

Data Network Dashboards

This document is currently under construction

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Preface

Automated Characterization of Health Information at Large-scale Longitudinal Evidence Systems (ACHILLES) is a profiling tool developed by the OHDSI community to provide descriptive statistics of databases standardized to the OMOP Common Data Model. These characteristics are presented graphically in the ATLAS tool. However, this solution does not allow for database comparison across the data network. The Data Network Dashboards aggregates ACHILLES results files from databases in the network and displays the descriptive statistics through graphical dashboards. This tool is helpful to gain insight in the growth of the data network and is useful for the selection of databases for specific research questions. In the software demonstration we show a first version of this tool that will be further developed in EHDEN in close collaboration with all our stakeholders, including OHDSI.

Contributors

To develop this tool, EHDEN organized a hack-a-thon (Aveiro, December 2-3, 2019), where we defined and implemented a series of charts and dashboards containing the most relevant information about the OMOP CDM databases. The team involved in this task were composed by the following members:

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License

The system is open-source and this manual was written in RMarkdown using the bookdown package.

Acknowledges

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Chapter 1

Introduction

The OHDSI research network has been growing steadily which results in an increasing number of healthcare databases standardized to the OMOP CDM format. The OHDSI community created the ACHILLES tool (Automated Characterization of Health Information at Large-scale Longitudinal Exploration System) to characterize those databases. The results are available to the data custodian in their local ATLAS tool and helps them to gain insights in their data and helps in assessing the feasibility of a particular research questions.

ACHILLES was designed to extract the metadata from a single database, which by itself does not allow the comparison with the remaining databases in the network. However, we believe there is even more value in sharing this information with others to enable network research in a Data Network Dashboard.

1.1 Data Network Dashboard

The European Health Data and Evidence Network (EHDEN) project therefore designed a Data Network Dashboard tool, a web application to aggregate information from distributed OMOP CDM databases. It uses the ACHILLES results files to construct graphical dashboards and enables database comparison (Figure 1.1). The tool is built on Apache Superset, which is an open-source enterprise-ready business intelligence web application that can provide powerful and fully customizable graphical representations of data. Achilles results can be uploaded through the EHDEN Database Catalogue using the dashboards plugin but can also be directly uploaded in the tool. Figure 1. Example of a dashboards tool presenting age and gender distributions (simulated data).

In this tools, we defined and implemented a series of charts and dashboards containing the most relevant information about the databases, such as:

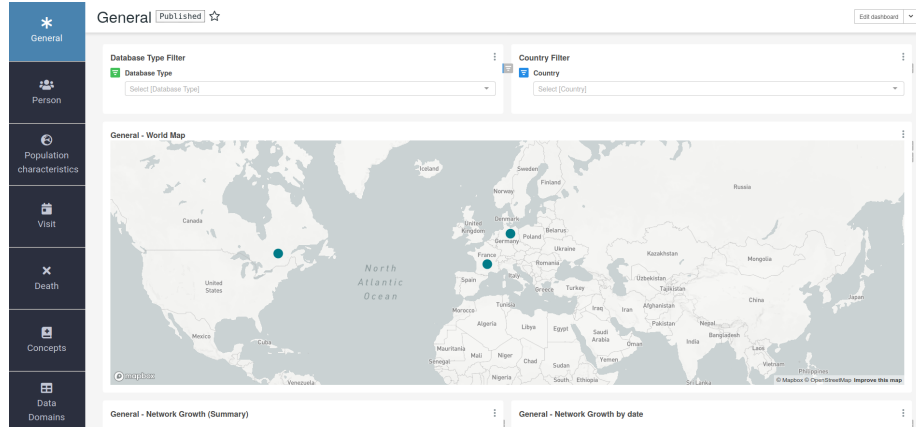


Figure 1.1: Example of a dashboards tool presenting the databases available in the network (simulated data)

- **General:** dashboards that shows the databases types per country, the distribution of data source types, the growth of the Network including the number of database and the number of patients in the databases over time;
- **Person:** representing the number of patients per country, age distribution at first observation, year of birth distribution and normalized gender distribution;
- **Population characteristics:** dashboard with the cumulative patient time, persons with continuous observation per month, and the start and end dates of those periods;
- **Visit:** chart to compare the number and type of visit occurrence records;
- **Death:** information about the number of death records by month, and the patient age at time of death;
- **Concepts:** bubble chart which shows the number of patients and records per concept over the databases;
- **Data domains:** heat map visualization of the major data domains in each database.

Chapter 2

Installation

TO DO production and dev environments...

Make sure that you have docker and docker-compose installed in your machine. Then, please follow these steps:

- Please enter in the “docker” directory and create your `.env` file here, using `.env-example` as reference. For local installation, you can just copy the `.env-example` content to a new file. Note: In case of port errors in the next steps, the problem could be related to a port already in use by your system that you defined here and it is busy, chose other.
- Tip the following commands in the command line:
 1. Clone the Apache Superset repository:

```
git clone https://github.com/apache/incubator-superset
  ../superset
cp ../superset/contrib/docker/superset_config.py ../superset
```
 2. Init the Apache Superset (This creates a user, so it is necessary to interact with the console):

```
docker-compose run --rm superset ./docker-init.sh
```
 3. Init the Dashboard Layout (This creates a user, so it is necessary to interact with the console):

```
docker-compose run --rm dashboard_viewer ./docker-init.sh
```
 4. Finally, bring up the containers

```
docker-compose up -d
```

To check if everything is ok, please wait 2 minutes and tip `docker ps` and the following containers need to be running:

```
... 0.0.0.0:8088->8088/tcp    dashboard_viewer_superset_1
... 0.0.0.0:8000->8000/tcp    dashboard_viewer_dashboard_viewer_1
... 0.0.0.0:6379->6379/tcp    dashboard_viewer_redis_1
... 5432/tcp                  dashboard_viewer_postgres_1
```

Now, you have a clean setup running in your machine. To try the application using synthetic data, please continue to follow the steps in the “Demo” section.

2.1 Insert Concepts

The concepts table are not in the repository due to its dimension. Therefore, to insert this table in the installation, you should perform the following steps:

1. Download concept.csv file from here (todo)
2. Copy the file to the /tmp directory inside of the postgres container

```
docker cp concept.csv dashboard_viewer_postgres_1:/tmp/
```

3. Enter in the dashboard_viewer_postgres_1 container:

```
docker exec -it dashboard_viewer_postgres_1 bash
```

4. Enter in the achilles database:

```
psql achilles
```

5. Create the table in the database using this command:

```
CREATE TABLE concept (
  concept_id      INTEGER      NOT NULL,
  concept_name     VARCHAR(255) NOT NULL,
  domain_id       VARCHAR(20)  NOT NULL,
  vocabulary_id    VARCHAR(20) NOT NULL,
  concept_class_id VARCHAR(20) NOT NULL,
  standard_concept VARCHAR(1)   NULL,
  concept_code     VARCHAR(50)  NOT NULL,
  valid_start_date DATE         NOT NULL,
  valid_end_date   DATE         NOT NULL,
  invalid_reason   VARCHAR(1)   NULL
);
```

6. Copy the CSV file content to the table (this could take a while):

```
COPY public.concept from '/tmp/concept.csv' WITH DELIMITER ','
CSV HEADER;
```

7. Alter table ownership:

```
-- <user> : defined in the .env file  
ALTER TABLE public.concept OWNER TO <user>;
```

8. Create index in table:

```
CREATE INDEX achilles_results_analysis_id_index ON  
    achilles_results (analysis_id);  
CREATE INDEX achilles_results_source_index ON achilles_results  
    (data_source_id);  
CREATE INDEX concept_concept_id_index ON concept (concept_id);  
CREATE INDEX concept_concept_name_index ON concept  
    (concept_name);
```

2.2 Import dashboards

TO DO

2.3 Dummy data

TO DO

Chapter 3

General

VERY INCOMPLETE Discuss the goal of this dashboard... TO DO

3.1 Database Type Filter

This filter which is a type of chart in Superset was designed to be used in the dashboard aiming the filtering of the data based on the field ‘database_type’ from the table ‘data_source’. It is important to give the alias ‘Type’ to this field in the select operations because Superset does not recognize as the same field otherwise.

3.1.1 SQL query

```
-- Country and database type filters
SELECT source.name,
       country.country AS Country,
       database_type AS Type,
       source.slug
FROM public.data_source AS source INNER JOIN public.country
     AS country ON source.country_id=country.id;
```

3.1.2 Chart settings

The main characteristics of this chart are presented in Figure 3.1, being the following:

- Data Tab:

- **Customize Tab:**
 - **Y Axis Label:**
 - **X Axis Label:**
 - **Legend:** Checked
 - **Stacked Bars:**
 - **Bar Values:**
 - **Sort Bars:**
 - **Extra Controls:**
 - **Reduce X ticks:**

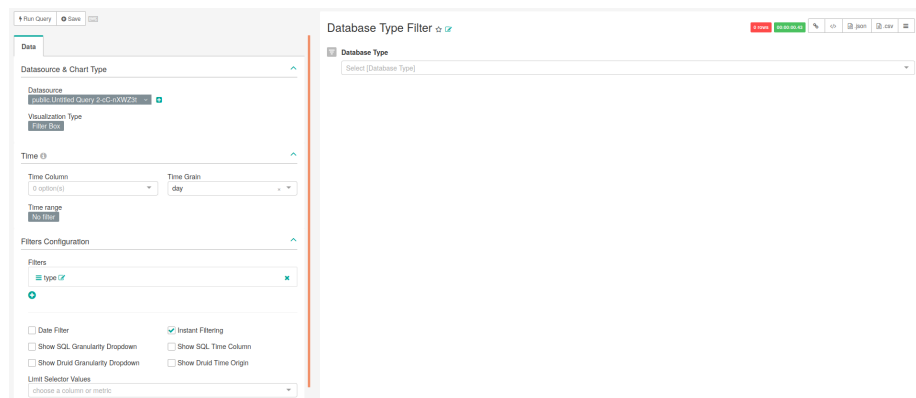


Figure 3.1: Superset chart creation: Settings for creating the database type filter.

3.2 Country Filter

Discuss what is important to see in this chart... TO DO

3.2.1 SQL query

```
-- Country and database type filters
SELECT source.name,
```

```
country.country AS Country,  
database_type AS Type,  
source.slug  
FROM public.data_source AS source INNER JOIN public.country  
AS country ON source.country_id=country.id;
```

3.2.2 Chart settings

TO DO

3.3 General - World Map

Discuss what is important to see in this chart... TO DO

3.3.1 SQL query

```
-- General - World Map  
SELECT name,  
slug,  
release_date,  
database_type AS Type,  
latitude,  
longitude,  
link,  
country AS Country,  
continent  
FROM public.data_source AS source INNER JOIN public.country  
AS country ON source.country_id=country.id;
```

3.3.2 Chart settings

TO DO

3.4 General - Network Growth (Summary)

Discuss what is important to see in this chart... TO DO

3.4.1 SQL query

```

-- 108      General - Network Growth (Summary)
SELECT data.source,
       data.country AS Country,
       data.database_type AS Type,
       --cast(stratum_1 as INTEGER )*30 AS Days,
       data.release_date - cast(stratum_1 AS INTEGER) *
       INTERVAL '1 month' as Time,
       count_value           AS count
FROM (
  SELECT source.name           AS source,
         achilles.analysis_id  AS analysis_id,
         achilles.stratum_1,
         achilles.stratum_2,
         achilles.stratum_3,
         achilles.stratum_4,
         achilles.stratum_5,
         achilles.count_value,
         country.country,
         source.database_type,
         source.release_date
  FROM public.achilles_results AS achilles INNER JOIN
       public.data_source AS source ON
       achilles.data_source_id=source.id
  INNER JOIN public.country AS country ON
       source.country_id=country.id
) data
WHERE analysis_id = 108;

```

3.4.2 Chart settings

TO DO

3.5 General - Network Growth by Date

Discuss what is important to see in this chart... TO DO

3.5.1 SQL query

```
-- 108    General - Network Growth by Date
SELECT data.source,
       data.country AS Country,
       data.database_type AS Type,
       cast(stratum_1 as Integer)*30 AS DAY,
       count_value      AS count
FROM (
  SELECT source.name           AS source,
         achilles.analysis_id AS analysis_id,
         achilles.stratum_1,
         achilles.stratum_2,
         achilles.stratum_3,
         achilles.stratum_4,
         achilles.stratum_5,
         achilles.count_value,
         country.country,
         source.database_type
  FROM public.achilles_results AS achilles INNER JOIN
        public.data_source AS source ON
        achilles.data_source_id=source.id
  INNER JOIN public.country AS country ON
        source.country_id=country.id
) data
WHERE analysis_id = 108;
```

3.5.2 Chart settings

TO DO

3.6 General - Patients per Country

Discuss what is important to see in this chart... TO DO

3.6.1 SQL query

```
-- 1    General - Patients per Country
SELECT source.name,
       country.country AS Country,
       source.database_type AS Type,
```

```
        count_value AS patient_count,  
        source.slug  
FROM public.achilles_results AS achilles  
      INNER JOIN public.data_source AS source ON  
        achilles.data_source_id=source.id  
      INNER JOIN public.country AS country ON  
        source.country_id=country.id  
WHERE analysis_id = 1;
```

3.6.2 Chart settings

TO DO

3.7 General - Database Types per Country

Discuss what is important to see in this chart... TO DO

3.7.1 SQL query

```
-- 1    General - Database types per Country  
SELECT source.name,  
        country.country AS Country,  
        database_type AS Type,  
        count_value AS "Nr_patients",  
        source.slug  
FROM public.achilles_results AS achilles  
      INNER JOIN public.data_source AS source ON  
        achilles.data_source_id=source.id  
      INNER JOIN public.country AS country ON  
        source.country_id=country.id  
WHERE analysis_id = 1;
```

3.7.2 Chart settings

TO DO

Chapter 4

Person

Discuss the goal of this dashboard... TO DO

In this dashboard is present the “Database Type Filter”, that was detailed in the Chapter General. Besides, it was necessary to customize the dashboard JSON Metadata in order to obtain the colours blue and rose in the chart representing the gender distribution. Therefore, the following entry should be added in the settings of this dashboard:

```
"label_colors": {  
  "Male": "#3366FF",  
  "Female": "#FF3399"  
}
```

4.1 Person - Patients by age

Discuss what is important to see in this chart... TO DO

4.1.1 SQL query

```
-- 101 Person - Patients by age  
SELECT source.name,  
       cast(stratum_1 as int) as Age,  
       count_value as count,  
       source.slug  
FROM public.achilles_results AS achilles INNER JOIN  
     public.data_source AS source ON
```

```

    achilles.data_source_id=source.id
WHERE analysis_id = 101;

```

4.1.2 Chart settings

The main characteristics of this chart are presented in Figure 4.1, being the following:

- **Data Tab:**
 - **Visualization Type:** Bar Chart
 - **Time range:** No filter
 - **Metrics:** MAX(count)
 - **Filters:** Empty
 - **Series:** age
 - **Breakdowns:** name
 - **Row limit:** Empty
 - **Contribution:** Not checked
- **Customize Tab:**
 - **Y Axis Label:** Count
 - **X Axis Label:** Age
 - **Legend:** Checked
 - **Stacked Bars:** Checked
 - **Bar Values:** Not checked
 - **Sort Bars:** Checked
 - **Extra Controls:** Not checked
 - **Reduce X ticks:** Checked

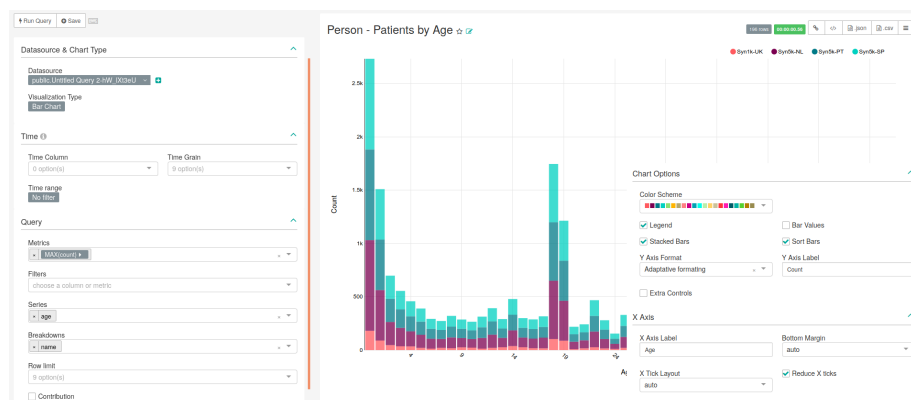


Figure 4.1: Settings for creating chart representing patient by age (bar chart). Image changed to contain information hidden in the customize menu.

4.2 Person - Births by Year

Discuss what is important to see in this chart... TO DO

4.2.1 SQL query

```
-- 3 Person - Births by year
SELECT source.name,
       stratum_1 AS "Birth_year",
       count_value AS count,
       source.slug
FROM public.achilles_results AS achilles INNER JOIN
     public.data_source AS source ON
     achilles.data_source_id=source.id
WHERE analysis_id = 3;
```

4.2.2 Chart settings

The main characteristics of this chart are presented in Figure 4.2, being the following:

- **Data Tab:**
 - **Visualization Type:** Bar Chart
 - **Time range:** No filter
 - **Metrics:** SUM(count)
 - **Filters:** Empty
 - **Series:** Birth_year
 - **Breakdowns:** name
 - **Row limit:** Empty
 - **Contribution:** Not checked
- **Costumize Tab:**
 - **Y Axis Label:** Count
 - **X Axis Label:** Age
 - **Legend:** Checked
 - **Stacked Bars:** Checked
 - **Bar Values:** Not checked
 - **Sort Bars:** Checked
 - **Extra Controls:** Not checked
 - **Reduce X ticks:** Checked

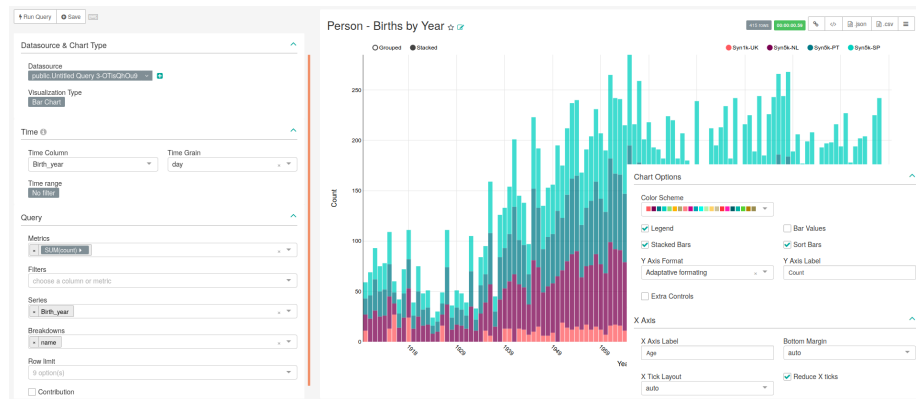


Figure 4.2: Settings for creating chart representing births by year (bar chart). Image changed to contain information hidden in the customize menu.

4.3 Person - Gender Distribution

Discuss what is important to see in this chart... TO DO

4.3.1 SQL query

```
-- 2 Person - Gender distribution
SELECT source.name,
       concept_name AS Gender,
       count_value AS Number_of_persons,
       source.slug
FROM public.achilles_results AS achilles INNER JOIN
     public.data_source AS source ON
     achilles.data_source_id = source.id
JOIN (
    SELECT '8507' AS concept_id, 'Male' AS concept_name UNION
    SELECT '8532' AS concept_id, 'Female' AS concept_name) AS
     concepts ON achilles.stratum_1=concept_id
WHERE analysis_id = 2;
```

4.3.2 Chart settings

The main characteristics of this chart are presented in Figure 4.3, being the following:

- **Data Tab:**

- **Visualization Type:** Bar Chart
- **Time range:** No filter
- **Metrics:** Max(number_of_persons)
- **Filters:** Empty
- **Series:** name
- **Breakdowns:** gender
- **Row limit:** Empty
- **Contribution:** Checked
- **Customize Tab:**
 - **Y Axis Label:** Empty
 - **X Axis Label:** Databases
 - **Legend:** Checked
 - **Stacked Bars:** Checked
 - **Bar Values:** Not checked
 - **Sort Bars:** Checked
 - **Extra Controls:** Checked
 - **Reduce X ticks:** Checked



Figure 4.3: Settings for creating chart representing the gender distribution (bar chart). Image changed to contain information hidden in the customize menu.

Chapter 5

Population Characteristics

Discuss the goal of this dashboard... TO DO In this dashboard is present the “Database Type Filter”, that was detailed in the Chapter General.

5.1 Population characteristics - Patients in Observation Period per Month

Discuss what is important to see in this chart... TO DO Patients in Observation Period per month (whole month)

5.1.1 SQL query

```
-- 110      Population characteristics -  
-- Patients in Observation Period per month (whole month)  
SELECT source.name,  
       to_date(stratum_1, 'YYYYMM') as Date,  
       count_value as "Nr_patients",  
       source.slug  
FROM public.achilles_results AS achilles  
     INNER JOIN public.data_source AS source ON  
       achilles.data_source_id=source.id  
WHERE analysis_id = 110;
```

5.1.2 Chart settings

The main characteristics of this chart are presented in Figure 5.1, being the following:

- **Data Tab:**
 - **Visualization Type:** Bar Chart
 - **Time range:** No filter
 - **Metrics:** MAX(Nr_patients) as “Num of Patients”
 - **Filters:** Empty
 - **Series:** date
 - **Breakdowns:** name
 - **Row limit:** Empty
 - **Contribution:** Not checked
- **Costumize Tab:**
 - **Y Axis Label:** Number of Patients
 - **X Axis Label:** Dates
 - **Legend:** Checked
 - **Stacked Bars:** Checked
 - **Bar Values:** Not checked
 - **Sort Bars:** Checked
 - **Extra Controls:** Not checked
 - **Reduce X ticks:** Checked

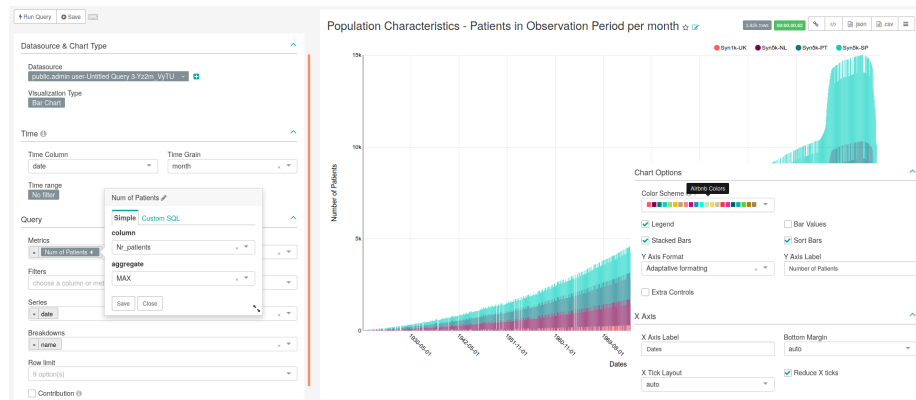


Figure 5.1: Settings for creating chart representing patient in observation per month (bar chart). Image changed to contain information hidden in the customize menu.

5.2 Population characteristics - Observation Period End Dates

Discuss what is important to see in this chart... TO DO

5.2.1 SQL query

```
-- 112 Population characteristics -
--      Observation Period End Dates
SELECT source.name,
       to_date(stratum_1, 'YYYYMM') as year_month,
       count_value as patient_count
FROM public.achilles_results AS achilles
     INNER JOIN public.data_source AS source ON
       achilles.data_source_id=source.id
WHERE analysis_id = 112;
```

5.2.2 Chart settings

The main characteristics of this chart are presented in Figure 5.2, being the following:

- **Data Tab:**
 - **Visualization Type:** Bar Chart
 - **Time range:** No filter
 - **Metrics:** SUM(patient_count) as “Patients”
 - **Filters:** Empty
 - **Series:** year_month
 - **Breakdowns:** name
 - **Row limit:** Empty
 - **Contribution:** Not checked
- **Costumize Tab:**
 - **Y Axis Label:** Number of Patients
 - **X Axis Label:** Year
 - **Legend:** Checked
 - **Stacked Bars:** Checked
 - **Bar Values:** Not checked
 - **Sort Bars:** Checked
 - **Extra Controls:** Not checked
 - **Reduce X ticks:** Checked

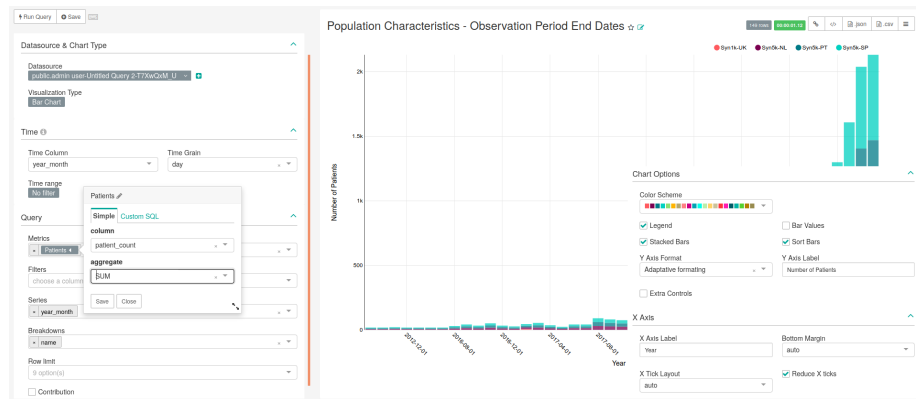


Figure 5.2: Settings for creating chart representing the number of patients at the end of their observation period (bar chart). Image changed to contain information hidden in the customize menu.

5.3 Population characteristics - Observation Period Start Dates

Discuss what is important to see in this chart... TO DO

5.3.1 SQL query

```
-- 111 Population characteristics -
-- Observation Period Start Dates
SELECT source.name,
       to_date(stratum_1, 'YYYYMM') as year_month,
       count_value as patient_count
FROM public.achilles_results AS achilles
     INNER JOIN public.data_source AS source ON
       achilles.data_source_id=source.id
WHERE analysis_id = 111;
```

5.3.2 Chart settings

The main characteristics of this chart are presented in Figure 5.3, being the following:

- **Data Tab:**
 - **Visualization Type:** Bar Chart
 - **Time range:** No filter

5.3. POPULATION CHARACTERISTICS - OBSERVATION PERIOD START DATES29

- **Metrics:** SUM(patient_count) as “Patients”
- **Filters:** Empty
- **Series:** year_month
- **Breakdowns:** name
- **Row limit:** Empty
- **Contribution:** Not checked
- **Customize Tab:**
 - **Y Axis Label:** Number of Patients
 - **X Axis Label:** Year
 - **Legend:** Checked
 - **Stacked Bars:** Checked
 - **Bar Values:** Not checked
 - **Sort Bars:** Checked
 - **Extra Controls:** Not checked
 - **Reduce X ticks:** Checked



Figure 5.3: Settings for creating chart representing the number of patients at the start of their observation period (bar chart). Image changed to contain information hidden in the customize menu.

Chapter 6

Visit

Discuss what is important to see in this chart... TO DO In this dashboard is present the “Database Type Filter”, that was detailed in the Chapter General.

6.1 Visit - Types

Discuss what is important to see in this chart... TO DO

6.1.1 SQL query

```
-- 201 Visit - Types
SELECT source.name,
       concept_name AS "Observation",
       count_value AS "Nr_Observations",
       source.slug
FROM public.achilles_results AS achilles
     INNER JOIN public.data_source AS source ON
       achilles.data_source_id=source.id
     INNER JOIN public.concept ON
       stratum_1 = CAST(concept_id AS text)
WHERE analysis_id = 201;
```

6.1.2 Chart settings

The main characteristics of this chart are presented in Figure 6.1, being the following:

- **Data Tab:**
 - **Visualization Type:** Bar Chart
 - **Time range:** No filter
 - **Metrics:** MAX(Nr_Observations) as Observations
 - **Filters:** Empty
 - **Series:** name
 - **Breakdowns:** Observation
 - **Row limit:** Empty
 - **Contribution:** Not checked
- **Customize Tab:**
 - **Y Axis Label:** Empty
 - **X Axis Label:** Databases
 - **Legend:** Checked
 - **Stacked Bars:** Checked
 - **Bar Values:** Not checked
 - **Sort Bars:** Checked
 - **Extra Controls:** Checked
 - **Reduce X ticks:** Checked



Figure 6.1: Settings for creating chart representing the types of visit in the databases (bar chart). Image changed to contain information hidden in the customize menu.

Chapter 7

Death

Discuss what is important to see in this chart... TO DO In this dashboard is present the “Database Type Filter”, that was detailed in the Chapter General.

7.1 Death - By Month per Thousand People

Discuss what is important to see in this chart... TO DO

7.1.1 SQL query

```
-- 502 Death - By Month per Thousand People
SELECT source.name,
       to_date(stratum_1, 'YYYYMM') as Date,
       count_value as count,
       source.slug
FROM public.achilles_results AS achilles
     INNER JOIN public.data_source AS source ON
       achilles.data_source_id=source.id
WHERE analysis_id = 502;
```

7.1.2 Chart settings

The main characteristics of this chart are presented in Figure 7.1, being the following:

- **Data Tab:**
 - **Visualization Type:** Bar Chart

- **Time range:** No filter
- **Metrics:** MAX(count) as “Count”
- **Filters:** Empty
- **Series:** date
- **Breakdowns:** Empty
- **Row limit:** Empty
- **Contribution:** Not checked
- **Customize Tab:**
 - **Y Axis Label:** Number of Patients (in thousands)
 - **X Axis Label:** Databases
 - **Legend:** Checked
 - **Stacked Bars:** Not checked
 - **Bar Values:** Not checked
 - **Sort Bars:** Checked
 - **Extra Controls:** Not checked
 - **Reduce X ticks:** Not checked



Figure 7.1: Settings for creating chart show in thousands the number of death patients in the network (bar chart). Image changed to contain information hidden in the customize menu.

7.2 Death - Number of Records

Discuss what is important to see in this chart... TO DO

7.2.1 SQL query

```
-- 501 Death - Number of Records
SELECT source.name,
```

```
        count_value as count,  
        source.slug  
FROM public.achilles_results AS achilles  
      INNER JOIN public.data_source AS source ON  
        achilles.data_source_id=source.id  
WHERE analysis_id = 501;
```

7.2.2 Chart settings

The main characteristics of this chart are presented in Figure 7.2, being the following:

- **Data Tab:**
 - **Visualization Type:** Bar Chart
 - **Time range:** No filter
 - **Metrics:** MAX(count) as “Count”
 - **Filters:** Empty
 - **Series:** name
 - **Breakdowns:** Empty
 - **Row limit:** Empty
 - **Contribution:** Not checked
- **Costumize Tab:**
 - **Y Axis Label:** Number of Patients
 - **X Axis Label:** Databases
 - **Legend:** Checked
 - **Stacked Bars:** Not checked
 - **Bar Values:** Not checked
 - **Sort Bars:** Not checked
 - **Extra Controls:** Not checked
 - **Reduce X ticks:** Checked



Figure 7.2: Settings for creating chart show the number of death patients in each database (bar chart). Image changed to contain information hidden in the customize menu.

Chapter 8

Concepts

Discuss the organization of this dashboard... TO DO

This chapter follows a different organization due to the reuse of the same query in several charts.

8.1 Concepts General Tab

Say the goal of this tab TO DO

This tab uses an unique query and all the filters and charts were created using the same output.

8.1.1 SQL query

```
SELECT
  q1.concept_id AS concept_id,
  q1.concept_name AS concept_name,
  q1.domain_id,
  source.name,
  sum(q1.count_value) AS "Occurrence_count",
  sum(q1.count_person) AS "Person_count",
  CASE
    WHEN sum(q1.count_value) <= 10 THEN '<=10'
    WHEN sum(q1.count_value) <= 100 THEN '11-10^2'
    WHEN sum(q1.count_value) <= 1000 THEN '10^2-10^3'
    WHEN sum(q1.count_value) <= 10000 THEN '10^3-10^4'
    WHEN sum(q1.count_value) <= 100000 THEN '10^4-10^5'
```

```

        WHEN sum(q1.count_value)<=1000000 THEN '10^5-10^6'
        ELSE '>10^6'
    END AS "magnitude_occurrences",
    CASE
        WHEN sum(q1.count_person)<=10 THEN '<=10'
        WHEN sum(q1.count_person)<=100 THEN '11-10^2'
        WHEN sum(q1.count_person)<=1000 THEN '10^2-10^3'
        WHEN sum(q1.count_person)<=10000 THEN '10^3-10^4'
        WHEN sum(q1.count_person)<=100000 THEN '10^4-10^5'
        WHEN sum(q1.count_person)<=1000000 THEN '10^5-10^6'
        ELSE '>10^6'
    END AS "magnitude_persons"
FROM (SELECT analysis_id,
            stratum_1 concept_id,
            data_source_id,
            concept_name,
            domain_id,
            count_value, 0 AS count_person
FROM achilles_results
JOIN concept ON cast(stratum_1 AS BIGINT)=concept_id
WHERE analysis_id in (201, 301, 401, 601, 701, 801, 901, 1001,
1801)
UNION (SELECT analysis_id,
            stratum_1 concept_id,
            data_source_id,
            concept_name,
            domain_id,
            0 AS count_value,
            sum(count_value) AS count_person
FROM achilles_results
JOIN concept on cast(stratum_1 AS BIGINT)=concept_id
WHERE analysis_id in (202, 401, 601, 701, 801, 901,
1001, 1801)
GROUP BY analysis_id, stratum_1, data_source_id,
concept_name, domain_id) ) AS q1
INNER JOIN public.data_source AS source ON q1.data_source_id=source.id
GROUP BY q1.concept_id, q1.concept_name, q1.domain_id,source.name;

```

8.1.2 Charts

Here are all the charts presented in this dashboard using the previous query TO DO

8.1.2.1 Entity Type Filter

Discuss what is important to see in this chart... TO DO The main characteristics of this chart are presented in Figure 6.1, being the following:

- **Data Tab:**
 - **Visualization Type:** Bar Chart
 - **Time range:** No filter
 - **Metrics:**
 - **Filters:** Empty
 - **Series:**
 - **Breakdowns:**
 - **Row limit:** Empty
 - **Contribution:** Not checked
- **Customize Tab:**
 - **Y Axis Label:**
 - **X Axis Label:**
 - **Legend:** Checked
 - **Stacked Bars:**
 - **Bar Values:**
 - **Sort Bars:**
 - **Extra Controls:**
 - **Reduce X ticks:**



Figure 8.1: Settings for creating chart representing the number of patients at the start of their observation period (bar chart). Image changed to contain information hidden in the customize menu.

8.1.2.2 Concept Filter

Discuss what is important to see in this chart... TO DO The main characteristics of this chart are presented in Figure 6.1, being the following:

- **Data Tab:**
 - **Visualization Type:** Bar Chart
 - **Time range:** No filter
 - **Metrics:**
 - **Filters:** Empty
 - **Series:**
 - **Breakdowns:**
 - **Row limit:** Empty
 - **Contribution:** Not checked
- **Customize Tab:**
 - **Y Axis Label:**
 - **X Axis Label:**
 - **Legend:** Checked
 - **Stacked Bars:**
 - **Bar Values:**
 - **Sort Bars:**
 - **Extra Controls:**
 - **Reduce X ticks:**

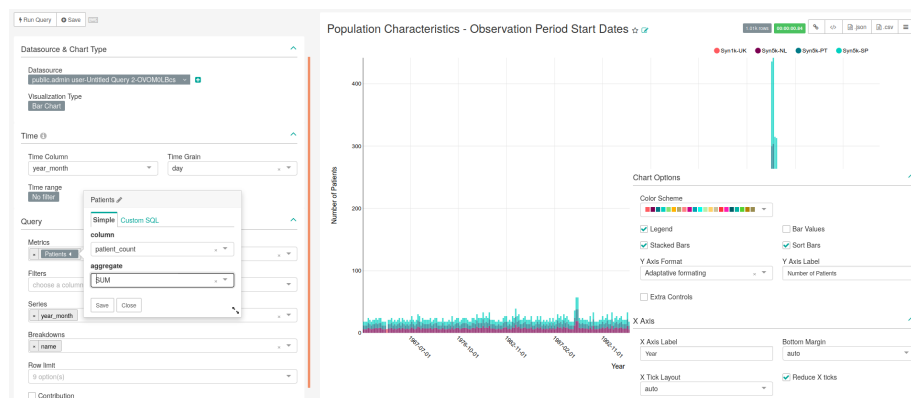


Figure 8.2: Settings for creating chart representing the number of patients at the start of their observation period (bar chart). Image changed to contain information hidden in the customize menu.

8.1.2.3 Number of Concepts

Discuss what is important to see in this chart... TO DO The main characteristics of this chart are presented in Figure 6.1, being the following:

- **Data Tab:**
 - **Visualization Type:** Bar Chart
 - **Time range:** No filter
 - **Metrics:**

- **Filters:** Empty
- **Series:**
- **Breakdowns:**
- **Row limit:** Empty
- **Contribution:** Not checked
- **Customize Tab:**
 - **Y Axis Label:**
 - **X Axis Label:**
 - **Legend:** Checked
 - **Stacked Bars:**
 - **Bar Values:**
 - **Sort Bars:**
 - **Extra Controls:**
 - **Reduce X ticks:**



Figure 8.3: Settings for creating chart representing the number of patients at the start of their observation period (bar chart). Image changed to contain information hidden in the customize menu.

8.1.2.4 Concept Browser Table

Discuss what is important to see in this chart... TO DO The main characteristics of this chart are presented in Figure 6.1, being the following:

- **Data Tab:**
 - **Visualization Type:** Bar Chart
 - **Time range:** No filter
 - **Metrics:**
 - **Filters:** Empty
 - **Series:**
 - **Breakdowns:**
 - **Row limit:** Empty

- **Contribution:** Not checked
- **Costumize Tab:**
 - **Y Axis Label:**
 - **X Axis Label:**
 - **Legend:** Checked
 - **Stacked Bars:**
 - **Bar Values:**
 - **Sort Bars:**
 - **Extra Controls:**
 - **Reduce X ticks:**

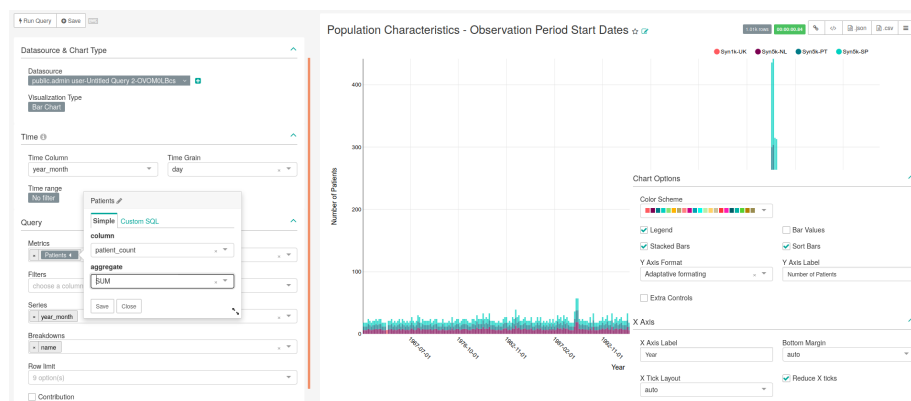


Figure 8.4: Settings for creating chart representing the number of patients at the start of their observation period (bar chart). Image changed to contain information hidden in the customize menu.

8.1.2.5 # of Occurrences

Discuss what is important to see in this chart... TO DO The main characteristics of this chart are presented in Figure 6.1, being the following:

- **Data Tab:**
 - **Visualization Type:** Bar Chart
 - **Time range:** No filter
 - **Metrics:**
 - **Filters:** Empty
 - **Series:**
 - **Breakdowns:**
 - **Row limit:** Empty
 - **Contribution:** Not checked
- **Costumize Tab:**
 - **Y Axis Label:**
 - **X Axis Label:**

- **Legend:** Checked
- **Stacked Bars:**
- **Bar Values:**
- **Sort Bars:**
- **Extra Controls:**
- **Reduce X ticks:**

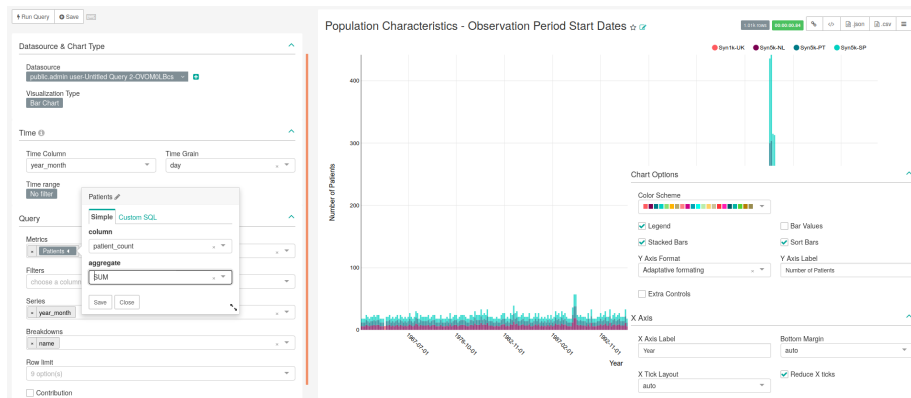


Figure 8.5: Settings for creating chart representing the number of patients at the start of their observation period (bar chart). Image changed to contain information hidden in the customize menu.

8.1.2.6 # of Patients

Discuss what is important to see in this chart... TO DO The main characteristics of this chart are presented in Figure 6.1, being the following:

- **Data Tab:**
 - **Visualization Type:** Bar Chart
 - **Time range:** No filter
 - **Metrics:**
 - **Filters:** Empty
 - **Series:**
 - **Breakdowns:**
 - **Row limit:** Empty
 - **Contribution:** Not checked
- **Costumize Tab:**
 - **Y Axis Label:**
 - **X Axis Label:**
 - **Legend:** Checked
 - **Stacked Bars:**
 - **Bar Values:**
 - **Sort Bars:**

- Extra Controls:
- Reduce X ticks:

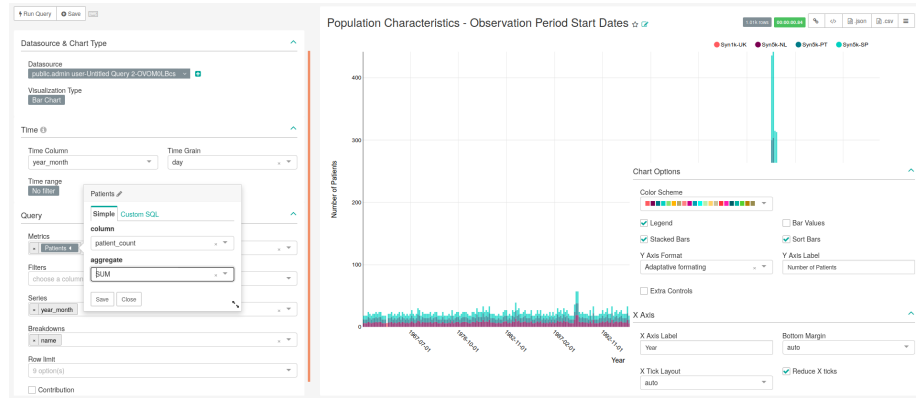


Figure 8.6: Settings for creating chart representing the number of patients at the start of their observation period (bar chart). Image changed to contain information hidden in the customize menu.

8.2 Concepts Domains Tab

Discuss what is important to see in this chart... TO DO

This tab is composed of six bar charts that show the percentage of existent concepts in each database. These charts are similar but divided by the concept domains existent in the standard vocabularies, which are the conditions, procedures, drugs, observations, measurements and devices.

8.2.1 SQL query

```
-- Concepts Domains
SELECT source.name,
       CASE WHEN analysis_id = 405 THEN 'Condition'
       WHEN analysis_id = 605 THEN 'Procedure'
       WHEN analysis_id = 705 THEN 'Drug'
       WHEN analysis_id = 805 THEN 'Observation'
       WHEN analysis_id = 1805 THEN 'Measurement'
       WHEN analysis_id = 2105 THEN 'Device'
       ELSE 'Other' END AS domain_name,
       concept_name, sum(count_value) AS num_records
FROM public.achilles_results AS achilles
```

```

INNER JOIN public.data_source AS source ON
    achilles.data_source_id=source.id
INNER JOIN public.concept AS c1 ON
    stratum_2 = CAST(concept_id AS text)
WHERE analysis_id IN (405, 605, 705, 805, 1805, 2105)
GROUP BY source.name, concept_name,
    CASE WHEN analysis_id = 405 THEN 'Condition'
    WHEN analysis_id = 605 THEN 'Procedure'
    WHEN analysis_id = 705 THEN 'Drug'
    WHEN analysis_id = 805 THEN 'Observation'
    WHEN analysis_id = 1805 THEN 'Measurement'
    WHEN analysis_id = 2105 THEN 'Device'
    ELSE 'Other' END

```

8.2.2 Chart settings

The difference between the six charts related to concept domains is the condition in the filter. Therefore, to create all the charts of this dashboard, it is necessary to follow the main characteristics presented in Figure 8.7 and the list of possible values for the filter. Those characteristics are the following:

- **Data Tab:**
 - **Visualization Type:** Bar Chart
 - **Time range:** No filter
 - **Metrics:** SUM(num_records) as “Nr Records”
 - **Filters:** domain = **See filter list**
 - **Series:** name
 - **Breakdowns:** concept_name
 - **Row limit:** Empty
 - **Contribution:** Checked
- **Costumize Tab:**
 - **Y Axis Label:**
 - **X Axis Label:**
 - **Legend:** Checked
 - **Stacked Bars:** Checked
 - **Bar Values:** Not checked
 - **Sort Bars:** Not checked
 - **Extra Controls:** Not checked
 - **Reduce X ticks:** Not checked
- **Filter List:**
 - **Concepts - Condition Types:** Condition
 - **Concepts - Procedure Types:** Procedure
 - **Concepts - Drug Types:** Drug
 - **Concepts - Observation Types:** Observation
 - **Concepts - Measurement Types:** Measurement

– Concepts - Device Types: Device

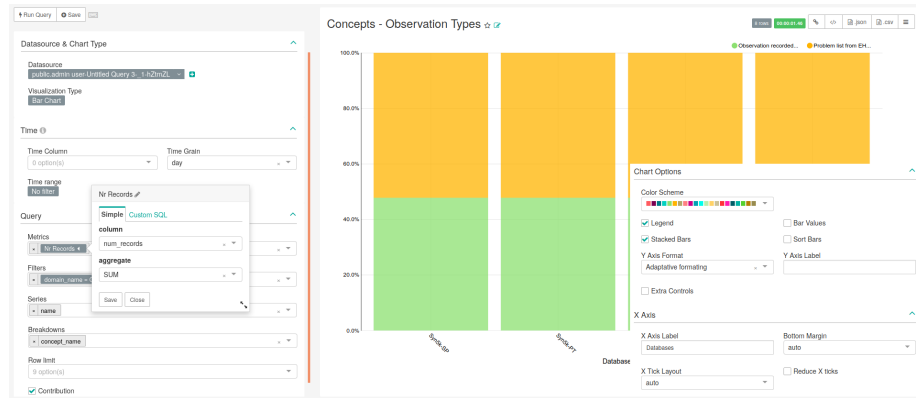


Figure 8.7: Settings for creating all the charts related with the concept domains for each databases (bar chart). Image changed to contain information hidden in the customize menu.

Chapter 9

Data Domains

Discuss what is important to see in this chart... TO DO In this dashboard is present the “Database Type Filter”, that was detailed in the Chapter General.

9.1 Data Domains - Number of Records per Person

Discuss what is important to see in this chart... TO DO

9.1.1 SQL query

```
-- 201, 401, 501, 601, 701, 801, 1801, 2101, 2201
-- Data domains - Number of records per peson
SELECT
    source.name,
    CASE
        WHEN analysis_id = 201 THEN 'Visit'
        WHEN analysis_id = 401 THEN 'Condition'
        WHEN analysis_id = 501 THEN 'Death'
        WHEN analysis_id = 601 THEN 'Procedure'
        WHEN analysis_id = 701 THEN 'Drug Exposure'
        WHEN analysis_id = 801 THEN 'Observation'
        WHEN analysis_id = 1801 THEN 'Measurement'
        WHEN analysis_id = 2101 THEN 'Device'
        WHEN analysis_id = 2201 THEN 'Note'
    END AS Data_Domain,
    SUM(count_value) /AVG(num_persons) AS "Records per person",
```

```
source.slug
FROM public.achilles_results AS achilles
INNER JOIN public.data_source AS source ON
    achilles.data_source_id=source.id
INNER JOIN (
    SELECT data_source_id , count_value AS num_persons
    FROM achilles_results
    WHERE analysis_id = 1
) counts ON
    achilles.data_source_id = counts.data_source_id
GROUP BY analysis_id, source.name, source.slug
HAVING analysis_id IN (201, 401, 501, 601, 701, 801, 1801, 2101,
2201)
```

9.1.2 Chart settings

The main characteristics of this chart are presented in Figure 9.1, being the following:

- **Data Tab:**
 - **Visualization Type:** Heatmap
 - **Time range:** No filter
 - **X:** name
 - **Y:** data_domain
 - **Metric:** SUM(records_per_person) as “Sum of records per person”
 - **Filters:** Empty
 - **Row limit:** Empty
 - **Legend:** Checked
 - **Show percentage:** Checked
 - **Show Values:** Not checked
 - **Normalized:** Not checked

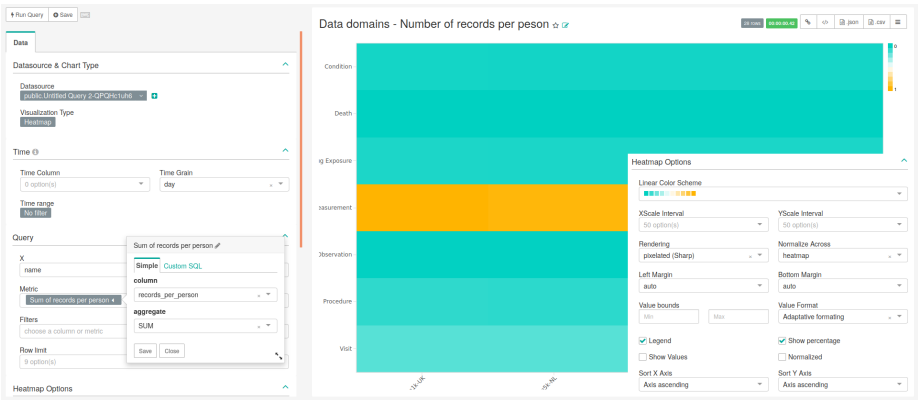


Figure 9.1: Settings for creating chart representing the number of records per patient in the different data domains (heatmap). Image changed to contain information hidden in the customize menu.