mcpp_taller7_john_caro

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1 Taller 7

Métodos Computacionales para Políticas Públicas - URosario

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1.1 Instrucciones:

- Guarde una copia de este *Jupyter Notebook* en su computador, idealmente en una carpeta destinada al material del curso.
- Modifique el nombre del archivo del *notebook*, agregando al final un guión inferior y su nombre y apellido, separados estos últimos por otro guión inferior. Por ejemplo, mi *notebook* se llamaría: mcpp_taller7_santiago_matallana
- Marque el *notebook* con su nombre y e-mail en el bloque verde arriba. Reemplace el texto "[Su nombre acá]" con su nombre y apellido. Similar para su e-mail.
- Desarrolle la totalidad del taller sobre este *notebook*, insertando las celdas que sea necesario debajo de cada pregunta. Haga buen uso de las celdas para código y de las celdas tipo *markdown* según el caso.
- Recuerde salvar periódicamente sus avances.
- Cuando termine el taller:

  1. Descárguelo en PDF. Si tiene algún problema con la conversión, descárguelo en HTML.
  2. Suba todos los archivos a su repositorio en GitHub, en una carpeta destinada exclusivamente para este taller, antes de la fecha y hora límites.

(Todos los ejercicios tienen el mismo valor.)

Este taller tiene dos partes. Una obligatoria, relativamente fácil, y otra voluntaria y más retadora. Los invito a intentar desarrollar el taller en su totalidad.

En este taller exploraremos los datos de crimen de Chicago.

Descargue los datos de crimen del Chicago Data Portal solo para el año 2015 (https://data.cityofchicago.org/Public-Safety/Crimes-2001-to-present/ijzp-q8t2).

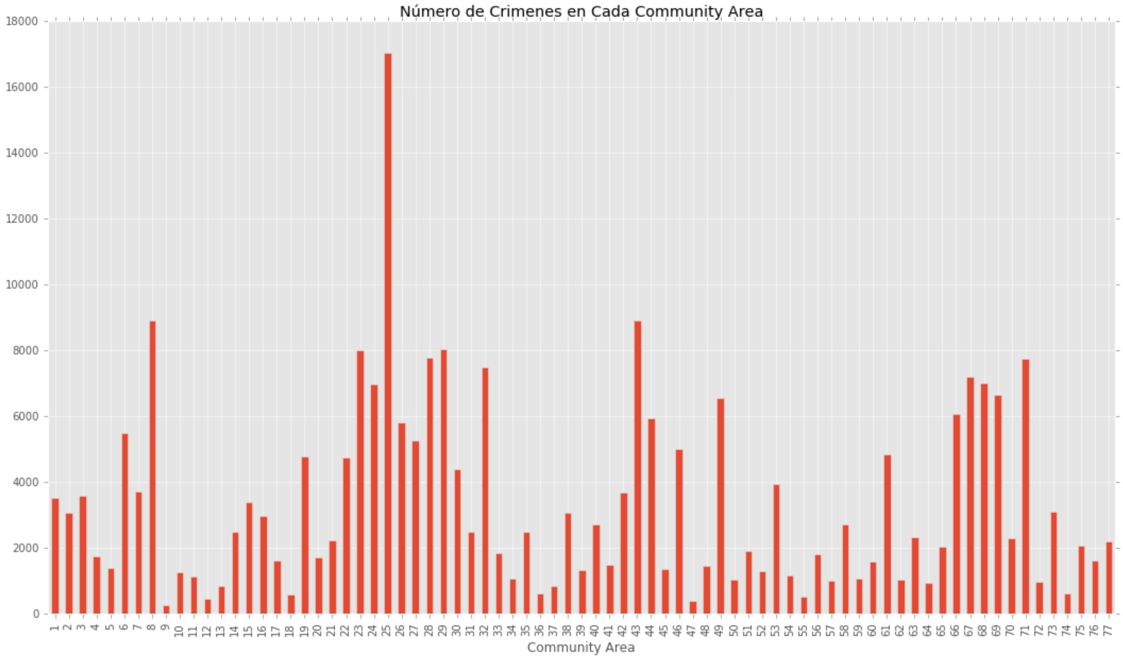
1.1.1 Parte obligatoria

1.1.2 1.

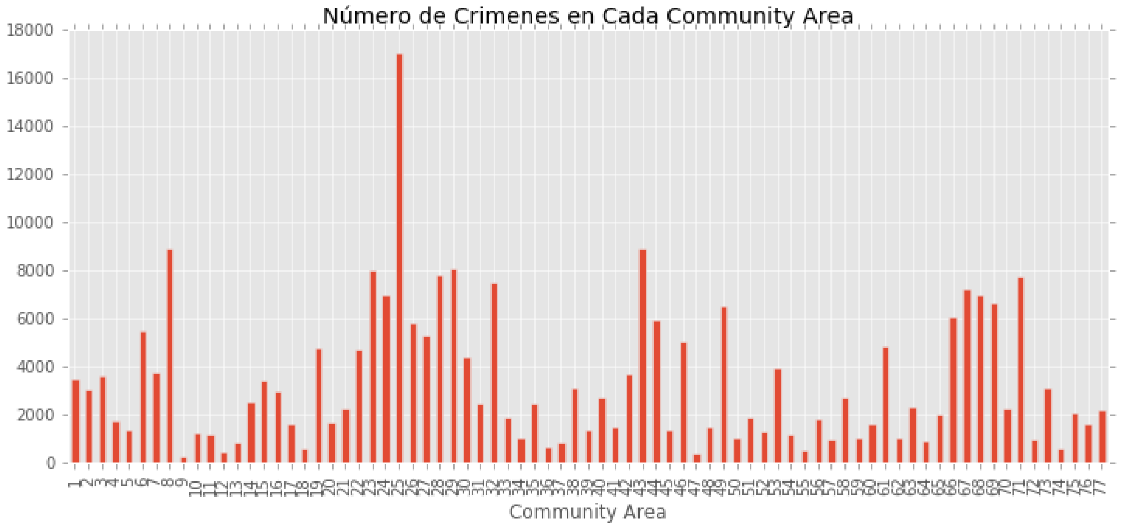
Calcule el número de crímenes en cada Community Area en 2015. Haga un gráfico de barras que lo ilustre.

```
In [1]: import pandas as pd
        import numpy as np
        from numpy.random import randn
        import matplotlib.pyplot as plt
        %matplotlib inline
        plt.rcParams["figure.figsize"] = [18.0, 10.0]
        plt.style.use('ggplot')

        crimes = pd.read_csv('Crimes_-_2001_to_present.csv', parse_dates=['Date'])
```

```
In [2]: numeros_crimenes_c_area = crimes.groupby('Community Area')['ID'].agg('count
        numeros_crimenes_c_area.plot(kind='bar',title="Número de Crimenes en Cada C
```



```
In [3]: numeros_crimenes_c_area.plot(kind='bar', figsize=(12,5),title="Número de Cr
```



1.1.3 2.

Ordene las Community Areas de acuerdo con el número de crímenes. ¿Qué Community Area (por nombre, idealmente) presenta el mayor número de crímenes? ¿El menor?

```
In [4]: numeros_crimenes_c_area_ordenado = numeros_crimenes_c_area.sort_values()
        C_area_menor_crimenes = numeros_crimenes_c_area_ordenado.head(1)
        C_area_mayor_crimenes = numeros_crimenes_c_area_ordenado.tail(1)
        numeros_crimenes_c_area_ordenado
```

```
Out[4]: Community Area
        9        254
        47       380
        12       444
        55       506
        18       572
        74       608
        36       622
        13       828
        37       834
        64       927
        72       976
        57       986
        62      1030
        50      1037
        34      1057
        59      1063
        11      1140
        54      1173
```

```
10     1259
52     1303
39     1340
45     1356
5      1375
48     1458
41     1493
60     1590
76     1622
17     1626
20     1703
4      1747
      ...
73     3109
15     3392
1      3519
3      3585
42     3665
7      3726
53     3949
30     4393
22     4737
19     4769
61     4842
46     5009
27     5270
6      5495
26     5794
44     5943
66     6081
49     6545
69     6653
24     6959
68     6991
67     7203
32     7489
71     7733
28     7788
23     8015
29     8039
43     8906
8      8920
25    17020
Name: ID, dtype: int64
```

```
In [5]: C_area_menor_crimenes
```

```
Out[5]: Community Area
```

```
        9    254
        Name: ID, dtype: int64
```

```
In [6]: C_area_mayor_crimenes

Out[6]: Community Area
        25    17020
        Name: ID, dtype: int64
```

1.1.4 3.

Cree una tabla cuyas filas sean días del año (yyyy-mm-dd) y las columnas las 77 Community Areas. En cada campo de la tabla deberá haber el correspondiente número de crímenes. Seleccione algunas Community Areas que le llamen la atención y haga un gráfico de serie de tiempo.

Pista: El siguiente código puede serle útil.

```
In [7]: # Create function to strip time from date field, and use it to create anoth
        def to_day(timestamp):
            return timestamp.replace(minute=0,hour=0, second=0)

        crimes['Day'] = crimes['Date'].apply(to_day)
```

```
In [11]: crimes_by_community_day = crimes.groupby(['Community Area', 'Day'])

         crimes_by_community_day_count = crimes_by_community_day['ID'].agg('count')
         crimes_by_community_day_count

Out[11]: Community Area  Day
         1               2015-01-01    13
                         2015-01-02     5
                         2015-01-03     7
                         2015-01-04    12
                         2015-01-05     6
                         2015-01-06     7
                         2015-01-07     6
                         2015-01-08     6
                         2015-01-09    10
                         2015-01-10     6
                         2015-01-11     8
                         2015-01-12     3
                         2015-01-13    10
                         2015-01-14    17
                         2015-01-15     9
                         2015-01-16    13
                         2015-01-17    12
                         2015-01-18    12
                         2015-01-19     3
                         2015-01-20     8
                         2015-01-21    18
```

```
                2015-01-22     7
                2015-01-23    12
                2015-01-24    14
                2015-01-25     5
                2015-01-26    10
                2015-01-27     6
                2015-01-28    15
                2015-01-29     9
                2015-01-30     8
                              ..
77              2015-12-01     2
                2015-12-02     8
                2015-12-03     4
                2015-12-04     3
                2015-12-05     4
                2015-12-06     9
                2015-12-07     6
                2015-12-08     9
                2015-12-09     6
                2015-12-10     2
                2015-12-11     9
                2015-12-12     3
                2015-12-13     5
                2015-12-14    12
                2015-12-15     7
                2015-12-16     5
                2015-12-17     7
                2015-12-18     4
                2015-12-19     4
                2015-12-20     1
                2015-12-21     5
                2015-12-22     8
                2015-12-23     7
                2015-12-24     5
                2015-12-25     4
                2015-12-26     8
                2015-12-27     2
                2015-12-28     9
                2015-12-29     4
                2015-12-30     5
Name: ID, dtype: int64
```

```
In [12]: community_timeseries = crimes_by_community_day_count.unstack('Community Ar
         community_timeseries
```

```
Out[12]: Community Area    1     2     3     4    5     6     7     8    9    10  .
         Day                                                                     .
         2015-01-01      13.0   7.0  11.0   4.0  5.0  22.0  12.0  43.0  1.0  5.0  .
```

```
2015-01-02       5.0   9.0   8.0   3.0  2.0  10.0   9.0  27.0  NaN  2.0  .
2015-01-03       7.0  11.0   9.0   7.0  4.0   6.0  11.0  27.0  1.0  3.0  .
2015-01-04      12.0   7.0   9.0  10.0  3.0  15.0   5.0  16.0  1.0  4.0  .
2015-01-05       6.0   7.0   5.0   4.0  5.0  15.0   7.0  11.0  1.0  3.0  .
2015-01-06       7.0   8.0   6.0   5.0  NaN  13.0   7.0  13.0  NaN  4.0  .
2015-01-07       6.0   2.0   4.0   5.0  1.0   8.0   6.0  17.0  1.0  2.0  .
2015-01-08       6.0   6.0   3.0   5.0  NaN   6.0   5.0   8.0  1.0  NaN  .
2015-01-09      10.0   5.0  10.0   2.0  4.0  14.0   6.0  21.0  NaN  3.0  .
2015-01-10       6.0  12.0   8.0   NaN  1.0  10.0   5.0  24.0  2.0  2.0  .
2015-01-11       8.0   6.0  11.0   5.0  4.0  20.0   4.0  26.0  1.0  2.0  .
2015-01-12       3.0   6.0   6.0   6.0  1.0   7.0  11.0  17.0  NaN  6.0  .
2015-01-13      10.0  10.0   9.0   5.0  4.0   8.0   6.0  15.0  NaN  3.0  .
2015-01-14      17.0   8.0   9.0   4.0  3.0   5.0  11.0  15.0  1.0  3.0  .
2015-01-15       9.0   8.0   8.0   6.0  7.0   9.0  11.0  18.0  1.0  4.0  .
2015-01-16      13.0   6.0  12.0   5.0  5.0  12.0  12.0  22.0  1.0  8.0  .
2015-01-17      12.0   5.0   5.0   2.0  5.0  16.0   7.0  30.0  1.0  4.0  .
2015-01-18      12.0   6.0  12.0   7.0  5.0  14.0   8.0  18.0  1.0  2.0  .
2015-01-19       3.0  12.0   7.0   3.0  5.0  10.0  11.0  25.0  NaN  3.0  .
2015-01-20       8.0   8.0   9.0  10.0  3.0  13.0  12.0  31.0  NaN  4.0  .
2015-01-21      18.0   8.0   8.0  10.0  9.0  12.0   9.0  29.0  2.0  2.0  .
2015-01-22       7.0   7.0   6.0   9.0  7.0  14.0  10.0  21.0  NaN  6.0  .
2015-01-23      12.0  11.0   6.0   4.0  6.0   8.0   6.0  27.0  1.0  5.0  .
2015-01-24      14.0   9.0   7.0   8.0  4.0  11.0  15.0  23.0  NaN  4.0  .
2015-01-25       5.0   9.0   3.0   5.0  2.0  20.0   6.0  29.0  NaN  2.0  .
2015-01-26      10.0   8.0   5.0   4.0  3.0  13.0   5.0  13.0  1.0  NaN  .
2015-01-27       6.0   8.0   6.0   3.0  3.0   6.0   3.0  13.0  NaN  3.0  .
2015-01-28      15.0   9.0  10.0   1.0  1.0   9.0  11.0  26.0  NaN  1.0  .
2015-01-29       9.0   9.0  11.0   2.0  3.0  11.0   7.0  26.0  1.0  6.0  .
2015-01-30       8.0  11.0   6.0   5.0  3.0  12.0  10.0  21.0  NaN  6.0  .
...              ...   ...   ...   ...  ...   ...   ...   ...  ...  ...  .
2015-12-02      12.0   7.0  11.0   4.0  7.0  12.0  11.0  23.0  1.0  1.0  .
2015-12-03       6.0  11.0   9.0   2.0  4.0  12.0   7.0  32.0  1.0  1.0  .
2015-12-04       8.0   9.0   8.0   4.0  5.0  10.0   4.0  26.0  NaN  3.0  .
2015-12-05       9.0   7.0   5.0   5.0  5.0   8.0  13.0  33.0  1.0  2.0  .
2015-12-06       9.0  11.0  11.0   2.0  NaN  20.0   8.0  24.0  NaN  2.0  .
2015-12-07       7.0  10.0   8.0   1.0  6.0  10.0   8.0  19.0  1.0  3.0  .
2015-12-08       5.0   9.0   4.0   3.0  6.0  17.0  12.0  33.0  3.0  7.0  .
2015-12-09      12.0  11.0   7.0   8.0  9.0  15.0  12.0  24.0  NaN  5.0  .
2015-12-10       3.0   6.0   9.0   8.0  6.0  25.0  13.0  29.0  1.0  3.0  .
2015-12-11      11.0   7.0  11.0   6.0  5.0  19.0  10.0  29.0  NaN  2.0  .
2015-12-12      10.0   5.0   7.0   8.0  4.0  25.0  15.0  38.0  1.0  2.0  .
2015-12-13       7.0  12.0  10.0   3.0  4.0  21.0   9.0  38.0  NaN  6.0  .
2015-12-14      15.0  12.0  11.0   9.0  6.0   9.0  10.0  27.0  1.0  4.0  .
2015-12-15      10.0   6.0  11.0   5.0  3.0  10.0  21.0  24.0  NaN  9.0  .
2015-12-16       6.0   7.0  12.0   5.0  4.0  19.0   9.0  20.0  1.0  3.0  .
2015-12-17       8.0   8.0   8.0   7.0  5.0  18.0  19.0  28.0  NaN  3.0  .
2015-12-18      13.0   7.0   6.0   6.0  2.0  17.0  19.0  27.0  NaN  3.0  .
2015-12-19       7.0  11.0   6.0   3.0  1.0  10.0  12.0  41.0  2.0  3.0  .
```

```
2015-12-20        12.0   8.0  13.0   7.0  3.0  18.0  10.0  21.0  1.0  2.0  .
2015-12-21         6.0   2.0  11.0   4.0  NaN   6.0  11.0  32.0  NaN  3.0  .
2015-12-22        13.0  11.0  15.0   5.0  4.0  13.0   9.0  26.0  NaN  NaN  .
2015-12-23        12.0  11.0  14.0   6.0  5.0  18.0  12.0  28.0  NaN  3.0  .
2015-12-24         8.0  11.0   2.0   6.0  3.0  19.0  11.0  26.0  NaN  7.0  .
2015-12-25         2.0   6.0   3.0   3.0  NaN   5.0   5.0  10.0  1.0  5.0  .
2015-12-26         6.0  11.0  12.0   1.0  1.0  17.0   5.0  26.0  NaN  9.0  .
2015-12-27        14.0   8.0   6.0   3.0  1.0  16.0  11.0  32.0  NaN  1.0  .
2015-12-28         7.0   8.0   5.0   2.0  2.0  10.0   8.0  19.0  NaN  3.0  .
2015-12-29         6.0   7.0  12.0   8.0  3.0   8.0   5.0  25.0  NaN  1.0  .
2015-12-30         5.0   8.0   7.0   4.0  1.0  11.0  15.0  27.0  1.0  6.0  .
2015-12-31         NaN   NaN   NaN   NaN  NaN   1.0   NaN   NaN  NaN  NaN  .

Community Area      68    69    70    71   72    73   74   75    76    77
Day
2015-01-01        29.0  23.0   9.0  44.0  2.0   8.0  2.0  5.0   6.0   8.0
2015-01-02        12.0  21.0   5.0  17.0  1.0  11.0  1.0  2.0   6.0   5.0
2015-01-03        23.0  12.0   8.0  18.0  NaN   8.0  1.0  7.0   3.0   3.0
2015-01-04        13.0  15.0   9.0  12.0  1.0   5.0  NaN  1.0   6.0   1.0
2015-01-05        16.0  12.0   8.0  17.0  NaN   5.0  2.0  2.0   7.0   5.0
2015-01-06        15.0  14.0   6.0  11.0  2.0   8.0  2.0  3.0   6.0   4.0
2015-01-07        11.0   7.0   4.0  16.0  3.0   7.0  NaN  3.0   7.0   1.0
2015-01-08         9.0   9.0   6.0  10.0  2.0   4.0  1.0  5.0   3.0   3.0
2015-01-09        18.0  14.0  10.0  20.0  1.0   9.0  2.0  8.0   5.0   2.0
2015-01-10         9.0  13.0   6.0  28.0  3.0   3.0  1.0  5.0   5.0   2.0
2015-01-11        17.0   8.0  11.0  17.0  2.0  10.0  2.0  4.0   2.0   4.0
2015-01-12        12.0  18.0   6.0  19.0  3.0   5.0  1.0  4.0   4.0   3.0
2015-01-13        19.0  12.0   9.0  11.0  2.0   6.0  NaN  4.0   6.0   6.0
2015-01-14        21.0  16.0   6.0  24.0  NaN   5.0  1.0  1.0   2.0   6.0
2015-01-15        19.0  20.0   4.0  21.0  3.0   7.0  2.0  6.0   6.0   5.0
2015-01-16        18.0  17.0   8.0  16.0  4.0   5.0  NaN  5.0   7.0   3.0
2015-01-17        29.0  13.0   7.0  15.0  2.0   6.0  2.0  5.0  10.0   3.0
2015-01-18        20.0  22.0   3.0  20.0  1.0  11.0  NaN  8.0   2.0   4.0
2015-01-19        24.0  19.0   3.0  28.0  NaN  13.0  NaN  6.0   8.0   4.0
2015-01-20        19.0  15.0   5.0  23.0  1.0  10.0  NaN  8.0   6.0   7.0
2015-01-21        11.0  12.0   7.0  29.0  5.0   2.0  2.0  6.0   3.0   9.0
2015-01-22        19.0  13.0  11.0  22.0  1.0   5.0  1.0  6.0   4.0   6.0
2015-01-23        26.0  18.0   6.0  20.0  1.0   7.0  3.0  4.0   6.0   8.0
2015-01-24        10.0  13.0   5.0  17.0  1.0   8.0  NaN  3.0   5.0  10.0
2015-01-25        15.0  13.0   7.0  15.0  3.0   4.0  1.0  6.0   3.0   5.0
2015-01-26        18.0  16.0  10.0  29.0  1.0   8.0  1.0  9.0   2.0   8.0
2015-01-27        20.0  16.0   9.0  20.0  2.0  11.0  2.0  6.0   3.0   5.0
2015-01-28        13.0  16.0   3.0  18.0  2.0   7.0  1.0  6.0   5.0   6.0
2015-01-29        19.0  20.0   4.0  24.0  2.0   6.0  1.0  8.0   4.0   5.0
2015-01-30        20.0  22.0   6.0  20.0  5.0   7.0  NaN  6.0   2.0   4.0
...                ...   ...   ...   ...  ...   ...  ...  ...   ...   ...
2015-12-02        23.0  13.0   6.0  23.0  1.0   8.0  4.0  6.0   6.0   8.0
2015-12-03        16.0  19.0   7.0  17.0  2.0   7.0  3.0  3.0   2.0   4.0
```

```
2015-12-04      18.0  15.0   3.0  21.0  1.0   7.0  NaN  6.0   2.0   3.0
2015-12-05      13.0  20.0   5.0  26.0  3.0   9.0  3.0  5.0   2.0   4.0
2015-12-06      19.0  20.0   6.0  22.0  5.0  10.0  1.0  1.0   4.0   9.0
2015-12-07      20.0  21.0   3.0  30.0  3.0   8.0  2.0  6.0   4.0   6.0
2015-12-08       9.0  16.0   9.0  29.0  1.0   6.0  2.0  1.0   1.0   9.0
2015-12-09      11.0  16.0   3.0  20.0  6.0   7.0  1.0  4.0   4.0   6.0
2015-12-10      19.0  16.0   8.0  20.0  2.0   8.0  4.0  5.0   3.0   2.0
2015-12-11      17.0  19.0   3.0  19.0  4.0  10.0  3.0  4.0  10.0   9.0
2015-12-12      17.0  16.0   9.0  19.0  1.0   7.0  2.0  NaN   5.0   3.0
2015-12-13      17.0  17.0   7.0  14.0  NaN   2.0  3.0  3.0   5.0   5.0
2015-12-14      18.0  29.0  11.0  12.0  4.0   4.0  2.0  6.0   3.0  12.0
2015-12-15      19.0  19.0  11.0  14.0  NaN   8.0  1.0  7.0   3.0   7.0
2015-12-16      18.0  15.0  10.0  23.0  1.0   9.0  2.0  4.0   4.0   5.0
2015-12-17      15.0  19.0   4.0  15.0  NaN  10.0  NaN  6.0   7.0   7.0
2015-12-18      15.0  16.0   7.0  19.0  3.0   9.0  NaN  4.0   5.0   4.0
2015-12-19      10.0  12.0   5.0  21.0  1.0   7.0  NaN  2.0   3.0   4.0
2015-12-20      15.0  23.0   5.0  15.0  3.0   7.0  2.0  2.0   5.0   1.0
2015-12-21      12.0  15.0   3.0  18.0  2.0   9.0  1.0  1.0   2.0   5.0
2015-12-22      26.0  16.0   3.0  16.0  2.0   6.0  NaN  5.0   2.0   8.0
2015-12-23      18.0  23.0   8.0  19.0  1.0   9.0  4.0  8.0   2.0   7.0
2015-12-24      16.0  22.0   4.0  19.0  3.0   3.0  2.0  5.0   3.0   5.0
2015-12-25      13.0  15.0   3.0  18.0  1.0   5.0  NaN  6.0   3.0   4.0
2015-12-26      15.0  18.0   6.0  17.0  1.0  10.0  NaN  3.0   7.0   8.0
2015-12-27      11.0  19.0   3.0  26.0  2.0   8.0  2.0  1.0   4.0   2.0
2015-12-28      12.0  22.0   9.0  14.0  2.0   6.0  2.0  2.0   3.0   9.0
2015-12-29      18.0  16.0   7.0  18.0  NaN   8.0  3.0  2.0   2.0   4.0
2015-12-30      11.0  23.0   6.0  14.0  2.0   8.0  1.0  7.0   5.0   5.0
2015-12-31       NaN   NaN   NaN   NaN  NaN   NaN  NaN  NaN   NaN   NaN

[365 rows x 77 columns]
```

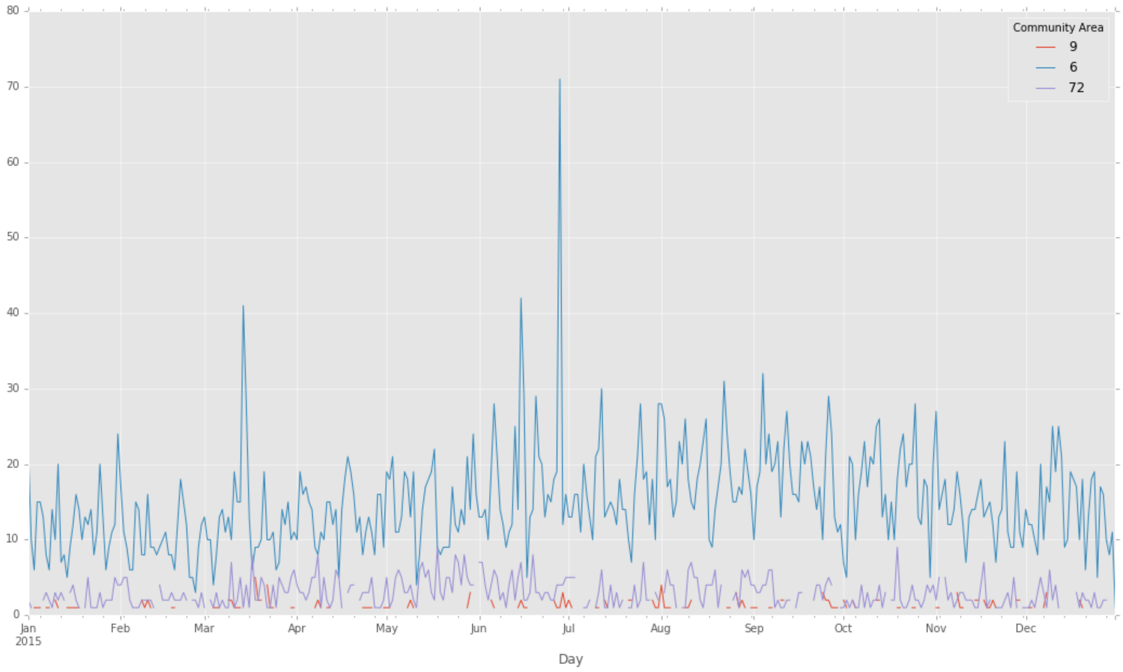
```
In [14]: community_timeseries.describe()
```

```
C:\Users\Usuario\Anaconda3\lib\site-packages\numpy\lib\function_base.py:3834: Runti
  RuntimeWarning)
```

```
Out[14]: Community Area          1           2           3           4           5
         count          364.000000  364.000000  364.000000  357.000000  347.000000
         mean             9.667582    8.403846    9.848901    4.893557    3.962536
         std              3.396959    3.024070    3.656267    2.318680    2.097696
         min              2.000000    2.000000    2.000000    1.000000    1.000000
         25%                   NaN         NaN         NaN         NaN         NaN
         50%                   NaN         NaN         NaN         NaN         NaN
         75%                   NaN         NaN         NaN         NaN         NaN
         max             20.000000   21.000000   29.000000   13.000000   12.000000

         Community Area          6           7           8           9          10
```

```
count           365.000000  364.000000  364.000000  180.000000  352.000000
mean             15.054795   10.236264   24.505495    1.411111    3.576705
std               6.664426    3.826715    7.202117    0.707414    1.924448
min               1.000000    2.000000    5.000000    1.000000    1.000000
25%              10.000000         NaN         NaN         NaN         NaN
50%              14.000000         NaN         NaN         NaN         NaN
75%              19.000000         NaN         NaN         NaN         NaN
max              71.000000   21.000000   53.000000    5.000000   10.000000

Community Area     ...             68          69          70          71
count              ...     364.000000  364.000000  364.000000  364.000000
mean               ...      19.206044   18.277473    6.260989   21.244505
std                ...       5.626469    5.052609    2.679483    5.210510
min                ...       7.000000    5.000000    1.000000   10.000000
25%                ...            NaN         NaN         NaN         NaN
50%                ...            NaN         NaN         NaN         NaN
75%                ...            NaN         NaN         NaN         NaN
max                ...      41.000000   33.000000   16.000000   44.000000

Community Area          72          73          74          75          76
count           332.000000  364.000000  289.000000  362.000000  360.000000
mean              2.939759    8.541209    2.103806    5.668508    4.505556
std               1.820324    3.082154    1.275961    2.567764    2.141244
min               1.000000    1.000000    1.000000    1.000000    1.000000
25%                    NaN         NaN         NaN         NaN         NaN
50%                    NaN         NaN         NaN         NaN         NaN
75%                    NaN         NaN         NaN         NaN         NaN
max               9.000000   20.000000    9.000000   15.000000   11.000000

Community Area         77
count           362.00000
mean              6.10221
std               2.55641
min               1.00000
25%                   NaN
50%                   NaN
75%                   NaN
max              14.00000

[8 rows x 77 columns]
```

```
In [15]: community_timeseries[[9,6,72]].plot();
```



1.1.5 Parte voluntaria

Descargue la base de datos de información socioeconómica (https://data.cityofchicago.org/Health-Human-Services/Census-Data-Selected-socioeconomic-indicators-in-C/kn9c-c2s2).

1.1.6 4.

Cree una tabla que agregue el número de crímenes por Community Area. Una esa tabla con la de datos socioeconómicos y cree un "scatter plot" de número de crímenes vs ingreso per cápita. Explique la relación en palabras.

```
In [79]: n_c=numeros_crimenes_c_area

In [41]: crimes2 = pd.read_csv('Census_Data_-_Selected_socioeconomic_indicators_in_

In [49]: crimes2

Out[49]:     Community Area Number     COMMUNITY AREA NAME  PERCENT OF HOUSING CROW
         0                     1.0             Rogers Park
         1                     2.0             West Ridge
         2                     3.0                Uptown
         3                     4.0         Lincoln Square
         4                     5.0           North Center
         5                     6.0              Lake View
         6                     7.0           Lincoln Park
```

```
7                     8.0         Near North Side
8                     9.0             Edison Park
9                    10.0            Norwood Park
10                   11.0          Jefferson Park
11                   12.0             Forest Glen
12                   13.0              North Park
13                   14.0             Albany Park                        1
14                   15.0            Portage Park
15                   16.0             Irving Park
16                   17.0                 Dunning
17                   18.0              Montclaire
18                   19.0          Belmont Cragin                        1
19                   20.0                 Hermosa
20                   21.0                Avondale
21                   22.0            Logan Square
22                   23.0           Humboldt park                        1
23                   24.0               West Town
24                   25.0                  Austin
25                   26.0      West Garfield Park
26                   27.0      East Garfield Park
27                   28.0          Near West Side
28                   29.0          North Lawndale
29                   30.0          South Lawndale                        1
..                    ...                     ...
48                   49.0                Roseland
49                   50.0                 Pullman
50                   51.0           South Deering
51                   52.0               East Side
52                   53.0            West Pullman
53                   54.0               Riverdale
54                   55.0               Hegewisch
55                   56.0          Garfield Ridge
56                   57.0          Archer Heights
57                   58.0           Brighton Park                        1
58                   59.0           McKinley Park
59                   60.0              Bridgeport
60                   61.0                New City                        1
61                   62.0             West Elsdon                        1
62                   63.0               Gage Park                        1
63                   64.0                Clearing
64                   65.0               West Lawn
65                   66.0            Chicago Lawn
66                   67.0          West Englewood
67                   68.0               Englewood
68                   69.0  Greater Grand Crossing
69                   70.0                 Ashburn
70                   71.0          Auburn Gresham
71                   72.0                 Beverly
```

```
72                   73.0       Washington Height
73                   74.0         Mount Greenwood
74                   75.0             Morgan Park
75                   76.0                  O'Hare
76                   77.0               Edgewater
77                    NaN                 CHICAGO

    PERCENT HOUSEHOLDS BELOW POVERTY  PERCENT AGED 16+ UNEMPLOYED  \
0                               23.6                          8.7   
1                               17.2                          8.8   
2                               24.0                          8.9   
3                               10.9                          8.2   
4                                7.5                          5.2   
5                               11.4                          4.7   
6                               12.3                          5.1   
7                               12.9                          7.0   
8                                3.3                          6.5   
9                                5.4                          9.0   
10                               8.6                         12.4   
11                               7.5                          6.8   
12                              13.2                          9.9   
13                              19.2                         10.0   
14                              11.6                         12.6   
15                              13.1                         10.0   
16                              10.6                         10.0   
17                              15.3                         13.8   
18                              18.7                         14.6   
19                              20.5                         13.1   
20                              15.3                          9.2   
21                              16.8                          8.2   
22                              33.9                         17.3   
23                              14.7                          6.6   
24                              28.6                         22.6   
25                              41.7                         25.8   
26                              42.4                         19.6   
27                              20.6                         10.7   
28                              43.1                         21.2   
29                              30.7                         15.8   
..                               ...                          ...   
48                              19.8                         20.3   
49                              21.6                         22.8   
50                              29.2                         16.3   
51                              19.2                         12.1   
52                              25.9                         19.4   
53                              56.5                         34.6   
54                              17.1                          9.6   
55                               8.8                         11.3   
56                              14.1                         16.5   
```

```
57                            23.6                        13.9
58                            18.7                        13.4
59                            18.9                        13.7
60                            29.0                        23.0
61                            15.6                        16.7
62                            23.4                        18.2
63                             8.9                         9.5
64                            14.9                         9.6
65                            27.9                        17.1
66                            34.4                        35.9
67                            46.6                        28.0
68                            29.6                        23.0
69                            10.4                        11.7
70                            27.6                        28.3
71                             5.1                         8.0
72                            16.9                        20.8
73                             3.4                         8.7
74                            13.2                        15.0
75                            15.4                         7.1
76                            18.2                         9.2
77                            19.7                        12.9

    PERCENT AGED 25+ WITHOUT HIGH SCHOOL DIPLOMA  \
0                                           18.2
1                                           20.8
2                                           11.8
3                                           13.4
4                                            4.5
5                                            2.6
6                                            3.6
7                                            2.5
8                                            7.4
9                                           11.5
10                                          13.4
11                                           4.9
12                                          14.4
13                                          32.9
14                                          19.3
15                                          22.4
16                                          16.2
17                                          23.5
18                                          37.3
19                                          41.6
20                                          24.7
21                                          14.8
22                                          35.4
23                                          12.9
24                                          24.4
```

```
25                                          24.5
26                                          21.3
27                                           9.6
28                                          27.6
29                                          54.8
..                                           ...
48                                          16.9
49                                          13.1
50                                          21.0
51                                          31.9
52                                          20.5
53                                          27.5
54                                          19.2
55                                          19.3
56                                          35.9
57                                          45.1
58                                          32.9
59                                          22.2
60                                          41.5
61                                          37.0
62                                          51.5
63                                          18.8
64                                          33.6
65                                          31.2
66                                          26.3
67                                          28.5
68                                          16.5
69                                          17.7
70                                          18.5
71                                           3.7
72                                          13.7
73                                           4.3
74                                          10.8
75                                          10.9
76                                           9.7
77                                          19.5

    PERCENT AGED UNDER 18 OR OVER 64  PER CAPITA INCOME   HARDSHIP INDEX
0                               27.5               23939            39.0
1                               38.5               23040            46.0
2                               22.2               35787            20.0
3                               25.5               37524            17.0
4                               26.2               57123             6.0
5                               17.0               60058             5.0
6                               21.5               71551             2.0
7                               22.6               88669             1.0
8                               35.3               40959             8.0
9                               39.5               32875            21.0
```

```
10                              35.5              27751              25.0
11                              40.5              44164              11.0
12                              39.0              26576              33.0
13                              32.0              21323              53.0
14                              34.0              24336              35.0
15                              31.6              27249              34.0
16                              33.6              26282              28.0
17                              38.6              22014              50.0
18                              37.3              15461              70.0
19                              36.4              15089              71.0
20                              31.0              20039              42.0
21                              26.2              31908              23.0
22                              38.0              13781              85.0
23                              21.7              43198              10.0
24                              37.9              15957              73.0
25                              43.6              10934              92.0
26                              43.2              12961              83.0
27                              22.2              44689              15.0
28                              42.7              12034              87.0
29                              33.8              10402              96.0
..                               ...                ...               ...
48                              41.2              17949              52.0
49                              38.6              20588              51.0
50                              39.5              14685              65.0
51                              42.8              17104              64.0
52                              42.1              16563              62.0
53                              51.5               8201              98.0
54                              42.9              22677              44.0
55                              38.1              26353              32.0
56                              39.2              16134              67.0
57                              39.3              13089              84.0
58                              35.6              16954              61.0
59                              31.3              22694              43.0
60                              38.9              12765              91.0
61                              37.7              15754              69.0
62                              38.8              12171              93.0
63                              37.6              25113              29.0
64                              39.6              16907              56.0
65                              40.6              13231              80.0
66                              40.7              11317              89.0
67                              42.5              11888              94.0
68                              41.0              17285              66.0
69                              36.9              23482              37.0
70                              41.9              15528              74.0
71                              40.5              39523              12.0
72                              42.6              19713              48.0
73                              36.8              34381              16.0
74                              40.3              27149              30.0
```

```
75                              30.3              25828           24.0
76                              23.8              33385           19.0
77                              33.5              28202            NaN

[78 rows x 9 columns]
```

```
In [69]: precapita=crimes2.loc[0:76,['Community Area Number',"PER CAPITA INCOME "]]

In [70]: precapita

Out[70]:     Community Area Number  PER CAPITA INCOME 
0                           1.0              23939
1                           2.0              23040
2                           3.0              35787
3                           4.0              37524
4                           5.0              57123
5                           6.0              60058
6                           7.0              71551
7                           8.0              88669
8                           9.0              40959
9                          10.0              32875
10                         11.0              27751
11                         12.0              44164
12                         13.0              26576
13                         14.0              21323
14                         15.0              24336
15                         16.0              27249
16                         17.0              26282
17                         18.0              22014
18                         19.0              15461
19                         20.0              15089
20                         21.0              20039
21                         22.0              31908
22                         23.0              13781
23                         24.0              43198
24                         25.0              15957
25                         26.0              10934
26                         27.0              12961
27                         28.0              44689
28                         29.0              12034
29                         30.0              10402
..                          ...                ...
47                         48.0              28887
48                         49.0              17949
49                         50.0              20588
50                         51.0              14685
51                         52.0              17104
52                         53.0              16563
```

```
53                     54.0                8201
54                     55.0               22677
55                     56.0               26353
56                     57.0               16134
57                     58.0               13089
58                     59.0               16954
59                     60.0               22694
60                     61.0               12765
61                     62.0               15754
62                     63.0               12171
63                     64.0               25113
64                     65.0               16907
65                     66.0               13231
66                     67.0               11317
67                     68.0               11888
68                     69.0               17285
69                     70.0               23482
70                     71.0               15528
71                     72.0               39523
72                     73.0               19713
73                     74.0               34381
74                     75.0               27149
75                     76.0               25828
76                     77.0               33385

[77 rows x 2 columns]
```

```
In [77]: n_c.iloc[0:77,]
```

```
Out[77]:                    ID
         Community Area
         1                3519
         2                3059
         3                3585
         4                1747
         5                1375
         6                5495
         7                3726
         8                8920
         9                 254
         10               1259
         11               1140
         12                444
         13                828
         14               2501
         15               3392
         16               2960
         17               1626
```

```
        18                   572
        19                  4769
        20                  1703
        21                  2232
        22                  4737
        23                  8015
        24                  6959
        25                 17020
        26                  5794
        27                  5270
        28                  7788
        29                  8039
        30                  4393
        ...                  ...
        48                  1458
        49                  6545
        50                  1037
        51                  1900
        52                  1303
        53                  3949
        54                  1173
        55                   506
        56                  1796
        57                   986
        58                  2706
        59                  1063
        60                  1590
        61                  4842
        62                  1030
        63                  2334
        64                   927
        65                  2027
        66                  6081
        67                  7203
        68                  6991
        69                  6653
        70                  2279
        71                  7733
        72                   976
        73                  3109
        74                   608
        75                  2052
        76                  1622
        77                  2209

        [77 rows x 1 columns]
```

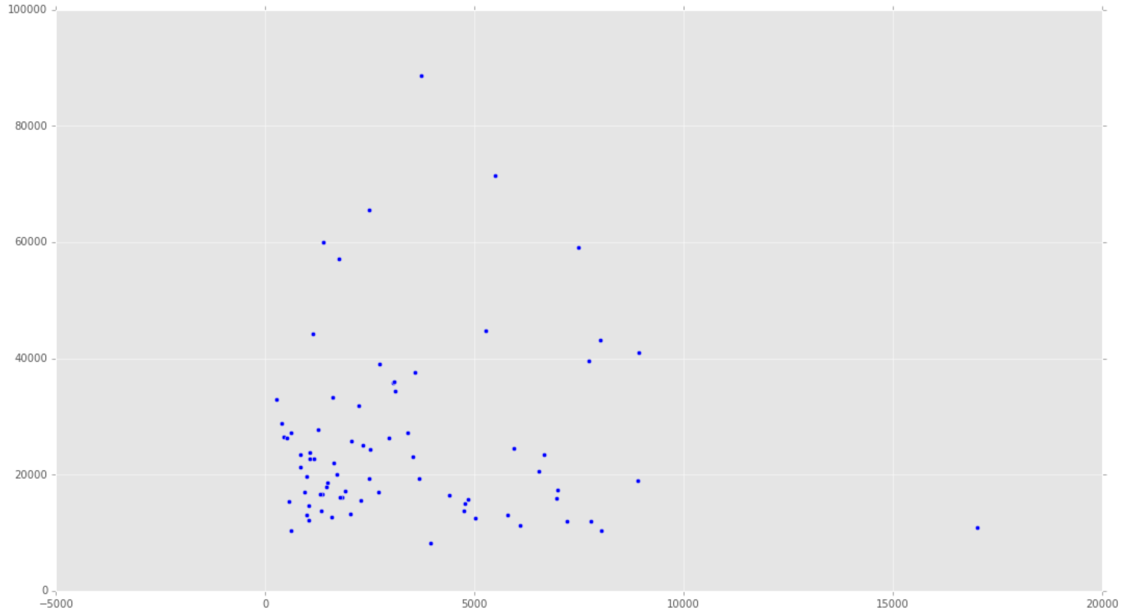
```
In [60]: precapita
```

```
Out[60]:     Community Area Number  PER CAPITA INCOME
         0                     1.0              23939
         1                     2.0              23040
         2                     3.0              35787
         3                     4.0              37524
         4                     5.0              57123
         5                     6.0              60058
         6                     7.0              71551
         7                     8.0              88669
         8                     9.0              40959
         9                    10.0              32875
         10                   11.0              27751
         11                   12.0              44164
         12                   13.0              26576
         13                   14.0              21323
         14                   15.0              24336
         15                   16.0              27249
         16                   17.0              26282
         17                   18.0              22014
         18                   19.0              15461
         19                   20.0              15089
         20                   21.0              20039
         21                   22.0              31908
         22                   23.0              13781
         23                   24.0              43198
         24                   25.0              15957
         25                   26.0              10934
         26                   27.0              12961
         27                   28.0              44689
         28                   29.0              12034
         29                   30.0              10402
         ..                    ...                ...
         47                   48.0              28887
         48                   49.0              17949
         49                   50.0              20588
         50                   51.0              14685
         51                   52.0              17104
         52                   53.0              16563
         53                   54.0               8201
         54                   55.0              22677
         55                   56.0              26353
         56                   57.0              16134
         57                   58.0              13089
         58                   59.0              16954
         59                   60.0              22694
         60                   61.0              12765
         61                   62.0              15754
         62                   63.0              12171
```

```
63                  64.0             25113
64                  65.0             16907
65                  66.0             13231
66                  67.0             11317
67                  68.0             11888
68                  69.0             17285
69                  70.0             23482
70                  71.0             15528
71                  72.0             39523
72                  73.0             19713
73                  74.0             34381
74                  75.0             27149
75                  76.0             25828
76                  77.0             33385

[77 rows x 2 columns]
```

```
In [94]: precapita["Crimes"]=n_c.iloc[0:77,]

         #df_tmp["tmp_factorial"] = df_tmp["tmp"].apply(np.math.factorial)
```

```
In [97]: plt.scatter(precapita["Crimes"],precapita["PER CAPITA INCOME "])
         plt.show()
```



```
In [ ]:
```