04	1.109e-02	0.026	0.9793
##	c(month)2012-01-01	-1.045e-02	1.113e-02	-0.939	0.3477
##	c(month)2012-02-01	2.973e-03	1.121e-02	0.265	0.7909
##	c(month)2012-03-01	1.820e-03	1.105e-02	0.165	0.8692
##	c(month)2012-04-01	4.576e-03	1.114e-02	0.411	0.6812
##	c(month)2012-05-01	4.361e-03	1.107e-02	0.394	0.6936
##	c(month)2012-06-01	-2.065e-03	1.107e-02	-0.187	0.8520
##	c(month)2012-07-01	6.781e-04	1.107e-02	0.061	0.9512
##	c(month)2012-08-01	-5.126e-03	1.111e-02	-0.461	0.6445
##	c(month)2012-09-01	2.322e-03	1.117e-02	0.208	0.8353
##	c(month)2012-10-01	-1.458e-02	1.117e-02	-1.305	0.1919
##	c(month)2012-11-01	3.463e-03	1.125e-02	0.308	0.7582
##	c(month)2012-12-01	-1.687e-02	1.130e-02	-1.494	0.1352
##	c(month)2013-01-01	3.795e-03	1.131e-02	0.335	0.7373
##	c(month)2013-02-01	-8.078e-03	1.156e-02	-0.699	0.4847
##	c(month)2013-03-01	-1.585e-02	1.137e-02	-1.395	0.1631
##	c(month)2013-04-01	3.512e-03	1.133e-02	0.310	0.7565
##	c(month)2013-05-01	1.411e-02	1.123e-02	1.257	0.2088
##	c(month)2013-06-01	7.059e-03	1.125e-02	0.628	0.5303
##	c(month)2013-07-01	1.753e-02	1.122e-02	1.563	0.1180
##	c(month)2013-08-01	-2.732e-03	1.122e-02	-0.244	0.8076
##	c(month)2013-09-01	3.037e-03	1.130e-02	0.269	0.7882
##	c(month)2013-10-01	-8.699e-03	1.134e-02	-0.767	0.4430
##	c(month)2013-11-01	-5.810e-03	1.144e-02	-0.508	0.6117
##	c(month)2013-12-01	3.319e-03	1.155e-02	0.287	0.7738
##	c(month)2014-01-01	-1.496e-02	1.171e-02	-1.278	0.2011
##	c(month)2014-02-01	2.499e-03	1.186e-02	0.211	0.8331

```

## c(month)2014-03-01 -4.441e-03 1.155e-02 -0.385 0.7005
## c(month)2014-04-01 -1.862e-02 1.148e-02 -1.622 0.1049
## c(month)2014-05-01 -5.901e-03 1.137e-02 -0.519 0.6038
## c(month)2014-06-01 -1.761e-03 1.130e-02 -0.156 0.8762
## c(month)2014-07-01 5.575e-03 1.126e-02 0.495 0.6206
## c(month)2014-08-01 -1.113e-03 1.130e-02 -0.098 0.9215
## c(month)2014-09-01 1.055e-03 1.134e-02 0.093 0.9259
## c(month)2014-10-01 -1.730e-03 1.133e-02 -0.153 0.8787
## c(month)2014-11-01 -8.539e-03 1.154e-02 -0.740 0.4591
## c(month)2014-12-01 -7.021e-03 1.153e-02 -0.609 0.5427
## c(month)2015-01-01 -4.922e-03 1.157e-02 -0.425 0.6705
## c(month)2015-02-01 -9.308e-03 1.196e-02 -0.778 0.4363
## c(month)2015-03-01 4.154e-03 1.153e-02 0.360 0.7187
## c(month)2015-04-01 -3.524e-03 1.156e-02 -0.305 0.7604
## c(month)2015-05-01 -6.722e-03 1.142e-02 -0.589 0.5561
## c(month)2015-06-01 -7.111e-03 1.143e-02 -0.622 0.5340
## c(month)2015-07-01 -8.631e-03 1.138e-02 -0.758 0.4483
## c(month)2015-08-01 -5.341e-03 1.136e-02 -0.470 0.6383
## c(month)2015-09-01 -1.012e-03 1.147e-02 -0.088 0.9297
## c(month)2015-10-01 -8.335e-03 1.147e-02 -0.727 0.4673
## c(month)2015-11-01 2.320e-03 1.162e-02 0.200 0.8418
## c(month)2015-12-01 -7.373e-03 1.161e-02 -0.635 0.5253
## c(month)2016-01-01 -5.344e-03 1.166e-02 -0.458 0.6467
## c(month)2016-02-01 -7.099e-03 1.180e-02 -0.601 0.5476
## c(month)2016-03-01 -1.453e-02 1.155e-02 -1.258 0.2084
## c(month)2016-04-01 9.818e-03 1.160e-02 0.846 0.3973
## c(month)2016-05-01 9.858e-03 1.145e-02 0.861 0.3891
## c(month)2016-06-01 -5.147e-03 1.141e-02 -0.451 0.6520
## c(month)2016-07-01 -1.082e-02 1.138e-02 -0.951 0.3417
## c(month)2016-08-01 -1.921e-02 1.134e-02 -1.694 0.0903
## c(month)2016-09-01 -1.542e-03 1.141e-02 -0.135 0.8925
## c(month)2016-10-01 3.118e-03 1.141e-02 0.273 0.7847
## c(month)2016-11-01 -1.398e-02 1.155e-02 -1.210 0.2261
## c(month)2016-12-01 -1.290e-02 1.163e-02 -1.109 0.2673
## c(month)2017-01-01 8.784e-05 1.159e-02 0.008 0.9940
## c(month)2017-02-01 -5.838e-03 1.179e-02 -0.495 0.6205
## c(month)2017-03-01 6.054e-03 1.171e-02 0.517 0.6050
## c(month)2017-04-01 -5.738e-03 1.164e-02 -0.493 0.6222
## c(month)2017-05-01 8.410e-03 1.154e-02 0.729 0.4660

## c(month)2017-06-01 -1.219e-02 1.151e-02 -1.059 0.2894
## c(month)2017-07-01 -6.123e-03 1.146e-02 -0.534 0.5930
## c(month)2017-08-01 -2.664e-03 1.148e-02 -0.232 0.8165
## c(month)2017-09-01 -8.493e-03 1.157e-02 -0.734 0.4628
## c(month)2017-10-01 -9.683e-03 1.155e-02 -0.839 0.4017
## c(month)2017-11-01 -1.685e-02 1.166e-02 -1.444 0.1486
## c(month)2017-12-01 -8.924e-03 1.166e-02 -0.765 0.4442
## factor(district)2 -2.438e-02 1.901e-02 -1.282 0.1998
## factor(district)3 -2.001e-02 2.128e-02 -0.940 0.3471
## factor(district)4 -3.633e-05 3.221e-02 -0.001 0.9991
## factor(district)5 -1.580e-02 2.106e-02 -0.750 0.4531
## factor(district)6 -1.386e-02 2.275e-02 -0.609 0.5424
## factor(district)7 -2.109e-02 2.271e-02 -0.928 0.3532
## factor(district)8 2.343e-02 6.598e-02 0.355 0.7226
## factor(district)9 3.110e-03 6.192e-02 0.050 0.9599

```

```
## factor(district)10 7.682e-03 6.920e-02 0.111 0.9116
## factor(district)11 -1.134e-02 2.276e-02 -0.498 0.6185
## factor(district)12 4.412e-04 4.463e-02 0.010 0.9921
## factor(district)13 -3.064e-03 4.251e-02 -0.072 0.9425
## factor(district)14 2.441e-02 5.880e-02 0.415 0.6781
## factor(district)15 -2.027e-02 2.122e-02 -0.956 0.3393
## factor(district)16 7.288e-03 5.178e-02 0.141 0.8881
## factor(district)17 1.080e-03 4.859e-02 0.022 0.9823
## factor(district)18 4.017e-03 2.594e-02 0.155 0.8770
## factor(district)19 8.935e-03 3.625e-02 0.247 0.8053
## factor(district)20 -1.545e-02 3.378e-02 -0.457 0.6475
## factor(district)21 -3.672e-02 2.291e-02 -1.603 0.1090
## factor(district)22 -6.345e-04 1.390e-02 -0.046 0.9636
## factor(district)23 -1.097e-02 4.180e-02 -0.262 0.7929
## factor(district)24 -1.540e-02 3.085e-02 -0.499 0.6177
## factor(district)25 2.203e-02 7.539e-02 0.292 0.7702
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.7068 on 1077743 degrees of freedom
## Multiple R-squared:  0.0001208, Adjusted R-squared:  -2.854e-05
## F-statistic: 0.8089 on 161 and 1077743 DF, p-value: 0.964
```

Exercise 5:

```
##
## Call:
## lm(formula = meanarrest ~ meantenure + meantotal_crime + meanmed +
##      meanblack + meanhis + meanwhite, data = panel3)
##
```

Consider within Estimator:

```
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.50944 -0.06213 -0.00365  0.05341  2.49863
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    4.669e-01  2.686e-02  17.384  <2e-16 ***
## meantenure      1.203e-05  1.439e-05   0.835  0.4035
## meantotal_crime -7.837e-06  4.425e-06  -1.771  0.0766 .
## meanmed         1.429e-07  1.901e-07   0.752  0.4522
## meanblack       4.042e-02  2.837e-02   1.425  0.1543
## meanhis         4.905e-02  2.940e-02   1.668  0.0953 .
## meanwhite       2.217e-02  3.347e-02   0.662  0.5078
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1466 on 13021 degrees of freedom
## Multiple R-squared:  0.0005331, Adjusted R-squared:  7.253e-05
## F-statistic: 1.157 on 6 and 13021 DF, p-value: 0.326
```

```
##
## Call:
## lm(formula = arrestdiff ~ tenurediff + median + crime + median +
##      black + his + white, data = panel5)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -6.0005 -0.9992  0.0000  0.9994  6.0005
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -5.569e-04  1.190e-03  -0.468   0.640
## tenurediff   5.004e-04  6.709e-04   0.746   0.456
## median       1.470e-07  1.162e-06   0.126   0.899
## crime        -2.721e-06  6.922e-06  -0.393   0.694
## black        -9.485e-02  1.590e-01  -0.597   0.551
## his          -1.119e-01  1.688e-01  -0.663   0.507
## white        -1.195e-01  2.154e-01  -0.555   0.579
##
## Residual standard error: 0.9995 on 1064870 degrees of freedom
## Multiple R-squared:  1.292e-06, Adjusted R-squared: -4.342e-06
## F-statistic: 0.2293 on 6 and 1064870 DF, p-value: 0.9673
```

```
##
## Call:
## lm(formula = arrest ~ tenure + total_crime + median_income +
##      black_share + hispanic_share + white_share, data = panel4)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.7496 -0.5075 -0.4281  0.4927  5.5120
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  7.684e-03  1.241e-02   0.619   0.536
## tenure       1.466e-05  2.190e-05   0.670   0.503
## total_crime   1.191e-06  1.846e-06   0.645   0.519
## median_income -7.879e-08  1.041e-07  -0.757   0.449
## black_share   -9.614e-03  1.342e-02  -0.716   0.474
## hispanic_share -1.047e-02  1.393e-02  -0.752   0.452
## white_share   -9.638e-03  1.514e-02  -0.637   0.524
##
## Residual standard error: 0.7025 on 1077898 degrees of freedom
## Multiple R-squared:  1.329e-06, Adjusted R-squared: -4.237e-06
## F-statistic: 0.2388 on 6 and 1077898 DF, p-value: 0.9638
```