Starting a pharmacy business in Buenos Aires

José Ignacio Chajchir

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Contents

1. Introduction

1.1 Background

Buenos Aires is the capital city of Argentina, the country where I was born and where I live. As the term “Buenos Aires” could represent different areas, the term “CABA” (stands for Ciudad Autonoma de Buenos Aires) is more accurate to differentiate the city from other places.

Large cities have a lot of diverse Neighborhoods and CABA is not an exception. If someone is interested in starting a business, location will be one of the most important factors for that business to be profitable.

1.2 Problem

The goal of this project is to, based on data, identify which are the most suitable neighborhoods in CABA to start a pharmacy business.

1.3 Target Audience

This report shall be of great interest for:

- Individual investors, especially those with background in the pharmacy business.
- Pharmacy chains interested in opening a new store

It should be useful for any organization or Specialists who perform demographic analysis.

2. Data acquisition and cleaning

2.1 Data targeting

To build a useful and neat dataframe that could lead into meaningful results, I thought about which features would be useful by asking some questions for each neighborhood.

a. How many pharmacies already exist in the neighborhood?
   The rate of persons per existing pharmacies should be a very important input parameter for the decision. If there are too many persons per pharmacies in the neighborhood, a new pharmacy will probably have clients.

b. How many persons live? How old are them?
   As mentioned in the point before, the rate of persons per existing pharmacies is very useful information, so these questions should be answered in order to calculate the rate. The age of the persons could be also valuable as older people tend to buy more medication.

c. Are these persons consumers of pharmacy products?
   If people living in the neighborhood have a low income, they will probably avoid spending money in esthetic or cosmetic products.

2.2 Data collection and cleaning

2.2.1 How many pharmacies already exists in the neighborhood?

For question “How many pharmacies already exists in the neighborhood?”, I used data from the search venue foursquare API. Although the API let you search only for pharmacies (by setting category ID) there´s a limit of 50 results per request. Therefore, data for the complete CABA area had to be collected using multiple requests, where each request belonged to a unique geographic point inside CABA area.

A grid of points was defined with certain parameters:

- The grid must represent CABA area. This area was obtained from a geojson file that contains Argentinian provinces.
- The distance within points must be defined based on:
    - Foursquare API radius parameter
    - 50 results per request limit

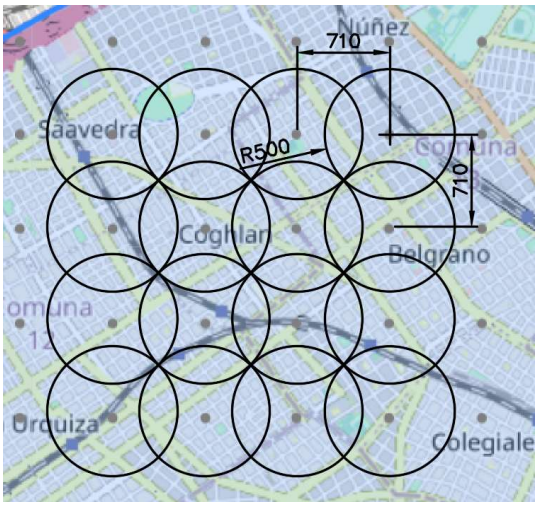


Figure 1: Shows chosen parameters for grid definition. With a radius of 500 meters and Longitude distance = Latitude distance = 710meters, the queries should find all the pharmacies in the target area. A radius of 500 meters doesn´t exceed the 50 results per query limit.

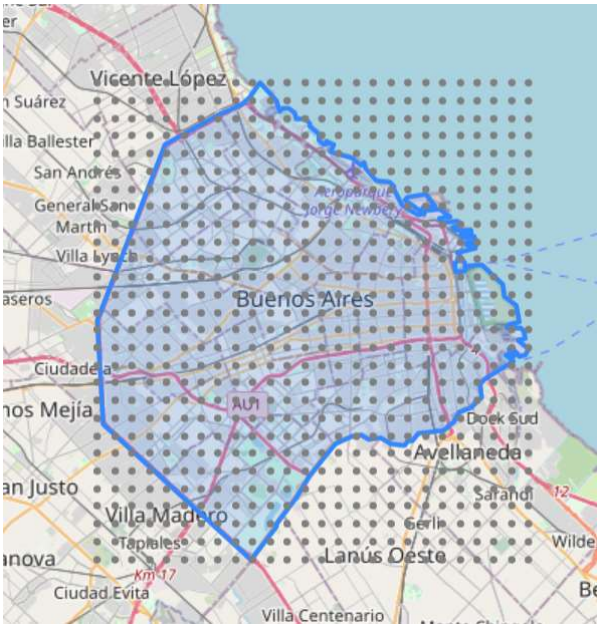


Figure 2: Grid of points and CABA polygon.

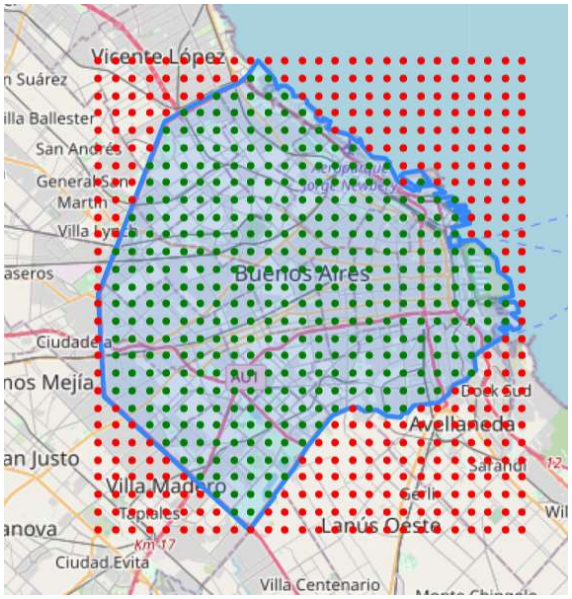


Figure 3: Grid of points classified (Green: inside CABA polygon – Red: outside CABA polygon)

Once the points inside CABA were defined, the foursquare API was tested with a few points to get familiar with the requested data.

I then created a function to obtain the data for every point inside CABA and compile the information into one single dataframe. After dropping repeated pharmacies (as showed in figure 1, intersection between circular areas were scanned twice), the dataframe looked like this:

	Point_number	Point Latitude	Point Longitude	Pharmacy name	Pharmacy Latitude	Pharmacy Longitude	Pharmacy distance to point	Pharmacy Adress	Pharmacy Address
0	2	-34.692071	-58.476496	Farmacia San Pedro	-34.690053	-58.481157	482	NaN	Cabildo
1	7	-34.685449	-58.476496	Farmacity	-34.686374	-58.476301	104	NaN	Cnel. Martiniano Chilavert 6461
2	7	-34.685449	-58.476496	Farmacia Belen	-34.685821	-58.475219	123	NaN	Cnel. Martiniano Chilavert 6364
3	7	-34.685449	-58.476496	Óptica Sacaria	-34.686685	-58.476368	138	NaN	Chilavert
4	9	-34.685449	-58.460790	Farmacia San Alberto	-34.686954	-58.461395	176	NaN	Cañada De Gomez 5201
5	14	-34.678828	-58.476496	Farmacia Inglesa	-34.676492	-58.476758	261	NaN	Somellera 5725
6	14	-34.678828	-58.476496	Optica De Betina	-34.677923	-58.474880	178	NaN	NaN
7	14	-34.678828	-58.476496	Farmacia Cientifica	-34.676375	-58.475732	281	NaN	NaN

Figure 4: Dataframe of unique pharmacies located in CABA area (total of 752 pharmacies).

Finally, I needed to find out in which neighborhood each pharmacy was located. Therefore, I decided to use a geojson file that contains CABA neighborhoods limits.

Figure 5: CABA neighborhoods geojson file.

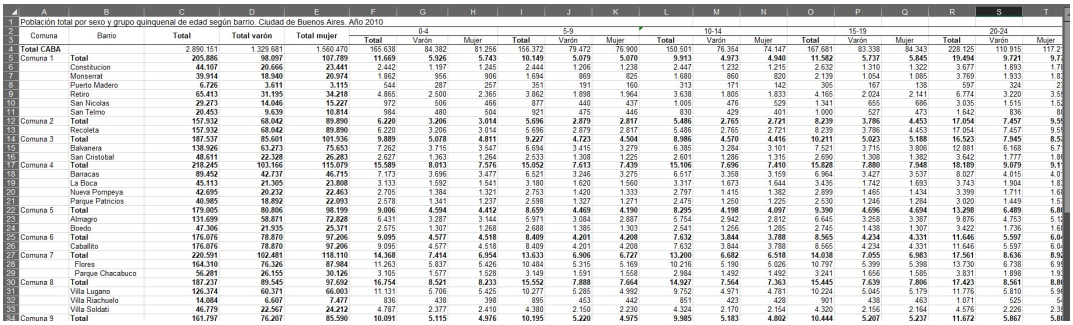
After running a for loop, the mentioned dataframe was completed with the "Neighborhood" column, and using groupby function I finally got the answer of "How many pharmacies already exists in the neighborhood?"

	Neighborhood	counts
0	ALMAGRO	26
1	BALVANERA	52
2	BARRACAS	16
3	BELGRANO	43
4	BOCA	4
5	BOEDO	6
6	CABALLITO	42

Figure 6: A total of 45 unique neighborhoods were listed in this dataframe

2.2.2 How many persons live in the neighborhood? How old are them?

I explored several governmental websites to discover the answers. I finally found demographic statistical data of CABA with the desired information.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	Población total por sexo y grupo quinquenal de edad según barrio. Ciudad de Buenos Aires. Año 2010																			
2							0-4			5-9			10-14			15-19			20-24	
3	Comuna	Barrio	Total	Total varón	Total mujer	Total	Varón	Mujer	Total	Varón	Mujer	Total	Varón	Mujer	Total	Varón	Mujer	Total	Varón	Mujer
4	Total CABA		2.890.151	1.329.681	1.560.470	165.638	84.382	81.256	156.372	79.472	76.900	150.501	76.354	74.147	167.681	83.338	84.343	228.125	110.915	117.2
5	Comuna 1	Total	205.886	98.097	107.789	11.669	5.926	5.743	10.149	5.079	5.070	9.913	4.973	4.940	11.562	5.737	5.845	19.494	9.721	9.7
6		Constitucion	44.107	20.666	23.441	2.442	1.197	1.245	2.444	1.206	1.238	2.447	1.232	1.215	2.632	1.310	1.322	3.677	1.893	1.7
7		Monserat	39.914	18.940	20.974	1.862	956	906	1.694	869	825	1.680	860	820	2.139	1.054	1.085	3.769	1.933	1.8
8		Puerto Madero	6.726	3.611	3.115	544	287	257	351	191	160	313	171	142	305	167	138	597	324	2
9		Retiro	65.413	31.195	34.218	4.865	2.500	2.365	3.862	1.898	1.964	3.638	1.805	1.833	4.165	2.024	2.141	6.774	3.220	3.5
10		San Nicolas	29.273	14.046	15.227	972	506	466	877	440	437	1.005	476	529	1.341	655	686	3.035	1.515	1.5
11		San Telmo	20.453	9.639	10.814	984	480	504	921	475	446	830	429	401	1.000	527	473	1.642	836	8
12	Comuna 2	Total	157.932	68.042	89.890	6.220	3.206	3.014	5.696	2.879	2.817	5.486	2.765	2.721	8.239	3.786	4.453	17.054	7.457	9.5
13		Recoleta	157.932	68.042	89.890	6.220	3.206	3.014	5.696	2.879	2.817	5.486	2.765	2.721	8.239	3.786	4.453	17.054	7.457	9.5
14	Comuna 3	Total	187.537	85.501	101.936	9.889	5.078	4.811	9.227	4.723	4.504	8.986	4.570	4.416	10.211	5.023	5.188	16.523	7.945	8.5
15		Balvanera	138.926	63.273	75.653	7.262	3.715	3.547	6.694	3.415	3.279	6.385	3.284	3.101	7.521	3.715	3.806	12.881	6.168	6.7
16		San Cristobal	48.611	22.328	26.283	2.627	1.363	1.264	2.533	1.308	1.225	2.601	1.286	1.315	2.690	1.308	1.382	3.642	1.777	1.8
17	Comuna 4	Total	218.245	103.166	115.079	15.589	8.013	7.576	15.052	7.613	7.439	15.106	7.696	7.410	15.828	7.880	7.948	16.189	9.079	9.1
18		Barracas	89.452	42.737	46.715	7.173	3.696	3.477	6.521	3.246	3.275	6.517	3.358	3.159	6.964	3.427	3.537	8.027	4.015	4.0
19		La Boca	45.113	21.305	23.808	3.133	1.592	1.541	3.180	1.620	1.560	3.317	1.673	1.644	3.435	1.742	1.693	3.743	1.904	1.8
20		Nueva Pompeya	42.695	20.232	22.463	2.705	1.384	1.321	2.753	1.420	1.333	2.797	1.415	1.382	2.899	1.465	1.434	3.399	1.711	1.6
21		Parque Patricios	40.985	18.892	22.093	2.578	1.341	1.237	2.598	1.327	1.271	2.475	1.250	1.225	2.530	1.246	1.284	3.020	1.449	1.5
22	Comuna 5	Total	179.005	80.806	98.199	9.006	4.594	4.412	8.659	4.469	4.190	8.295	4.198	4.097	9.390	4.696	4.694	13.298	6.489	6.8
23		Almagro	131.699	58.871	72.828	6.431	3.287	3.144	5.971	3.084	2.887	5.754	2.942	2.812	6.645	3.258	3.387	9.876	4.753	5.1
24		Boedo	47.306	21.935	25.371	2.575	1.307	1.268	2.688	1.385	1.303	2.541	1.256	1.285	2.745	1.438	1.307	3.422	1.736	1.6
25	Comuna 6	Total	176.076	78.870	97.206	9.095	4.577	4.518	8.409	4.201	4.208	7.632	3.844	3.788	8.565	4.234	4.331	11.646	5.597	6.0
26		Caballito	176.076	78.870	97.206	9.095	4.577	4.518	8.409	4.201	4.208	7.632	3.844	3.788	8.565	4.234	4.331	11.646	5.597	6.0
27	Comuna 7	Total	220.591	102.481	118.110	14.368	7.414	6.954	13.633	6.906	6.727	13.200	6.682	6.518	14.038	7.055	6.983	17.561	8.636	8.9
28		Flores	164.310	76.326	87.984	11.263	5.837	5.426	10.484	5.315	5.169	10.216	5.190	5.026	10.797	5.399	5.398	13.730	6.738	6.9
29		Parque Chacabuco	56.281	26.155	30.126	3.105	1.577	1.528	3.149	1.591	1.558	2.984	1.492	1.492	3.241	1.656	1.585	3.831	1.898	1.9
30	Comuna 8	Total	187.237	89.545	97.692	16.754	8.521	8.233	15.552	7.888	7.664	14.927	7.564	7.363	15.445	7.639	7.806	17.423	8.561	8.8
31		Villa Lugano	126.374	60.371	66.003	11.131	5.706	5.425	10.277	5.285	4.992	9.752	4.971	4.781	10.224	5.045	5.179	11.776	5.810	5.9
32		Villa Riachuelo	14.084	6.607	7.477	836	438	398	895	453	442	851	423	428	901	438	463	1.071	525	5
33		Villa Soldati	46.779	22.567	24.212	4.787	2.377	2.410	4.380	2.150	2.230	4.324	2.170	2.154	4.320	2.156	2.164	4.576	2.226	2.3
34	Comuna 9	Total	161.797	76.207	85.590	10.091	5.115	4.976	10.195	5.220	4.975	9.985	5.183	4.802	10.444	5.207	5.237	11.672	5.867	5.8

Figure 7: Excel file showing CABA population by sex, age group and neighborhood.

I then converted this excel file into a dataframe and performed cleaning operations. I also added a calculated column to get population above 65 years old. The desired dataframe was obtained:

	Neighborhood	Total	Total_more_65
0	CONSTITUCION	44107.0	6515.0
1	MONSERRAT	39914.0	5868.0
2	PUERTO MADERO	6726.0	490.0
3	RETIRO	65413.0	8336.0
4	SAN NICOLAS	29273.0	4325.0
5	SAN TELMO	20453.0	3590.0
6	RECOLETA	157932.0	31265.0
7	BALVANERA	138926.0	22096.0
8	SAN CRISTOBAL	48611.0	7932.0
9	BARRACAS	89452.0	9724.0
10	LA BOCA	45113.0	5661.0
11	NUEVA POMPEYA	42695.0	6617.0
12	PARQUE PATRICIOS	40985.0	6118.0
13	ALMAGRO	131699.0	23199.0
14	BOEDO	47306.0	7601.0

Figure 8: "Barrio" means Neigborhood in Spanish. "Total" represents the total population and "Total_more_65" represents the population aged more than 65.

2.2.3 Are these persons consumers of pharmacy products?

I searched online data of population income per neighborhood but unfortunately, I couldn´t find well-ordered and reliable information. What I did find instead, is real state information of price per square meter of each neighborhood. For the matter of this project, income and price per square meter were considered correlated.

	Neighborhood	USD/m2
0	Puerto Madero	5786
1	Palermo	3313
2	Belgrano	3164
3	Nuðez	3039
4	Recoleta	2973
5	Retiro	2926
6	Colegiales	2888
7	Villa Urquiza	2801
8	Coghlan	2690
9	Chacarita	2643

Figure 9

2.3 Data sources

Multiple datasets and geodata where needed to perform section 2.2:

- How many pharmacies already exists in the neighborhood? (2.2.1)
    - Zip file containing CABA shape file: https://infra.datos.gob.ar/catalog/modernizacion/dataset/7/distribution/7.34/download/provincias.zip
    - Existing Pharmacies in CABA: Foursquare API
    - CABA neighborhoods geojson file: https://cdn.buenosaires.gob.ar/datosabiertos/datasets/barrios/barrios.geojson
- How many persons live? How old are them? (2.2.2)
    - Statistics about neighborhood population: https://www.estadisticaciudad.gob.ar/eyc/?p=28008/PB_barrio_ARIP_CNP2010.xls
- Are these persons consumers of pharmacy products? (2.2.3)
    - Neighborhoods Price per Square meter: https://www.zonaprop.com.ar/noticias/zpindex/

2.4 Data preparation

In this section I will describe how dataframes obtained in section 2.2 where merged and modified so as to get the appropriate data needed to feed a model intended to answer the main question of this project.

At first, output data of section 2.2.2 was merged with output data of section 2.2.1. Since they had 48 and 45 neighborhoods respectively, a left join merge was performed.

Secondly, the obtained dataframe was merged with output data from section 2.2.3. After performing cleaning operations and adding calculated columns, the following table was obtained:

	Neighborhood	Total_pop	Total_pop_+65	Pharmacies	USD/m2	pop_per_pharma	+65pop_per_pharma
0	CONSTITUCION	44107.00	6515.00	6.00	1960	7351.17	1085.83
1	MONSERRAT	39914.00	5868.00	30.00	2083	1330.47	195.60
2	PUERTO MADERO	6726.00	490.00	4.00	5786	1681.50	122.50
3	RETIRO	65413.00	8336.00	22.00	2926	2973.32	378.91
4	SAN NICOLAS	29273.00	4325.00	48.00	2163	609.85	90.10
5	SAN TELMO	20453.00	3590.00	8.00	2417	2556.62	448.75
6	RECOLETA	157932.00	31265.00	88.00	2973	1794.68	355.28
7	BALVANERA	138926.00	22096.00	52.00	2043	2671.65	424.92
8	SAN CRISTOBAL	48611.00	7932.00	6.00	2015	8101.83	1322.00
9	BARRACAS	89452.00	9724.00	16.00	2364	5590.75	607.75
10	LA BOCA	45113.00	5661.00	4.00	1781	11278.25	1415.25
11	NUEVA POMPEYA	42695.00	6617.00	5.00	1872	8539.00	1323.40
12	PARQUE PATRICIOS	40985.00	6118.00	7.00	2022	5855.00	874.00

Figure 10

Columns “pop_per_pharma” and “+65pop_per_pharma” formulas:

- pop_per_pharma=Total_pop/Pharmacies
- +65pop_per_pharma=Total_pop_+65/Pharmacies

As mentioned in section 2.1, the rate of persons per existing pharmacies is a very important feature. I decided to add +65pop_per_pharma as older people are more likely to make pharmacies purchases, especially medication. So, if neighborhood A has a similar “pop_per_phama” as neighborhood B but neighborhood A has a better “+65pop_per_pharma” than B Neighborhood A should be one step ahead than B to start a new pharmacy.