

A Visual Study on Barcelona

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Figure 1: Cascada Monumental del Parc de la Ciutadella

ABSTRACT

Understanding the evolution on the social and environmental aspects of a big city, such as Barcelona, is a hard task, given the complex and even subjective answers one might obtain. Driven by the motivation to clarify such questions, this project seeks a better understanding regarding those topics about Barcelona, aiming to comprehend how and if the city has been evolving over the most recent years, by analysing social indicators, such as immigration and emigration, birth rates, life expectancy, unemployment and accidents, and also environmental ones, such as tree plantations. To achieve this, data visualisations will be used in order to develop clarifications on the subject, by mapping data to visual variables, providing an easier way of understanding Barcelona's people and environment. Thus, this project has the purpose of finding a better and more complete way of presenting answers about Barcelona, extending the textual and statistical information provided by the various data sets.

1 INTRODUCTION

The motivation behind the choice of this subject is to attain a deeper knowledge about the evolution of Barcelona by studying the chosen data, with the help of several different data visualisations. To accomplish this purpose, a main data set is used, comprised of ten different ones where it can be found information about the administration, urban environment, population, territory, economy and business in the city of Barcelona.

The questions this project aims to answer are mainly focused on indicators such as the urban environment and population, like for instance, questions such as "How has the unemployment in relation to the unemployment demand evolved in the last years?". More questions are specified on the next section of this document. This paper is divided into 5 sections where it is explained in deeper detail what questions this project aims to answer about Barcelona, the details of the chosen data sets, what other related work has been done and, finally, the project proposal.

2 RESEARCH QUESTIONS

To develop the proposed study, it is necessary to determine a guideline defining the main intended goals. This way, the research is conducted by the following questions:

- How is the population of Barcelona distributed by its districts? How has it evolved in time?

To get an initial overview of Barcelona we pretend to investigate the distribution of the population over districts, gender and age.

- What is the average life expectancy of the people of Barcelona? Is there a difference between districts? Has it evolved over time? Do women have a longer life expectancy than men?

Life expectancy is a health quality indicator that is quite important when evaluating the quality of life of a population. Because of this, it is pretended to analyse the life expectancy over districts and how it has been evolving in the latest years as well as if the trend that women live more than men also applies to Barcelona.

- How is the number of births in Barcelona distributed by its districts and neighbourhoods? How has it evolved in time? Is there a relation between birth rate and immigration rate?

The birth rate of a city is important to know if its population is ageing or not but birth rate isn't the only metric representing the population fluctuation and should be complemented with the immigration rate. It is pretended to understand if the population of Barcelona is not only ageing or not but if it is diversifying and if the entrance of immigrants in the city has an impact on birth rate.

- Has there been an increase of the planted trees over the years?

Street trees are an important part of a city improving its population's quality of life. According to this article[5], street trees have a bigger influence over people's health than an increase of income.

- How has the registered unemployment evolved? Does it differ over districts and gender or is it the same? How does it relate with unemployment demand?

Unemployment is an important aspect of any city providing rich information about its economical situation. If one is to move to Barcelona then they should investigate this metric in order to understand where they should work and if their gender might influence this choice.

- Where are the most dangerous areas to drive in Barcelona? And which weekdays and during what part of the day and hour is it more dangerous?

Either visiting or living in a city, road safety is always an important part of public health. Because of this it'll be studied what times of the day and which areas of Barcelona are the safest to drive in and which zones should be avoided.

Having set our research goals we shall now investigate the dataset we're working with and that will be used to answer all the research questions indicated above.

3 DATA SET

The full data set is comprised into ten different sections, each one corresponding to the different topics and indicators being studied. A detailed analysis of each one follows:

3.1 Accidents - 2017

A list of accidents handled by the local police in the city of Barcelona, in 2017. This data set includes information about when and where the accident happened including the precise coordinates. It also includes the number of vehicles involved, the number of victims and their injury severity.

Number of Records: 10 339

Size: 1.68 MB

3.2 Births

Births by district and by neighbourhoods of the city of Barcelona, from 2013 to 2017, for boys and girls.

Number of Records: 734

Size: 45,1 KB

3.3 Immigrants by Nationality

Immigrants by nationality and by neighbourhoods of the city of Barcelona, from 2015 to 2017.

Number of Records: 34 224

Size: 2,19 MB

3.4 Immigrants and Emigrants by Age

Immigrants and emigrants by quinquennial ages (recurring every 5 years), by district and neighbourhoods of the city of Barcelona, from 2015 to 2017.

Number of Records: 4662

Size: 269 KB

3.5 Population

Population by neighbourhood, by quinquennial ages (recurring every 5 years) and by gender of the city of Barcelona, from 2013 to 2017. Reading registers of inhabitants. The data set also includes unique IDs for the different neighbourhoods and districts.

Number of Records: 70 080

Size: 4,34 MB

3.6 Life Expectancy

Life Expectancy of the population of Barcelona between 2010 and 2014 containing information about neighbourhood and gender.

Number of Records: 146

Size: 7 KB

3.7 Unemployment

Registered unemployment and unemployment demand by district, neighbourhood and gender in the city of Barcelona. It includes the months from 2013 to 2017 and unique IDs for the districts and neighbourhoods.

Number of Records: 14 208

Size: 1,30 MB

3.8 Street trees of the city of Barcelona

Name of the species and geographical location of the trees of the city of Barcelona located on public roads. The information contains, among other data, the scientific name, the common name, the height, the direction and the width of the sidewalk, etc. The trees of the parks are not included. The coordinates are expressed in the ETRS89 reference system.

Number of Records: 156 623

Size: 44,7 MB

3.9 Shapefile of the districts of Barcelona

Shapefile that represents the different districts of the city of Barcelona.

Number of Records: 10

Size: 131 KB

3.10 Shapefile of the neighbourhoods of Barcelona

Shapefile that represents the different neighbourhoods of the city of Barcelona.

Number of Records: 73

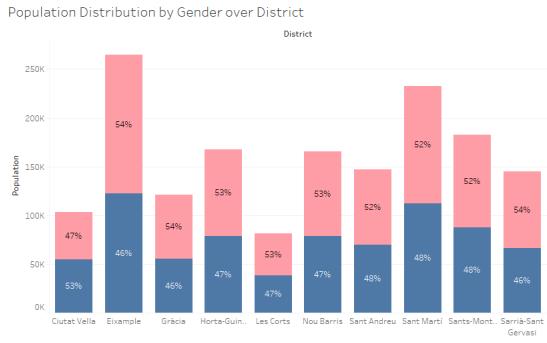
Size: 197 KB

4 EXPLORATORY DATA ANALYSIS

In order to study some aspects about the data being used, for example its distribution, the presence of missing values, or their range, the following visualisations were created to provide such results.

4.1 Population Distribution

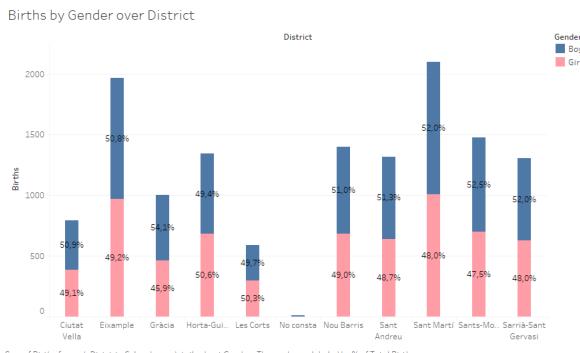
This visualisation allows the verification of what districts are more or less populated and how many men and women constitute the population in each district, with the gender mapped to the colour. Despite of not being present in figure 2, in Tableau it is possible to check these results for every year. Some conclusions can be derived, such as Eixample being the most populated district, and only in Ciutat Vella there are more men than women.



Sum of Population for each District. Color shows details about Gender. The marks are labeled by % of Total Population.

Figure 2: Distribution of Barcelona's Population by Gender over District

4.2 Births Distribution



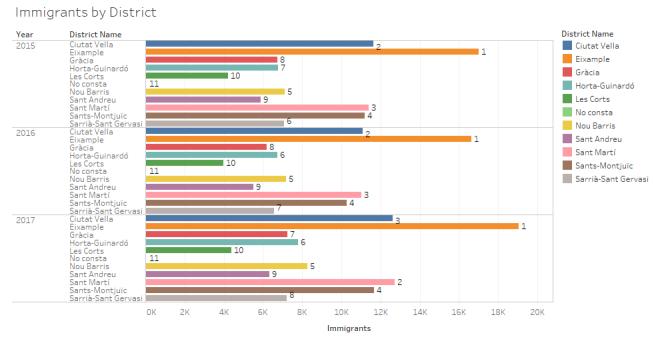
Sum of Births for each District. Color shows details about Gender. The marks are labeled by % of Total Births.

Figure 3: Distribution of Births by Gender over District

Similarly to the visualisation in figure 2, this one presents the number of births by gender (mapped to the colour) for each district in Barcelona, with the possibility to check for every year. It is also possible to see there are some missing values, present in the "No Consta" column: there are a total of seven, only in the year 2013, as it can be seen in figure 3. We can verify there isn't much difference in the number of births for both genders, since the length of the bar is similar, and that Eixample, the most populated one, is also the district with more births.

4.3 Immigration Distribution

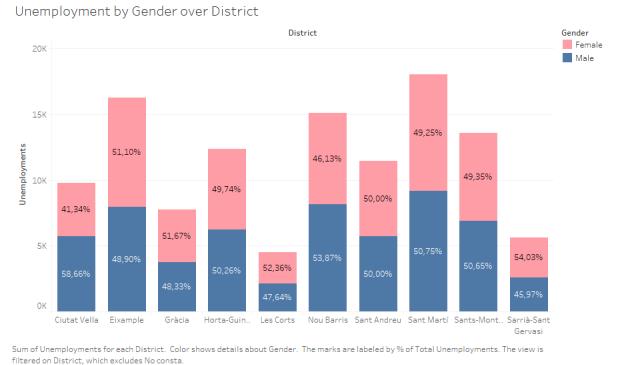
On figure 4, it is presented a bar chart with the ranked number of immigrants who moved to each district (mapped to the colour), for every year present in the data. Some missing values can be spotted, in the district column "No Consta", totalling 17: 6 in the year 2015, 7 in 2016 and the remaining 2 in 2017. Along the three years, a tendency can be spotted for most districts: from the first year to the second, there is a slight decrease in the number of immigrants, and from the second to the last year, that number increases to a value which is greater than the first year. Also, Eixample is for all years the district with most immigrants.



Sum of Immigrants for each District Name broken down by Year. Color shows details about District Name. The marks are labeled by Rank of Immigrants.

Figure 4: Distribution of Immigrants by District over Year

4.4 Unemployment Distribution



Sum of Unemployments for each District. Color shows details about Gender. The marks are labeled by % of Total Unemployments. The view is filtered on District, which excludes No consta.

Figure 5: Distribution of Barcelona Unemployment by District

In this visualisation, figure 5, the number of unemployed citizens of Barcelona are presented by gender, which is mapped to the colour, over the districts, being also possible in Tableau to verify these values year by year. In Sant Martí, the number of unemployments is the greatest, exceeding 18.000 people, while in Les Corts it is the smallest. There isn't much difference between unemployed man and women, however in six districts of the existing ten, there are more unemployed women.

4.5 Accidents Distribution

The final visualisation, displayed on figure 6, shows the distribution of the number of accident victims (mapped to size) by each hour of the day and the number of vehicles. We can see that accidents with most victims involve two vehicles and occur between 1PM and 8PM, with most victims exactly at 2PM.

4.6 Age Intervals

On the population data set, the age is grouped by several intervals of 4 years, i.e. [0,4], [5,9], [10,14], until [95+]. In order to obtain clearer visualisations, all these values were grouped in less categories: Child (0-14), Teenager(15-19), Adult(20-64) and Elder(65-95+).

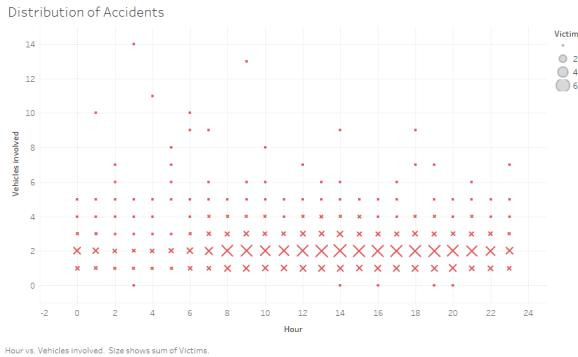


Figure 6: Distribution of Accident Victims by Hour and Vehicles Involved

5 STATE OF THE ART

5.1 Study concerning Accidents

The purpose of the study was to assess the one-year incidence of traffic injuries among residents with 14 years of age and older, as well as their distribution by age, gender, road-user category, place of occurrence, and severity of the injury. A one-year survey was conducted in the emergency departments in Barcelona, Spain[1]. Since this study is from 1999, we pretend to relate its information with the more recent one from 2017 that we have in order to understand if the rate of accidents in Barcelona has decreased and increased.

5.2 Data Visualisations of demographic indicators concerning Barcelona

The website Open Data Barcelona provides useful data on all indicators studied in this project. It has a section with Data Visualisations and Applications developed with data provided by the website.

- Nathalie Richer[2] has created an interactive visualisation called "Map of the street trees in Barcelona" with the localisation of its trees and distribution of the most present species. It was made using the available API in the data set Street trees of the city of Barcelona and on the Tableau platform. This visualisation can be seen in figure 7.
- The Map of the Street Trees in Barcelona allows an understanding of the distribution of the different species of trees along the roads of Barcelona.
- Juanjo Vidal also produced a visual display of the roadside trees in Barcelona. Its main focus is to study the NDVI index which is used to analyse the lushness ("greenness") of the vegetation. Its values range is from -1 to 1[3]. Just like Nathalie Richer's, the used data set does not include either park or area trees. The NDVI Vegetation Index and Street Trees in Barcelona city visualisation can be seen on figure 8. This visualisation has tree forms of filtering: NDVI June 2016, Arbar Viari per categories and Arbat Viari. The first one allows for an analysis of only the trees present along the roads of Barcelona in the year of 2016. The second filter shows information about the different trees species.

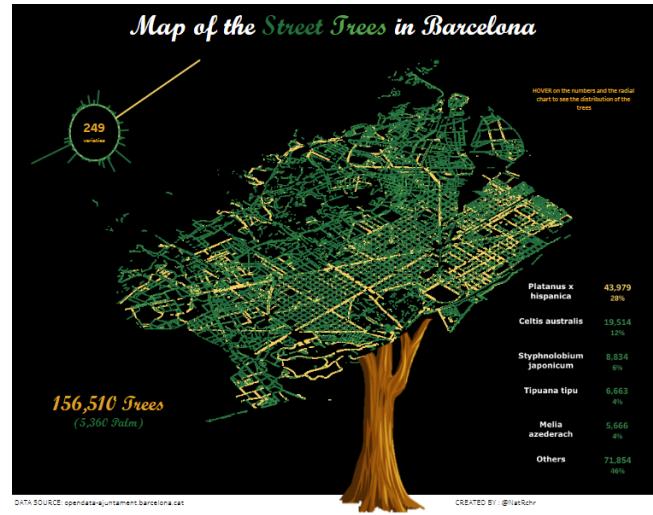


Figure 7: Nathalie Richer's Visualisation: Map of the Street Trees in Barcelona

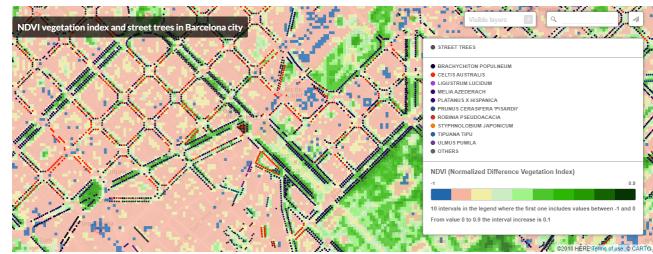


Figure 8: Juanjo Vidal's Visualisation: NDVI Vegetation Index and Street Trees in Barcelona city (using the three filters simultaneously)

Both Nathalie's Richer and Juanjo Vidal's visualisations do not take into account the trees that were planted along the years, only showing a specific - and not interactive - time frame.

- Xavier Vivancos García[4] created a Kaggle kernel with visualisations in order to analyse some important topics about Barcelona, such as its population's distribution, culture, transport and environment, corresponding to some indicators this project also addresses. Some examples of the visualisations produced can be seen on figures 9, 10, 11 and 12.

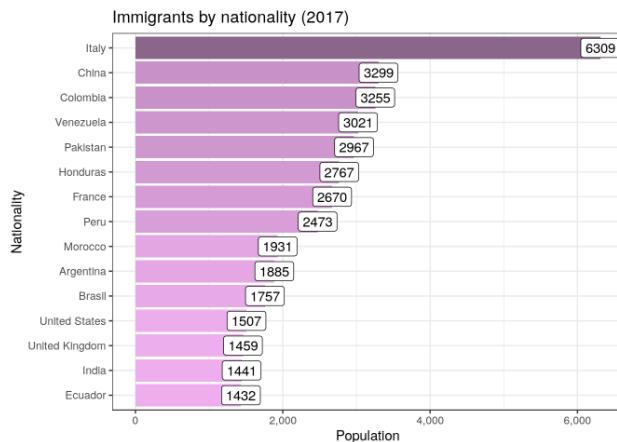


Figure 9: Xavier Vivancos García's Visualisation: Immigrants by Nationality (2017)

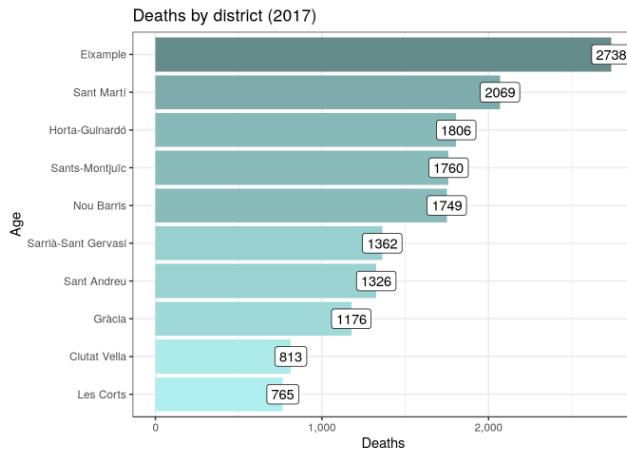


Figure 10: Xavier Vivancos García's Visualisation: Deaths by District (2017)

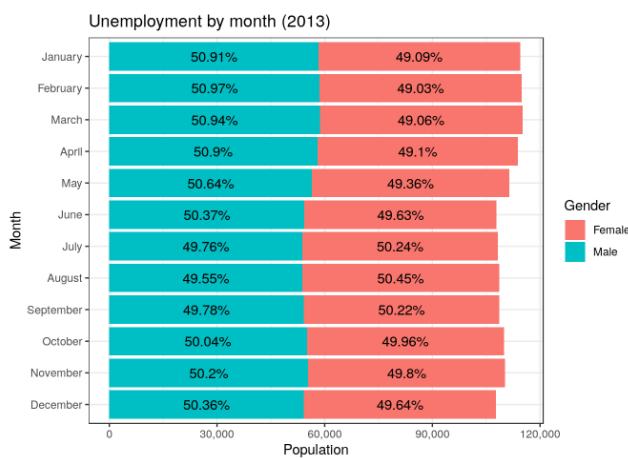


Figure 11: Xavier Vivancos García's Visualisation: Unemployment by Month (2013)

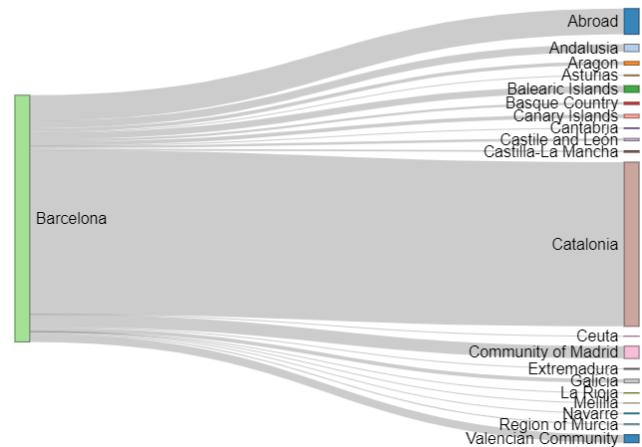


Figure 12: Xavier Vivancos García's Visualisation: Sankey Diagram displaying the emigration by place of destination (2017)

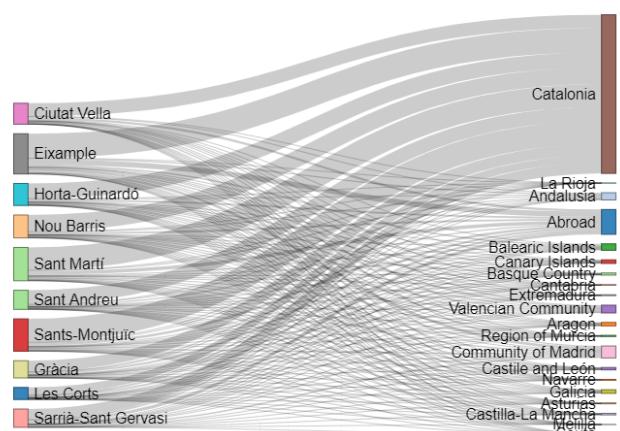


Figure 13: Xavier Vivancos García's Visualisation: Sankey Diagram displaying emigration by place of destination and by neighbourhoods (2017)

This is a very complete study of the chosen indicators concerning the population of Barcelona. It contains several information that can be extracted from the used data sets displayed in a very simplistic yet intuitive way. Although the use of Sankey Diagrams - that displays flows and their quantities, in proportion to another using the width of lines to show their magnitudes - is very clever on figure 12, it can become very confusing as can be seen on figure 13.

6 PROPOSAL AND RESULTS

To analyse the indicators referred on the previous sections we've developed five different dashboards comprised of several visualisations. Both the dashboards and its visualisations are further described in detail.

6.1 Population Overview

The dashboard of figure 14 aims to answer several questions about the distribution of population of Barcelona and its life expectancy. This dashboard is interactive so the user can select one or more districts to focus and analyse them in further detail.

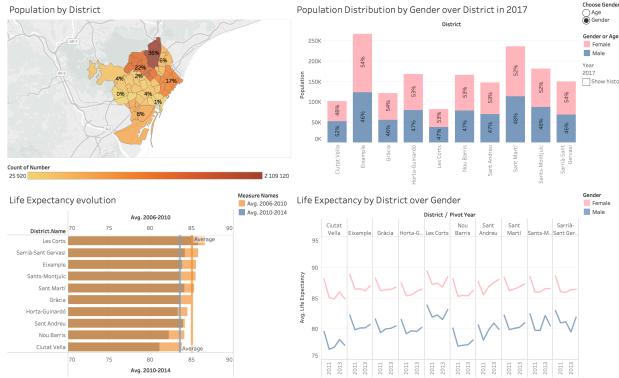


Figure 14: Population Overview Dashboard

The Population Overview dashboard is composed of the following visualisations:

- **Population by District**

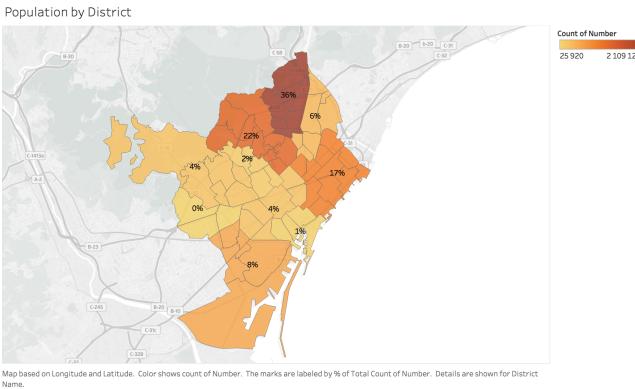


Figure 15: Population by District

The visualisation Population by District on figure 15 shows the percentage of the total population that lives in each district. The number of individuals is mapped to the intensity of the colour and the labels show the percentage over the total of Barcelona's population.

- **Population Distribution by Gender or Age over District:**

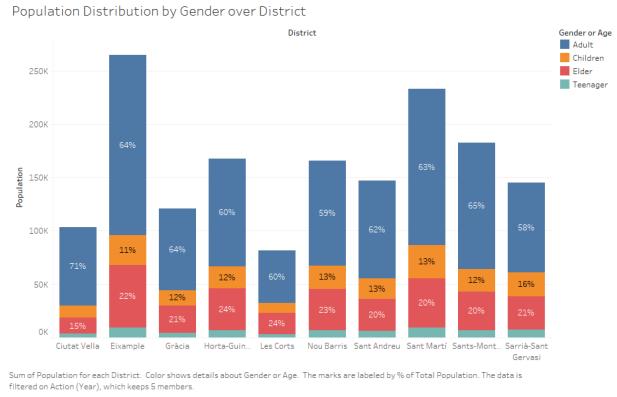


Figure 16: Population Distribution by Gender over District when Age is chosen

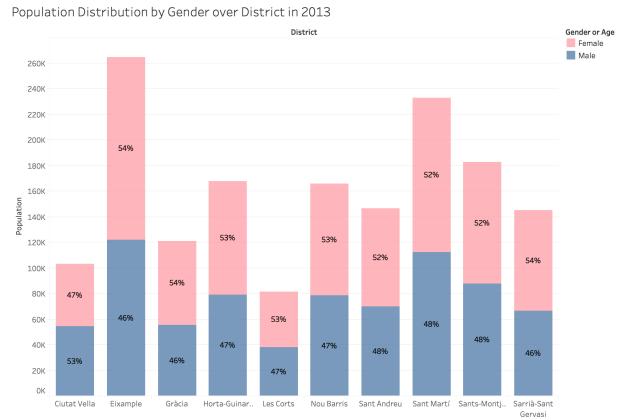


Figure 17: Population Distribution by Gender over District when Gender is chosen

In the visualisation Population Distribution by Age/Gender over District, shown on figures 16 and 17, the user can choose between visualising the data by age - figure 16 - or gender - figure 17.

It shows the distribution of the age groups, or gender, by district between the years of 2013 and 2017. In the case Age is chosen, the different age groups - Children, Teenager, Adult and Elder - are mapped to the colour and the labels show the percentage over the total of the district's population. In case the Gender is chosen, the gender is mapped to the colour and the labels represent, once more, the percentage over the total of the district's population. In both cases, the x-axis contains the districts and the y-axis has the population number. This visualisation answers the question of "How is the population distributed over districts and gender?" by presenting the districts over the columns and population over the rows.

- Life Expectancy evolution:

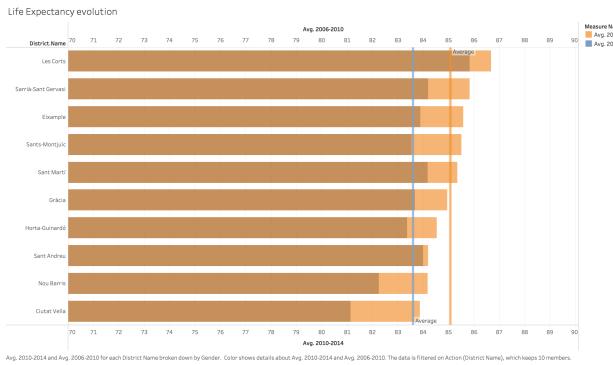


Figure 18: Life Expectancy Evolution

By clicking a district in the Population by District visualisation on figure 15, the Life Expectancy visualisation shown on figure 18 is filtered and only shows the information about the district that was clicked.

This visualisation answers the questions "What is the average life expectancy of the people of Barcelona? Is there a difference between districts? Has it evolved over time?". We can see that there is a significant difference between districts by looking at the different bar charts. We can also see the evolution of the life expectancy by looking at the difference between the blue and orange bars and verify that the life expectancy decreased on all districts.

- Life Expectancy by District over Gender:

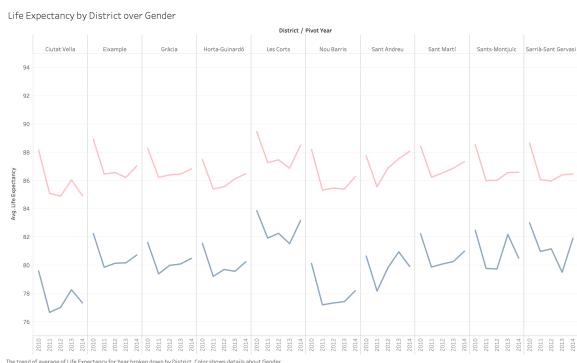


Figure 19: Life Expectancy by District over Gender

In the visualisation Life Expectancy by District over Gender shown on figure 19 it can be analysed the evolution of the life expectancy of each district by gender between the years of 2010 and 2014. The gender is mapped to the colour. By dividing the men and women in 2 groups we can clearly see that Barcelona isn't an exception and women have a longer life expectancy than men. We can also see there was a high drop in life expectancy in 2011.

By analysing the results shown in the Population Overview dashboard, the research questions about the population can be answered as follows:

- (1) **How is the population of Barcelona distributed by its districts? How has it evolved in time?**

Nou Barris district is the most populated district of Barcelona having 18% of Barcelona's population concentrated in it. Nou Barris is, constantly, the most densely populated district since the year of 2013 to 2017.

- (2) **What is the average life expectancy of the people of Barcelona? Is there a difference between districts? Has it evolved over time? Do women have a longer life expectancy than men?**

The life expectancy of people living in Barcelona differs according to gender and district. In this dashboard it can be observed that the district with the greater life expectancy, both for males and females, is Les Corts whilst the district with the shortest life expectancy for male individuals is Ciutat Vella and for females is Horta-Guinardó.

6.2 Unemployment Overview

This dashboard aims to answer questions about the evolution of the unemployment in Barcelona. The user can choose which month and year they wish to see information about.

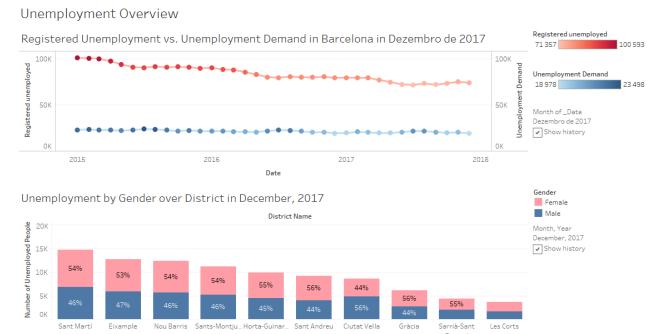


Figure 20: Unemployment Overview Dashboard

The Unemployment Overview dashboard is composed by the following visualisations:

- Registered Unemployment vs. Unemployment Demand in Barcelona



Figure 21: Registered Unemployment vs. Unemployment Demand in Barcelona

The visualisation shown on figure 21 shows the evolution of unemployment in relation to the unemployment demand between the years of 2015 and 2018, exclusive. The registered unemployment and the employment demand are both mapped to different colours and are both represented in different lines at the same time line. In the x-axis the years are present, and in the dual y-axis it shows both the values for registered unemployment and unemployment demand. Each point of the line represents one different month of the year and the measures studied are both measured in number of individuals, e.g. there are 100.000 individuals registered as unemployed on January of 2015. This visualisation answers the questions "How has the registered unemployment evolved?" and "How does it relate with unemployment demand?" by plotting both values at the same allowing for a comparison to easily be made. We can also see that fortunately the unemployment has been decreasing over the years and that this decrease is more noticeable during the Summer as expected from a premium tourist destination as Barcelona.

- Unemployment by Gender over District

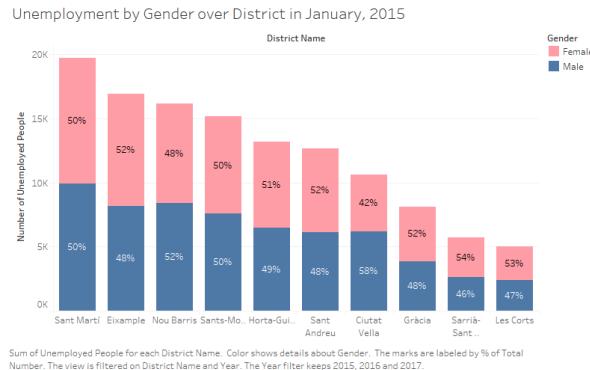


Figure 22: Unemployment by Gender over District

The visualisation Unemployment by Gender over District shown on figure 22 shows the unemployment rate of both males and females of each district of Barcelona. The gender is mapped to the colour and the labels show the percentage of males and females over the total of the district's population. The x-axis has the districts, and the y-axis the number of unemployed people. This visualisation answers the question "Does unemployment differ over districts and gender or is it the same?" by sub setting the unemployment over each district and by dividing it by gender. As we can see female unemployment is always bigger except in Ciutat Vella but as we've seen before this is also the only district where there are more men than women.

The dashboard Unemployment Overview and its visualisations were developed to answer the following research questions: How has the registered unemployment evolved? Does it differ over districts and gender or is it the same? How does it relate with unemployment demand?

By analysing the results shown in this dashboard, it can be concluded that the registered unemployment had its peak in January of 2015 decreasing ever since. It can also be stated that the male unemployment in December of 2017 is always above the female unemployment in every district except on Ciutat Vella where 56% of men are unemployed. The unemployment demand as barely changed over the years even with the decrease of registered unemployed people meaning that the people of Barcelona have not been able to reach this gap.

6.3 Birth Rate Overview

The dashboard Birth Rate Overview shown on figure 23 aims to answer several questions about the birth rate of Barcelona and how it relates with the immigration. This interactive dashboard allows the user to filter the data by year and to drill down on districts to see more detail about neighbourhoods.

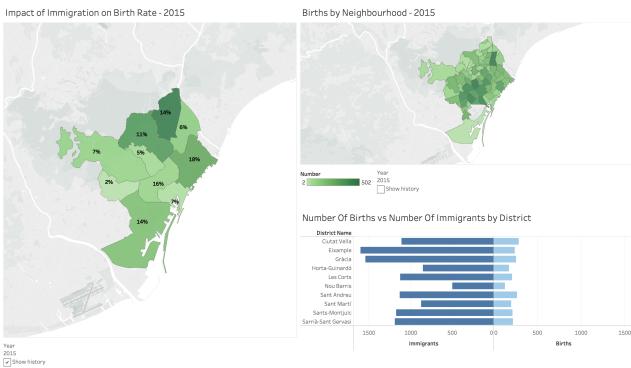


Figure 23: Birth Rate Dashboard

This dashboard is composed of the following visualisations:

- **Impact of Immigration on Birth Rate:**

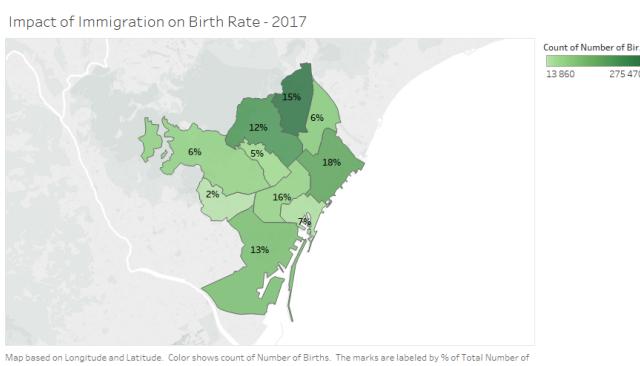


Figure 24: Impact of Immigration on Birth Rate

The visualisation Impact of Immigration on Birth Rate shown on figure 24, indicates how immigration has affected the birth rate in the districts of Barcelona between the years of 2015 and 2017. The number of babies born per district is mapped into the colour and the labels show the percentage of immigrants in each district. We can see that the districts with more immigrants also have more births.

- **Births by Neighbourhood:**

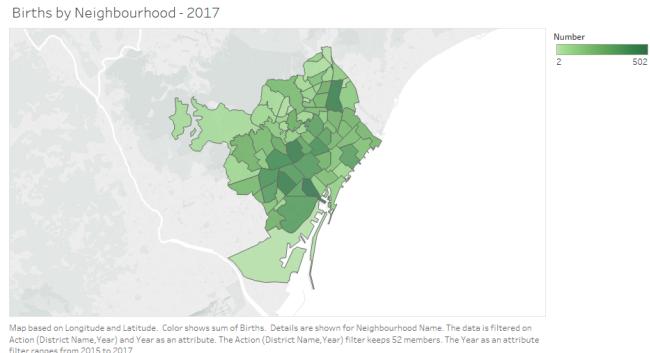


Figure 25: Births by Neighbourhood

The visualisation Births by Neighbourhood shown on figure 25 shows the number of babies born in each district's neighbourhood between the years of 2015 and 2017. The number of babies born is mapped to the colour. It allows to see the distribution of births of each district by its respective neighbourhoods.

- **Number of Births vs. Number of Immigrants by District:**

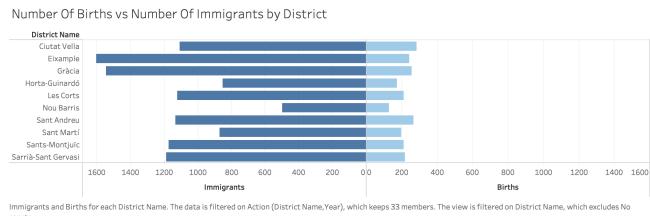


Figure 26: Number of Births vs. Number of Immigrants by District

The visualisation Number of Births vs. Number of Immigrants by District shown on figure 26 shows the number of births and the number of immigrants by district on the same scale. The dual x-axis contains both the number of immigrants and births, and the y-axis contains the districts.

The dashboard Birth Rate and its visualisations were developed to answer the following research questions: "How is the number of births in Barcelona distributed by its districts and neighbourhoods? How has it evolved in time? Is there a relation between birth rate and immigration rate?"

By analysing the results shown in this dashboard, it can be concluded that, between the years of 2015 and 2017, the immigration did not had an impact on the birth rate of the districts at all. Although the district with the most immigration rate in 2017 is Sant Martí, with 18% of its population being immigrants, it is not the one with the largest birth rate.

6.4 Accidents Overview

The dashboard Accidents Overview shown on figure 27 shows several important data about the accidents in Barcelona city. It aims to answer some questions about the most dangerous areas to drive around the city.

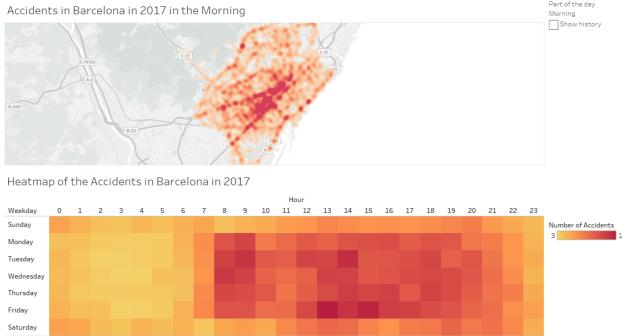


Figure 27: Accidents Overview Dashboard

This dashboard is composed of the following visualisations:

- **Accidents in Barcelona (2017)**

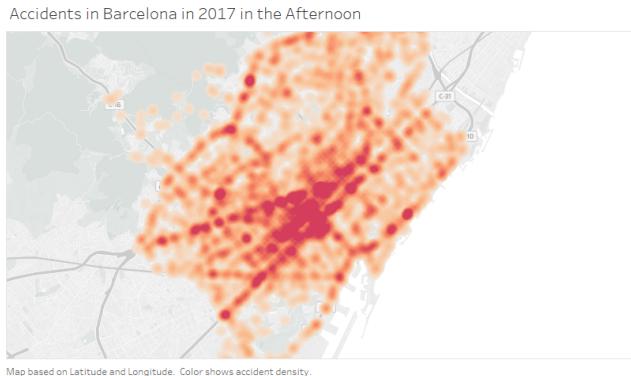


Figure 28: Accidents in Barcelona (2017)

The visualisation Accidents in Barcelona (2017) shown on figure 28 shows the areas of the city with more accidents depending on the time of day - morning, afternoon or evening. It also shows the number of vehicles involved and the number of victims for each accident present in the map. The number of accidents is mapped to the intensity of the colour.

- **Heat Map of the Accidents in Barcelona (2017)**

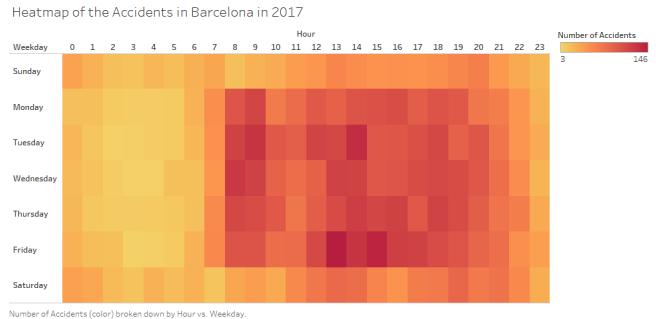


Figure 29: Heat Map of the Accidents in Barcelona (2017)

The Heat Map of the Accidents in Barcelona (2017) visualisation shown on figure 29 shows the distribution of accidents by day of the week and by hour of the day. The number of accidents is mapped to the intensity of the colour, the x-axis has the hour and the y-axis has the day of the week.

The dashboard Accidents Overview and its visualisations were developed to answer the following research questions: "Where are the most dangerous areas to drive in Barcelona? And which weekdays and during what part of the day and hour is it more dangerous?"

By analysing the results shown in this dashboard, it can be concluded that the most dangerous areas to drive in Barcelona are around the district Eixample and the famous Avinguda Diagonal. The weekdays with more accidents are, with no surprise, the workdays - Monday, Tuesday, Wednesday, Thursday and Friday - and the most dangerous hours to drive in these days are between 8 a.m. and 7 p.m., specially on Tuesdays at 09:00 and 14:00 and Fridays at 13:00 and 15:00.

6.5 Trees of Barcelona

The dashboard Trees of Barcelona is shown on figure 30 and it is composed of only one visualisation. It was created with the purpose of knowing if there was an increase on the number of planted trees in the city and where they were planted. This dashboard is interactive so the user can select the years between 2007 and 2019 and compare them. The trees' location is mapped to position, latitude and longitude, and the colour green is mapped to the intensity of the colour. Light green represents trees planted in previous years and dark green during the current year of the view.



Figure 30: Trees of Barcelona Dashboard

With this dashboard it can be concluded that there was a significantly increase of the number of trees planted in Barcelona between 2007 and 2019. This a great measure to improve the quality of life in the city and its people's health.

7 ANNEX

7.1 Accidents - 2017

Fields:

- ID (Categorical, Domain: 10 335 members)
- District Name (Categorical, Domain: 10 members)
- Neighbourhood Name (Categorical, Domain: 74 members)
- Street (Categorical, Domain: 4 253 members)
- Weekday (Categorical, 7) : ranges from Monday to Sunday
- Month (Categorical, 12) : ranges from January to December
- Day [1; 31]
- Hour [0; 23]
- Part of the day (Categorical, Domain: 3 members)
- Mild Injuries [0; 10] : Number of mild injuries in an accident
- Serious Injuries [0; 4] : Number of serious injuries in an accident
- Victims [0; 10] : Number of victims of an accident
- Vehicles Involved [0; 14] : Number of vehicles involved in an accident
- Longitude [2,0919; 2,2226]
- Latitude [41,3231; 41,4682]

Example: (2017S004615, Sant Martí, el Camp de l'Arpa del Clot, Las Navas de Tolosa, Thursday, May, 25, 14, Afternoon, 1, 0, 1, 3, 2,185272, 41,416365)

7.2 Births

Fields:

- Year (Categorical, Domain: 5 members)
- District Code (Categorical, Domain: 11 members)
- District Name (Categorical, Domain: 11 members)
- Neighbourhood Code (Categorical, Domain: 74 members)
- Neighbourhood Name (Categorical, Domain: 75 members)
- Gender (Categorical, Domain: 2 members)
- Number[0; 283]

Example: (2017; 1; Ciutat Vella; 1; el Raval; Boys; 283)

7.3 Immigrants by Nationality

Fields:

- Year (Categorical, Domain: 3 members)
- District Code (Categorical, Domain: 11 members)
- District Name (Categorical, Domain: 11 members)
- Neighbourhood Code (Categorical, Domain: 74 members)
- Neighbourhood Name (Categorical, Domain: 74 members)
- Nationality (Categorical, Domain: 177 members)
- Number[0; 1603]

Example: (2017; 1; Ciutat Vella; 1; el Raval; Spain; 1109)

7.4 Immigrants and Emigrants by Age

Fields:

- Year (Categorical, Domain: 3 members)
- District Code (Categorical, Domain: 11 members)
- District Name (Categorical, Domain: 11 members)
- Neighbourhood Code (Categorical, Domain: 74 members)
- Neighbourhood Name (Categorical, Domain: 74 members)
- Age (Categorical, Domain: 21 members)
- Immigrants [0; 1393]
- Emigrants [0; 451]

Example: (2017; 1; Ciutat Vella; 1; el Raval; 0-4; 154; 108)

7.5 Population

Fields:

- Year (Categorical, Domain: 5 members)
- District Code (Categorical, Domain: 10 members)
- District Name (Categorical, Domain: 10 members)
- Neighbourhood Code (Categorical, Domain: 73 members)
- Neighbourhood Name (Categorical, Domain: 73 members)
- Gender (Categorical, Domain: 2 members)
- Age (Categorical, Domain: 20 members)
- Number [0; 777]

Example: (2017; 1; Ciutat Vella; 1; el Raval; Male; 0-4; 224)

7.6 Life Expectancy

Fields:

- Neighborhood (Categorical, Domain: 73 members)
- 2006-2010 [74,2; 90,9]
- 2007-2011 [70,7; 88,2]
- 2008-2012 [69,5; 88,2]
- 2009-2013 [69; 88,5]
- 2010-2014 [71,3; 89,8]
- Gender (Categorical, Domain: 2 members)

Example: (el Raval; 87.5000; 84.9000; 84.7000; 84.9000; 85.3000; Female)

7.7 Unemployment

Fields:

- Year (Categorical, Domain: 5 members)
- Month (Categorical, Domain: 12 members)
- District Code (Categorical, Domain: 11 members)
- District Name (Categorical, Domain: 11 members)
- Neighbourhood Code (Categorical, Domain: 74 members)

- Neighbourhood Name (Categorical, Domain: 74 members)
- Gender (Categorical, Domain: 2 members)
- Demand Occupation (Categorical, Domain: 5 members)
- Number [0; 3094]

Example: (2017;January; 1; Ciutat Vella; 1; el Raval; Male; Registered unemployed; 2107)

7.8 Street trees of the city of Barcelona

Fields:

- Codi [0000022AR, 0019951AR] - Code of the tree
- X Etrs 89 [425,136.00, 434,869.79] - The coordinate X expressed in the ETRS89 reference system
- Y Etrs 89 [4,581,299.74, 4,587,967.41] - The coordinate Y expressed in the ETRS89 reference system
- Latitud Wgs84 [41.3800478, 41.4401509] - The latitude expressed in World Geodetic System 84
- Longitud Wgs84 [2.104602, 2.220761] - The longitude expressed in World Geodetic System 84
- Tipus Element (Categorical, Domain: 2 members) - Type of tree
- Espai Verd (Categorical, Domain: 842 members) - Green spaces names
- Adreca (Categorical, Domain: 43 908 members) - Address of the tree
- Alcada (Categorical, Domain: 5 members) - Categorical height of the tree
- Cat Especie ID [27, 5286637] - Tree species ID
- Nom Cientific - Species scientific name
- Nom Castella (Categorical, Domain: 204 members) - Castilian name
- Nom Catala (Categorical, Domain: 201 members) - Catalan name
- Categoria Arbrat (Categorical, Domain: 5 members) - Tree category
- Amplada Vorera [-1,45] - Sidewalk width
- Data Plantacio [2007,2019] - Date of plantation
- Tipus Aigua (Categorical, Domain: 3 members) - Type of water used for irrigation
- Tipus Reg (Categorical, Domain: 8 members) - Type of irrigation
- Tipus Superficie (Categorical, Domain: 7 members) - Type of surface
- Tipus Suport (Categorical, Domain: 10 members) - Type of support
- Cobertura Escocell (Categorical, Domain: 9 members) - Type of tree grill
- Mida Escocell (Categorical, Domain: 5 members) - Size of the flowerbed
- Vora Escocell (Categorical, Domain: 5 members) - Type of flowerbed

Example: (0000025AR; 430,270.56; 4,587,638.00; 41.4372866; 2.165353; ARBRE VIARI; Central de Nou Barris, Parc; Pg Fabra i Puig, 450; PETITA; 152; Populus nigra 'Italica'; Chopo lombardo; Pollancré gavatx; PRIMERA; null; 09/05/2017; null; GOTEIG; PAVIMENT; ESCOCCELL TRIANGULAR; SENSE COBERTURA; major que o igual a 100 cm; ALTRES)

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