OchoaWk3

January 30, 2023

1 *Week 3 Assigment Part 2 Data Exploration*

Our project will be focusing on senior's access to grocery stores via public transit. This data file details car ownership and location in Los Angeles, which will help to inform areas where seniors may not have access to personal transit and where public transit will be especially needed. The data used will be the American Community Survey's five year estimates (2017-2021) on vehicle access.

1.0.1 Importing the Data

[13]:
```
import pandas as pd
```

[14]:
```
df = pd.read_csv('Car Ownership & Commute.csv')
```

1.1 Inspecting the Data

[15]:
```
df.shape
```

[15]:
```
(6591, 100)
```

[16]:
```
df.head(3)
```

[16]:

	Geo_FIPS	Geo_QName	Geo_FILEID	\
0	60371011101	Block Group 1, Census Tract 1011.10, Los Angel…	ACSSF	
1	60371011102	Block Group 2, Census Tract 1011.10, Los Angel…	ACSSF	
2	60371011103	Block Group 3, Census Tract 1011.10, Los Angel…	ACSSF	

	Geo_STUSAB	Geo_SUMLEV	Geo_GEOCOMP	Geo_LOGRECNO	Geo_US	Geo_REGION	\
0	ca	150	0	15925	NaN	NaN	
1	ca	150	0	15926	NaN	NaN	
2	ca	150	0	15927	NaN	NaN	

	Geo_DIVISION	…	ACS21_5yr_B25045010s	ACS21_5yr_B25045011s	\
0	NaN	…	21.81818	49.69697	
1	NaN	…	26.06061	55.75758	
2	NaN	…	24.84848	33.93939	

```
   ACS21_5yr_B25045012s  ACS21_5yr_B25045013s  ACS21_5yr_B25045014s  \
0              24.84848             17.575760             19.393940
1              27.87879              7.878788             20.000000
2              16.96970              7.878788              7.878788

   ACS21_5yr_B25045015s  ACS21_5yr_B25045016s  ACS21_5yr_B25045017s  \
0              7.878788              47.27273             29.696970
1             18.787880              49.09091              8.484848
2             16.969700              30.30303             10.303030

   ACS21_5yr_B25045018s  ACS21_5yr_B25045019s
0              31.51515             26.666670
1              44.84848             29.090910
2              29.69697              7.878788

[3 rows x 100 columns]
```

[17]:
```
df.info(verbose=True, show_counts=True)
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 6591 entries, 0 to 6590
Data columns (total 100 columns):
 #   Column                Non-Null Count  Dtype
---  ------                --------------  -----
 0   Geo_FIPS              6591 non-null   int64
 1   Geo_QName             6591 non-null   object
 2   Geo_FILEID            6591 non-null   object
 3   Geo_STUSAB            6591 non-null   object
 4   Geo_SUMLEV            6591 non-null   int64
 5   Geo_GEOCOMP           6591 non-null   int64
 6   Geo_LOGRECNO          6591 non-null   int64
 7   Geo_US                0 non-null      float64
 8   Geo_REGION            0 non-null      float64
 9   Geo_DIVISION          0 non-null      float64
 10  Geo_STATECE           0 non-null      float64
 11  Geo_STATE             6591 non-null   int64
 12  Geo_COUNTY            6591 non-null   int64
 13  Geo_COUSUB            0 non-null      float64
 14  Geo_PLACE             0 non-null      float64
 15  Geo_TRACT             6591 non-null   int64
 16  Geo_BLKGRP            6591 non-null   int64
 17  Geo_CONCIT            0 non-null      float64
 18  Geo_AIANHH            0 non-null      float64
 19  Geo_AIANHHFP          0 non-null      float64
 20  Geo_AIHHTLI           0 non-null      float64
 21  Geo_AITSCE            0 non-null      float64
 22  Geo_AITS              0 non-null      float64
```

```
23  Geo_ANRC              0 non-null      float64
24  Geo_CBSA              0 non-null      float64
25  Geo_CSA               0 non-null      float64
26  Geo_METDIV            0 non-null      float64
27  Geo_MACC              0 non-null      float64
28  Geo_MEMI              0 non-null      float64
29  Geo_NECTA             0 non-null      float64
30  Geo_CNECTA            0 non-null      float64
31  Geo_NECTADIV          0 non-null      float64
32  Geo_UA                0 non-null      float64
33  Geo_UACP              0 non-null      float64
34  Geo_CDCURR            0 non-null      float64
35  Geo_SLDU              0 non-null      float64
36  Geo_SLDL              0 non-null      float64
37  Geo_VTD               0 non-null      float64
38  Geo_ZCTA3             0 non-null      float64
39  Geo_ZCTA5             0 non-null      float64
40  Geo_SUBMCD            0 non-null      float64
41  Geo_SDELM             0 non-null      float64
42  Geo_SDSEC             0 non-null      float64
43  Geo_SDUNI             0 non-null      float64
44  Geo_UR                0 non-null      float64
45  Geo_PCI               0 non-null      float64
46  Geo_TAZ               0 non-null      float64
47  Geo_UGA               0 non-null      float64
48  Geo_PUMA5             0 non-null      float64
49  Geo_PUMA1             0 non-null      float64
50  Geo_GEOID             6591 non-null   object
51  Geo_NAME              6591 non-null   object
52  Geo_BTTR              0 non-null      float64
53  Geo_BTBG              0 non-null      float64
54  Geo_PLACESE           0 non-null      float64
55  SE_A10030_001         6591 non-null   int64
56  SE_A10030_002         6591 non-null   int64
57  SE_A10030_003         6591 non-null   int64
58  SE_A10030_004         6591 non-null   int64
59  SE_A10030_005         6591 non-null   int64
60  SE_A10030_006         6591 non-null   int64
61  SE_A10030_007         6591 non-null   int64
62  ACS21_5yr_B25045001   6591 non-null   int64
63  ACS21_5yr_B25045002   6591 non-null   int64
64  ACS21_5yr_B25045003   6591 non-null   int64
65  ACS21_5yr_B25045004   6591 non-null   int64
66  ACS21_5yr_B25045005   6591 non-null   int64
67  ACS21_5yr_B25045006   6591 non-null   int64
68  ACS21_5yr_B25045007   6591 non-null   int64
69  ACS21_5yr_B25045008   6591 non-null   int64
70  ACS21_5yr_B25045009   6591 non-null   int64
```

```
 71  ACS21_5yr_B25045010   6591 non-null   int64
 72  ACS21_5yr_B25045011   6591 non-null   int64
 73  ACS21_5yr_B25045012   6591 non-null   int64
 74  ACS21_5yr_B25045013   6591 non-null   int64
 75  ACS21_5yr_B25045014   6591 non-null   int64
 76  ACS21_5yr_B25045015   6591 non-null   int64
 77  ACS21_5yr_B25045016   6591 non-null   int64
 78  ACS21_5yr_B25045017   6591 non-null   int64
 79  ACS21_5yr_B25045018   6591 non-null   int64
 80  ACS21_5yr_B25045019   6591 non-null   int64
 81  ACS21_5yr_B25045001s  6591 non-null   float64
 82  ACS21_5yr_B25045002s  6591 non-null   float64
 83  ACS21_5yr_B25045003s  6591 non-null   float64
 84  ACS21_5yr_B25045004s  6591 non-null   float64
 85  ACS21_5yr_B25045005s  6591 non-null   float64
 86  ACS21_5yr_B25045006s  6591 non-null   float64
 87  ACS21_5yr_B25045007s  6591 non-null   float64
 88  ACS21_5yr_B25045008s  6591 non-null   float64
 89  ACS21_5yr_B25045009s  6591 non-null   float64
 90  ACS21_5yr_B25045010s  6591 non-null   float64
 91  ACS21_5yr_B25045011s  6591 non-null   float64
 92  ACS21_5yr_B25045012s  6591 non-null   float64
 93  ACS21_5yr_B25045013s  6591 non-null   float64
 94  ACS21_5yr_B25045014s  6591 non-null   float64
 95  ACS21_5yr_B25045015s  6591 non-null   float64
 96  ACS21_5yr_B25045016s  6591 non-null   float64
 97  ACS21_5yr_B25045017s  6591 non-null   float64
 98  ACS21_5yr_B25045018s  6591 non-null   float64
 99  ACS21_5yr_B25045019s  6591 non-null   float64
dtypes: float64(61), int64(34), object(5)
memory usage: 5.0+ MB
```

1.2 Display Settings

[18]:
```
pd.set_option('display.max_columns', None)
pd.set_option('display.max_rows', None)
```

[19]:
```
df.sample()
```

[19]:

	Geo_FIPS	Geo_QName	\
6107	60377025023	Block Group 3, Census Tract 7025.02, Los Angel…	

	Geo_FILEID	Geo_STUSAB	Geo_SUMLEV	Geo_GEOCOMP	Geo_LOGRECNO	Geo_US	\
6107	ACSSF	ca	150	0	22032	NaN	

	Geo_REGION	Geo_DIVISION	Geo_STATECE	Geo_STATE	Geo_COUNTY	\
6107	NaN	NaN	NaN	6	37	

```
      Geo_COUSUB  Geo_PLACE  Geo_TRACT  Geo_BLKGRP  Geo_CONCIT  Geo_AIANHH  \
6107         NaN        NaN     702502           3         NaN         NaN

      Geo_AIANHHFP  Geo_AIHHTLI  Geo_AITSCE  Geo_AITS  Geo_ANRC  Geo_CBSA  \
6107           NaN          NaN         NaN       NaN       NaN       NaN

      Geo_CSA  Geo_METDIV  Geo_MACC  Geo_MEMI  Geo_NECTA  Geo_CNECTA  \
6107      NaN         NaN       NaN       NaN        NaN         NaN

      Geo_NECTADIV  Geo_UA  Geo_UACP  Geo_CDCURR  Geo_SLDU  Geo_SLDL  Geo_VTD  \
6107           NaN     NaN       NaN         NaN       NaN       NaN      NaN

      Geo_ZCTA3  Geo_ZCTA5  Geo_SUBMCD  Geo_SDELM  Geo_SDSEC  Geo_SDUNI  \
6107        NaN        NaN         NaN        NaN        NaN        NaN

      Geo_UR  Geo_PCI  Geo_TAZ  Geo_UGA  Geo_PUMA5  Geo_PUMA1  \
6107     NaN      NaN      NaN      NaN        NaN        NaN

                Geo_GEOID       Geo_NAME  Geo_BTTR  Geo_BTBG  Geo_PLACESE  \
6107  15000US060377025023  Block Group 3       NaN       NaN          NaN

      SE_A10030_001  SE_A10030_002  SE_A10030_003  SE_A10030_004  \
6107           1184              0            723            315

      SE_A10030_005  SE_A10030_006  SE_A10030_007  ACS21_5yr_B25045001  \
6107            146              0              0                 1184

      ACS21_5yr_B25045002  ACS21_5yr_B25045003  ACS21_5yr_B25045004  \
6107                  731                    0                    0

      ACS21_5yr_B25045005  ACS21_5yr_B25045006  ACS21_5yr_B25045007  \
6107                    0                    0                  731

      ACS21_5yr_B25045008  ACS21_5yr_B25045009  ACS21_5yr_B25045010  \
6107                   46                  492                  193

      ACS21_5yr_B25045011  ACS21_5yr_B25045012  ACS21_5yr_B25045013  \
6107                  453                    0                    0

      ACS21_5yr_B25045014  ACS21_5yr_B25045015  ACS21_5yr_B25045016  \
6107                    0                    0                  453

      ACS21_5yr_B25045017  ACS21_5yr_B25045018  ACS21_5yr_B25045019  \
6107                   53                  278                  122

      ACS21_5yr_B25045001s  ACS21_5yr_B25045002s  ACS21_5yr_B25045003s  \
```

```
6107              188.4848              187.8788              7.878788

      ACS21_5yr_B25045004s  ACS21_5yr_B25045005s  ACS21_5yr_B25045006s  \
6107              7.878788              7.878788              7.878788

      ACS21_5yr_B25045007s  ACS21_5yr_B25045008s  ACS21_5yr_B25045009s  \
6107              187.8788              29.69697              178.7879

      ACS21_5yr_B25045010s  ACS21_5yr_B25045011s  ACS21_5yr_B25045012s  \
6107              44.24242              107.2727              7.878788

      ACS21_5yr_B25045013s  ACS21_5yr_B25045014s  ACS21_5yr_B25045015s  \
6107              7.878788              7.878788              7.878788

      ACS21_5yr_B25045016s  ACS21_5yr_B25045017s  ACS21_5yr_B25045018s  \
6107              107.2727              35.75758              89.09091

      ACS21_5yr_B25045019s
6107              78.78788
```

1.3 Assigning Data Types

[20]:
```
df.Geo_FIPS.head()
```

[20]:
```
0    60371011101
1    60371011102
2    60371011103
3    60371011221
4    60371011222
Name: Geo_FIPS, dtype: int64
```

Need to fix FIPS code

[21]:
```
df.Geo_STATE.head()
```

[21]:
```
0    6
1    6
2    6
3    6
4    6
Name: Geo_STATE, dtype: int64
```

[22]:
```
df.Geo_COUNTY.head()
```

[22]:
```
0    37
1    37
2    37
```

```
3    37
4    37
Name: Geo_COUNTY, dtype: int64
```

Converting to string

[23]:
```
df = pd.read_csv(
    'Car Ownership & Commute.csv',
    dtype=
    {
        'Geo_FIPS':str,
        'Geo_STATE':str,
        'Geo_COUNTY': str
    }
)
```

Check edits

[24]:
```
df.head()
```

[24]:

	Geo_FIPS	Geo_QName	Geo_FILEID	Geo_STUSAB	Geo_SUMLEV	Geo_GEOCOMP	Geo_LOGRECNO	Geo_US	Geo_REGION	Geo_DIVISION	Geo_STATECE	Geo_STATE	Geo_COUNTY	Geo_COUSUB	Geo_PLACE	Geo_TRACT	Geo_BLKGRP	Geo_CONCIT	Geo_AIANHH	Geo_AIANHHFP	Geo_AIHHTLI
0	060371011101	Block Group 1, Census Tract 1011.10, Los Angel…	ACSSF	ca	150	0	15925	NaN	NaN	NaN	NaN	06	037	NaN	NaN	101110	1	NaN	NaN	NaN	NaN
1	060371011102	Block Group 2, Census Tract 1011.10, Los Angel…	ACSSF	ca	150	0	15926	NaN	NaN	NaN	NaN	06	037	NaN	NaN	101110	2	NaN	NaN	NaN	NaN
2	060371011103	Block Group 3, Census Tract 1011.10, Los Angel…	ACSSF	ca	150	0	15927	NaN	NaN	NaN	NaN	06	037	NaN	NaN	101110	3	NaN	NaN	NaN	NaN
3	060371011221	Block Group 1, Census Tract 1011.22, Los Angel…	ACSSF	ca	150	0	15928	NaN	NaN	NaN	NaN	06	037	NaN	NaN	101122	1	NaN	NaN	NaN	NaN
4	060371011222	Block Group 2, Census Tract 1011.22, Los Angel…	ACSSF	ca	150	0	15929	NaN	NaN	NaN	NaN	06	037	NaN	NaN	101122	2	NaN	NaN	NaN	NaN

```
   Geo_AITSCE  Geo_AITS  Geo_ANRC  Geo_CBSA  Geo_CSA  Geo_METDIV  Geo_MACC  \
0         NaN       NaN       NaN       NaN      NaN         NaN       NaN
1         NaN       NaN       NaN       NaN      NaN         NaN       NaN
2         NaN       NaN       NaN       NaN      NaN         NaN       NaN
3         NaN       NaN       NaN       NaN      NaN         NaN       NaN
4         NaN       NaN       NaN       NaN      NaN         NaN       NaN

   Geo_MEMI  Geo_NECTA  Geo_CNECTA  Geo_NECTADIV  Geo_UA  Geo_UACP  \
0       NaN        NaN         NaN           NaN     NaN       NaN
1       NaN        NaN         NaN           NaN     NaN       NaN
2       NaN        NaN         NaN           NaN     NaN       NaN
3       NaN        NaN         NaN           NaN     NaN       NaN
4       NaN        NaN         NaN           NaN     NaN       NaN

   Geo_CDCURR  Geo_SLDU  Geo_SLDL  Geo_VTD  Geo_ZCTA3  Geo_ZCTA5  Geo_SUBMCD  \
0         NaN       NaN       NaN      NaN        NaN        NaN         NaN
1         NaN       NaN       NaN      NaN        NaN        NaN         NaN
2         NaN       NaN       NaN      NaN        NaN        NaN         NaN
3         NaN       NaN       NaN      NaN        NaN        NaN         NaN
4         NaN       NaN       NaN      NaN        NaN        NaN         NaN

   Geo_SDELM  Geo_SDSEC  Geo_SDUNI  Geo_UR  Geo_PCI  Geo_TAZ  Geo_UGA  \
0        NaN        NaN        NaN     NaN      NaN      NaN      NaN
1        NaN        NaN        NaN     NaN      NaN      NaN      NaN
2        NaN        NaN        NaN     NaN      NaN      NaN      NaN
3        NaN        NaN        NaN     NaN      NaN      NaN      NaN
4        NaN        NaN        NaN     NaN      NaN      NaN      NaN

   Geo_PUMA5  Geo_PUMA1            Geo_GEOID       Geo_NAME  Geo_BTTR  \
0        NaN        NaN  15000US060371011101  Block Group 1       NaN
1        NaN        NaN  15000US060371011102  Block Group 2       NaN
2        NaN        NaN  15000US060371011103  Block Group 3       NaN
3        NaN        NaN  15000US060371011221  Block Group 1       NaN
4        NaN        NaN  15000US060371011222  Block Group 2       NaN

   Geo_BTBG  Geo_PLACESE  SE_A10030_001  SE_A10030_002  SE_A10030_003  \
0       NaN          NaN            595             84            188
1       NaN          NaN            560             90            116
2       NaN          NaN            339             18             94
3       NaN          NaN            786              9            190
4       NaN          NaN            586              0             88

   SE_A10030_004  SE_A10030_005  SE_A10030_006  SE_A10030_007  \
0            246             63              4             10
1            224            121              9              0
2            181             20             26              0
3            255            233             72             27
```

```
4            338             80             49             31

   ACS21_5yr_B25045001  ACS21_5yr_B25045002  ACS21_5yr_B25045003  \
0                  595                  339                   40
1                  560                  264                   28
2                  339                  247                    0
3                  786                  602                    9
4                  586                  426                    0

   ACS21_5yr_B25045004  ACS21_5yr_B25045005  ACS21_5yr_B25045006  \
0                    0                   40                    0
1                    0                    0                   28
2                    0                    0                    0
3                    0                    9                    0
4                    0                    0                    0

   ACS21_5yr_B25045007  ACS21_5yr_B25045008  ACS21_5yr_B25045009  \
0                  299                   18                  228
1                  236                   17                  129
2                  247                    0                  173
3                  593                    0                  370
4                  426                   44                  246

   ACS21_5yr_B25045010  ACS21_5yr_B25045011  ACS21_5yr_B25045012  \
0                   53                  256                   44
1                   90                  296                   62
2                   74                   92                   18
3                  223                  184                    0
4                  136                  160                    0

   ACS21_5yr_B25045013  ACS21_5yr_B25045014  ACS21_5yr_B25045015  \
0                   24                   20                    0
1                    0                   20                   42
2                    0                    0                   18
3                    0                    0                    0
4                    0                    0                    0

   ACS21_5yr_B25045016  ACS21_5yr_B25045017  ACS21_5yr_B25045018  \
0                  212                   67                   85
1                  234                    9                  172
2                   74                   11                   63
3                  184                   84                  100
4                  160                   62                   98

   ACS21_5yr_B25045019  ACS21_5yr_B25045001s  ACS21_5yr_B25045002s  \
0                   60              78.18182              63.63636
1                   53              68.48485              53.93939
```

```
2                    0              59.39394              56.96970
3                    0              81.81818              56.36364
4                    0              84.84849              58.18182

   ACS21_5yr_B25045003s  ACS21_5yr_B25045004s  ACS21_5yr_B25045005s  \
0             29.090910              7.878788             29.090910
1             25.454550              7.878788              7.878788
2              7.878788              7.878788              7.878788
3              9.090909              7.878788              9.090909
4              7.878788              7.878788              7.878788

   ACS21_5yr_B25045006s  ACS21_5yr_B25045007s  ACS21_5yr_B25045008s  \
0              7.878788              60.00000             18.181820
1             25.454550              47.27273             15.151520
2              7.878788              56.96970              7.878788
3              7.878788              55.75758              7.878788
4              7.878788              58.18182             30.909090

   ACS21_5yr_B25045009s  ACS21_5yr_B25045010s  ACS21_5yr_B25045011s  \
0              56.96970              21.81818              49.69697
1              39.39394              26.06061              55.75758
2              52.12121              24.84848              33.93939
3              51.51515              46.06061              84.84849
4              44.84848              32.12121              69.09091

   ACS21_5yr_B25045012s  ACS21_5yr_B25045013s  ACS21_5yr_B25045014s  \
0             24.848480             17.575760             19.393940
1             27.878790              7.878788             20.000000
2             16.969700              7.878788              7.878788
3              7.878788              7.878788              7.878788
4              7.878788              7.878788              7.878788

   ACS21_5yr_B25045015s  ACS21_5yr_B25045016s  ACS21_5yr_B25045017s  \
0              7.878788              47.27273             29.696970
1             18.787880              49.09091              8.484848
2             16.969700              30.30303             10.303030
3              7.878788              84.84849             69.090910
4              7.878788              69.09091             36.969700

   ACS21_5yr_B25045018s  ACS21_5yr_B25045019s
0              31.51515             26.666670
1              44.84848             29.090910
2              29.69697              7.878788
3              43.63636              7.878788
4              57.57576              7.878788
```

Confirm correct datatypes for FIPS Code

[25]:
```
df.info(verbose=True, show_counts=True)
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 6591 entries, 0 to 6590
Data columns (total 100 columns):
 #   Column                Non-Null Count  Dtype
---  ------                --------------  -----
 0   Geo_FIPS              6591 non-null   object
 1   Geo_QName             6591 non-null   object
 2   Geo_FILEID            6591 non-null   object
 3   Geo_STUSAB            6591 non-null   object
 4   Geo_SUMLEV            6591 non-null   int64
 5   Geo_GEOCOMP           6591 non-null   int64
 6   Geo_LOGRECNO          6591 non-null   int64
 7   Geo_US                0 non-null      float64
 8   Geo_REGION            0 non-null      float64
 9   Geo_DIVISION          0 non-null      float64
 10  Geo_STATECE           0 non-null      float64
 11  Geo_STATE             6591 non-null   object
 12  Geo_COUNTY            6591 non-null   object
 13  Geo_COUSUB            0 non-null      float64
 14  Geo_PLACE             0 non-null      float64
 15  Geo_TRACT             6591 non-null   int64
 16  Geo_BLKGRP            6591 non-null   int64
 17  Geo_CONCIT            0 non-null      float64
 18  Geo_AIANHH            0 non-null      float64
 19  Geo_AIANHHFP          0 non-null      float64
 20  Geo_AIHHTLI           0 non-null      float64
 21  Geo_AITSCE            0 non-null      float64
 22  Geo_AITS              0 non-null      float64
 23  Geo_ANRC              0 non-null      float64
 24  Geo_CBSA              0 non-null      float64
 25  Geo_CSA               0 non-null      float64
 26  Geo_METDIV            0 non-null      float64
 27  Geo_MACC              0 non-null      float64
 28  Geo_MEMI              0 non-null      float64
 29  Geo_NECTA             0 non-null      float64
 30  Geo_CNECTA            0 non-null      float64
 31  Geo_NECTADIV          0 non-null      float64
 32  Geo_UA                0 non-null      float64
 33  Geo_UACP              0 non-null      float64
 34  Geo_CDCURR            0 non-null      float64
 35  Geo_SLDU              0 non-null      float64
 36  Geo_SLDL              0 non-null      float64
 37  Geo_VTD               0 non-null      float64
 38  Geo_ZCTA3             0 non-null      float64
 39  Geo_ZCTA5             0 non-null      float64
```

```
40  Geo_SUBMCD             0 non-null      float64
41  Geo_SDELM              0 non-null      float64
42  Geo_SDSEC              0 non-null      float64
43  Geo_SDUNI              0 non-null      float64
44  Geo_UR                 0 non-null      float64
45  Geo_PCI                0 non-null      float64
46  Geo_TAZ                0 non-null      float64
47  Geo_UGA                0 non-null      float64
48  Geo_PUMA5              0 non-null      float64
49  Geo_PUMA1              0 non-null      float64
50  Geo_GEOID              6591 non-null   object
51  Geo_NAME               6591 non-null   object
52  Geo_BTTR               0 non-null      float64
53  Geo_BTBG               0 non-null      float64
54  Geo_PLACESE            0 non-null      float64
55  SE_A10030_001          6591 non-null   int64
56  SE_A10030_002          6591 non-null   int64
57  SE_A10030_003          6591 non-null   int64
58  SE_A10030_004          6591 non-null   int64
59  SE_A10030_005          6591 non-null   int64
60  SE_A10030_006          6591 non-null   int64
61  SE_A10030_007          6591 non-null   int64
62  ACS21_5yr_B25045001    6591 non-null   int64
63  ACS21_5yr_B25045002    6591 non-null   int64
64  ACS21_5yr_B25045003    6591 non-null   int64
65  ACS21_5yr_B25045004    6591 non-null   int64
66  ACS21_5yr_B25045005    6591 non-null   int64
67  ACS21_5yr_B25045006    6591 non-null   int64
68  ACS21_5yr_B25045007    6591 non-null   int64
69  ACS21_5yr_B25045008    6591 non-null   int64
70  ACS21_5yr_B25045009    6591 non-null   int64
71  ACS21_5yr_B25045010    6591 non-null   int64
72  ACS21_5yr_B25045011    6591 non-null   int64
73  ACS21_5yr_B25045012    6591 non-null   int64
74  ACS21_5yr_B25045013    6591 non-null   int64
75  ACS21_5yr_B25045014    6591 non-null   int64
76  ACS21_5yr_B25045015    6591 non-null   int64
77  ACS21_5yr_B25045016    6591 non-null   int64
78  ACS21_5yr_B25045017    6591 non-null   int64
79  ACS21_5yr_B25045018    6591 non-null   int64
80  ACS21_5yr_B25045019    6591 non-null   int64
81  ACS21_5yr_B25045001s   6591 non-null   float64
82  ACS21_5yr_B25045002s   6591 non-null   float64
83  ACS21_5yr_B25045003s   6591 non-null   float64
84  ACS21_5yr_B25045004s   6591 non-null   float64
85  ACS21_5yr_B25045005s   6591 non-null   float64
86  ACS21_5yr_B25045006s   6591 non-null   float64
87  ACS21_5yr_B25045007s   6591 non-null   float64
```

```
 88  ACS21_5yr_B25045008s  6591 non-null   float64
 89  ACS21_5yr_B25045009s  6591 non-null   float64
 90  ACS21_5yr_B25045010s  6591 non-null   float64
 91  ACS21_5yr_B25045011s  6591 non-null   float64
 92  ACS21_5yr_B25045012s  6591 non-null   float64
 93  ACS21_5yr_B25045013s  6591 non-null   float64
 94  ACS21_5yr_B25045014s  6591 non-null   float64
 95  ACS21_5yr_B25045015s  6591 non-null   float64
 96  ACS21_5yr_B25045016s  6591 non-null   float64
 97  ACS21_5yr_B25045017s  6591 non-null   float64
 98  ACS21_5yr_B25045018s  6591 non-null   float64
 99  ACS21_5yr_B25045019s  6591 non-null   float64
dtypes: float64(61), int64(31), object(8)
memory usage: 5.0+ MB
```

1.3.1 Removing Null Columns

[26]:
```
df.columns[df.isna().all()].tolist()
```

[26]:
```
['Geo_US',
 'Geo_REGION',
 'Geo_DIVISION',
 'Geo_STATECE',
 'Geo_COUSUB',
 'Geo_PLACE',
 'Geo_CONCIT',
 'Geo_AIANHH',
 'Geo_AIANHHFP',
 'Geo_AIHHTLI',
 'Geo_AITSCE',
 'Geo_AITS',
 'Geo_ANRC',
 'Geo_CBSA',
 'Geo_CSA',
 'Geo_METDIV',
 'Geo_MACC',
 'Geo_MEMI',
 'Geo_NECTA',
 'Geo_CNECTA',
 'Geo_NECTADIV',
 'Geo_UA',
 'Geo_UACP',
 'Geo_CDCURR',
 'Geo_SLDU',
 'Geo_SLDL',
 'Geo_VTD',
 'Geo_ZCTA3',
```

```
 'Geo_ZCTA5',
 'Geo_SUBMCD',
 'Geo_SDELM',
 'Geo_SDSEC',
 'Geo_SDUNI',
 'Geo_UR',
 'Geo_PCI',
 'Geo_TAZ',
 'Geo_UGA',
 'Geo_PUMA5',
 'Geo_PUMA1',
 'Geo_BTTR',
 'Geo_BTBG',
 'Geo_PLACESE']
```

[27]:
```
df = df.dropna(axis=1,how="all")
```

Check to see if empty columns were removed

[28]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 6591 entries, 0 to 6590
Data columns (total 58 columns):
 #   Column                Non-Null Count  Dtype
---  ------                --------------  -----
 0   Geo_FIPS              6591 non-null   object
 1   Geo_QName             6591 non-null   object
 2   Geo_FILEID            6591 non-null   object
 3   Geo_STUSAB            6591 non-null   object
 4   Geo_SUMLEV            6591 non-null   int64
 5   Geo_GEOCOMP           6591 non-null   int64
 6   Geo_LOGRECNO          6591 non-null   int64
 7   Geo_STATE             6591 non-null   object
 8   Geo_COUNTY            6591 non-null   object
 9   Geo_TRACT             6591 non-null   int64
 10  Geo_BLKGRP            6591 non-null   int64
 11  Geo_GEOID             6591 non-null   object
 12  Geo_NAME              6591 non-null   object
 13  SE_A10030_001         6591 non-null   int64
 14  SE_A10030_002         6591 non-null   int64
 15  SE_A10030_003         6591 non-null   int64
 16  SE_A10030_004         6591 non-null   int64
 17  SE_A10030_005         6591 non-null   int64
 18  SE_A10030_006         6591 non-null   int64
 19  SE_A10030_007         6591 non-null   int64
 20  ACS21_5yr_B25045001   6591 non-null   int64
 21  ACS21_5yr_B25045002   6591 non-null   int64
```

```
 22  ACS21_5yr_B25045003   6591 non-null   int64
 23  ACS21_5yr_B25045004   6591 non-null   int64
 24  ACS21_5yr_B25045005   6591 non-null   int64
 25  ACS21_5yr_B25045006   6591 non-null   int64
 26  ACS21_5yr_B25045007   6591 non-null   int64
 27  ACS21_5yr_B25045008   6591 non-null   int64
 28  ACS21_5yr_B25045009   6591 non-null   int64
 29  ACS21_5yr_B25045010   6591 non-null   int64
 30  ACS21_5yr_B25045011   6591 non-null   int64
 31  ACS21_5yr_B25045012   6591 non-null   int64
 32  ACS21_5yr_B25045013   6591 non-null   int64
 33  ACS21_5yr_B25045014   6591 non-null   int64
 34  ACS21_5yr_B25045015   6591 non-null   int64
 35  ACS21_5yr_B25045016   6591 non-null   int64
 36  ACS21_5yr_B25045017   6591 non-null   int64
 37  ACS21_5yr_B25045018   6591 non-null   int64
 38  ACS21_5yr_B25045019   6591 non-null   int64
 39  ACS21_5yr_B25045001s  6591 non-null   float64
 40  ACS21_5yr_B25045002s  6591 non-null   float64
 41  ACS21_5yr_B25045003s  6591 non-null   float64
 42  ACS21_5yr_B25045004s  6591 non-null   float64
 43  ACS21_5yr_B25045005s  6591 non-null   float64
 44  ACS21_5yr_B25045006s  6591 non-null   float64
 45  ACS21_5yr_B25045007s  6591 non-null   float64
 46  ACS21_5yr_B25045008s  6591 non-null   float64
 47  ACS21_5yr_B25045009s  6591 non-null   float64
 48  ACS21_5yr_B25045010s  6591 non-null   float64
 49  ACS21_5yr_B25045011s  6591 non-null   float64
 50  ACS21_5yr_B25045012s  6591 non-null   float64
 51  ACS21_5yr_B25045013s  6591 non-null   float64
 52  ACS21_5yr_B25045014s  6591 non-null   float64
 53  ACS21_5yr_B25045015s  6591 non-null   float64
 54  ACS21_5yr_B25045016s  6591 non-null   float64
 55  ACS21_5yr_B25045017s  6591 non-null   float64
 56  ACS21_5yr_B25045018s  6591 non-null   float64
 57  ACS21_5yr_B25045019s  6591 non-null   float64
dtypes: float64(19), int64(31), object(8)
memory usage: 2.9+ MB
```

1.3.2 looks like they were removed as columns went from 100->58

[29]:
```
df.head()
```

[29]:

	Geo_FIPS	Geo_QName	Geo_FILEID	\
0	060371011101	Block Group 1, Census Tract 1011.10, Los Angel…	ACSSF	
1	060371011102	Block Group 2, Census Tract 1011.10, Los Angel…	ACSSF	
2	060371011103	Block Group 3, Census Tract 1011.10, Los Angel…	ACSSF	

```
3  060371011221  Block Group 1, Census Tract 1011.22, Los Angel…      ACSSF
4  060371011222  Block Group 2, Census Tract 1011.22, Los Angel…      ACSSF

  Geo_STUSAB  Geo_SUMLEV  Geo_GEOCOMP  Geo_LOGRECNO Geo_STATE Geo_COUNTY  \
0         ca         150            0         15925        06        037
1         ca         150            0         15926        06        037
2         ca         150            0         15927        06        037
3         ca         150            0         15928        06        037
4         ca         150            0         15929        06        037

   Geo_TRACT  Geo_BLKGRP           Geo_GEOID       Geo_NAME  SE_A10030_001  \
0     101110           1  15000US060371011101  Block Group 1            595
1     101110           2  15000US060371011102  Block Group 2            560
2     101110           3  15000US060371011103  Block Group 3            339
3     101122           1  15000US060371011221  Block Group 1            786
4     101122           2  15000US060371011222  Block Group 2            586

   SE_A10030_002  SE_A10030_003  SE_A10030_004  SE_A10030_005  SE_A10030_006  \
0             84            188            246             63              4
1             90            116            224            121              9
2             18             94            181             20             26
3              9            190            255            233             72
4              0             88            338             80             49

   SE_A10030_007  ACS21_5yr_B25045001  ACS21_5yr_B25045002  \
0             10                  595                  339
1              0                  560                  264
2              0                  339                  247
3             27                  786                  602
4             31                  586                  426

   ACS21_5yr_B25045003  ACS21_5yr_B25045004  ACS21_5yr_B25045005  \
0                   40                    0                   40
1                   28                    0                    0
2                    0                    0                    0
3                    9                    0                    9
4                    0                    0                    0

   ACS21_5yr_B25045006  ACS21_5yr_B25045007  ACS21_5yr_B25045008  \
0                    0                  299                   18
1                   28                  236                   17
2                    0                  247                    0
3                    0                  593                    0
4                    0                  426                   44

   ACS21_5yr_B25045009  ACS21_5yr_B25045010  ACS21_5yr_B25045011  \
0                  228                   53                  256
```

```
1                  129                   90                  296
2                  173                   74                   92
3                  370                  223                  184
4                  246                  136                  160

   ACS21_5yr_B25045012  ACS21_5yr_B25045013  ACS21_5yr_B25045014  \
0                   44                   24                   20
1                   62                    0                   20
2                   18                    0                    0
3                    0                    0                    0
4                    0                    0                    0

   ACS21_5yr_B25045015  ACS21_5yr_B25045016  ACS21_5yr_B25045017  \
0                    0                  212                   67
1                   42                  234                    9
2                   18                   74                   11
3                    0                  184                   84
4                    0                  160                   62

   ACS21_5yr_B25045018  ACS21_5yr_B25045019  ACS21_5yr_B25045001s  \
0                   85                   60              78.18182
1                  172                   53              68.48485
2                   63                    0              59.39394
3                  100                    0              81.81818
4                   98                    0              84.84849

   ACS21_5yr_B25045002s  ACS21_5yr_B25045003s  ACS21_5yr_B25045004s  \
0              63.63636             29.090910              7.878788
1              53.93939             25.454550              7.878788
2              56.96970              7.878788              7.878788
3              56.36364              9.090909              7.878788
4              58.18182              7.878788              7.878788

   ACS21_5yr_B25045005s  ACS21_5yr_B25045006s  ACS21_5yr_B25045007s  \
0             29.090910              7.878788              60.00000
1              7.878788             25.454550              47.27273
2              7.878788              7.878788              56.96970
3              9.090909              7.878788              55.75758
4              7.878788              7.878788              58.18182

   ACS21_5yr_B25045008s  ACS21_5yr_B25045009s  ACS21_5yr_B25045010s  \
0             18.181820              56.96970              21.81818
1             15.151520              39.39394              26.06061
2              7.878788              52.12121              24.84848
3              7.878788              51.51515              46.06061
4             30.909090              44.84848              32.12121
```

```
   ACS21_5yr_B25045011s  ACS21_5yr_B25045012s  ACS21_5yr_B25045013s  \
0              49.69697             24.848480             17.575760
1              55.75758             27.878790              7.878788
2              33.93939             16.969700              7.878788
3              84.84849              7.878788              7.878788
4              69.09091              7.878788              7.878788

   ACS21_5yr_B25045014s  ACS21_5yr_B25045015s  ACS21_5yr_B25045016s  \
0             19.393940              7.878788             47.27273
1             20.000000             18.787880             49.09091
2              7.878788             16.969700             30.30303
3              7.878788              7.878788             84.84849
4              7.878788              7.878788             69.09091

   ACS21_5yr_B25045017s  ACS21_5yr_B25045018s  ACS21_5yr_B25045019s
0             29.696970             31.51515             26.666670
1              8.484848             44.84848             29.090910
2             10.303030             29.69697              7.878788
3             69.090910             43.63636              7.878788
4             36.969700             57.57576              7.878788
```

1.3.3 Defining Columns

rename columns for ease

[84]:
```
columns_to_keep = ['Geo_FIPS',
                   'SE_A10030_001',
                   'SE_A10030_002',
                   'SE_A10030_003',
                   'SE_A10030_004',
                   'SE_A10030_005',
                   'SE_A10030_006',
                   'SE_A10030_007',
                   'ACS21_5yr_B25045001',
                   'ACS21_5yr_B25045002',
                   'ACS21_5yr_B25045003',
                   'ACS21_5yr_B25045004',
                   'ACS21_5yr_B25045005',
                   'ACS21_5yr_B25045006',
                   'ACS21_5yr_B25045007',
                   'ACS21_5yr_B25045008',
                   'ACS21_5yr_B25045009',
                   'ACS21_5yr_B25045010',
                   'ACS21_5yr_B25045011',
                   'ACS21_5yr_B25045012',
                   'ACS21_5yr_B25045013',
                   'ACS21_5yr_B25045014',
```

```
                    'ACS21_5yr_B25045015',
                    'ACS21_5yr_B25045016',
                    'ACS21_5yr_B25045017',
                    'ACS21_5yr_B25045018',
                    'ACS21_5yr_B25045019']
```

[91]:
```
df[columns_to_keep] = df2
```

1.3.4 Renaming Columns

[ ]:
```
```

[94]:
```
df2.columns = ['FIPS',
                        'Occupied Housing Units',
                        'No Vehicle Available',
                        '1 Vehicle Available',
                        '2 Vehicles Available',
                        '3 Vehicles Available',
                        '4 Vehicles Available',
                        '5 or More Vehicles Available',
                        'Total',
                        'Owner Occupied',
                        'No Vehicle Available',
                        'Householder 15 To 34 Years',
                        'Householder 35 To 64 Years',
                        'Householder 65 Years And Over',
                        '1 Or More Vehicles Available',
                        'Householder 15 To 34 Years',
                        'Householder 35 To 64 Years',
                        'Householder 65 Years And Over',
                        'Renter Occupied',
                        'No Vehicle Available',
                        'Householder 15 To 34 Years',
                        'Householder 35 To 64 Years',
                        'Householder 65 Years And Over',
                        '1 Or More Vehicles Available',
                        'Householder 15 To 34 Years',
                        'Householder 35 To 64 Years',
                        'Householder 65 Years And Over']
```

check to see if it worked:

[96]:
```
df2.sample(5)
```

[96]:
```
              FIPS  Occupied Housing Units  No Vehicle Available  \
5114  060375706024                     364                    54
1011  060371852032                     512                    30
```

```
3527  060374309023                    306                     0
6556  060379800051                      0                     0
4062  060375008002                    573                    34

      1 Vehicle Available  2 Vehicles Available  3 Vehicles Available  \
5114                  121                    93                    58
1011                  191                   156                    88
3527                  107                   120                    38
6556                    0                     0                     0
4062                  164                   120                    93

      4 Vehicles Available  5 or More Vehicles Available  Total  \
5114                    38                             0    364
1011                    25                            22    512
3527                    41                             0    306
6556                     0                             0      0
4062                   120                            42    573

      Owner Occupied  No Vehicle Available  Householder 15 To 34 Years  \
5114              86                     0                           0
1011             175                     8                           0
3527             108                     0                           0
6556               0                     0                           0
4062             382                    34                           0

      Householder 35 To 64 Years  Householder 65 Years And Over  \
5114                           0                              0
1011                           0                              8
3527                           0                              0
6556                           0                              0
4062                           0                             34

      1 Or More Vehicles Available  Householder 15 To 34 Years  \
5114                           86                            0
1011                          167                           18
3527                          108                            0
6556                            0                            0
4062                          348                            0

      Householder 35 To 64 Years  Householder 65 Years And Over  \
5114                          35                             51
1011                          79                             70
3527                         105                              3
6556                           0                              0
4062                         234                            114

      Renter Occupied  No Vehicle Available  Householder 15 To 34 Years  \
```

```
5114              278                    54                           0
1011              337                    22                           5
3527              198                     0                           0
6556                0                     0                           0
4062              191                     0                           0

      Householder 35 To 64 Years  Householder 65 Years And Over  \
5114                          13                             41
1011                          17                              0
3527                           0                              0
6556                           0                              0
4062                           0                              0

      1 Or More Vehicles Available  Householder 15 To 34 Years  \
5114                           224                          57
1011                           315                          51
3527                           198                          41
6556                             0                           0
4062                           191                          44

      Householder 35 To 64 Years  Householder 65 Years And Over
5114                          153                             14
1011                          227                             37
3527                          144                             13
6556                            0                              0
4062                          109                             38
```

[97]:
```
#Displaying a signle column (ex: Variable "Total")

df2['Total'].head()
```

[97]:
```
0    595
1    560
2    339
3    786
4    586
Name: Total, dtype: int64
```

[99]:
```
# Mean:
df2['Total'].mean()
```

[99]:
```
507.17812168108026
```

[100]:
```
# Mean
df2['Total'].median()
```

[100]:
```
466.0
```

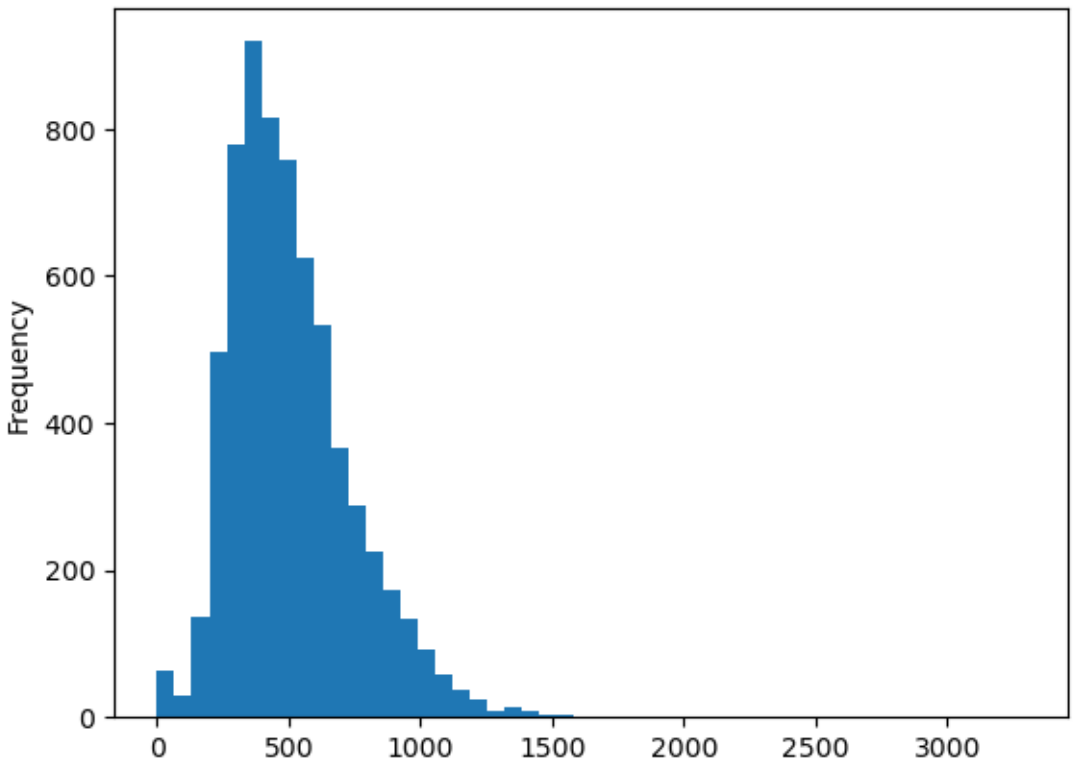
[101]:
```
# stats info:
df2['Total'].describe()
```

[101]:
```
count    6591.000000
mean      507.178122
std       236.437333
min         0.000000
25%       339.000000
50%       466.000000
75%       632.000000
max      3292.000000
Name: Total, dtype: float64
```

1.3.5 Histogram:

[103]:
```
df2['Total'].plot.hist(bins=50)
```

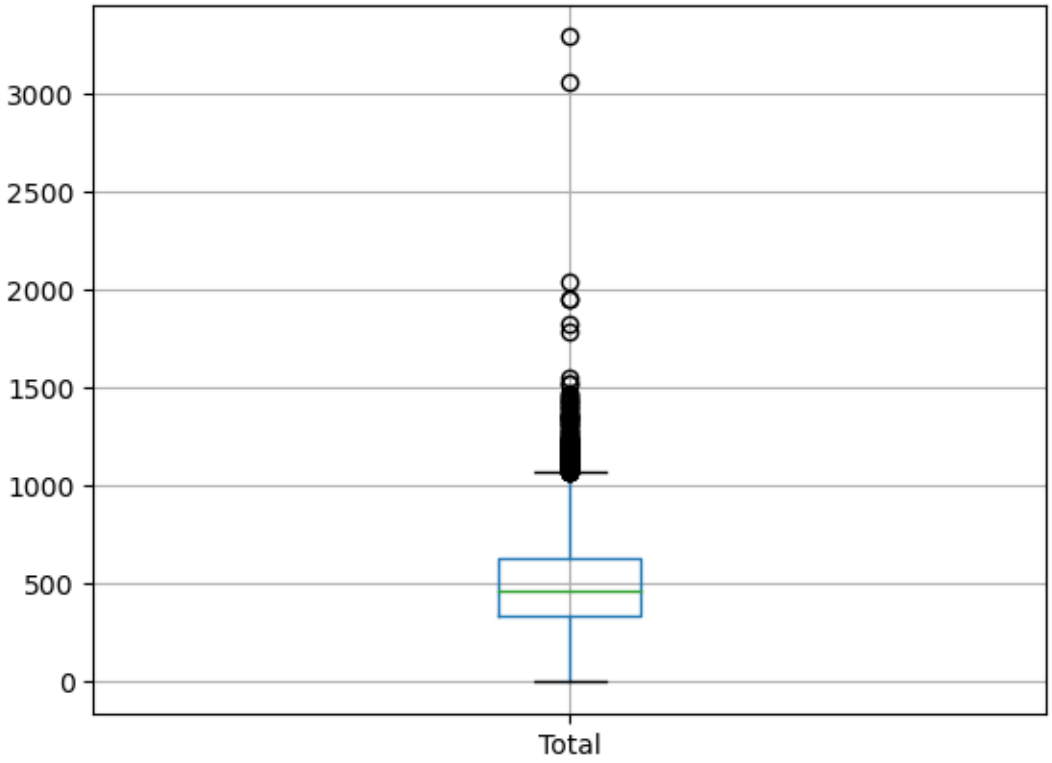
[103]:
```
<AxesSubplot: ylabel='Frequency'>
```



1.3.6 Box Plot

[104]:
```
df2.boxplot(column=['Total'])
```

[104]: <AxesSubplot: >



2 Mapping

Our project will focus on seniors located in Los Angelels. We will use census data to locate.

[ ]:
```
import geopandas as gpd
```

[25]:
```
# import geographic data file containing census tracts
tracts = gpd.read_file('Census_Tracts_2020.geojson')
tracts.head()
```

[25]:

	OBJECTID	CT20	LABEL	ShapeSTArea	ShapeSTLength	\
0	1	101110	1011.10	1.229562e+07	15083.854287	
1	2	101122	1011.22	2.845774e+07	31671.455844	
2	3	101220	1012.20	7.522093e+06	12698.783810	
3	4	101221	1012.21	3.812000e+06	9161.710543	
4	5	101222	1012.22	3.191371e+06	9980.600461	

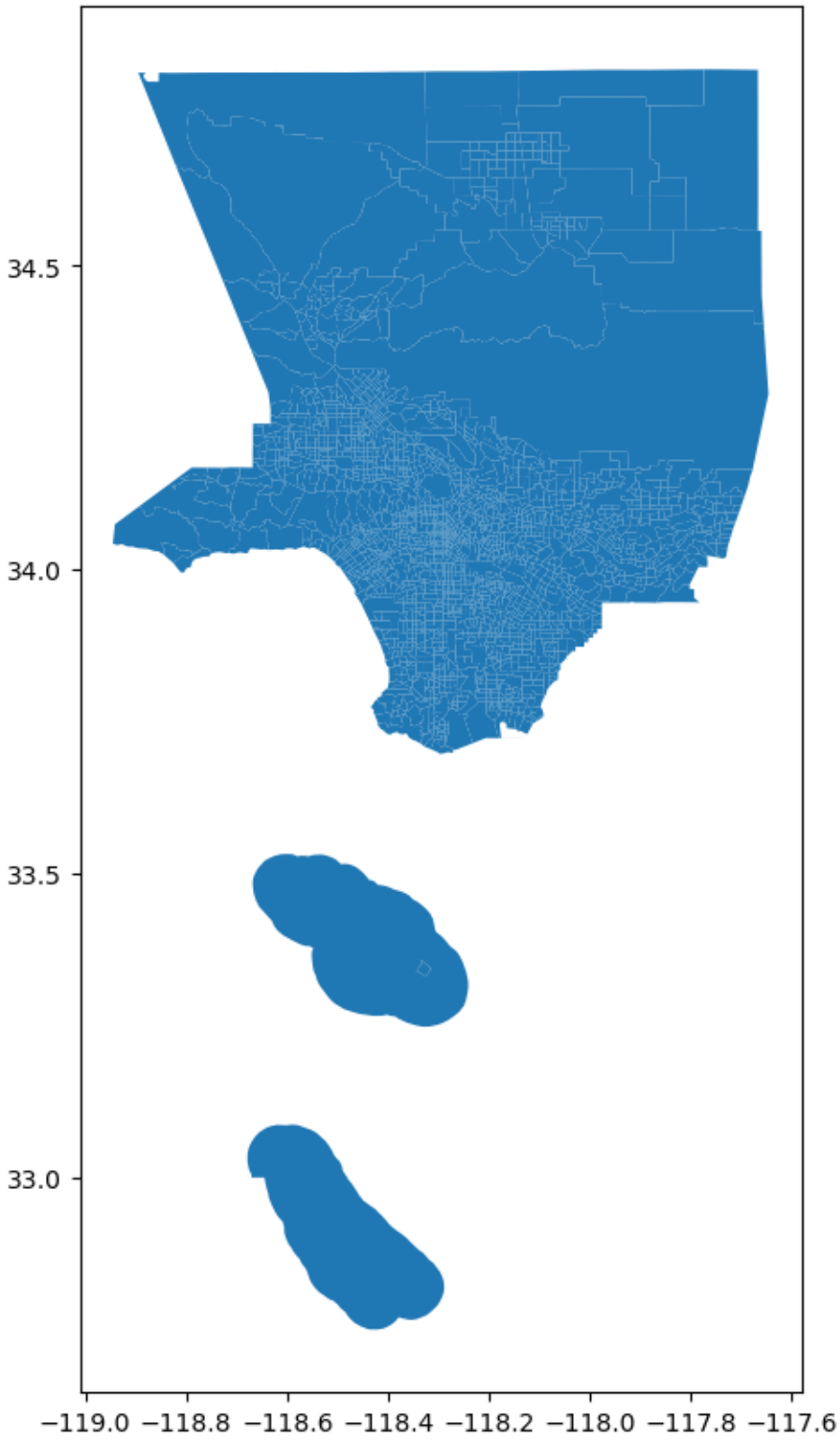
```
                                                 geometry
0  POLYGON ((-118.28491 34.25948, -118.28492 34.2…
1  POLYGON ((-118.29015 34.27417, -118.29015 34.2…
2  POLYGON ((-118.28100 34.25592, -118.28198 34.2…
3  POLYGON ((-118.28735 34.25591, -118.28863 34.2…
4  POLYGON ((-118.28594 34.25405, -118.28594 34.2…
```

2.0.1 Mapping Los Angeles

[ ]:

[26]:
```
tracts.plot(figsize=(12,10))
```

[26]: <AxesSubplot: >


34.5
34.0
33.5
33.0
−119.0 −118.8 −118.6 −118.4 −118.2 −118.0 −117.8 −117.6

[ ]:

[29]:
```
tracts.info(verbose=True, show_counts=True)
```

```
<class 'geopandas.geodataframe.GeoDataFrame'>
RangeIndex: 2495 entries, 0 to 2494
Data columns (total 6 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   OBJECTID       2495 non-null   int64
 1   CT20           2495 non-null   object
 2   LABEL          2495 non-null   object
 3   ShapeSTArea    2495 non-null   float64
 4   ShapeSTLength  2495 non-null   float64
 5   geometry       2495 non-null   geometry
dtypes: float64(2), geometry(1), int64(1), object(2)
memory usage: 117.1+ KB
```

[35]:
```
#subset only the columns that we need (FIPS and Geo)
tracts = tracts [['CT20','geometry']]
tracts.head()
```

[35]:

	CT20	geometry
0	101110	POLYGON ((-118.28491 34.25948, -118.28492 34.2…
1	101122	POLYGON ((-118.29015 34.27417, -118.29015 34.2…
2	101220	POLYGON ((-118.28100 34.25592, -118.28198 34.2…
3	101221	POLYGON ((-118.28735 34.25591, -118.28863 34.2…
4	101222	POLYGON ((-118.28594 34.25405, -118.28594 34.2…

[ ]:
```

```