Import modules

```
import json
import tweepy
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import missingno as msno
import time
import seaborn as sns

from datetime import datetime
```

Reading data

```
data = pd.read_csv('Full_data.csv')
```

Look for dimension, types, missing values and duplicates

```
print(data.shape)
print(data.columns)
data.head(3)
```

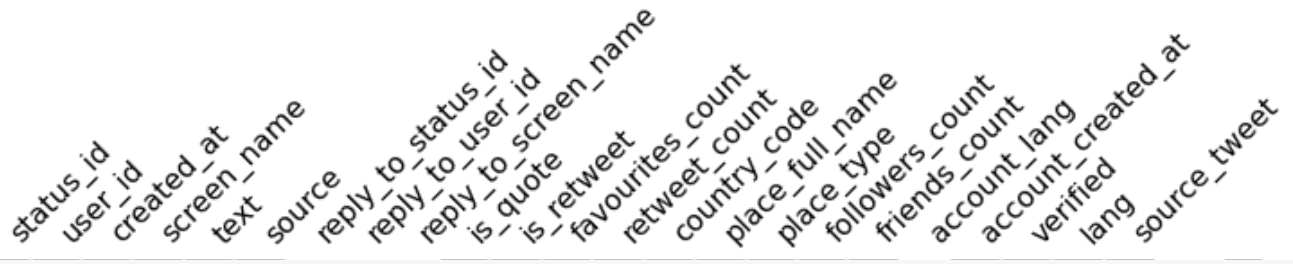
```
(10137, 23)
Index(['status_id', 'user_id', 'created_at', 'screen_name', 'text', 'source',
       'reply_to_status_id', 'reply_to_user_id', 'reply_to_screen_name',
       'is_quote', 'is_retweet', 'favourites_count', 'retweet_count',
       'country_code', 'place_full_name', 'place_type', 'followers_count',
       'friends_count', 'account_lang', 'account_created_at', 'verified',
       'lang', 'source_tweet'],
```

```
1 data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10137 entries, 0 to 10136
Data columns (total 23 columns):
 #   Column                Non-Null Count  Dtype  
---  ------                --------------  -----  
 0   status_id             10137 non-null  int64  
 1   user_id               10137 non-null  int64  
 2   created_at            10137 non-null  object 
 3   screen_name           10137 non-null  object 
 4   text                  10137 non-null  object 
 5   source                10137 non-null  object 
 6   reply_to_status_id    1451 non-null   float64
 7   reply_to_user_id      1794 non-null   float64
 8   reply_to_screen_name  1794 non-null   object 
 9   is_quote              10137 non-null  bool   
 10  is_retweet            10137 non-null  bool   
 11  favourites_count      10137 non-null  int64  
 12  retweet_count         10137 non-null  int64  
 13  country_code          9825 non-null   object 
 14  place_full_name       9825 non-null   object 
 15  place_type            9825 non-null   object 
 16  followers_count       10137 non-null  int64  
 17  friends_count         10137 non-null  int64  
 18  account_lang          0 non-null      float64
 19  account_created_at    10137 non-null  object 
 20  verified              10137 non-null  bool   
 21  lang                  10137 non-null  object 
 22  source_tweet          10137 non-null  object 
dtypes: bool(3), float64(3), int64(6), object(11)
memory usage: 1.6+ MB
```

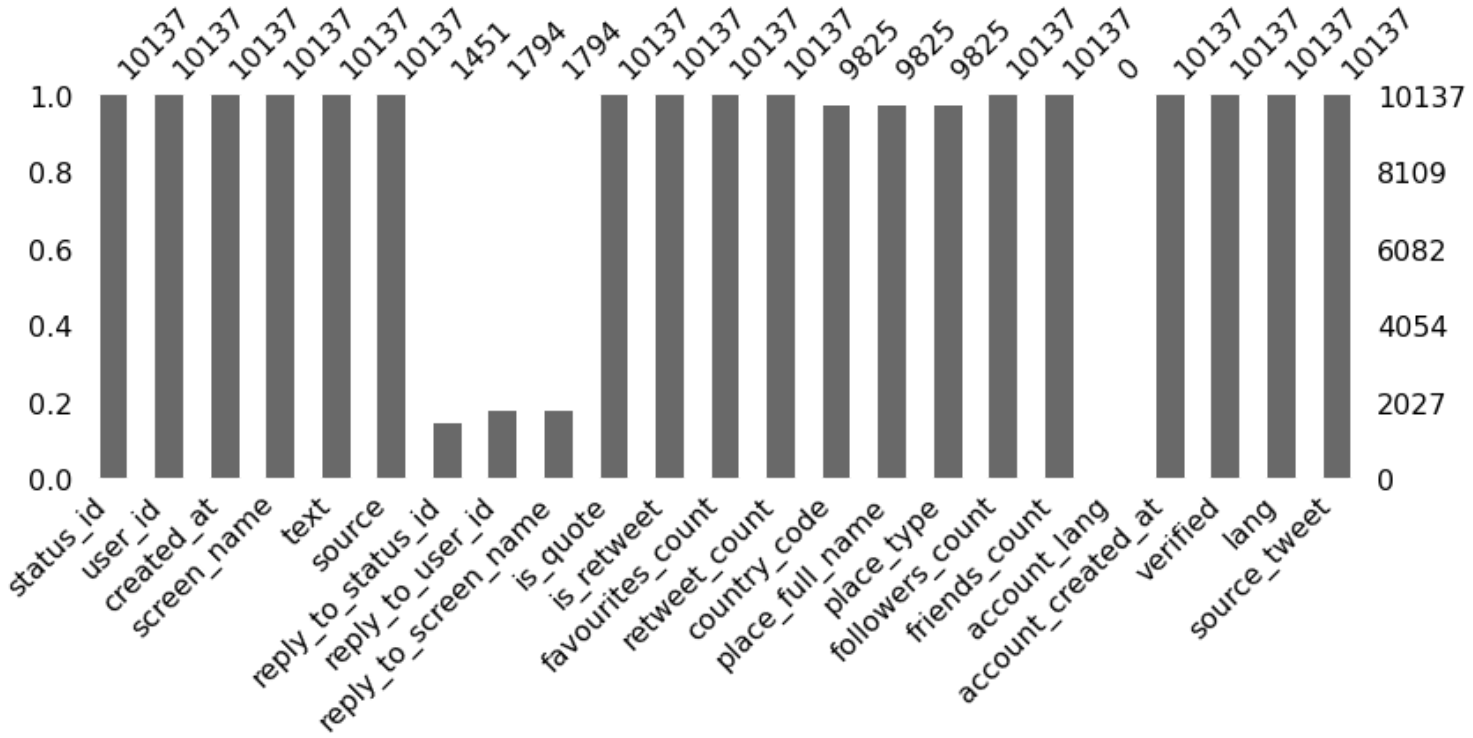
```
1 msno.matrix(data, figsize=(13, 4))
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fb5e1f2fdd8>
```




```
1 msno.bar(data, figsize=(13, 4))
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fb5df6406d8>
```



- Since the columns account_lang doesn't have any value, then we procced to drop it

```
1 data_ = data.drop(['account_lang'], axis=1).copy()
```

- Here we notice that there are about 400 tweet repeat it, so we procced to delete them.

```
1 print("Unique values:")
2 data_.nunique()
```

```
Unique values:
status_id               9703
user_id                 3387
created_at              9682
screen_name             3393
text                    9702
source                    11
reply_to_status_id      1009
reply_to_user_id         852
reply_to_screen_name     854
is_quote                   2
is_retweet                 1
favourites_count        4977
retweet_count            113
country_code               2
place_full_name          432
place_type                 4
followers_count         3634
friends_count           2631
```

```
data_.groupby('status_id').count().sort_values(by='user_id', ascending=False).head()
```

status_id	user_id	created_at	screen_name	text	source	reply_to_status_id	reply_to
1246926034873827328	12	12	12	12	12	12	
1244712607069745152	9	9	9	9	9	9	
1243245611102732288	8	8	8	8	8	8	
1244291628204019712	8	8	8	8	8	8	
1244357680673759232	8	8	8	8	8	8	

```
data_[data_['status_id'] == 1246926034873827328]['text']
```

```
9688     @CoordinaValle La marcha del 8M y el evento de...
9689     @CoordinaValle La marcha del 8M y el evento de...
9735     @CoordinaValle La marcha del 8M y el evento de...
9736     @CoordinaValle La marcha del 8M y el evento de...
9797     @CoordinaValle La marcha del 8M y el evento de...
9798     @CoordinaValle La marcha del 8M y el evento de...
9876     @CoordinaValle La marcha del 8M y el evento de...
9877     @CoordinaValle La marcha del 8M y el evento de...
9966     @CoordinaValle La marcha del 8M y el evento de...
9967     @CoordinaValle La marcha del 8M y el evento de...
10066    @CoordinaValle La marcha del 8M y el evento de...
10067    @CoordinaValle La marcha del 8M y el evento de...
Name: text, dtype: object
```

```
data1 = data_.drop_duplicates('status_id', keep='first').copy()
```

```
print(data1.shape)
data1.head(3)
```

```
data1.head(3)
```

```
(9703, 22)
```

	status_id	user_id	created_at	screen_name	text	source	repl
0	1244051801516711938	803282972317204480	2020-03-29 00:00:37	redcomunitariat	Este lunes estaremos hablando sobre la situaci...	Twitter for iPhone	
1	1244052036511051778	2476348920	2020-03-29 00:01:33	SebasCamposCol	Aquí con frío🥶 viendo cómo pasa la cuarentena🕯...	Twitter for Android	
2	1244052338412847104	239176842	2020-03-29 00:02:45	Jonathan_518	Hoy es #sábado, apenas es hora de bañarme y or...	Twitter for iPhone	

There's something weird, there are tweets with the same text, but they seem to have different ids, and be publish in differents dates

```
for i in data1[data1['text'].duplicated()].index[:3]:
    print(f"[ Id: {data1.loc[i][data1.columns[0]]},\n"
          f" user id: {data1.loc[i][data1.columns[1]]},\n"
          f" date: {data1.loc[i][data1.columns[2]]},\n"
          f" text: {data1.loc[i][data1.columns[4]]}\n]\n")
```

```
[ Id: 1245834468935340033,
 user id: 376451765,
 date: 2020-04-02 22:04:18,
 text: #FelizJueves #QuedateEnCasa #EstaEnTusManos #LaVidaEsSagrada #COVID19 #HaciendoCiudad #Con
]

[ Id: 1245881819741990914,
 user id: 376451765,
 date: 2020-04-03 01:12:27,
 text: #FelizJueves #QuedateEnCasa #EstaEnTusManos #LaVidaEsSagrada #COVID19 #HaciendoCiudad #Con
]

[ Id: 1247637085756035075,
 user id: 376451765,
 date: 2020-04-07 21:27:15,
 text: #FelizMartes #QuedateEnCasa #EstaEnTusManos #LaVidaEsSagrada #COVID19 #HaciendoCiudad #Con
]
```

Categorical variables

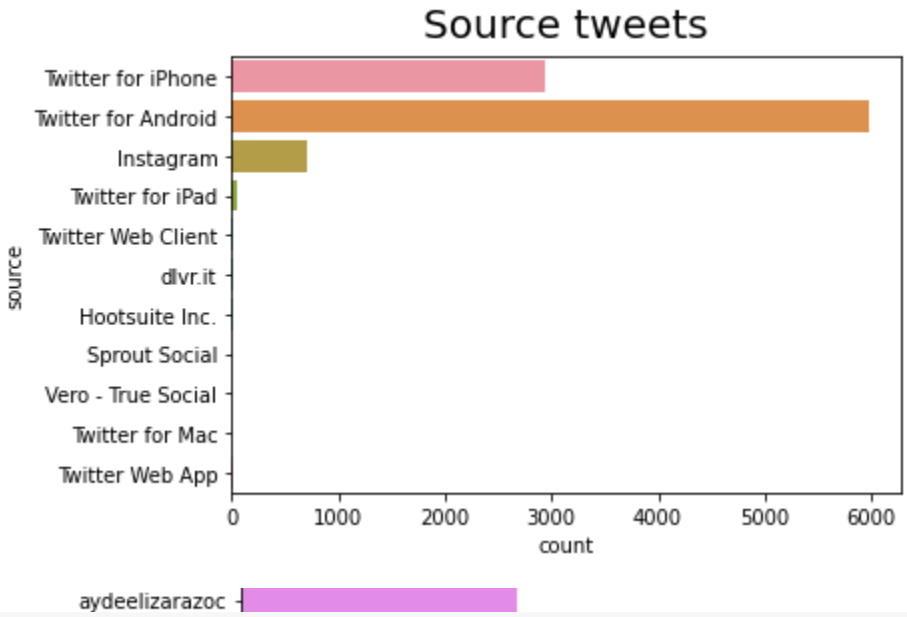
- screen_name
- source
- reply_to_screen_name
- is_quote
- place_full name
- place_type
- lang
- country_code

```
print(f"Number of screen_names: {data1['screen_name'].shape[0]}")
print(f"Number of unique screen_names: {len(set(data1['screen_name'].unique()))}")
first_twenty = data1['screen_name'].value_counts()[:25].index

plt.figure(figsize=(10, 8))
sns.countplot(y='screen_name',
              data = data1[data1['screen_name'].apply(lambda x: x in first_twenty)],
              order =  data1[data1['screen_name'].apply(lambda x: x in first_twenty)]
              ['screen_name'].value_counts().sort_values(ascending=False).index)

plt.title("25 most-frequent screenames for tweets", fontsize=20, verticalalignment='bottom')
```

```
Number of screen_names: 9703
Number of unique screen_names: 3393
Text(0.5, 1.0, '25 most-frequent screenames for tweets')
```

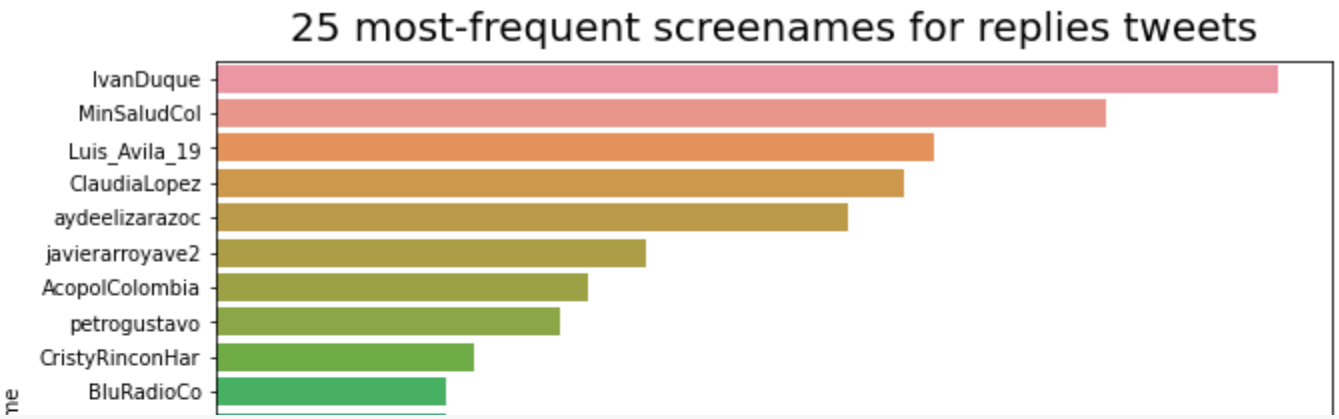

```
sns.countplot(y='source', data = data1)
plt.title("Source tweets", fontsize=20, verticalalignment='bottom')
```

```
Text(0.5, 1.0, 'Source tweets')
```




```
print(f"Number of replies screen_names: {data1['reply_to_screen_name'].shape[0]}")
print(f"Number of unique replies screen_names: {len(set(data1['reply_to_screen_name'].unique()))}")
first_twenty = data1['reply_to_screen_name'].value_counts()[:25].index

plt.figure(figsize=(10, 8))
sns.countplot(y='reply_to_screen_name',
              data = data1[data1['reply_to_screen_name'].apply(lambda x: x in first_twenty)],
              order =  data1[data1['reply_to_screen_name'].apply(lambda x: x in first_twenty)]
              ['reply_to_screen_name'].value_counts().sort_values(ascending=False).index)

plt.title("25 most-frequent screenames for replies tweets", fontsize=20, verticalalignment='bottom')
```

```
Number of replies screen_names: 9703
Number of unique replies screen_names: 855
Text(0.5, 1.0, '25 most-frequent screenames for replies tweets')
```



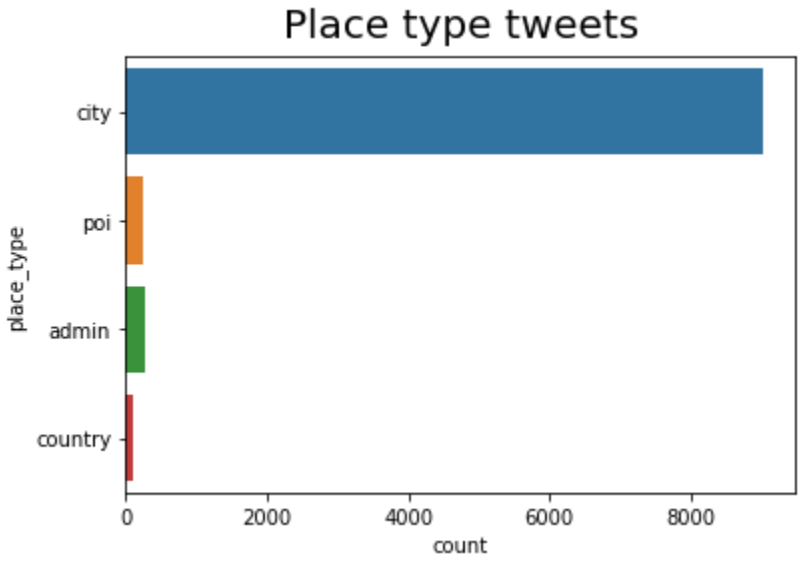

```
df_temp = data1[~data1['reply_to_screen_name'].isnull()].copy()
```

```
# print("\n\n".join(df_temp[df_temp['reply_to_screen_name'] == 'MinSaludCol']['text'].apply(lambda x
```

Here we notice that the tweets that has more replies are the ones related to a colombian politician or a colombian entity.

```
sns.countplot(y='place_type', data = data1)
plt.title("Place type tweets", fontsize=20, verticalalignment='bottom')
```

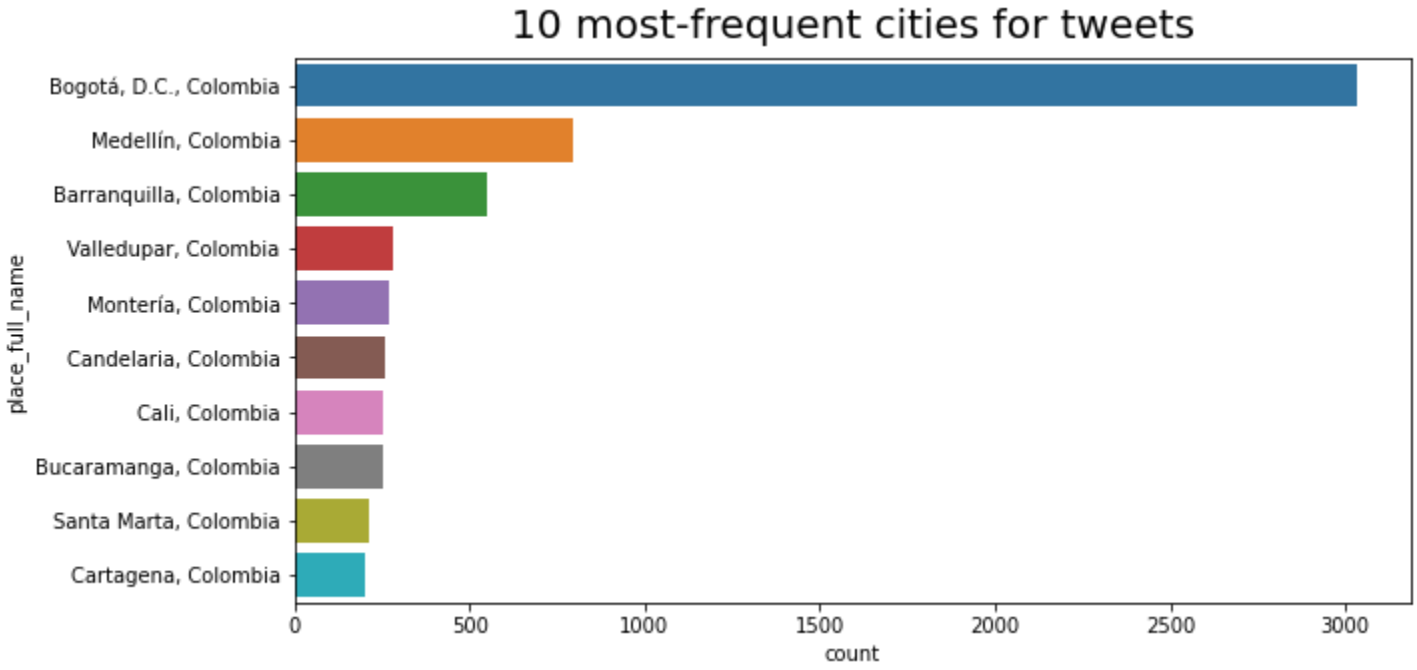
```
Text(0.5, 1.0, 'Place type tweets')
```




```
df = data1[data1['place_type'] == 'city'].copy()

print(f"Number of cities: {df['place_full_name'].shape[0]}")
print(f"Number of unique cities: {len(set(df['place_full_name'].unique()))}")
first_twenty = df['place_full_name'].value_counts()[:10].index

plt.figure(figsize=(10, 5))
sns.countplot(y='place_full_name',
```

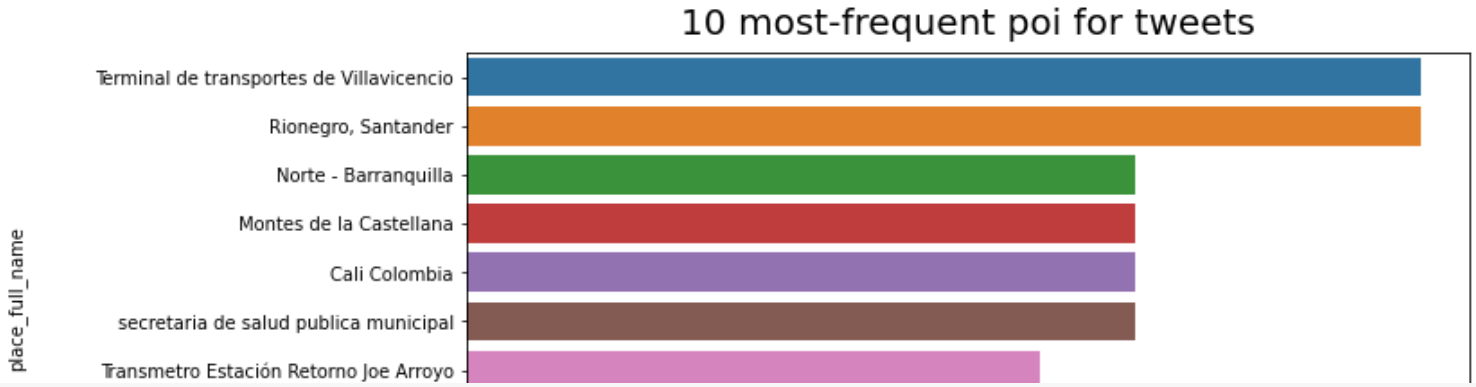
```
              data = df[df['place_full_name'].apply(lambda x: x in first_twenty)],
              order =  df[df['place_full_name'].apply(lambda x: x in first_twenty)]
              ['place_full_name'].value_counts().sort_values(ascending=False).index)

plt.title("10 most-frequent cities for tweets", fontsize=20, verticalalignment='bottom')

```

```
Number of cities: 9023
Number of unique cities: 258
Text(0.5, 1.0, '10 most-frequent cities for tweets')
```



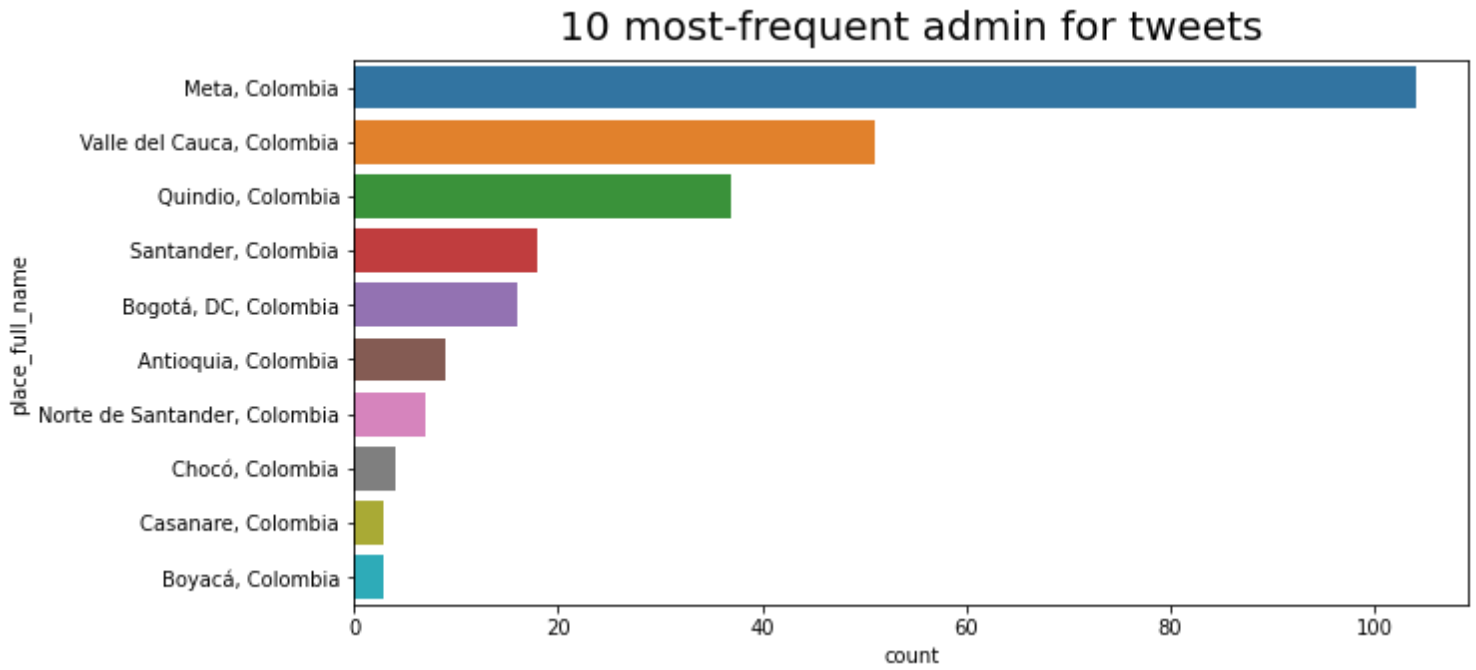

```
df = data1[data1['place_type'] == 'poi'].copy()

print(f"Number of poi: {df['place_full_name'].shape[0]}")
print(f"Number of unique poi: {len(set(df['place_full_name'].unique()))}")
first_twenty = df['place_full_name'].value_counts()[:10].index

plt.figure(figsize=(10, 5))
sns.countplot(y='place_full_name',
              data = df[df['place_full_name'].apply(lambda x: x in first_twenty)],
              order =  df[df['place_full_name'].apply(lambda x: x in first_twenty)]
              ['place_full_name'].value_counts().sort_values(ascending=False).index)

plt.title("10 most-frequent poi for tweets", fontsize=20, verticalalignment='bottom')


```

```
Number of poi: 239
Number of unique poi: 154
Text(0.5, 1.0, '10 most-frequent poi for tweets')
```



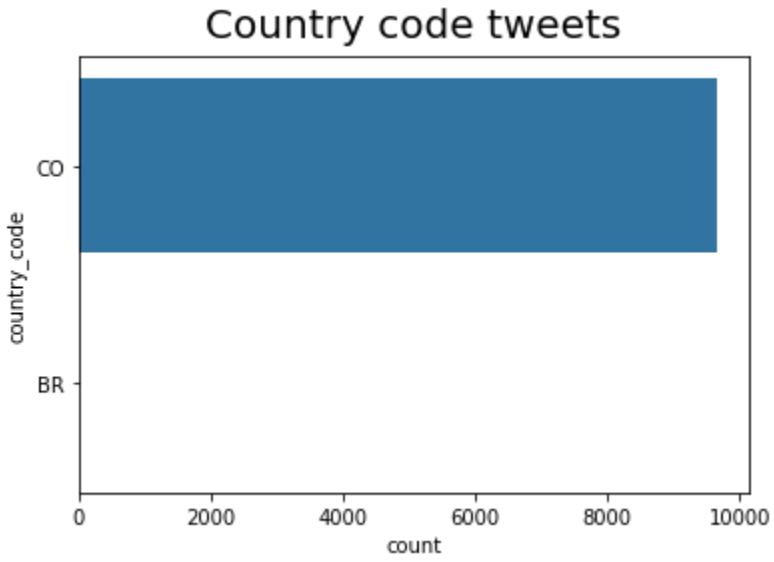

```
df = data1[data1['place_type'] == 'admin'].copy()

print(f"Number of admin: {df['place_full_name'].shape[0]}")
print(f"Number of unique admin: {len(set(df['place_full_name'].unique()))}")
first_twenty = df['place_full_name'].value_counts()[:10].index

plt.figure(figsize=(10, 5))
sns.countplot(y='place_full_name',
              data = df[df['place_full_name'].apply(lambda x: x in first_twenty)],
              order =  df[df['place_full_name'].apply(lambda x: x in first_twenty)]
              ['place_full_name'].value_counts().sort_values(ascending=False).index)

plt.title("10 most-frequent admin for tweets", fontsize=20, verticalalignment='bottom')

```

```
Number of admin: 265
Number of unique admin: 19
Text(0.5, 1.0, '10 most-frequent admin for tweets')
```




```
sns.countplot(y='country_code', data = data1)
plt.title("Country code tweets", fontsize=20, verticalalignment='bottom')
```

```
Text(0.5, 1.0, 'Country code tweets')
```



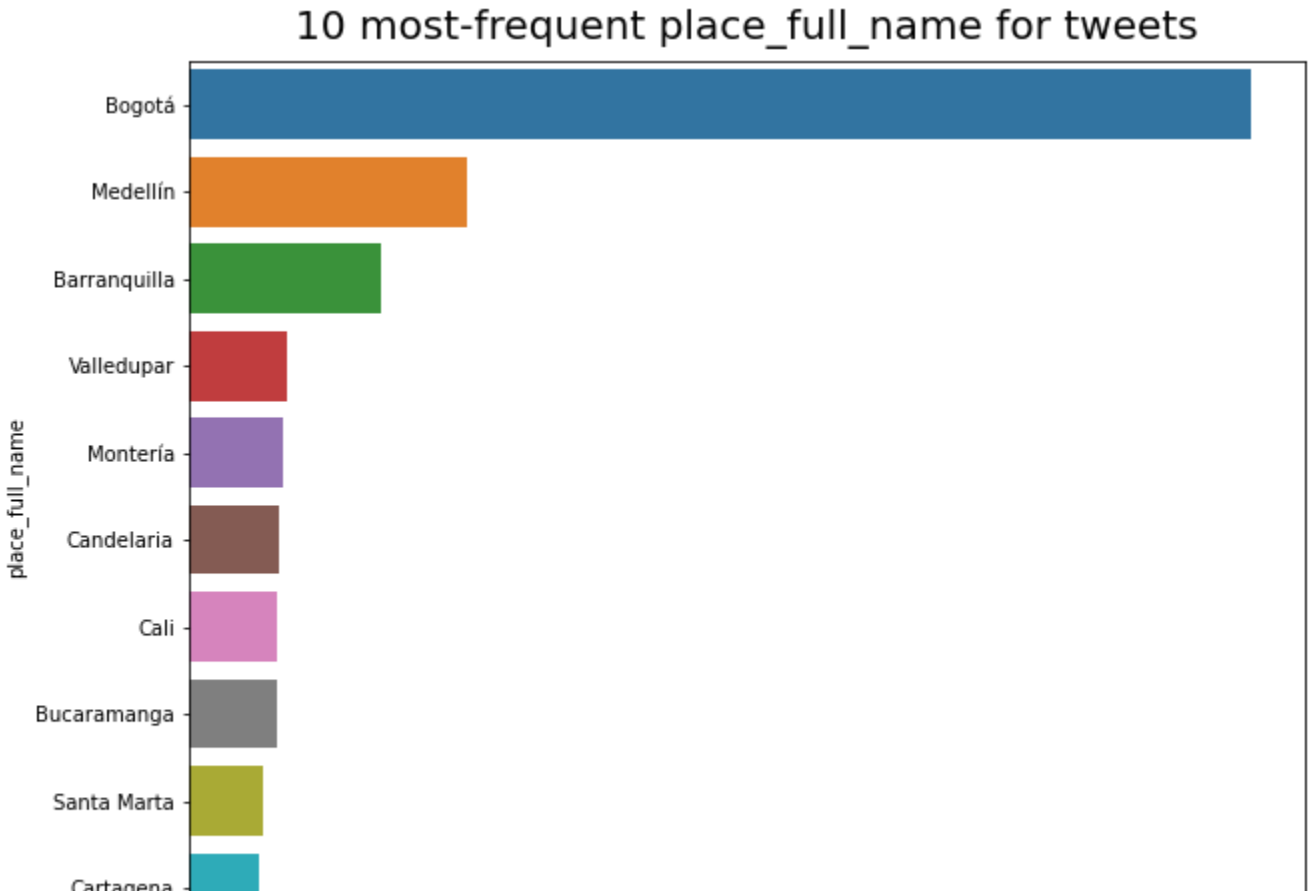
Since all tweets are from Colombia is not need it to have he feature Country code

```
data2 = data1[data1['country_code'] == 'CO'].drop(['country_code'], axis=1).copy()
data2['place_full_name'] = data2['place_full_name'].apply(lambda x: x.split(',')[0])
```

```
cities_population = {'Bogotá': 7413000,
                     'Medellín': 2529403,
                     'Barranquilla': 1274250,
                     'Valledupar': 490075,
                     'Montería': 460223,
                     'Candelaria': 23985,
                     'Cali': 2471474,
                     'Bucaramanga': 581130,
                     'Santa Marta': 515556,
                     'Cartagena': 1036412
                    }
```

```
print(f"Number of places: {data2['place_full_name'].shape[0]}")
print(f"Number of unique places: {len(set(data2['place_full_name'].unique()))}")
first_twenty = data2['place_full_name'].value_counts()[:10].index

plt.figure(figsize=(10, 8))
sns.countplot(y='place_full_name',
              data = data2[data2['place_full_name'].apply(lambda x: x in first_twenty)],
              order =  data2[data2['place_full_name'].apply(lambda x: x in first_twenty)]
              ['place_full_name'].value_counts().sort_values(ascending=False).index)

plt.title("10 most-frequent place_full_name for tweets", fontsize=20, verticalalignment='bottom')
```

```
Number of places: 9642
Number of unique places: 418
Text(0.5, 1.0, '10 most-frequent place_full_name for tweets')
```

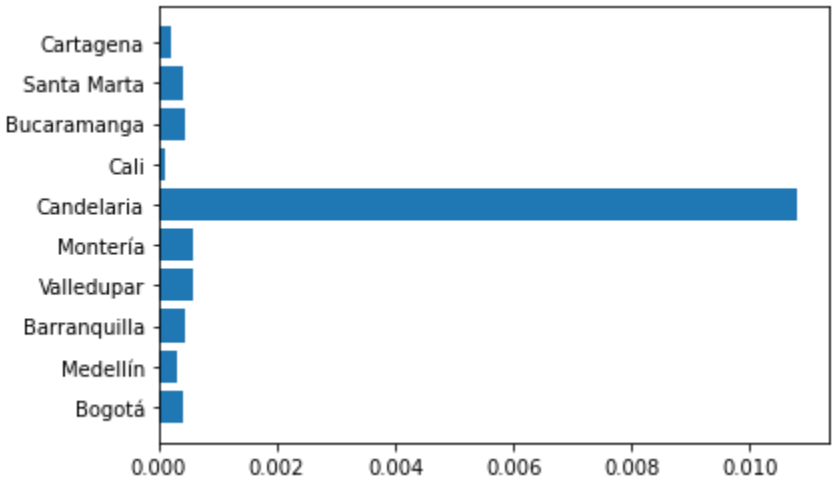


We notice that most of the tweets are from Bogotá, however there are more people in Bogotá than in other cities, so we're going to normalize data with population per city

```
cities_names = data2['place_full_name'].value_counts()[:10].index.tolist()
cities_count = data2['place_full_name'].value_counts()[:10].tolist()
cities_count_ = [cities_count[i]/cities_population[cities_names[i]] for i in range(len(cities_count)
```

```
plt.barh(cities_names, cities_count_)
```

```
<BarContainer object of 10 artists>
```



Another interesting thing is that there are plenty of tweets of a Bogotá neighborhood (Candelaria). So, we're going to add it to Bogotá

```
cities_names_ = cities_names.copy()
cities_count_ = cities_count.copy()

```

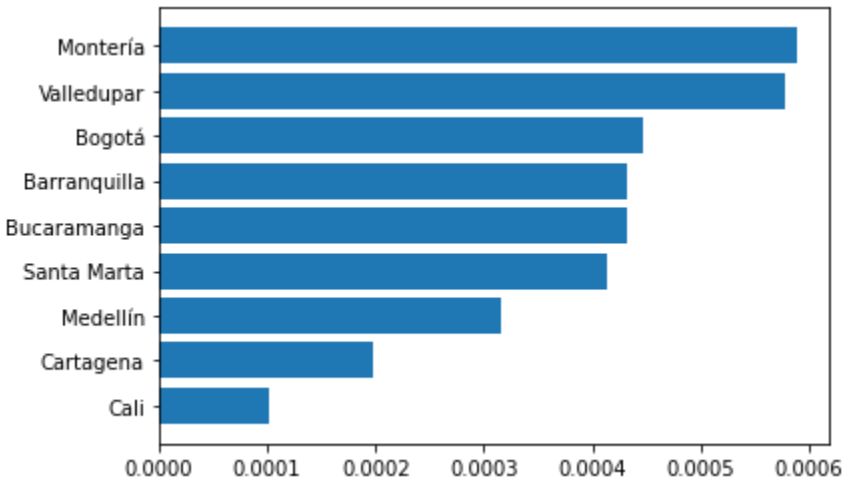
```
cities_names_.pop(5)
cities_count_[0] += cities_count_.pop(5)
cities_count_ = [cities_count_[i]/cities_population[cities_names_[i]] for i in range(len(cities_cour
```

```
cities_most_freq = [(cities_names_[i], cities_count_[i]) for i in range(len(cities_count_))]
cities_most_freq.sort(key=lambda x:x[1])
cities_most_freq
```

```
[('Cali', 0.00010236806051773153),
 ('Cartagena', 0.00019683291972690399),
 ('Medellín', 0.00031628016571499284),
 ('Santa Marta', 0.0004131461955636245),
 ('Bucaramanga', 0.00043191712697675217),
 ('Barranquilla', 0.00043241122228762017),
 ('Bogotá', 0.00044637798462161067),
 ('Valledupar', 0.0005774626332704178),
 ('Montería', 0.0005888449729804898)]
```

```
plt.barh([i[0] for i in cities_most_freq], [i[1] for i in cities_most_freq])
```

```
<BarContainer object of 9 artists>
```

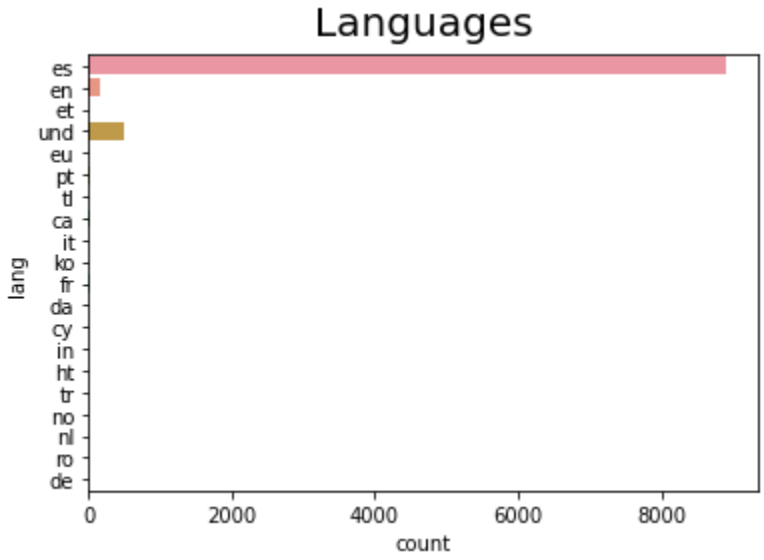


Now, we see that actually the city with a bigger percentage of tweets is Monteria, however Bogotá doesn't stand behind, it is in third place.

```
sns.countplot(y='lang', data = data2)
plt.title("Languages", fontsize=20, verticalalignment='bottom')
```

```
plt.title('Languages', fontsize=20, verticalalignment='bottom')
```

```
Text(0.5, 1.0, 'Languages')
```



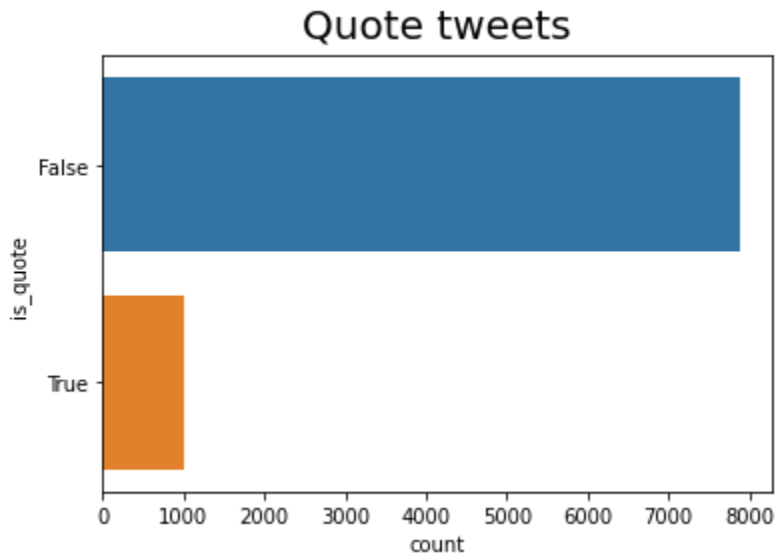
There are plenty of languages, since we are going to use NPL for spanish text, then we're going to drop tweets with other languages

```
data3 = data2[data2['lang'] == 'es'].copy()
print(data3.shape)
```

```
(8909, 21)
```

```
sns.countplot(y='is_quote', data = data3)
plt.title("Quote tweets", fontsize=20, verticalalignment='bottom')
```

```
Text(0.5, 1.0, 'Quote tweets')
```



Variables numericas

- favorite_count
- retweet_count
- followers_count
- friends_count

To see the behavior of these features over time, we're gonna plot them all tweets, and then split the data into replies and original tweets to do the same plots

```
1 data3.columns
```

```
Index(['status_id', 'user_id', 'created_at', 'screen_name', 'text', 'source',
       'reply_to_status_id', 'reply_to_user_id', 'reply_to_screen_name',
       'is_quote', 'is_retweet', 'favourites_count', 'retweet_count',
       'place_full_name', 'place_type', 'followers_count', 'friends_count',
       'account_created_at', 'verified', 'lang', 'source_tweet'],
      dtype='object')
```

```
1 data3['created_at'] = pd.to_datetime(data3['created_at'])
2 data3['account_created_at'] = pd.to_datetime(data3['account_created_at'])
```

```
1 data3['day'] = data3['created_at'].dt.to_period('d')
```

```
1 data3[['favourites_count', 'retweet_count', 'followers_count', 'friends_count']].describe()
```

	favourites_count	retweet_count	followers_count	friends_count
count	8909.000000	8909.000000	8.909000e+03	8909.000000
mean	8267.765518	3.173196	8.079546e+03	1508.830508
std	17778.678265	21.844543	5.086454e+04	4239.547439
min	0.000000	0.000000	0.000000e+00	0.000000
25%	533.000000	0.000000	2.350000e+02	283.000000
50%	2315.000000	0.000000	8.230000e+02	687.000000
75%	7631.000000	2.000000	3.525000e+03	1644.000000
max	272462.000000	1163.000000	1.857053e+06	104637.000000

```
1 def plot_time_series(df):
2     fig, axes = plt.subplots(nrows=2, ncols=2, figsize=(15, 8))
3     cols = ['favourites_count', 'retweet_count', 'followers_count', 'friends_count']
4     for i in range(2):
5         for j in range(2):
6             col = cols[i+j] if i==0 else cols[i+j+1]
7             axes[i][j].set_title(f'{col} over time', fontsize=15)
8             df.groupby('day')[col].sum().plot(ax=axes[i][j])
9             df.groupby('day')[col].sum().rolling(window=3).mean().plot(ax=axes[i][j])
```

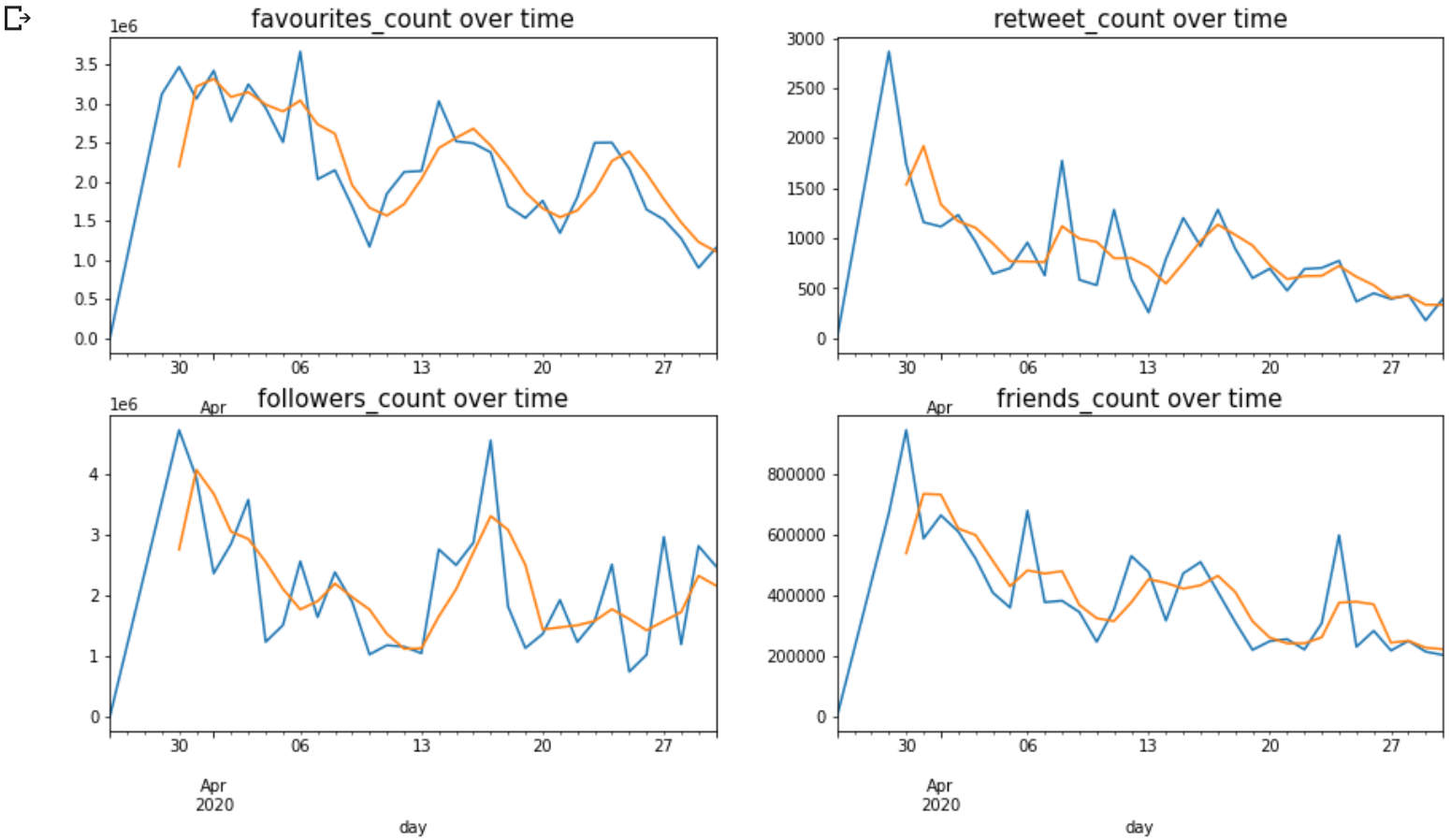
```
10
```

```
1 print(f"First day: {min(data3['created_at'])}")
2 print(f"Last day: {max(data3['created_at'])}")
```

```
First day: 2020-03-26 18:37:06
Last day: 2020-04-30 23:59:12
```

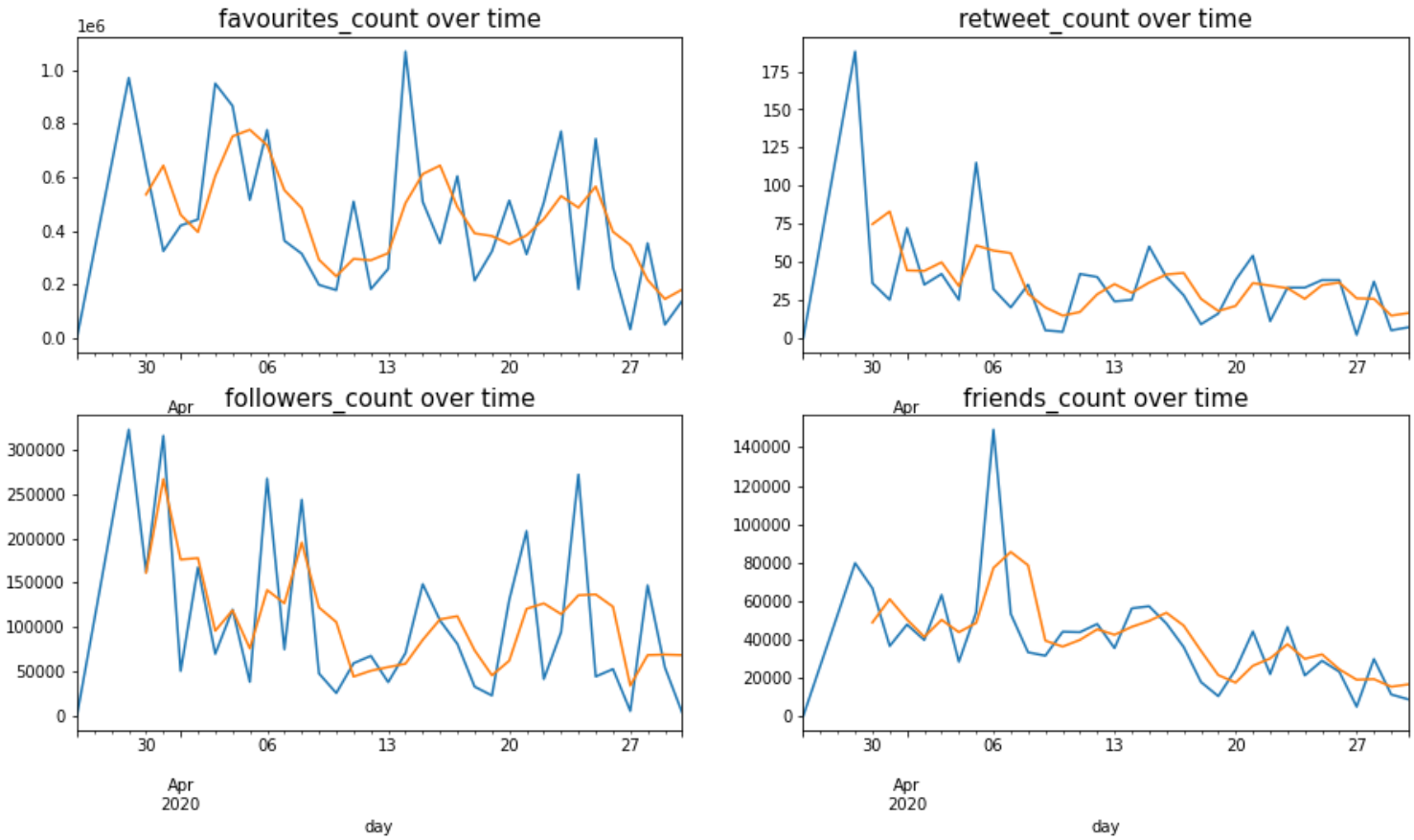
All tweets

```
1 plot_time_series(data3)
```



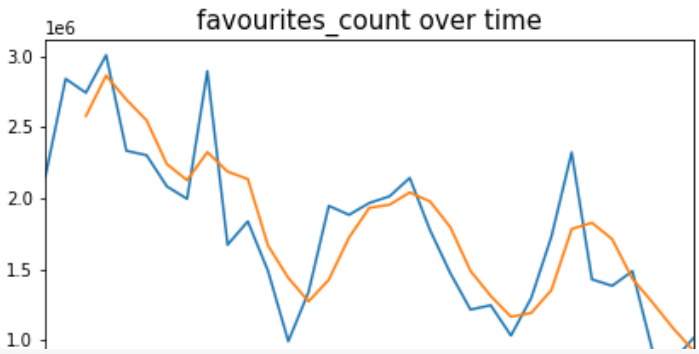
Original tweets

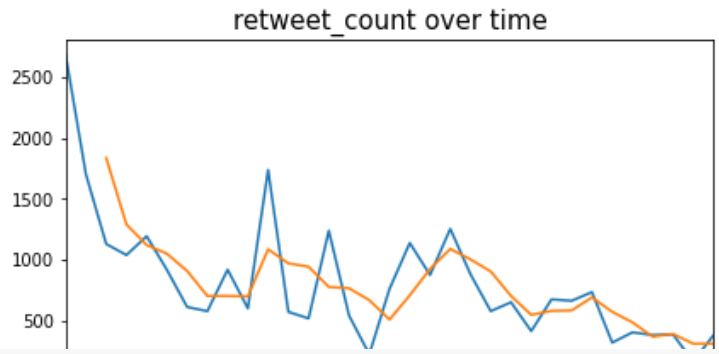
```
1 original_tweets = data3[~data3['reply_to_status_id'].isnull() ]
2 plot_time_series(original_tweets)
```



Replies tweets

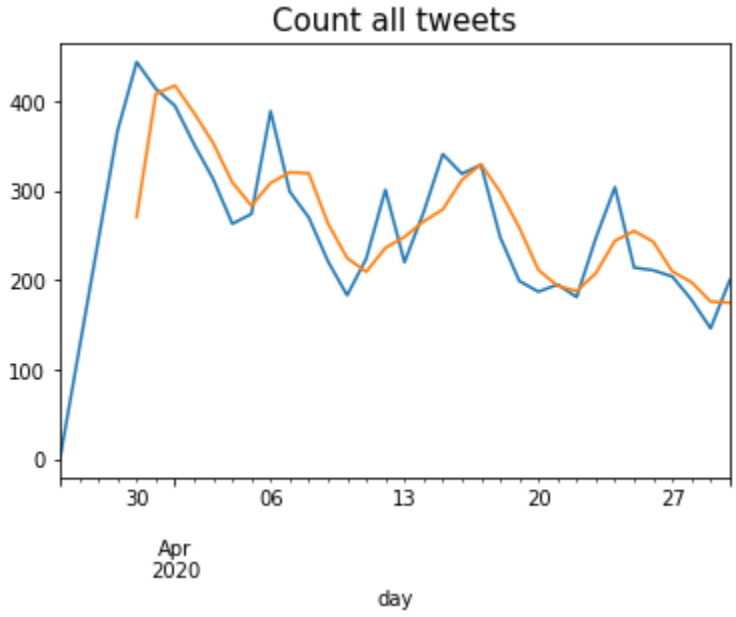
```
1 replies_tweets = data3[data3['reply_to_status_id'].isnull() ]
2 plot_time_series(replies_tweets)
```





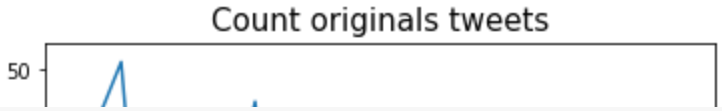

```
plt.title('Count all tweets', fontsize=15)
data3.groupby('day')['status_id'].count().plot()
data3.groupby('day')['status_id'].count().rolling(window=3).mean().plot()

```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fb5db69a7b8>
```



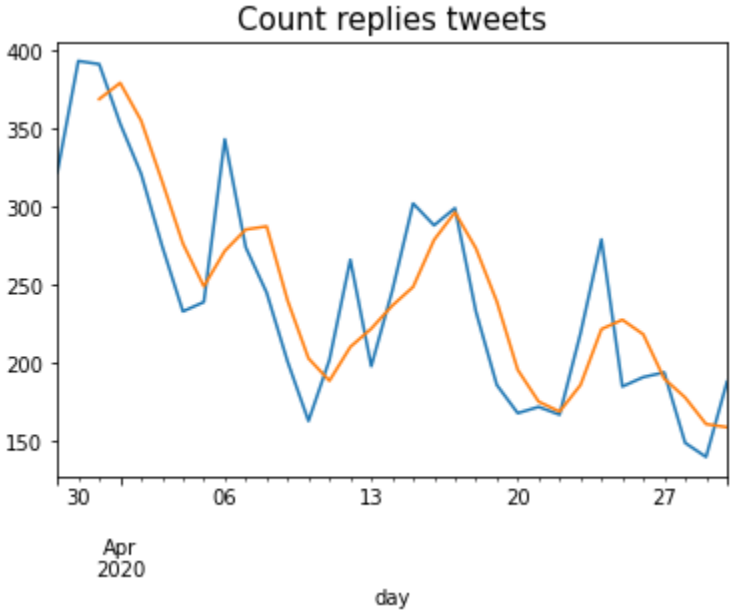

```
plt.title('Count originals tweets', fontsize=15)

original_tweets.groupby('day')['status_id'].count().plot()
original_tweets.groupby('day')['status_id'].count().rolling(window=3).mean().plot()
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fb5db595ef0>
```




```
plt.title('Count replies tweets', fontsize=15)

replies_tweets.groupby('day')['status_id'].count().plot()
replies_tweets.groupby('day')['status_id'].count().rolling(window=3).mean().plot()
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fb5db586470>
```




```
1
```

Natural Language Proccesing

```
# !pip install wordcloud
```

```
import nltk
import contractions
import re
import emoji
import wordcloud as wc
import string


from collections import Counter

nltk.download('punkt')
nltk.download('wordnet')
nltk.download('stopwords')
nltk.download('averaged_perceptron_tagger')
stop_words = nltk.corpus.stopwords.words('spanish')
```

```
[nltk_data] Downloading package punkt to /root/nltk_data...
[nltk_data]   Package punkt is already up-to-date!
[nltk_data] Downloading package wordnet to /root/nltk_data...
[nltk_data]   Package wordnet is already up-to-date!
[nltk_data] Downloading package stopwords to /root/nltk_data...
[nltk_data]   Package stopwords is already up-to-date!
[nltk_data] Downloading package averaged_perceptron_tagger to
[nltk_data]     /root/nltk_data...
[nltk_data]   Package averaged_perceptron_tagger is already up-to-
[nltk_data]       date!
```

```
1
```

```
def create_wordcloud(text, plt_):
    wordcloud = wc.WordCloud(max_font_size=50,
                             max_words=100,
                             scale=10,
                             background_color="white")\
                             .generate(text)
    plt.figure(figsize=(10,5))
    plt_.imshow(wordcloud, interpolation="bilinear")
    plt_.axis("off")
#     plt.show()

def remove_links(text):
    text_ = re.sub(r'https?:\/\/.*[\r\n]*', '', text, flags=re.MULTILINE)
    return text_


def remove_space(text):
    text_ = re.sub(r'[\r|\n|\r\n]+', '\n', text)
    return text_


def extract_emojis(text):
     return ''.join(c for c in text if c in emoji.UNICODE_EMOJI)

def get_hashtags(text):
    patter = re.compile(r"# (\w+)")
    all_hashtags = [f"#{i}" for i in patter.findall(text)]
    return all_hashtags

def get_mentions(text):
    patter = re.compile(r"@ (\w+)")
    all_hashtags = [f"@{i}" for i in patter.findall(text)]
    return all_hashtags

def remove_special_characters(text):
    punctuation = string.punctuation+"¡"
    text = re.sub(f"[{punctuation}]", '', text)
    return text

def remove_repeated_word(text):
```

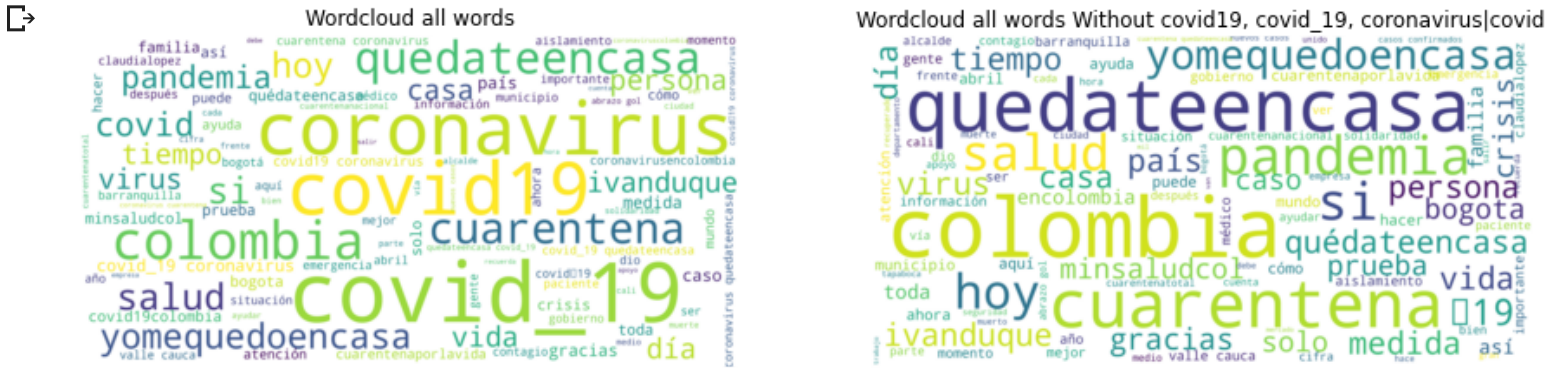
```
    tokens = nltk.word_tokenize(" ".join(data3['text']))


def remove_stopwords(text):
    tokens = nltk.word_tokenize(text)
    tokens = [token.strip() for token in tokens]
    filtered_tokens = [token for token in tokens if token.lower() not in stop_words]
    filtered_text = " ".join(filtered_tokens)
    return filtered_text

def clean_text(text):
    text1 = remove_links(text)
    text2 = remove_space(text1)
    text3 = remove_stopwords(text2)
    return text3
```

```
1
```

Wordcloud of all words

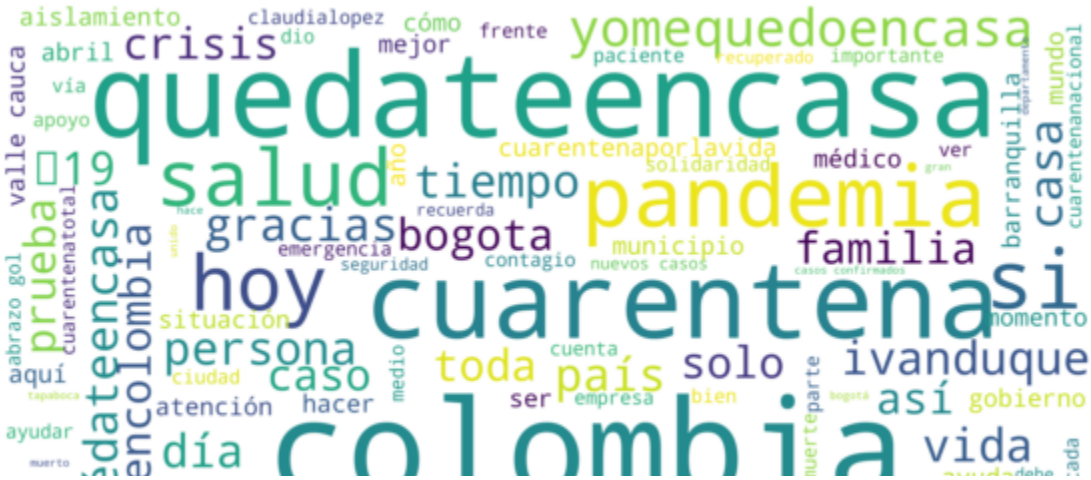
```
text = clean_text(" ".join(data3['text']))
```

```
fig, axes = plt.subplots(nrows=1, ncols=2, figsize=(15, 8))

axes[0].set_title('Wordcloud all words')
axes[1].set_title('Wordcloud all words Without covid19, covid_19, coronavirus|covid')

create_wordcloud(text.lower(), axes[0])
create_wordcloud(re.sub(r"covid19|covid_19|coronavirus|covid", "", text.lower()), axes[1])
```




```
<Figure size 720x360 with 0 Axes>
<Figure size 720x360 with 0 Axes>
```

```
create_wordcloud(re.sub('(@\w*)|(#\w*)|(covid19)|(covid_19)|(coronavirus)|(covid)', '', text.lower()
```

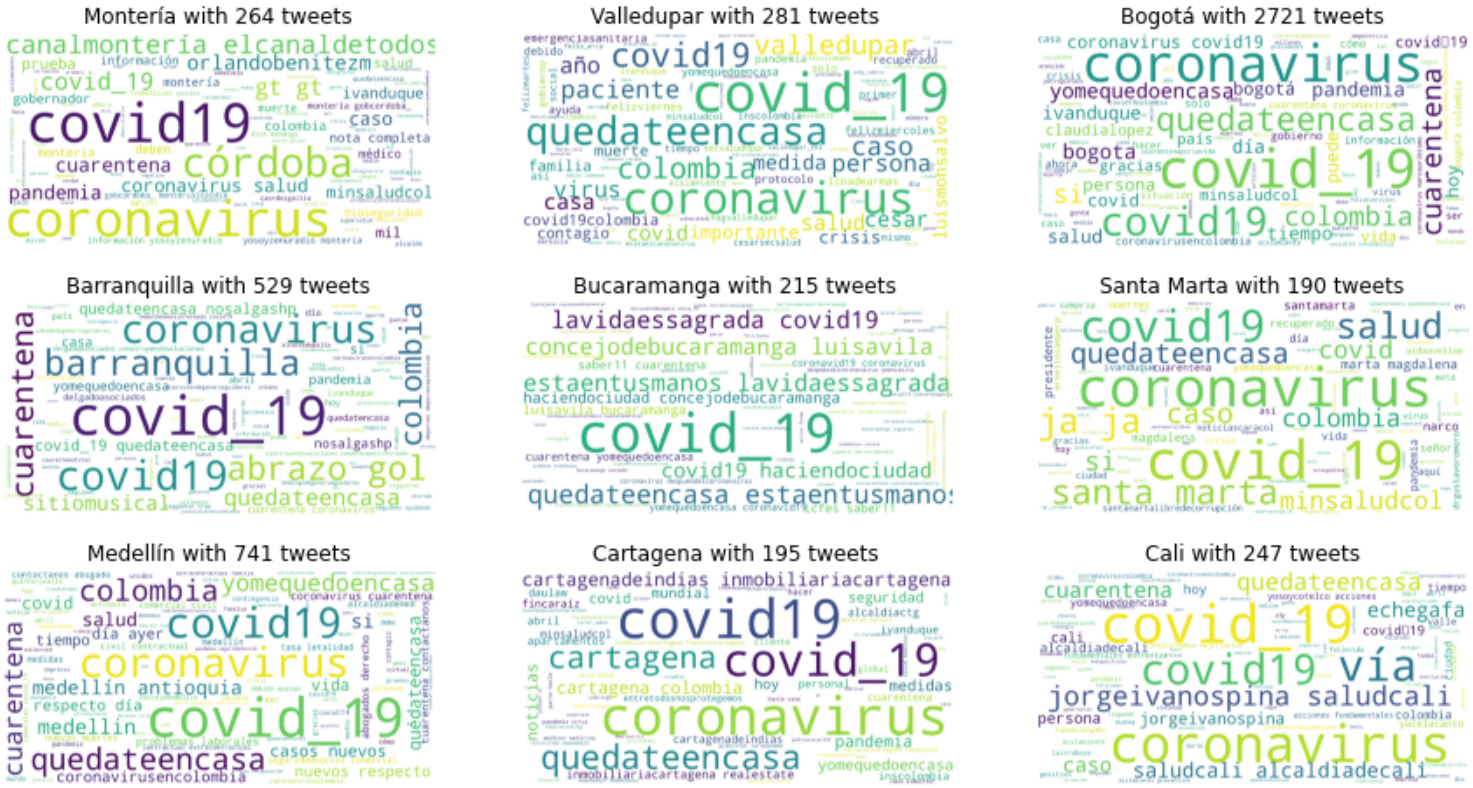


Just for curiosity we're going to see wordclouds for the ten most frequent cities of tweets

```
most_frequent_cities = [i[0] for i in cities_most_freq][::-1]
most_frequent_cities
```

```
['Montería',
 'Valledupar',
 'Bogotá',
 'Barranquilla',
 'Bucaramanga',
 'Santa Marta',
 'Medellín',
 'Cartagena',
 'Cali']
```

```
fig, axes = plt.subplots(nrows=3, ncols=3, figsize=(15, 8))
c = 0
for city in most_frequent_cities:
    temp_data = data3[data3['place_full_name'] == city].copy()
#     print(f"{city} has {temp_data.shape} tweets")
    temp_text = clean_text(" ".join(temp_data['text']))
    axes[c//3][c%3].set_title(f"{city} with {temp_data.shape[0]} tweets")
    create_wordcloud(temp_text.lower(), axes[c//3][c%3])
    c+=1

```



<Figure size 720x360 with 0 Axes>

Without [covid19|covid_19|coronavirus|covid]

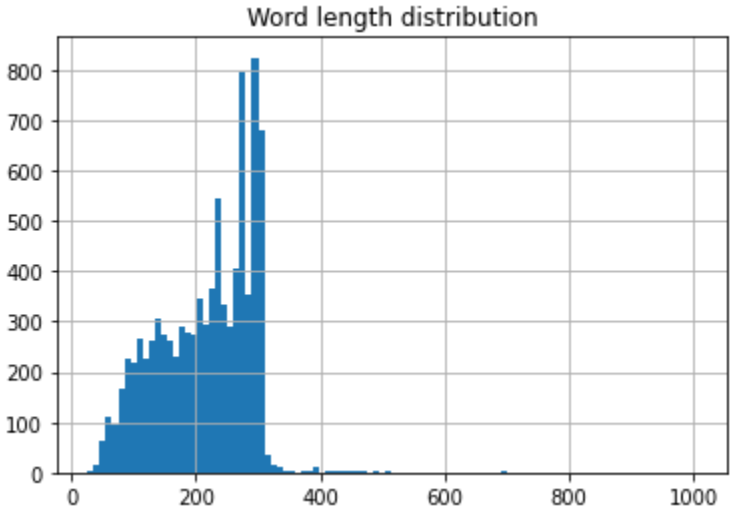
<Figure size 720x360 with 0 Axes>

```
fig, axes = plt.subplots(nrows=3, ncols=3, figsize=(15, 8))
c = 0
for city in most_frequent_cities:
    temp_data = data3[data3['place_full_name'] == city].copy()
#     print(f"{city} has {temp_data.shape} tweets")
    temp_text = clean_text(" ".join(temp_data['text']))
    axes[c//3][c%3].set_title(f"{city} with {temp_data.shape[0]} tweets")
    create_wordcloud(re.sub(r"covid19|covid_19|coronavirus|covid", "", temp_text.lower()), axes[c//3
    c+=1

```


```
1 data3['len_text'] = data3['text'].apply(lambda x: len(x))
```

```
1 print(data3.shape)
2 plt.title('Word length distribution')
3 data3['len_text'].sort_values().hist(bins=100)
```

```
(8909, 23)
<matplotlib.axes._subplots.AxesSubplot at 0x7fb5d2373eb8>
```



Also we have plenty of hashtags, mentions and emojis. So, let's see what we got

Emojis

```
1 import regex
```

```
1 def get_emojis_(text):
2     emoji_list = []
```

```
    data = regex.findall(r'\X', text)
    for word in data:
        if any(char in emoji.UNICODE_EMOJI for char in word):
            emoji_list.append(word)

    return emoji_list
```

```
emojis_ = extract_emojis(text)
emojis_[:200]
```

```
'🙄👑\U0001f9a0🚦\U0001f9ee💱🚫🏠➡\U0001f9fc👏📈😳\U0001f92a😤🤘👏👏👏👏🦁👌💻👩🔬💪👨
👩👧👦🦠\U0001f932▯\U0001f9fc🚫🚫🙏👇⬇▲🤕▲\U0001f9a0🚫🏠➡👑\U0001f9a0\U0001f9fc👏📈\U
0001f9f4📈💡🏢👌⬇➡📲✅✅✅✅❤😴👉🥗🏃♂❤➕👉☎🐶🐱\U0001f90d💚co💯\U0001f9a0😷🙏💉🤍
💚💔\U0001f9a0📺🤍❤co🌎🌍🌏🙌🏢\U0001f92d🚫🏠➡
```

```
```

```
```

```
# Counter(emojis_).most_common(50)
```

```
emojis2 = Counter(get_emojis_(text)).most_common()
x = [i[0] for i in emojis2]
y = [i[1] for i in emojis2]
print([i[0] for i in emojis2[1:250]])
```

```
['😷', '👏', '\U0001f9a0', '⬇', '⤵', '👉', '👇', '👉', '👏', '👇', '📌', '🤍', '➡', '✅',
```

```
plt.plot(x[:10], y[:10])
```

```
[<matplotlib.lines.Line2D at 0x7fb5d34c7be0>]/usr/local/lib/python3.6/dist-packages/matplotlib/ba
  font.set_text(s, 0.0, flags=flags)
/usr/local/lib/python3.6/dist-packages/matplotlib/backends/backend_agg.py:214: RuntimeWarning: Gl
  font.set_text(s, 0.0, flags=flags)
/usr/local/lib/python3.6/dist-packages/matplotlib/backends/backend_agg.py:214: RuntimeWarning: Gl
  font.set_text(s, 0.0, flags=flags)
/usr/local/lib/python3.6/dist-packages/matplotlib/backends/backend_agg.py:214: RuntimeWarning: Gl
  font.set_text(s, 0.0, flags=flags)
/usr/local/lib/python3.6/dist-packages/matplotlib/backends/backend_agg.py:214: RuntimeWarning: Gl
  font.set_text(s, 0.0, flags=flags)
/usr/local/lib/python3.6/dist-packages/matplotlib/backends/backend_agg.py:214: RuntimeWarning: Gl
  font.set_text(s, 0.0, flags=flags)
/usr/local/lib/python3.6/dist-packages/matplotlib/backends/backend_agg.py:214: RuntimeWarning: Gl
  font.set_text(s, 0.0, flags=flags)
/usr/local/lib/python3.6/dist-packages/matplotlib/backends/backend_agg.py:214: RuntimeWarning: Gl
  font.set_text(s, 0.0, flags=flags)
/usr/local/lib/python3.6/dist-packages/matplotlib/backends/backend_agg.py:183: RuntimeWarning: Gl
  font.set_text(s, 0, flags=flags)
/usr/local/lib/python3.6/dist-packages/matplotlib/backends/backend_agg.py:183: RuntimeWarning: Gl
  font.set_text(s, 0, flags=flags)
/usr/local/lib/python3.6/dist-packages/matplotlib/backends/backend_agg.py:183: RuntimeWarning: Gl
  font.set_text(s, 0, flags=flags)
/usr/local/lib/python3.6/dist-packages/matplotlib/backends/backend_agg.py:183: RuntimeWarning: Gl
  font.set_text(s, 0, flags=flags)
/usr/local/lib/python3.6/dist-packages/matplotlib/backends/backend_agg.py:183: RuntimeWarning: Gl
```

Hashtags

```
/usr/local/lib/python3.6/dist-packages/matplotlib/backends/backend_agg.py:183: RuntimeWarning: Gl
```

```
hashtags = get_hashtags(text)
print(len(hashtags))
print(hashtags[:50])
```

```
12769
['#Covid_19', '#Coronavirus', '#Covid_19', '#QueVainabella', '#Covid_19', '#SabadoDeGanarSeguidor
```

```
hashtags2 = Counter(hashtags).most_common(30)
x = [i[0] for i in hashtags2]
y = [i[1] for i in hashtags2]
print(hashtags2)
```

```
[('#Covid_19', 1165), ('#coronavirus', 807), ('#COVID19', 545), ('#QuedateEnCasa', 369), ('#Coron
```

```
# plt.figure(figsize=(10, 7))
# plt.barh(x[::-1], y[::-1])
x[:10]
```

```
['#Covid_19',
 '#coronavirus',
 '#COVID19',
 '#QuedateEnCasa',
```

Daiy use of hashtags

```
1 df_count_hashtags = data3[['day']].drop_duplicates().copy()
```

```
1 ten_most_frequent_hashtags = x[:15]
2 dates = data3['day'].unique()
3
4 for hashtag in ten_most_frequent_hashtags:
5     daily_use = []
6     for date_ in dates:
7         temp_df = data3[data3['day'] == date_].copy()
8         daily_use.append(sum(temp_df['text'].apply(lambda x: 1 if hashtag in x else 0)))
9     df_count_hashtags[hashtag] = daily_use
10
11 #     print(daily_use)
```

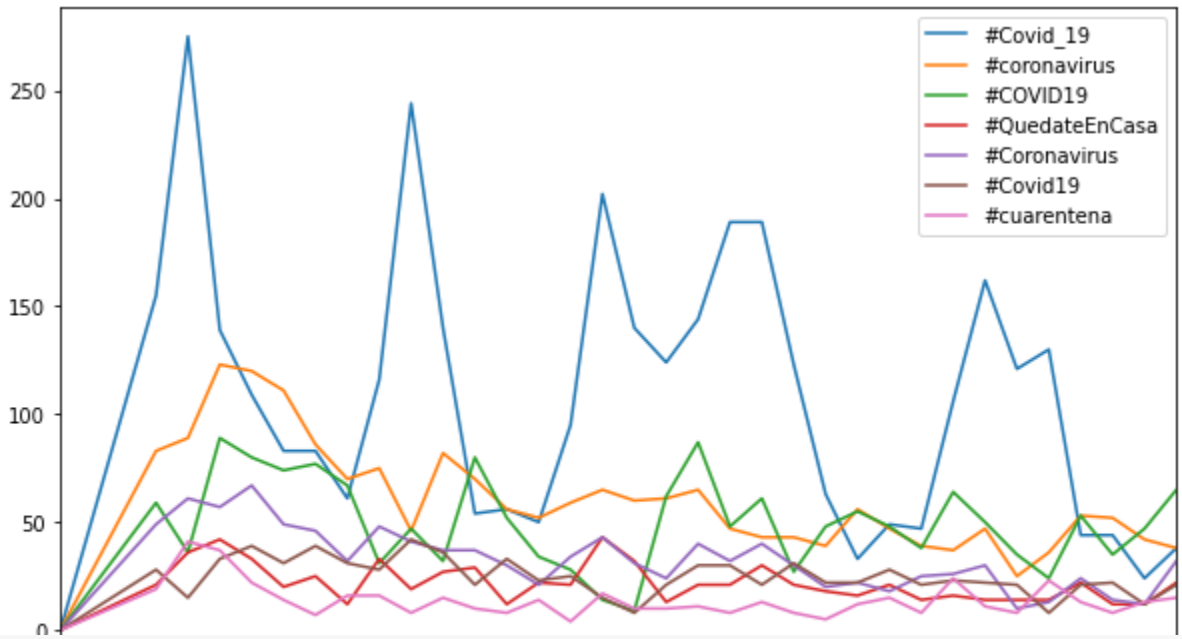
```
1 df_count_hashtags.head()
```

	day	#Covid_19	#coronavirus	#COVID19	#QuedateEnCasa	#Coronavirus	#Covid19	#cuarente
0	2020-03-29	155	83	59	21	49	28	
386	2020-03-30	275	89	36	36	61	15	
858	2020-03-31	139	123	89	42	57	33	
1305	2020-04-01	109	120	80	33	67	39	
1726	2020-04-02	83	111	74	20	49	31	

```
1 df_count_hashtags.index = df_count_hashtags['day']
```

```
1 df_count_hashtags[df_count_hashtags.columns[1:8]].sort_index().plot(figsize=(10, 6))
```

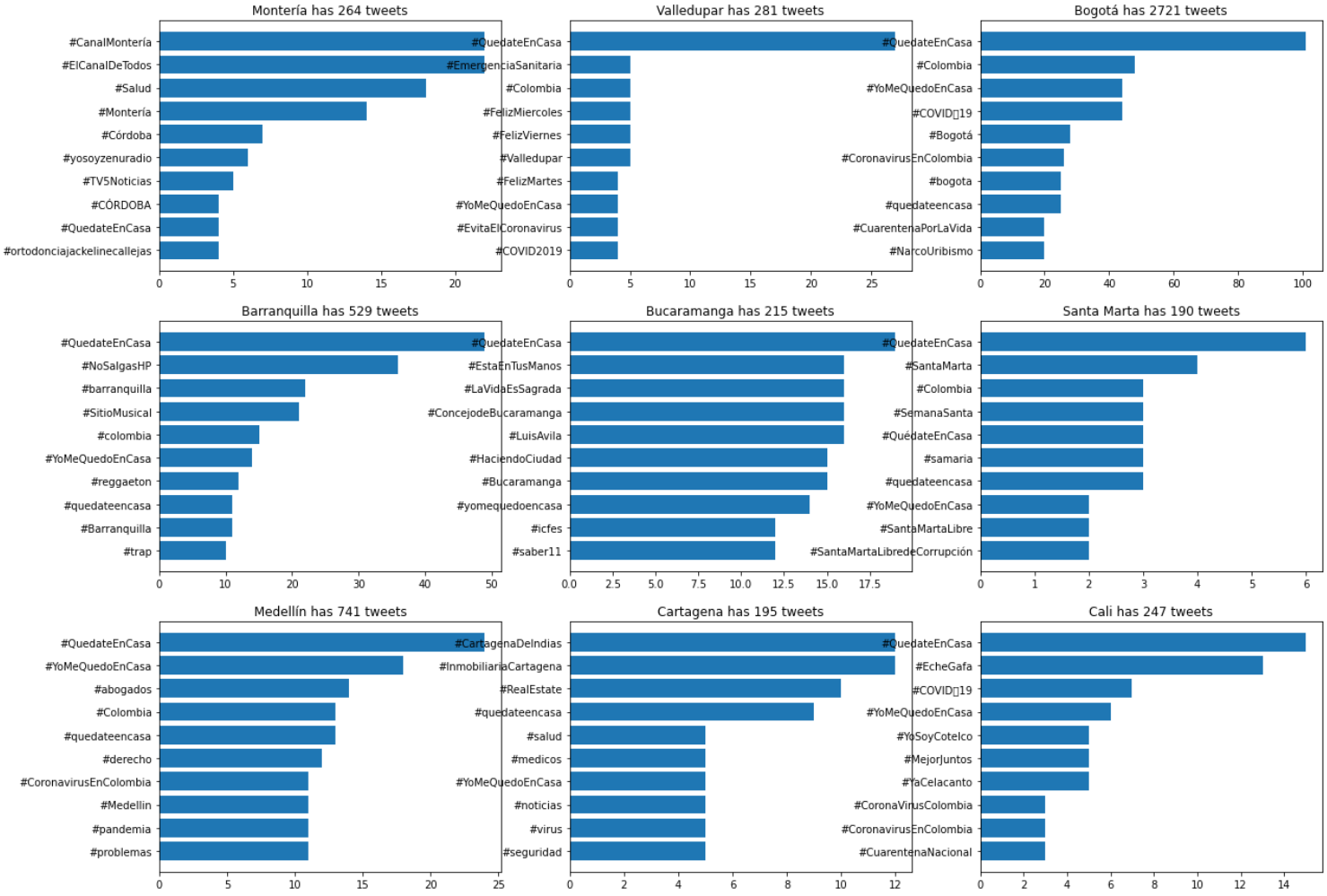
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fb5d236ee10>
```




```
1
```

```
1 fig, axes = plt.subplots(nrows=3, ncols=3, figsize=(20, 15))
2 c=0
3 for city in most_frequent_cities:
4     temp_data = data3[data3['place_full_name'] == city].copy()
5 #     print(f"{city} has {temp_data.shape} tweets")
6     temp_text = clean_text(" ".join(temp_data['text']))
7     temp_hashtags = get_hashtags(temp_text)
8     temp_hashtags2 = Counter(temp_hashtags).most_common()
9     del_covid_words = ["#covid", "#covid19", "#coronavirus", "#cuarentena", "#covid19colombia", "#co
10    temp_hashtags2 = [i for i in temp_hashtags2 if not i[0].lower() in del_covid_words][:10]
11    x = [i[0] for i in temp_hashtags2]
12    y = [i[1] for i in temp_hashtags2]
13    axes[c//3][c%3].set_title(f"{city} has {temp_data.shape[0]} tweets")
14    axes[c//3][c%3].barh(x[::-1], y[::-1])
15    c+=1
```

```
/usr/local/lib/python3.6/dist-packages/matplotlib/backends/backend_agg.py:214: RuntimeWarning: Gl
  font.set_text(s, 0.0, flags=flags)
/usr/local/lib/python3.6/dist-packages/matplotlib/backends/backend_agg.py:183: RuntimeWarning: Gl
  font.set_text(s, 0, flags=flags)
```



Mentions

```
1 mentions = get_mentions(text)
2 print(len(mentions))
3 # mentions[:15]
```

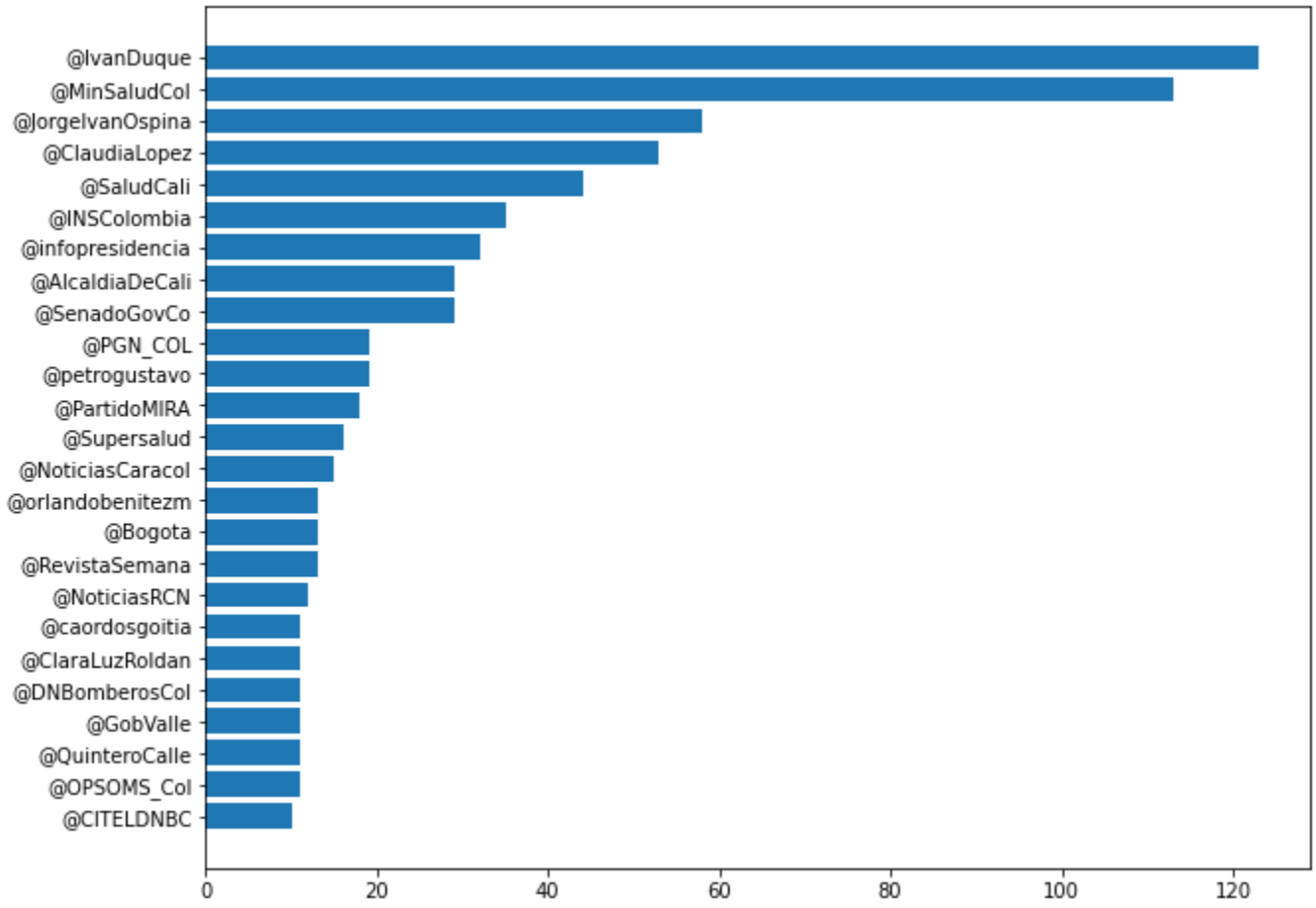
```
2805
```

```
1 mentions2 = Counter(mentions).most_common(25)
2 x = [i[0] for i in mentions2]
3 y = [i[1] for i in mentions2]
4 mentions2[:10]
```

```
[('@IvanDuque', 123),
 ('@MinSaludCol', 113),
 ('@JorgeIvanOspina', 58),
 ('@ClaudiaLopez', 53),
 ('@SaludCali', 44),
 ('@INSColombia', 35),
```

```
1 plt.figure(figsize=(10, 8))
2 plt.barh(x[::-1], y[::-1])
```

```
<BarContainer object of 25 artists>
```



Daily use of mentions

```
1 data3.head()
```

	status_id	user_id	created_at	screen_name	text	source	repl
0	1244051801516711938	803282972317204480	2020-03-29 00:00:37	redcomunitariat	Este lunes estaremos hablando sobre la situaci...	Twitter for iPhone	
1	1244052036511051778	2476348920	2020-03-29 00:01:33	SebasCamposCol	Aquí con frío🥶 viendo cómo pasa la cuarentena🕯...	Twitter for Android	
2	1244052338412847104	239176842	2020-03-29 00:02:45	Jonathan_518	Hoy es #sábado, apenas es hora de bañarme y or...	Twitter for iPhone	
					En el unico PAIS donde la quienes creo que lo	Twitter	

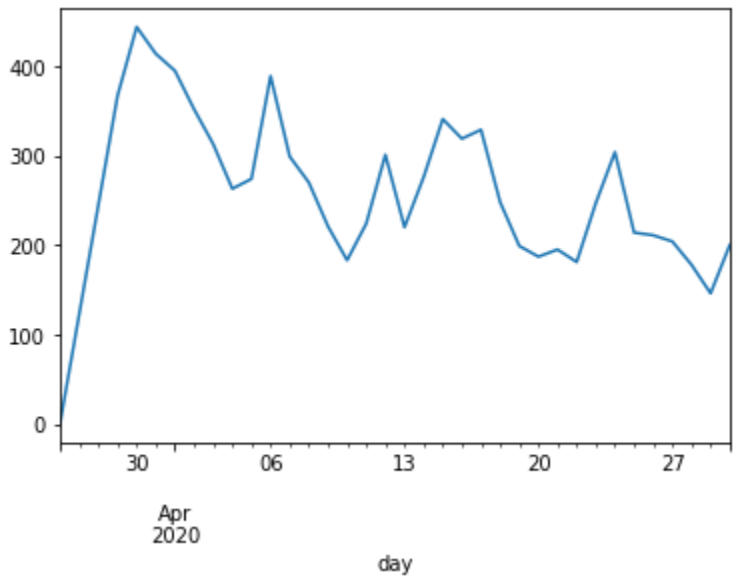
```
def get_hashtags_(text):
    patter = re.compile(r"#(\w+)")
    all_hashtags = [f"#{i}" for i in patter.findall(text)]
    return all_hashtags
```

```
df_count_mentions = data3[['day']].drop_duplicates().copy()
```

```
data3['hashtags'] = data3['text'].apply(lambda x: get_hashtags_(x))
```

```
data3.groupby('day')['hashtags'].count().plot()
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fb5d2b827f0>
```



```
ten_most_frequent_mentions = x[:15]
dates = data3['day'].unique()

for mention in ten_most_frequent_mentions:
    daily_use = []
    for date_ in dates:
        temp_df = data3[data3['day'] == date_].copy()
        daily_use.append(sum(temp_df['text'].apply(lambda x: 1 if mention in x else 0)))
    df_count_mentions[mention] = daily_use

#     print(daily_use)
```

```
df_count_mentions.head()
```

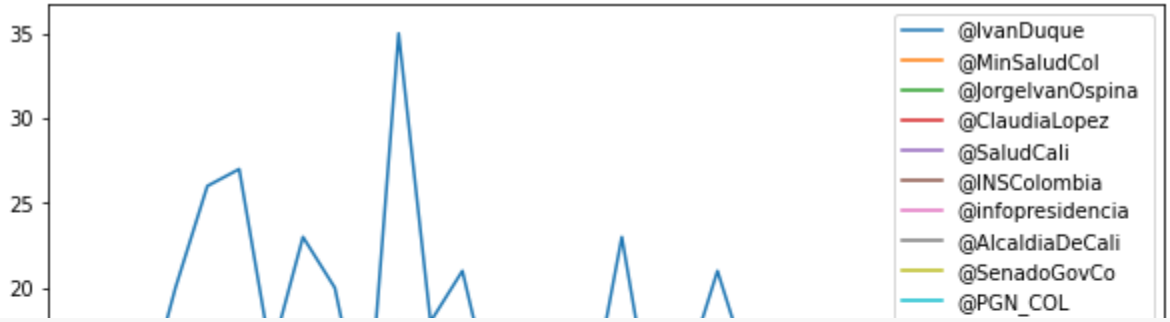
	day	@IvanDuque	@MinSaludCol	@JorgeIvanOspina	@ClaudiaLopez	@SaludCali	@INSColombia
0	2020-03-29	13	17	4	9	1	7
386	2020-03-30	20	15	1	5	0	7
858	2020-03-31	26	16	4	15	3	4
1305	2020-04-01	27	17	3	11	3	6
1726	2020-04-02	16	17	5	8	5	6

```
df_count_mentions.index=df_count_mentions['day']
```

```
# df_count_mentions.groupby('day').count().plot()
```

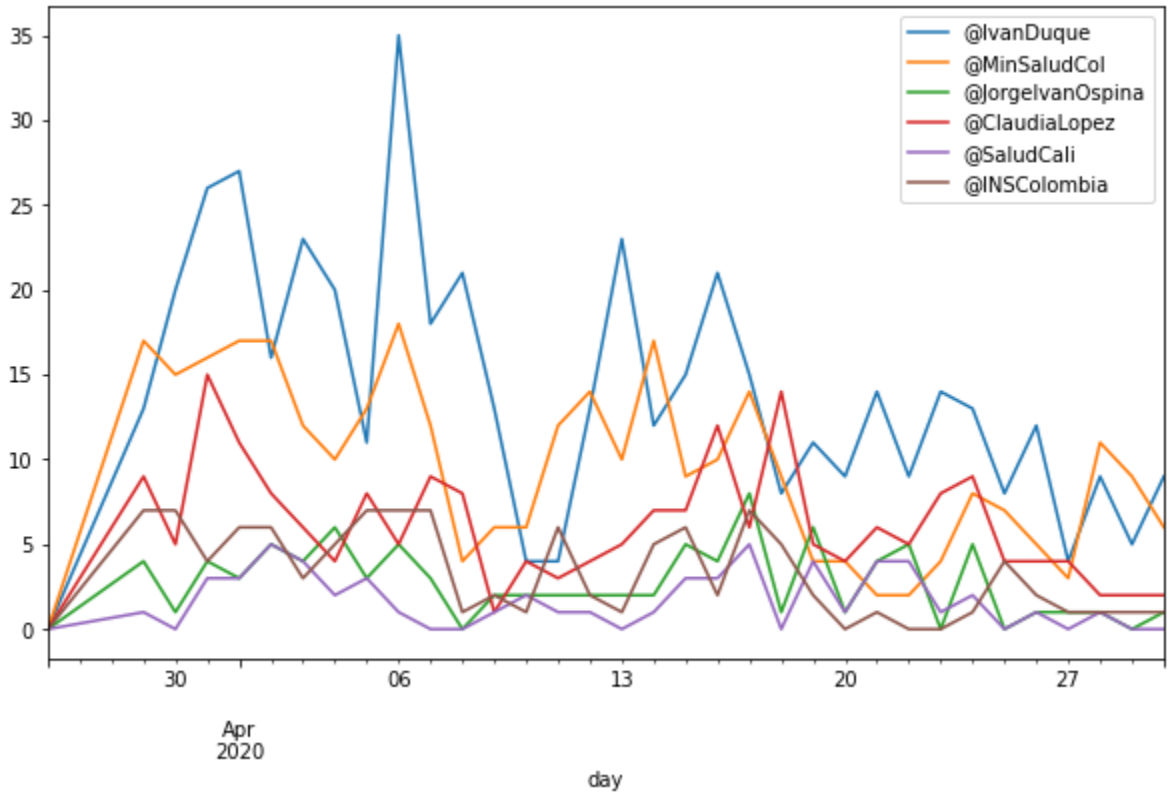
```
df_count_mentions[df_count_mentions.columns[1:]].sort_index().plot(figsize=(10,6))
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fb5d2ed2908>
```




```
1 df_count_mentions[df_count_mentions.columns[1:7]].sort_index().plot(figsize=(10,6))
```

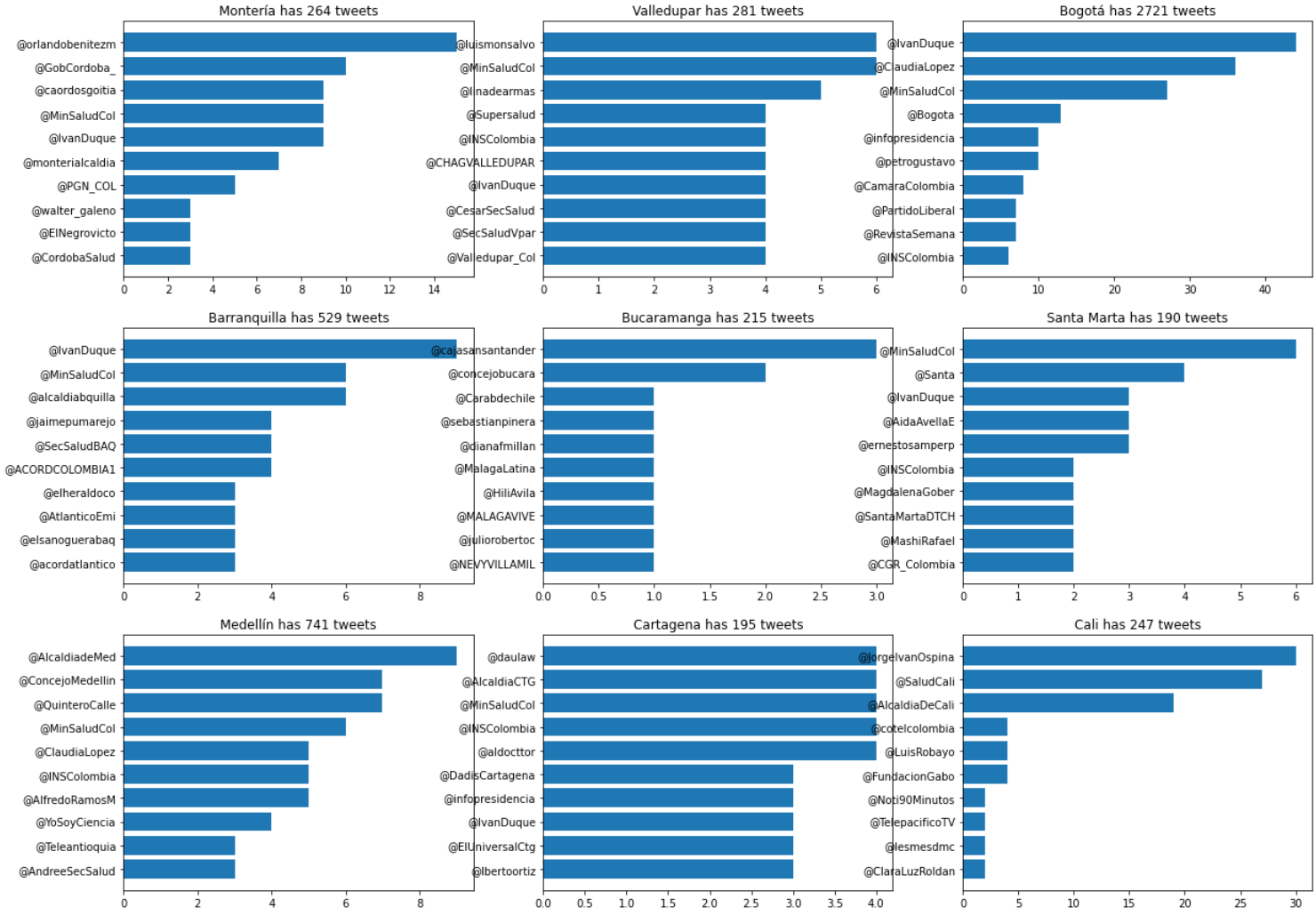
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fb5d304b048>
```



Mentions separated by region

```
1 fig, axes = plt.subplots(nrows=3, ncols=3, figsize=(20, 15))
2 c=0
3 for city in most_frequent_cities:
4     temp_data = data3[data3['place_full_name'] == city].copy()
5 #     print(f"{city} has {temp_data.shape} tweets")
6     temp_text = clean_text(" ".join(temp_data['text']))
7     temp_mentions = get_mentions(temp_text)
8     temp_mentions2 = Counter(temp_mentions).most_common()
9     del_covid_words = ["#covid", "#covid19", "#coronavirus", "#cuarentena", "#covid19colombia", "#c
10    temp_mentions2 = [i for i in temp_mentions2 if not i[0].lower() in del_covid_words][:10]
11    x = [i[0] for i in temp_mentions2]
12    y = [i[1] for i in temp_mentions2]
13    axes[c//3][c%3].set_title(f"{city} has {temp_data.shape[0]} tweets")
14    axes[c//3][c%3].barh(x[::-1], y[::-1])
```

```
c+=1
```


Montería has 264 tweets
@orlandobenitezm
@GobCordoba_
@caordosgoitia
@MinSaludCol
@IvanDuque
@monterialcaldia
@PGN_COL
@walter_galeno
@ElNegrovicto
@CordobaSalud
@luismonsalvo
@MinSaludCol
@linadearmas
@Supersalud
@INSColombia
@CHAGVALLEDUPAR
@IvanDuque
@CesarSecSalud
@SecSaludVpar
@Valledupar_Col
Valledupar has 281 tweets
Bogotá has 2721 tweets
@IvanDuque
@ClaudiaLopez
@MinSaludCol
@Bogota
@infopresidencia
@petrogustavo
@CamaraColombia
@PartidoLiberal
@RevistaSemana
@INSColombia
Barranquilla has 529 tweets
@IvanDuque
@MinSaludCol
@alcaldiabquilla
@jaimepumarejo
@SecSaludBAQ
@ACORDCOLOMBIA1
@elheraldoco
@AtlanticoEmi
@elsanoguerabaq
@acordatlantico
Bucaramanga has 215 tweets
@cajasansantander
@concejobucara
@Carabdechile
@sebastianpinera
@dianafmillan
@MalagaLatina
@HiliAvila
@MALAGAVIVE
@juliorobertoc
@NEVYVILLAMIL
Santa Marta has 190 tweets
@MinSaludCol
@Santa
@IvanDuque
@AidaAvellaE
@ernestosamperp
@INSColombia
@MagdalenaGober
@SantaMartaDTCH
@MashiRafael
@CGR_Colombia
Medellín has 741 tweets
@AlcaldiadeMed
@ConcejoMedellin
@QuinteroCalle
@MinSaludCol
@ClaudiaLopez
@INSColombia
@AlfredoRamosM
@YoSoyCiencia
@Teleantioquia
@AndreeSecSalud
Cartagena has 195 tweets
@daulaw
@AlcaldiaCTG
@MinSaludCol
@INSColombia
@aldocttor
@DadisCartagena
@infopresidencia
@IvanDuque
@ElUniversalCtg
@lbertoortiz
Cali has 247 tweets
@JorgeIvanOspina
@SaludCali
@AlcaldiaDeCali
@cotelcolombia
@LuisRobayo
@FundacionGabo
@Noti90Minutos
@TelepacificoTV
@lesmesdmc
@ClaraLuzRoldan

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