

Data Network Dashboards

This document is currently under construction

2021-08-03

Contents

| | | |
|----------|---|-----------|
| 1 | Preface | 5 |
| 2 | Introduction | 7 |
| 3 | Installation | 9 |
| 4 | Processes | 13 |
| 5 | Backups | 23 |
| 5.1 | Restore | 24 |
| 6 | Customizations | 27 |
| 7 | Development Instructions | 31 |
| 8 | Code Documentation | 33 |
| 9 | Dashboards | 35 |
| 9.1 | Per Database | 35 |
| 9.2 | Database Level Dashboard | 45 |
| 9.3 | General [Deprecated] | 49 |
| 9.4 | Person [Deprecated] | 57 |
| 9.5 | Observation Period [Deprecated] | 63 |
| 9.6 | Visit [Deprecated] | 68 |
| 9.7 | Death [Deprecated] | 71 |
| 9.8 | Concepts Browser [Deprecated] | 75 |
| 9.9 | Provenance [Deprecated] | 79 |
| 9.10 | Data Domains [Deprecated] | 82 |

Chapter 1

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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Considerations

This manual was written to be a guide for a clean installation of this system with all the dashboards that we defined during the project. The first chapter describes the goal of the system and the second how to install the system. The remaining chapters are dedicated to the dashboards, in which chapters describes one dashboard and all its charts. To simplify the representation of the dashboard's layout, we used similar schemas as it is presented in Figure 1.1. The white box is the dashboard and the inside boxes are charts. The colour changes in relation to the type of chart.

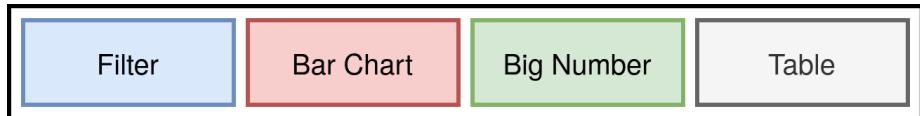


Figure 1.1: Example of a dashboards tool presenting the databases available in the network (simulated data)

License

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

Acknowledges

This work has been conducted in the context of EHDEN, a project that receives funding from the European Union's Horizon 2020 and EFPIA through IMI2 Joint Undertaking initiative, under grant agreement No 806968.

Chapter 2

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.

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 2.1). 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:

- **General:** dashboards that shows the databases types per country, the distribution of data source types, the growth of the Network including



Figure 2.1: Example of a dashboards tool presenting the databases available in the network (simulated data)

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 3

Installation

Currently, we use docker to deploy our environment

First Steps

1. Clone the repository with the command `git clone --recurse-submodules https://github.com/EHDEN/NetworkDashboards`. If you already cloned the repository without the `--recurse-submodules` option, run `git submodule update --init` to fetch the superset submodule.
2. Create a `.env` file on the `docker` directory, using `.env-example` as a reference, setting all necessary environment variables (`SUPERSET_MAPBOX_API_KEY` and `DASHBOARD_VIEWER_SECRET_KEY`).

Dashboard Viewer setup

1. If you wish to expose the dashboard viewer app through a specific domain(s) you must add it/them to the `ALLOWED_HOSTS` list on file `dashboard_viewer/dashboard_viewer/settings.py` and remove the `'*'` entry.
2. Build containers' images: `docker-compose build`. This might take several minutes.
3. Set up the database and create an admin account for the dashboard viewer app: `docker-compose run --rm dashboard ./docker-init.sh`.

Insert Concepts

The concepts table is not in the repository due to its dimension, therefore we use directly the Postgres console to insert this table in the installation.

1. Get your concept csv file from Athena

2. Copy the file into postgres container

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

3. Enter in the postgres container:

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

4. Enter in the `achilles` database (value of the variable `POSTGRES_ACHILLES_DB` on the `.env` file) with the `root` user (value of the variable `POSTGRES_ROOT_USER` on the `.env` file):

```
psql achilles root
```

5. Create the `concept` table

```
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)

To get both ' (single quotes) and " (double quotes) on the `concept_name` column we use a workaround by setting the quote character to one that should never be in the text. Here we used \b (backslash).

```
COPY public.concept FROM '/tmp/concept.csv' WITH CSV HEADER
  DELIMITER E'\t' QUOTE E'\b';
```

7. Create index in table (this could take a while):

```
CREATE INDEX concept_concept_id_index ON concept (concept_id);
CREATE INDEX concept_concept_name_index ON concept (concept_name);
```

8. Set the owner of the `concept` table to the `achilles` user (value of the variable `POSTGRES_ACHILLES_USER` on the `.env` file):

```
ALTER TABLE concept OWNER TO achiller
```

9. Bring up the containers: `docker-compose up -d`.

10. Run the command `docker-compose run --rm dashboard python manage.py generate_materialized_views` to create the materialized

views on Postgres.

Superset setup

1. Make sure that the container `superset-init` has finished before continuing. It is creating the necessary tables on the database and creating permissions and roles.
2. Execute the script `./superset/one_time_run_scripts/superset-init.sh`. This will create an admin account and associate the `achilles` database to Superset. **Attention:** You must be in the docker directory to execute this script.
3. We have already built some dashboards so if you want to import them run the script `./superset/one_time_run_scripts/load_dashboards.sh`. **Attention:** You must be in the docker directory to execute this script.
4. If you used the default ports:
 - Go to `http://localhost` to access the dashboard viewer app.
 - Go to `http://localhost:8088` to access superset.
5. To any anonymous user view dashboards, add the following:
 - all datasource access on `all_datasource_access`
 - can csrf token on Superset
 - can dashboard on Superset
 - can explore json on Superset
 - can read on Chart
 - can read on CssTemplate

Dummy data

On a fresh installation, there are no `achilles_results` data so Superset's dashboards will display "No results". On the root of this repository, you can find the `demo` directory where we have an ACHILLES results file with synthetic data that you can upload to a data source on the uploader app of the dashboard viewer (`http://localhost/uploader`). If you wish to compare multiple data sources, on the `demo` directory there is also a python script that allows you to generate new ACHILLES results files, where it generates random count values based on the ranges of values for each set of `analysis_id` and strata present on a base ACHILLES results file. So, from the one ACHILLES results file we provided, you can have multiple data sources with different data.

Chapter 4

Processes

Data Sources

Target: platform user

Before uploading any data to this platform, a data source owner has to create a data source instance to then associate the upload data with.

The creation of data source is done through the `[BASE_URL]/uploader/` URL, where 7 fields are expected:

1. name: an extensive name
2. acronym: a short name
3. country: where is the data source localized
4. link (Optional): web page of the data source
5. database type: type of OMOP database
6. coordinates: a more accurate representation of the data source's localization
7. hash (Optional): the internal unique identifier of a data source

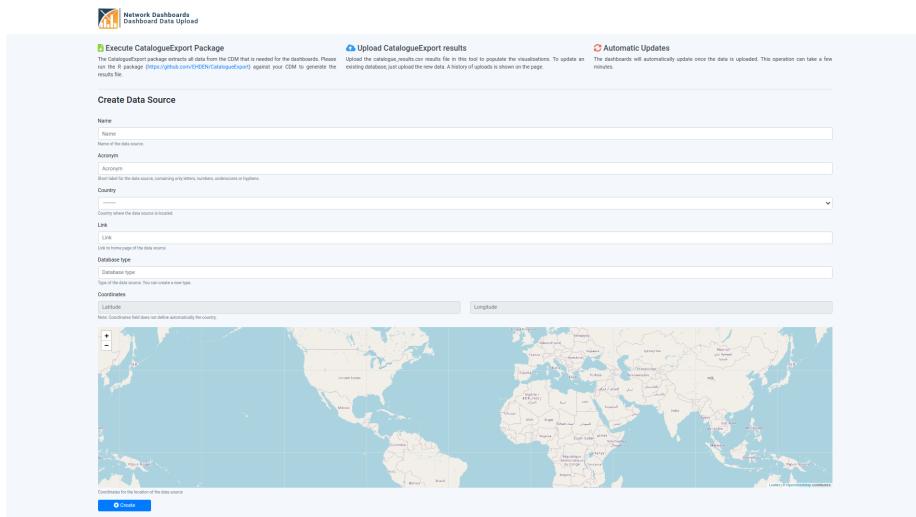
If you access `[BASE_URL]/uploader/` the 7th field (hash) is set automatically for something random, however, if you want to set it use the `[BASE_URL]/uploader/[HASH]/` URL.

To avoid duplication on the database type field, this field is transformed (use title case and trimmed) and then is checked there is already a record (Database Type) with the same value.

There are several ways to create a data source:

1. Create through a web form

By accessing the `[BASE_URL]/uploader/` URL, you will get a form where you can fill the fields, where the country field is a dropdown and the coordinates field is set through a map widget.



2. Automatically create when performing a GET to the [BASE_URL]/uploader/ URL

If the Network Dashboards platform is being used as a third-party application and the main application has all the data for the required fields, the data source can be automatically created and the user is redirected directly to the upload files page.

To perform this, each field should be provided as a URL parameter when accessing the [BASE_URL]/uploader/ URL. If all required fields are provided and are valid the data source is created and the user is redirected to the upload files page. If a required field is missing or is not valid the webform is presented to the user so it can manually fill those fields.

3. Automatically create by performing a POST to the [BASE_URL]/uploader/ URL

Since the creation URL does not have csrf cookie protection, you can perform a POST request as you were submitting a form.

Notes For the automatic options:

- Since the coordinates field is composed of two fields (latitude, longitude), it should be submitted as `coordinates_0=[latitude]` and `coordinates_1=[longitude]`
- The country field should match one of the available on the dropdown of the webform.

Draft Status

After a data owner uploads data into his data source, he might not want to make it public right away. To achieve this a data source has a boolean field telling

whether if the data source is in draft mode. This then also allows creating dashboards with data of non-draft data sources only.

There are three ways to change the value of this draft status field:

1. Through the Django admin app (`[BASE_URL]/admin/`)
2. Accessing the respective edit page of the data source. This requires a feature to be enabled, which is more detailed on the Allow Draft Status Updates section of the Customization chapter.
3. Perform a PATCH request to the `[BASE_URL]/uploader/[HASH]/` URL. On this request, other fields, other than the draft status, can be changed. The body of the request must be a JSON object with the fields that will suffer changes and their new values.

Catalogue Results Files

Target: platform user

Once a data source is created you can access its upload page by accessing the `[BASE_URL]/uploader/[HASH]/`. If no data source has the provided hash you will be redirected back to the data source creation form.

On the upload page you can:

1. Go to the edit page of your data source
2. Upload a catalogue results file
3. Check the upload history

A catalogue results file is a CSV file, the result obtained after running the EHDEN/CatalogueExport R package on an OMOP database. It is a variant of the OHDSI/Achilles where it only extracts a subset of analyses of the ACHILLES' original set.

The upload form expects a CSV file with the following columns:

| Name | Type | Required/Non-Nullable/Non-Empty |
|--------------|--------|---------------------------------|
| analysis_id | int | Yes |
| stratum_1 | string | No |
| stratum_2 | string | No |
| stratum_3 | string | No |
| stratum_4 | string | No |
| stratum_5 | string | No |
| count_value | int | Yes |
| min_value | double | No |
| max_value | double | No |
| avg_value | double | No |
| stdev_value | double | No |
| median_value | double | No |
| p10_value | double | No |

| Name | Type | Required/Non-Nullable/Non-Empty |
|-----------|--------|---------------------------------|
| p25_value | double | No |
| p75_value | double | No |
| p90_value | double | No |

The uploaded file must:

- either contain the first 7 columns OR all 16 columns
- contain the columns in the same order as presented in the table above

While parsing the uploaded file, some data is extracted to then present on the Upload history and to update data source information. This data is extracted from the record with analysis id 0, **which is required to be present on the file**, and 5000, which is optional. Next is presented the data extracted and their description:

- R Package Version: the version of CatalogueExport R package used
- Generation Date: date at which the CatalogueExport was executed on the OMOP database
- Source Release Date: date at which the OMOP database was released
- CDM Release Date: date at which the used CDM version was released
- CDM Version: version of the CDM used
- Vocabulary Version: version of the vocabulary used

The next table is presented where the previous data is stored on the rows with analysis id 0 and 5000:

| Analysis Id | Stratum 1 | Stratum 2 | Stratum 3 | Stratum 4 | Stratum 5 |
|-------------|-----------|---------------------|------------------|-------------|----------------|
| 0 | | R Package Version | Generation Date | | |
| 5000 | | Source Release Date | CDM Release Date | CDM Version | Vocabulary Ver |

Materialized Views

Target: admin user

For each chart, Superset has an underlying SQL query which in our case is run every time a chart is rendered. If one of these queries takes too long to execute the charts will also take too long until they are rendered and eventually users might get timeout messages given a bad user experience.

To avoid this problem, instead of executing the raw SQL query we create a postgres materialized view of the query, which is then used to feed the data to the chart. So only a simple `SELECT x FROM x` query is executed when a chart

is rendered.

So whenever I create a chart I have to access the Postgres console? No, we created an unmanaged Materialized Queries model that maps to the materialized views on Postgres. With it you can create new materialized views through the Django admin app, by accessing the `[BASE_URL]/admin/` URL.



You have to provide the materialized view name and its query, which will then be used to execute the query `CREATE MATERIALIZED VIEW [name] AS [query]`, which will be executed on a background task so the browser doesn't hang and times out, in case of complicated queries. Taking this into account, the record associated will not appear on the Django admin app until the `CREATE MATERIALIZED VIEW` query finishes.

To give feedback on the background task we use celery/django-celery-results, so you can check the status of a task on the Task Results model of the Celery Results app

The screenshot shows the Django administration interface with the following sections:

- AUTHENTICATION AND AUTHORIZATION**: Groups (Add, Change), Users (Add, Change)
- CELERY RESULTS**: Task results (Add, Change) - The "Task results" link is highlighted with a red box.
- CONSTANCE**: Config (Change)
- MATERIALIZED_QUERIES_MANAGER**: Materialized querys (Add, Change)
- TABSMANAGER**: Tab groups (Add, Change), Tabs (Add, Change)
- UPLOADER**: Countries (Add, Change), Data sources (Add, Change), Database types (Add, Change), Upload histories (Change)

After the creation of a Materialized Query, there will be a message telling the id of the task which is executing the `CREATE MATERIALIZED VIEW` query. You can then check for the record associated with the task, click on the id to get more details. If something went wrong check the error message either on Result Data or Traceback fields under the Result section

The screenshot shows the 'Result' tab of a task in Superset. The 'Result Data' section contains a message: "'Materialized view test2 successfully created'". Below it are fields for 'Created Date/Time' (Feb 19, 2021, 8:45 p.m.) and 'Completed Date/Time' (Feb 19, 2021, 8:45 p.m.). The 'Traceback' section is empty. The 'Task Meta Information' section shows a JSON object with a key 'children'. At the bottom are buttons for 'Delete', 'Save and add another', 'Save and continue editing', and a large blue 'SAVE' button.

After all this, the final step is to add the materialized view as a Dataset. Login into Superset, then go to Data -> Datasets and create a new one. Select the **Achilles** database, the **public** schema, then the created materialized view and click "ADD". After this, the materialized view can be used as a data source for a new chart.

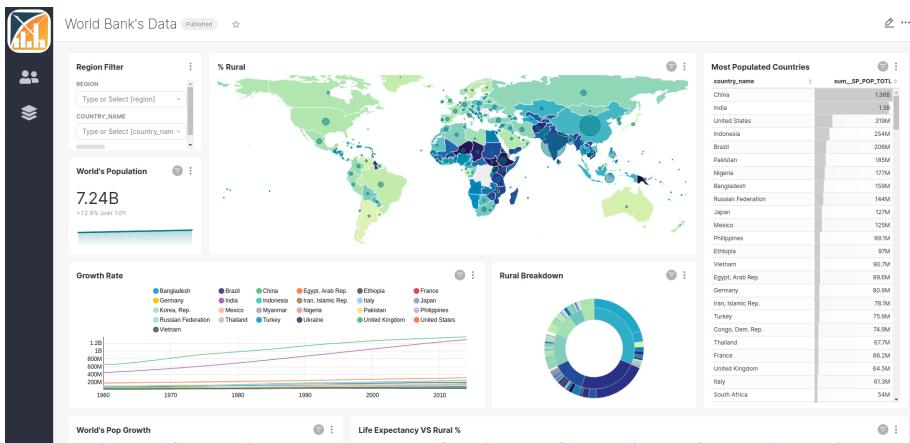
Tabs View [Deprecated]

Note: This app is no longer maintained and the associated urls were unlinked.

Target: admin user

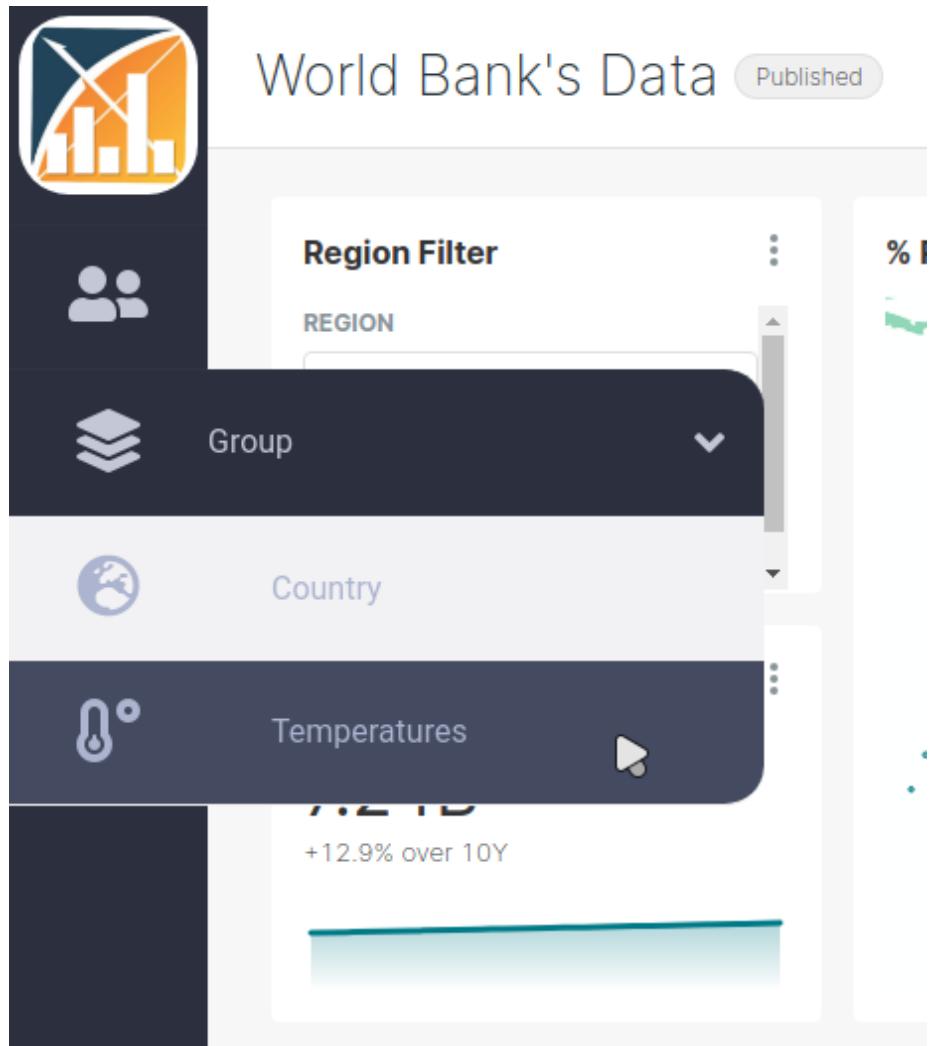
Once there are data sources on the platform, data was uploaded to them and there are dashboards created on Superset, researchers can now browse through the dashboards and analyze and compare the data of the different data sources. One way to allow this would be to let them browse through the dashboard list on Superset. However, if there was some dashboards not ready to show to the public users, they could still access them.

For that, it was created a page, with a sidebar, where public users could browse through the available and ready dashboards. It can be accessed through the URL `[BASE_URL]/tabs/`



The sidebar entries can be configured through the Django admin app, accessing the Tabsmanager app section. Here two models are available to create:

- Tab Groups: They allow to group several sidebar entries within a collapsable group.



- Tabs: Will create a clickable entry on the sidebar that can be presented within a group. When a tab is clicked the associated dashboard will be displayed on the page.

Each entry, tab, or group of them, expects:

- Title/Name
- Icon: Name of a font awesome version 5 icon
- Position: Allows to order entries along the sidebar. If a Tab has a group, then this field will order the tabs within that group only.
- Visible: If whether or not this tab or group should be visible. The goal

of this field is to avoid having to delete the record from the database just because a certain tab is not ready and later on created it from scratch.

Tabs additionally expect an URL, which will be used to display a Superset dashboard in an iframe. To hide Superset's menu bar, an additional **standalone** URL parameter should be appended to the provided URL of a tab. The value of the **standalone** arguments depends on the expected result:

- 1: menu bar is hidden. the bar where the dashboard title, publish status, and three dots option menu are present will still appear
- 2: both the menu bar and the dashboard title bar are hidden.

By default, the dashboard of the first tab is displayed on the page, however, if one wants a specific tab to be displayed when the page is opened, its title should be present in the hash part of the URL. For example, if there is a tab called People, to make that tab selected at the start the following URL should be used [BASE_URL] /tabs/#People.

Chapter 5

Backups

1. Create a credentials file (the structure of the file depends on the target cloud server)
2. Create a `.dashboards_backups.conf` file under your home directory (variable `$HOME`) using `dashboards_backups.conf.example` as base, setting the appropriate value for the several variables.

For variables associated with files and directories always use *absolute* paths.

Variables:

- **RUN:** Set it to 0 if you don't want the next scheduled backup to run.

This variable allows you to cancel any backup runs while you are doing some maintenance on the application.

- **CONSTANCE_REDIS_DB:** Number of the Redis database where the django constance config is stored. The default value is 2. This value should be the same as the environment variable `REDIS_CONSTANCE_DB` of the dashboard container.
- The following variables are associated with the arguments of the `backup_uploader` python package. Check its usage for more details:
 - **APP_NAME:** The backup process will generate some directories with this name in places that are shared with other applications.
 - **SERVER:** The name of the target cloud server to where backups should be uploaded (dropbox or mega).
 - **BACKUP_CHAIN_CONFIG:** Allows having different directories with backups of different ages.

- CREDENTIALS_FILE_PATH: File containing the credentials to access the server to upload the backup file.
3. Install the `backup_uploader` python package by following its install instructions.
 4. Schedule your backups

```
* * * * * Command_to_execute
| | | | |
| | | | Day of the Week ( 0 - 6 ) ( Sunday = 0 )
| | | |
| | | Month ( 1 - 12 )
| | |
| | Day of Month ( 1 - 31 )
| |
| Hour ( 0 - 23 )
|
Min ( 0 - 59 )
```

(Retrieved from: Tutorialspoint)

Ex: To run every day at 3:00 am

1. `crontab -e`
2. Add entry `0 3 * * * $HOME/NetworkDashboards/backups/backup.sh`
(The path to the backup script might be different)

5.1 Restore

1. Select the compressed backup you want to restore and decompress it:

```
tar -xJf BACKUP_FILE.tar.xz.
```

2. 1. Redis

1. Make sure the redis docker container is down.
2. (Re)place the file `dump.rdb` on the redis volume by the file `redis.rdb`. By default the redis volume is located where this repository was cloned on the directory `docker/volumes/redis`.
3. Change its permissions, owner and group:

```
chmod 0644 docker/volumes/redis/dump.rdb
sudo chown -R 999:999 docker/volumes/redis
```

2. Postgres

1. Make sure all containers that make changes on the database are stopped.

2. Copy the file `postgres_backup.sql` into the postgres container

```
docker cp postgres.sql [CONTAINER_ID] :/tmp.
```

3. Execute the backup script:

```
docker exec -u root dashboard_viewer_postgres_1 psql  
-f /tmp/postgres_backup.sql -U \$POSTGRES_USER -d  
\$POSTGRES_DB.
```

3. **Media Files** If you have a volume pointing to where the media files are stored, replace all files with the ones present on the downloaded backup file. Else:

1. Bring the dashboard container up `docker-compose up -d dashboard`

2. Enter in the container `docker exec -it [CONTAINER_ID] bash`

3. If you don't know where the media files are stored you can check the value of the `MEDIA_ROOT` variable

1. `python manage.py shell`
2. `from django.conf import settings`
3. `print(settings.MEDIA_ROOT)`

4. Remove the entire `MEDIA_ROOT` directory and exit the container

5. Copy the media directory present on the backup file to the catalogue container `docker cp -a collected-media [CONTAINER_ID] :[MEDIA_ROOT_PARENT_PATH]`

Chapter 6

Customizations

This platform is currently being used within the scope of the European Health Data & Evidence Network (EHDEN) project. To allow the dashboard viewer Django application to be easily used by another project or company, several components support customization in runtime, removing the need to change such things directly on the source code.

To achieve this we make use of Contance that allows configuring several fields which then can be changed through the Django admin app.

Platform Logo

It is visible both in the Tabs Manager and the Catalogue Results Uploader URLs.



The platform allows two possible ways to choose a logo: upload a file or provide an URL to an image.

| NAME | DEFAULT | VALUE |
|--|-----------------|--|
| APP_LOGO_IMAGE Image file to use as app logo. | CDM-BI-icon.png | Current file: CDM-BI-icon.png <input type="button" value="Choose File"/> No file chosen |
| APP_LOGO_URL Url to the image to use as app logo.This setting will be used over the APP_LOG_IMAGE | | <input type="text"/> <input type="button" value="Reset to default"/> |

If both fields are provided, the URL one will be used.

On the tabs manager app, we also allow customization of the CSS associated both with the image itself and its container.

| | | |
|--|---|---|
| TABS_LOGO_CONTAINER_CSS Css for the div container of the logo image | padding: 5px 5px 5px 5px; height: 100px; margin-bottom: 10px; | <input type="text"/> <input type="button" value="Reset to default"/> |
| TABS_LOGO_IMG_CSS Css for the img tag displaying the app logo | background: #fff; object-fit: contain; width: 90px; height: 100%; border-radius: 25px; padding: 0 5px 0 5px; transition: width 400ms, height 400ms; position: relative; z-index: 5; | <input type="text"/> <input type="button" value="Reset to default"/> |

Platform Title

All pages of the uploader app use the same base HTML file which contains a header with the platform logo, page title, and platform title.



The first was already mentioned before, the second can't be changed. The last can be altered using a Constance field.

| | | |
|---|--------------------|---|
| APP_TITLE Title to use for the several pages | Network Dashboards | <input type="text"/> <input type="button" value="Reset to default"/> |
|---|--------------------|---|

Uploader Page Texts

The data source creation page has three columns with some text providing some instructions for the creation of a data source and the upload of catalogue results.

Execute CatalogueExport Package
The CatalogueExport package extracts all data from the CDM that is needed for the dashboards. Please run the R package (<https://github.com/EHDEN/CatalogueExport>) against your CDM to generate the results file.

Upload CatalogueExport results
Upload the catalogue_results.csv results file in this tool to populate the visualisations. To update an existing database, just upload the new data. A history of uploads is shown on the page.

Automatic Updates
The dashboards will automatically update once the data is uploaded. This operation can take a few minutes.

Create Data Source

The text of these three columns is customizable, where markdown can be used, which is then transformed into HTML before rendering the page.

UPLOADER_AUTO_UPDATE
Text for the 'Automatic Updates' section on the uploader app

The dashboards will automatically update once the data is uploaded. This can take a few minutes.

UPLOADER_EXECUTE_EXPORT_PACKAGE
Text for the 'Execute CatalogueExport Package' section on the uploader app

The CatalogueExport package extracts all data from the CDM that is needed for the dashboards. Please run the R package (<https://github.com/EHDEN/CatalogueExport>) against your CDM to generate the results file.

UPLOADER_UPLOAD
Text for the 'Upload Achilles results' section on the uploader app

Upload the catalogue_results.csv results file in this tool to populate the visualisations. To update an existing database, just upload the new data. A history of uploads is shown on the page.

Allow Draft Status Updates

In the section Draft Status of the Processes chapter, it was already explained the concept around draft data sources.

By default, a user can NOT change the data source status on the edit page of a data source, only being allowed to do it through a PATCH request. Changes through the web edit form can be allowed by changing a Constance field.

| | |
|--|-------|
| UPLOADER_ALLOW_EDIT_DRAFT_STATUS | False |
| <small>If a Data Source owner can change the draft status when editing its details</small> | |
| <input type="checkbox"/> Reset to default | |

Then an additional draft field will be available on the edit data source form.

The screenshot shows a portion of a data source edit form. At the top, there is a configuration section with a table containing the setting 'UPLOADER_ALLOW_EDIT_DRAFT_STATUS' set to 'False'. Below this, there is a note about changing draft status when editing details, followed by a checkbox labeled 'Reset to default' which is unchecked. The main form area contains fields for 'Link to home page of the dat...', 'Database type' (set to 'Test'), 'Type of the data source. You...', and a checked checkbox labeled 'Draft'. There is also a 'Coordinates' field containing the value '40.6331262443015' and a note below it stating 'Note: Coordinates field does...'. The entire screenshot is framed by a light gray border.

Chapter 7

Development Instructions

Repository Description

Superset

Github Checks

Tests

Python Requirements

Documentation

Chapter 8

Code Documentation

Chapter 9

Dashboards

9.1 Per Database

Label Colors

In order to obtain the colors blue and rose in the chart representing the gender distribution, add the following JSON entry to the JSON object of the **JSON Metadata** field on the edit dashboard page:

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

CSS

To hide the dashboard header insert the following css code to the **CSS** field on the edit page:

```
.dashboard > div:not(.dashboard-content) { /* dashboard header */  
    display: none;  
}
```

With this every time you want to edit the dashboard layout you have to either comment the CSS inserted or remove it so the “Edit Dashboard” button can show again.

Data Source Filter

For the filter to work the name of the fields to filter should match in all tables used on the charts of this dashboard.

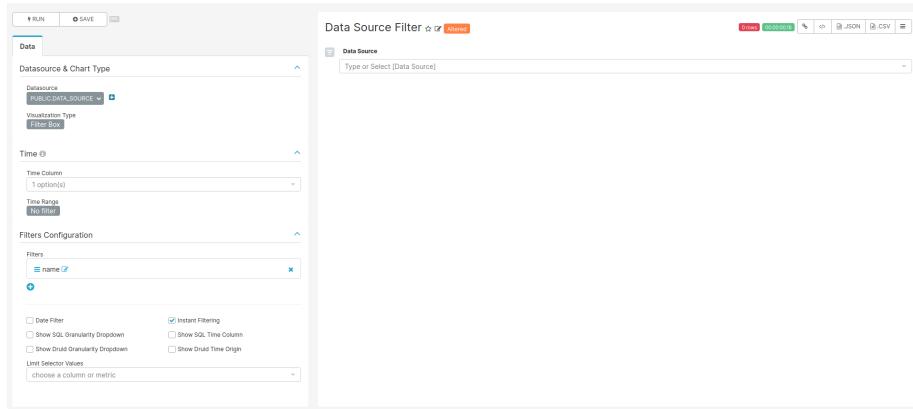


Figure 9.1: Settings for creating the Data Source filter chart

SQL query

No SQL query, use the sql table `data_source` of the `achilles` database.

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Filter Box
 - Time
 - * Time range: No filter
 - Filters Configuration
 - * Filters:
 - name
 - * Date Filter: off
 - * Instant Filtering: on

Demographics Tab

Number of Patients

```
SELECT
    achilles_results.count_value,
    data_source.name,
    data_source.acronym
FROM achilles_results
JOIN data_source ON achilles_results.data_source_id=data_source.id
WHERE analysis_id = 1
```

SQL query

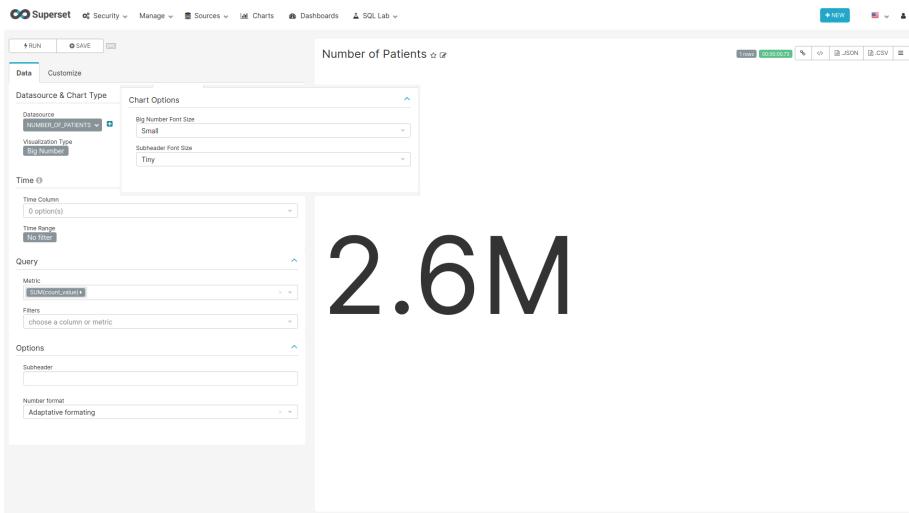


Figure 9.2: Settings for creating the Number of Patients chart

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Big Number
 - Time Time range: No filter
 - Query
 - * Metric: sum(count_value)
- Customize Tab
 - Big Number Font Size: Small
 - Subheader Font Size: Tiny

Gender Table

```
SELECT source.name as name,
       source.acronym,
       concept_name as gender,
       count_value
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 CAST(stratum_1 AS BIGINT) = concept_id
WHERE analysis_id = 2
```

SQL Query {#genderTableQuery}

Chart settings

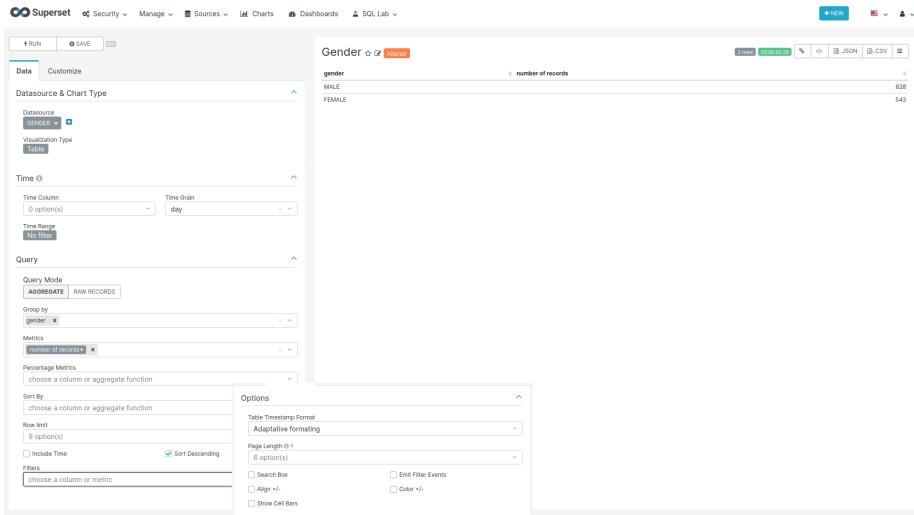


Figure 9.3: Settings for creating the Gender Table chart

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Table
 - Time
 - * Time range: No filter
 - Query
 - * Query Mode: Aggregate
 - * Group by: gender
 - * Metrics: SUM(count_value) with label number of records
 - * Row limit: None
- Customize Tab
 - Options
 - * Show Cells Bars: off

Gender Pie

SQL query Same as Gender Table query

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Pie Chart
 - Time
 - * Time range: No filter
 - Query

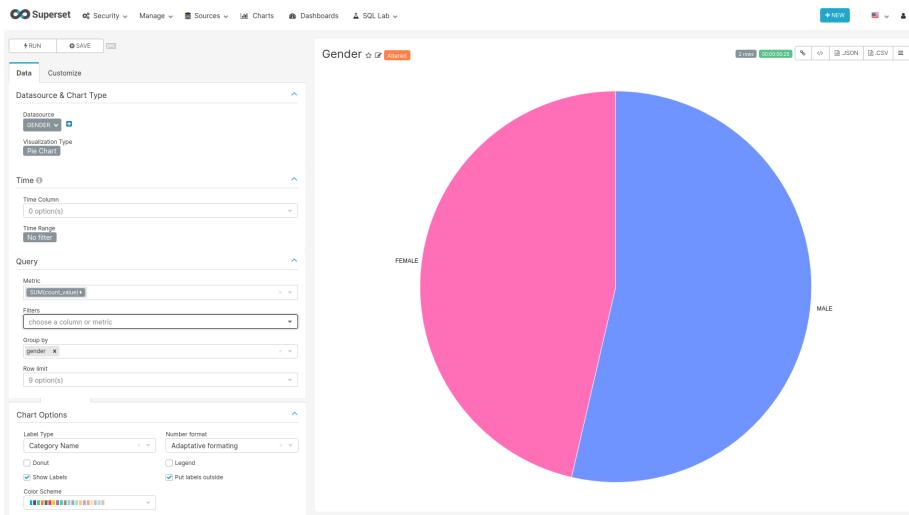


Figure 9.4: Settings for creating the Gender Pie chart

- * Metric: SUM(count_value)
- * Group by: gender
- * Row limit: None
- Customize Tab
 - Chart Options
 - * Legend: off

Age at first observation - Table

Same chart as the one used on the Person dashboard.

Age at first observation - Bars

Same chart as the one used on the Person dashboard.

Year of Birth

Same chart as the one used on the Person dashboard.

Data Domains Tab

Average Number of Records per Person

Same chart as the one used on the Data Domains dashboard.

Total Number of Records

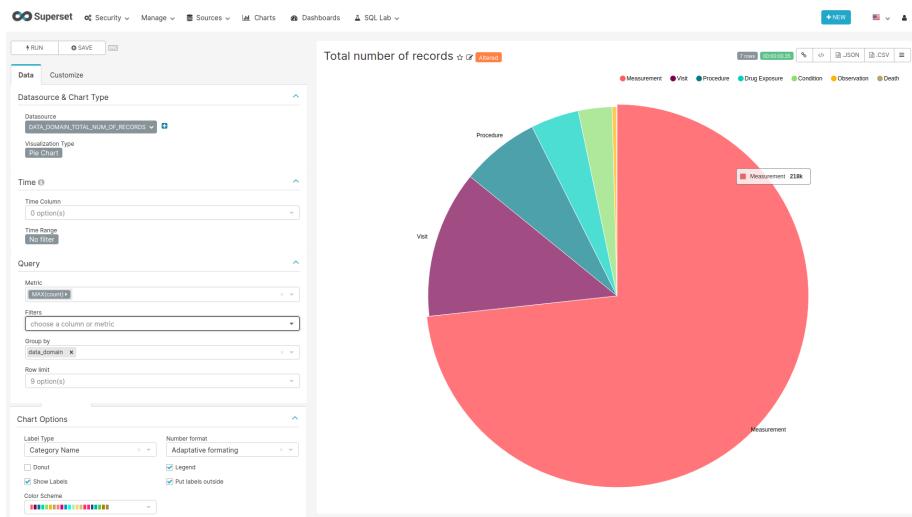


Figure 9.5: Settings for creating the Total Number of Records chart

```

SELECT
  data_source.name,
  data_source.acronym,
  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) AS "count"
FROM achilles_results
JOIN data_source ON achilles_results.data_source_id=data_source.id
GROUP BY name, acronym, analysis_id
HAVING analysis_id IN (201, 401, 501, 601, 701, 801, 1801, 2101, 2201)
  
```

SQL query

Chart settings

- Data Tab

- Datasource & Chart Type
 - * Visualization Type: Pie Chart
- Time
 - * Time range: No filter
- Query
 - * Metric: MAX(count)
 - * Group by: data_domain
 - * Row limit: None

Data Provenance Tab

Same six charts used on the Provenance dashboard.

Observation Period Tab

Number of Patients in Observation Period

Same chart used on the Observation Period dashboard.

Cumulative Observation Period

The cumulative observation time plot shows the percentage of patients that have more than X days of observation time.

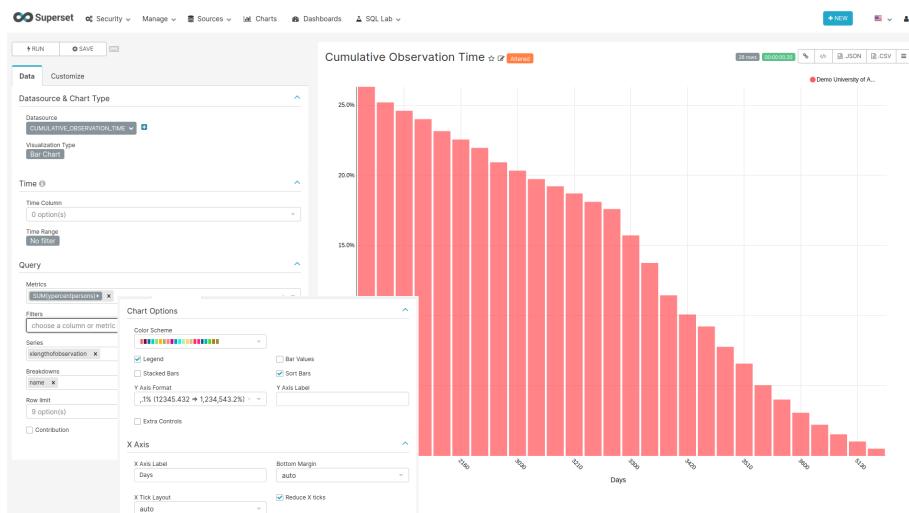


Figure 9.6: Settings for creating the Total Number of Records chart

```
SELECT
    name,
```

```

acronym,
xLengthOfObservation,
round(cumulative_sum / total, 5) as yPercentPersons
FROM (
    SELECT data_source_id, CAST(stratum_1 AS INTEGER) * 30 AS xLengthOfObservation, SUM(
        SELECT count_value
        FROM achilles_results
        WHERE analysis_id = 108
    ) AS cumulative_sums
    JOIN (
        SELECT data_source_id, count_value as total
        FROM achilles_results
        WHERE analysis_id = 1
    ) AS totals
    ON cumulative_sums.data_source_id = totals.data_source_id
    JOIN data_source ON cumulative_sums.data_source_id = data_source.id
    ORDER BY name, xLengthOfObservation
)

```

SQL Query

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Bar Chart
 - Time
 - * Time range: No filter
 - Query
 - * Metrics: SUM(ypercentpersons)
 - * Series: xlengtbofobservation
 - * Breakdowns: name
 - * Row limit: None
- Customize Tab
 - Chart Options
 - * Sort Bars: on
 - * Y Axis Fomat: ,1% (12345.432 => 1,234,543.2%)
 - * Y Axis Label: Number of Patients
 - X Axis
 - * X Axis Label: Days
 - * Reduce X ticks: on

Visit Tab

Visit Type Graph

```
SELECT
```

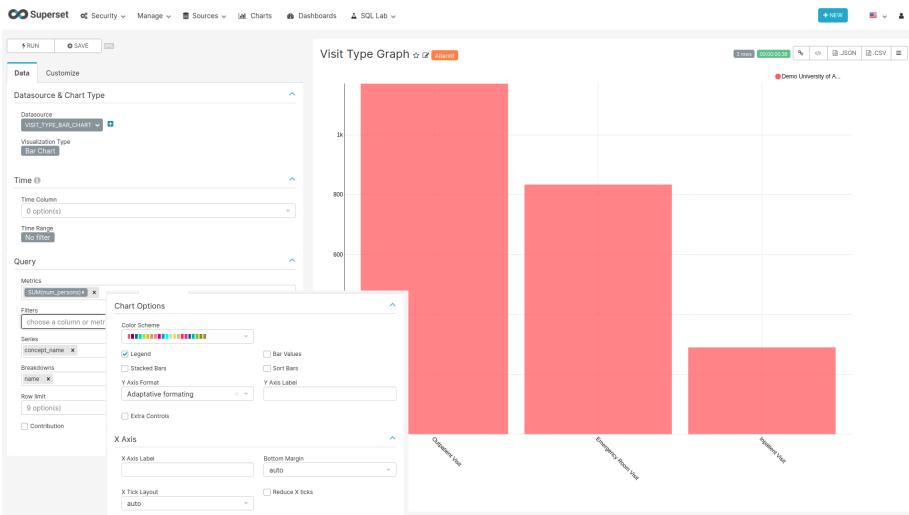


Figure 9.7: Settings for creating the Visit Type Graph chart

```

data_source.name,
data_source.acronym,
concept.concept_name,
achilles_results.count_value AS num_persons
FROM (SELECT * FROM achilles_results WHERE analysis_id = 200) AS achilles_results
JOIN data_source ON achilles_results.data_source_id = data_source.id
JOIN concept ON CAST(achilles_results.stratum_1 AS BIGINT) = concept.concept_id
  
```

SQL Query

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Bar Chart
 - Time
 - * Time range: No filter
 - Query
 - * Metrics: SUM(num_persons)
 - * Series: concept_name
 - * Breakdowns: name
 - * Row limit: None

Visit Type Table

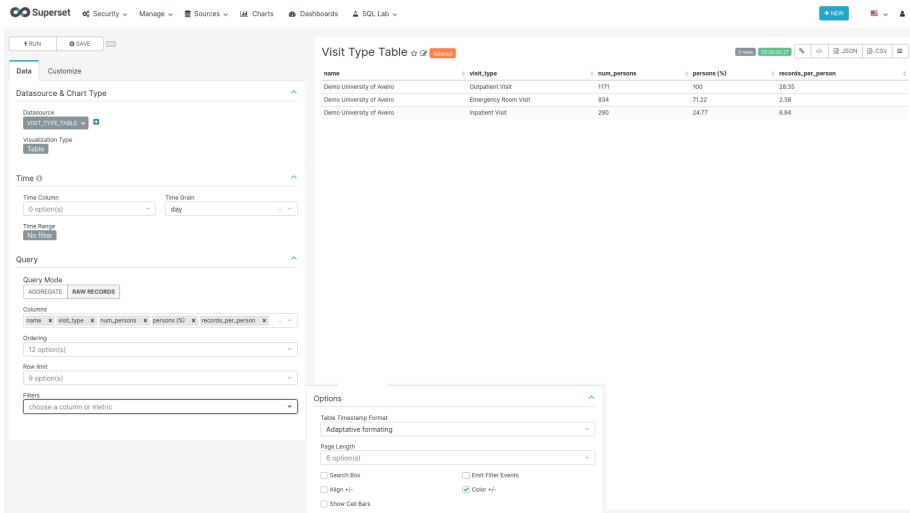


Figure 9.8: Settings for creating the Visit Type Table chart

```

SELECT
    name,
    acronym,
    concept.concept_name,
    ar1.count_value AS num_persons,
    round(100.0 * ar1.count_value / denom.count_value, 2) AS percent_persons,
    round(1.0 * ar2.count_value / ar1.count_value, 2) AS records_per_person
FROM (
    SELECT *
    FROM achilles_results WHERE analysis_id = 200) AS ar1
JOIN (
    SELECT *
    FROM achilles_results WHERE analysis_id = 201) AS ar2
    ON ar1.stratum_1 = ar2.stratum_1 AND ar1.data_source_id = ar2.data_source_id
JOIN (
    SELECT *
    FROM achilles_results WHERE analysis_id = 1) AS denom
    ON ar1.data_source_id = denom.data_source_id
JOIN data_source ON data_source.id = ar1.data_source_id
JOIN concept ON CAST(ar1.stratum_1 AS INTEGER) = concept_id
ORDER BY ar1.data_source_id, ar1.count_value DESC

```

SQL Query

Chart Settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Table
 - Time
 - * Time range: No filter
 - Query
 - * Query Mode: Raw Records
 - * Columns: name, visit_type, num_persons, percent_persons with label persons (%), records_per_person
 - * Row limit: None
- Customize Tab
 - Options
 - * Show Cell Bars: off

Concept Browser Tab

Concept Browser Table

Same chart used on the Concept Browser dashboard.

Meta Data Tab

Meta Data Table

Same chart used on the General dashboard.

9.2 Database Level Dashboard

This dashboard is an exact copy of the Per Database dashboard but several legends and fields displayed on the original are hidden either through CSS or by changing some chart settings. On the following sections we will only present the things to change on the original charts.

Label Colors

In order to obtain the colors blue and rose in the chart representing the gender distribution, add the following JSON entry to the JSON object of the **JSON Metadata** field on the edit dashboard page:

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

CSS

To hide the dashboard header insert the following css code to the CSS field on the edit page:

```
/* hides the filter badges on right side of charts */
.dashboard-filter-indicators-container {
    display: none;
}
/* hides the acronym filter */
.grid-content > .dragdroppable.dragdroppable-row > .with-popover-menu {
    display: none;
}
/*
WARNING panel 1 id hardcoded
Hides the X Axis Label of the heatmap on the Data Domains tab
*/
#TABS-nLIU6H5mcT-pane-1 g.x.axis > g.tick text {
    display: none;
}
/*
WARNING panel 2 id hardcoded
Hides the X Axis Labels of the bar charts on the Data Provenance tab
*/
#TABS-nLIU6H5mcT-pane-2 g.nv-x.nv-axis.nvd3-svg > g.nvd3.nv-wrap.nv-axis > g > g.tick.
```

With this every time you want to edit the dashboard layout you have to either comment the CSS inserted or remove it so the “Edit Dashboard” button can show again.

Data Source Filter - hidden

For the filter to work the name of the fields to filter should match in all tables used on the charts of this dashboard.

SQL query

No SQL query, use the sql table `data_source` of the `achilles` database.

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Filter Box
 - Time
 - * Time range: No filter

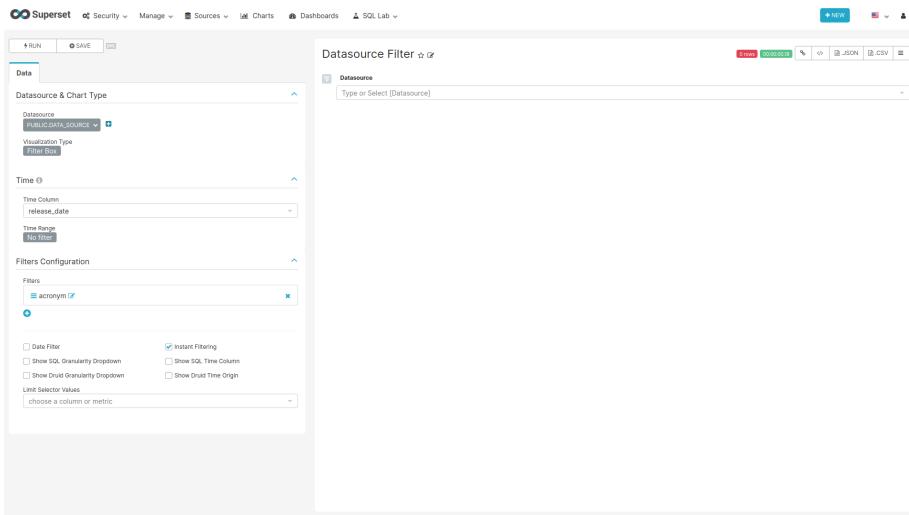


Figure 9.9: Settings for creating the Data Source filter chart

- Filters Configuration
 - * Filters:
 - acronym
 - * Date Filter: off
 - * Instant Filtering: on

Demographics Tab

Number of Patients

No changes

Gender Table

No changes

Gender Pie

No changes

Age at first observation - Table

Remove the name field from the columns to display.

- Data Tab
 - Query
 - * Columns: 0-10, 10-20, 20-30, 30-40, 40-50, 50-60, 60-70, 70-80, 80-90, 90+

Age at first observation - Bars

Remove legend.

- Customize Tab
 - Chart Options
 - * Legend: off

Year of Birth

Remove legend.

- Customize Tab
 - Chart Options
 - * Legend: off

Data Domains Tab

No changes

Data Provenance Tab

No changes

Observation Period Tab**Number of Patients in Observation Period**

Remove legend.

- Customize Tab
 - Chart Options
 - * Legend: off

Cumulative Observation Period

Remove legend.

- Customize Tab
 - Chart Options
 - * Legend: off

Visit Tab**Visit Type Graph**

Remove legend.

- Customize Tab
 - Chart Options
 - * Legend: off

Visit Type Table

Remove the `name` field from the columns to display.

- Data Tab
 - Query
 - * Columns: visit_type, num_persons, percent_persons with label persons (%), records_per_person

Concept Browser Tab

Concept Browser Table

Remove the `source_name` field from the columns to display.

- Data Tab
 - Query
 - * Columns: concept_id, concept_name, domain_id, magnitude_persons, magnitude_occurrences

Meta Data Tab

Meta Data Table

Remove the `name` field from the columns to display.

- Data Tab
 - Query
 - * Columns: source_release_date, cdm_release_date, cdm_version, vocabulary_version

9.3 General [Deprecated]

CSS

To hide the dashboard header insert the following css code to the `CSS` field on the edit page:

```
.dashboard > div:not(.dashboard-content) { /* dashboard header */
  display: none;
}
```

With this every time you want to edit the dashboard layout you have to either comment the CSS inserted or remove it so the “Edit Dashboard” button can show again.

Database Type and Country Filter

These filter were designed to be used in the dashboard aiming the filtering of the data based on the field “database_type” and “country” from the table

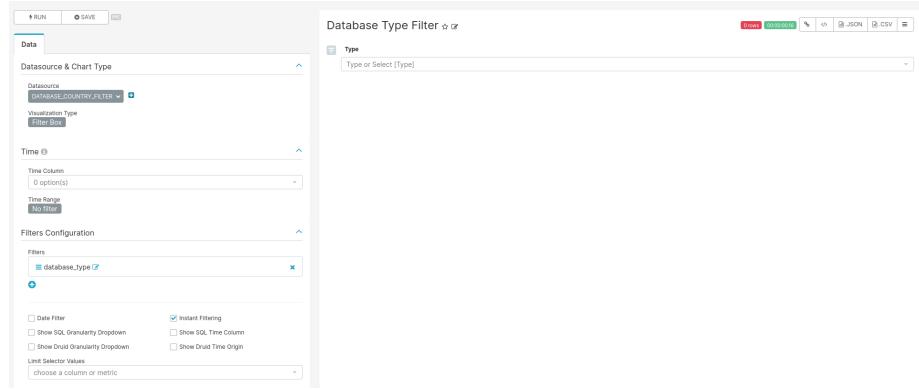


Figure 9.10: Settings for creating filters charts

“data_source”.

For the filters to work the name of the fields to filter should match in all tables used on the charts of this dashboard.

SQL query

```
SELECT source.name,
       country.country,
       source.database_type,
       source.acronym
  FROM public.data_source AS source
 INNER JOIN public.country AS country ON source.country_id=country.id
```

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Filter Box
 - Time
 - * Time range: No filter
 - Filters Configuration
 - * Filters:
 - database_type or country
 - * Date Filter: off
 - * Instant Filtering: on

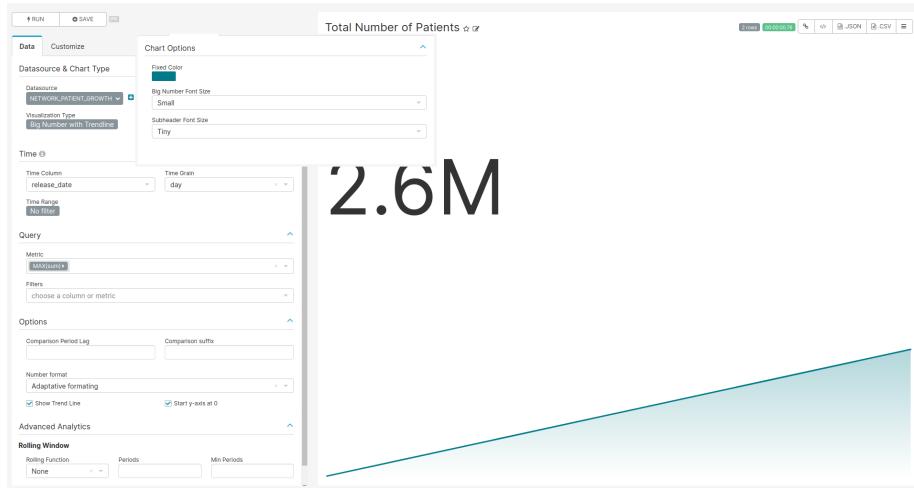


Figure 9.11: Settings for creating the Total Number of Patients chart

Total Number of Patients

SQL query

```
SELECT
    country,
    database_type,
    release_date,
    SUM(count_value) OVER (ORDER BY release_date ASC)
FROM achilles_results
JOIN data_source ON data_source_id = data_source.id
JOIN country ON data_source.country_id = country.id
WHERE analysis_id = 1
```

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Big Number with Trendline
 - Time
 - * Time range: No filter
 - Query
 - * Metrics: MAX(sum)
 - * Series: release_date
 - * Breakdowns: source
- Customize Tab
 - Chart Options

- * Big Number Font Size: Small
- * Subheader Font Size: Tiny

Network Growth by Date

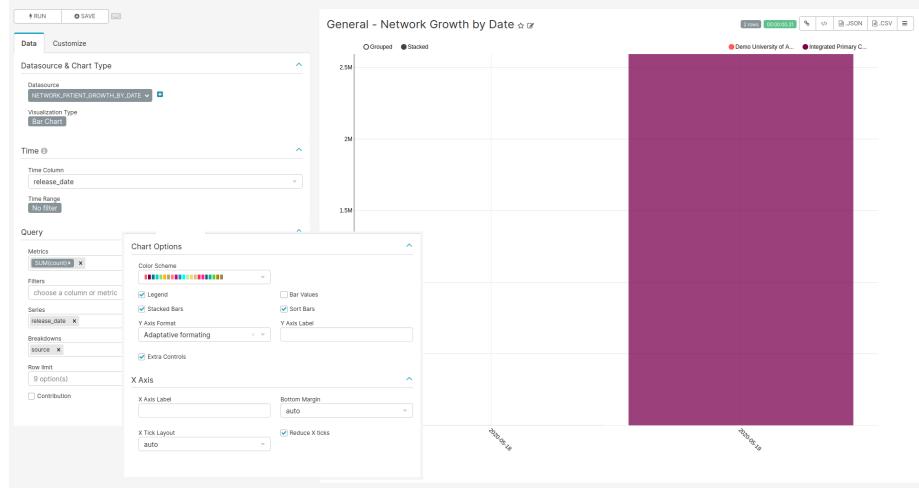


Figure 9.12: Settings for creating the Network Growth by Date chart

SQL query

```

SELECT source.name AS source,
       country.country,
       source.database_type,
       source.release_date,
       concepts.concept_name AS gender,
       achilles.count_value as count
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
JOIN (
    SELECT '8507' AS concept_id, 'Male' AS concept_name
    UNION
    SELECT '8532', 'Female'
) AS concepts ON achilles.stratum_1 = concept_id
WHERE analysis_id = 2
  
```

Chart settings

- Data Tab
 - Datasource & Chart Type

- * Visualization Type: Bar Chart
- Time
 - * Time range: No filter
- Query
 - * Metrics: SUM(count_value)
 - * Series: release_date
 - * Breakdowns: source
- Customize Tab
 - Chart Options
 - * Stacked Bars: on
 - * Sort Bars: on
 - * Extra Controls: on
 - X Axis
 - * Reduce X ticks: on

Patients per Country

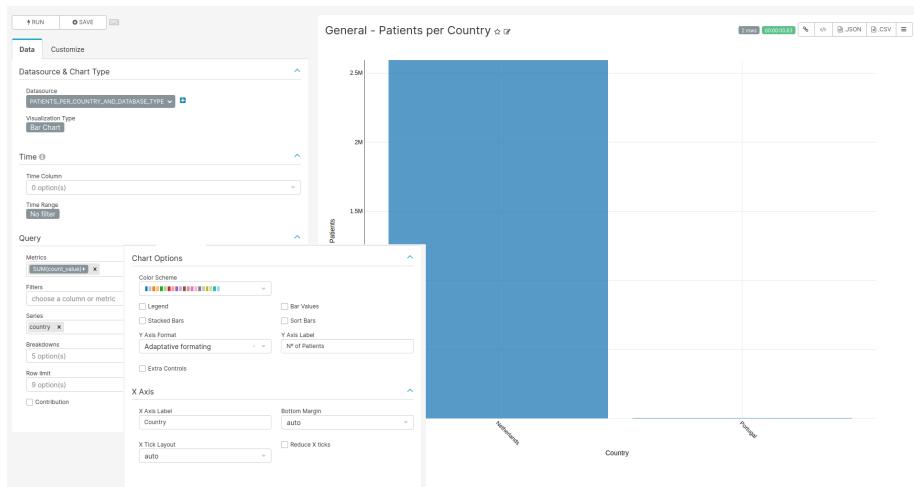


Figure 9.13: Settings for creating the Patients per Country chart

SQL query {#patientsPerCountryQuery}

```

SELECT country.country,
       source.database_type,
       count_value
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
  
```

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Bar Chart
 - Time
 - * Time range: No filter
 - Query
 - * Metrics: SUM(count_value)
 - * Series: country
- Customize Tab
 - Chart Options
 - * Legend: off
 - * Y Axis Label: N° of Patients
 - X Axis
 - * X Axis Label: Country

Database Types per Country

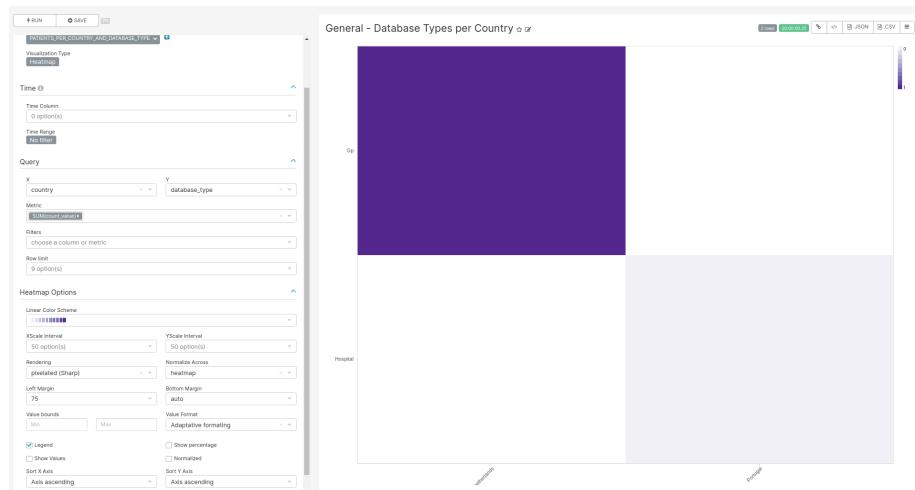


Figure 9.14: Settings for creating the Database Type per Country chart

SQL query

Same as Patients per Country query

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Heatmap

- Time
 - * Time range: No filter
- Query
 - * X: country
 - * Y: database_type
 - * Metric: SUM(country_value)
- Heatmap Options
 - * Left Margin: 75
 - * Show Percentage: off

World Map

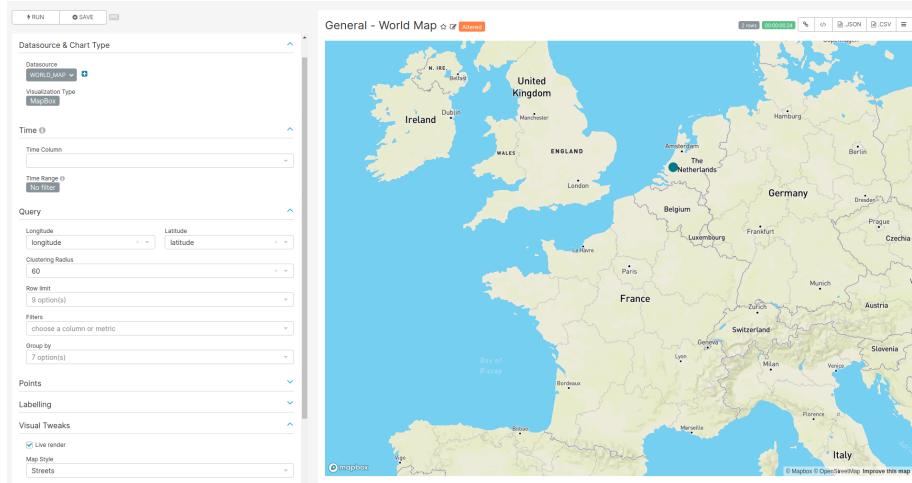


Figure 9.15: Settings for creating the World Map chart

SQL query

```
SELECT name,
       acronym,
       database_type,
       latitude,
       longitude,
       country
FROM public.data_source AS source
INNER JOIN public.country AS country ON source.country_id=country.id
```

Chart settings

- Data Tab
 - Datasource & Chart Type

- * Visualization Type: MapBox
- Time
 - * Time range: No filter
- Query
 - * Longitude: longitude
 - * Latitude: latitude
- Visual Tweaks
 - * Map Style: Streets or Light or Outdoors

Meta Data

| name | source_release_date | cdm_release_date | cdm_version | vocabulary_version |
|-------------------------------------|---------------------|------------------|-------------|--------------------|
| Integrated Primary Care Information | 2020-07-07 | 2020-07-12 | 5.3.1 | v5.0-03-APR-20 |

Figure 9.16: Settings for creating the Meta Data chart

SQL query

```

SELECT
    acronym,
    stratum_1 as "name",
    database_type,
    country,
    stratum_2 as "source_release_date",
    stratum_3 as "cdm_release_date",
    stratum_4 as "cdm_version",
    stratum_5 as "vocabulary_version"
FROM achilles_results
JOIN data_source ON achilles_results.data_source_id = data_source.id
JOIN country ON data_source.country_id = country.id
WHERE analysis_id=5000
  
```

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Table
 - Time
 - * Time range: No filter
 - Query
 - * Query Mode: Raw Records
 - * Columns: name, source_release_date, cdm_release_date, cdm_version, vocabulary_version

9.4 Person [Deprecated]

Label Colors

In order to obtain the colors blue and rose in the chart representing the gender distribution, add the following JSON entry to the JSON object of the JSON Metadata field on the edit dashboard page:

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

CSS

To hide the dashboard header insert the following css code to the CSS field on the edit page:

```
.dashboard > div:not(.dashboard-content) { /* dashboard header */
  display: none;
}
```

With this every time you want to edit the dashboard layout you have to either comment the CSS inserted or remove it so the “Edit Dashboard” button can show again.

Data Source Filter

For the filter to work the name of the fields to filter should match in all tables used on the charts of this dashboard.

SQL query

No SQL query, use the sql table `data_source` of the `achilles` database.

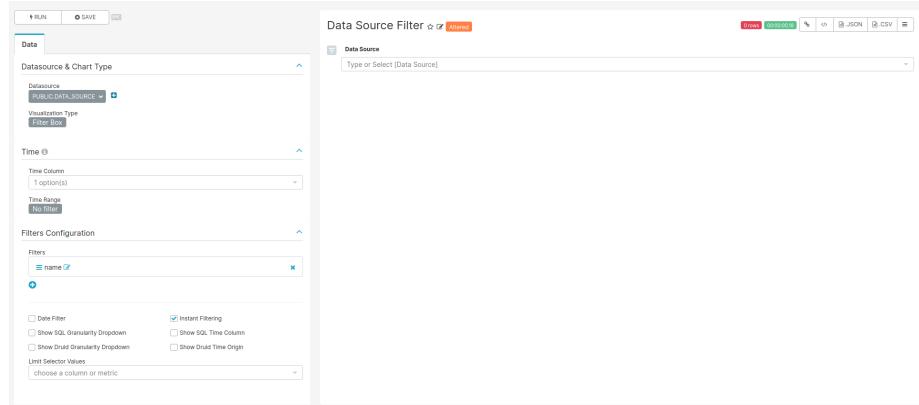


Figure 9.17: Settings for creating the Data Source filter chart

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Filter Box
 - Time
 - * Time range: No filter
 - Filters Configuration
 - * Filters:
 - name
 - * Date Filter: off
 - * Instant Filtering: on

Age at first observation - Table {#age1ObservationTable}

SQL query

```
SELECT source.name,
       source.acronym,
       SUM(CASE WHEN CAST(stratum_2 AS INTEGER) < 10 THEN count_value END) AS "0-10",
       SUM(CASE WHEN CAST(stratum_2 AS INTEGER) >= 10 AND CAST(stratum_2 AS INTEGER) < 20 THEN count_value END) AS "10-20",
       SUM(CASE WHEN CAST(stratum_2 AS INTEGER) >= 20 AND CAST(stratum_2 AS INTEGER) < 30 THEN count_value END) AS "20-30",
       SUM(CASE WHEN CAST(stratum_2 AS INTEGER) >= 30 AND CAST(stratum_2 AS INTEGER) < 40 THEN count_value END) AS "30-40",
       SUM(CASE WHEN CAST(stratum_2 AS INTEGER) >= 40 AND CAST(stratum_2 AS INTEGER) < 50 THEN count_value END) AS "40-50",
       SUM(CASE WHEN CAST(stratum_2 AS INTEGER) >= 50 AND CAST(stratum_2 AS INTEGER) < 60 THEN count_value END) AS "50-60",
       SUM(CASE WHEN CAST(stratum_2 AS INTEGER) >= 60 AND CAST(stratum_2 AS INTEGER) < 70 THEN count_value END) AS "60-70",
       SUM(CASE WHEN CAST(stratum_2 AS INTEGER) >= 70 AND CAST(stratum_2 AS INTEGER) < 80 THEN count_value END) AS "70-80",
       SUM(CASE WHEN CAST(stratum_2 AS INTEGER) >= 80 AND CAST(stratum_2 AS INTEGER) < 90 THEN count_value END) AS "80-90",
       SUM(CASE WHEN CAST(stratum_2 AS INTEGER) >= 90 THEN count_value END) AS "90+"
FROM public.achilles_results AS achilles
```

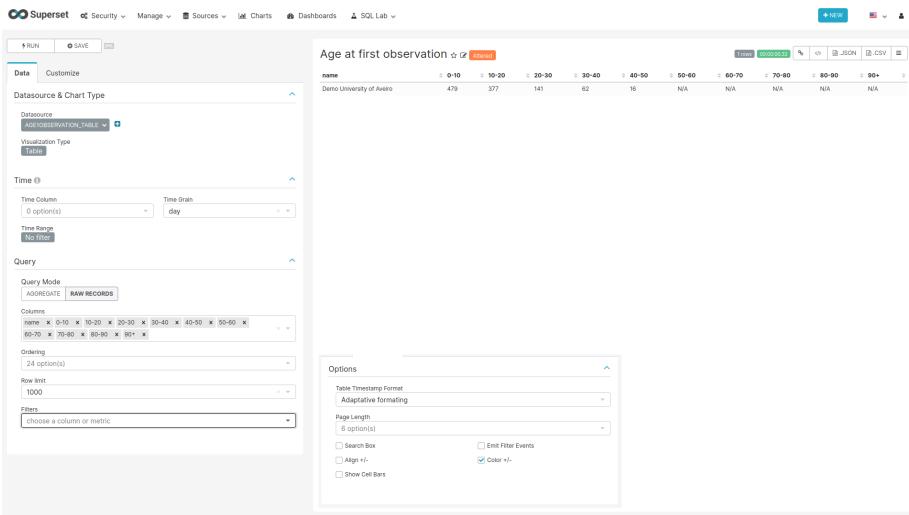


Figure 9.18: Settings for creating the Age at First Observation Table chart

```

INNER JOIN public.data_source AS source ON achilles.data_source_id=source.id
INNER JOIN public.concept ON CAST(stratum_1 AS BIGINT) = concept_id
WHERE analysis_id = 102
GROUP BY name, acronym
  
```

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Table
 - Time
 - * Time range: No filter
 - Query
 - * Query Mode: Raw Records
 - * Columns: name, 0-10, 10-20, 20-30, 30-40, 40-50, 50-60, 60-70, 70-80, 80-90, 90+
- Customize Tab
 - Options
 - * Show Cell Bars: off

Age at first observation - Bars {#age1ObservationBars}

SQL query

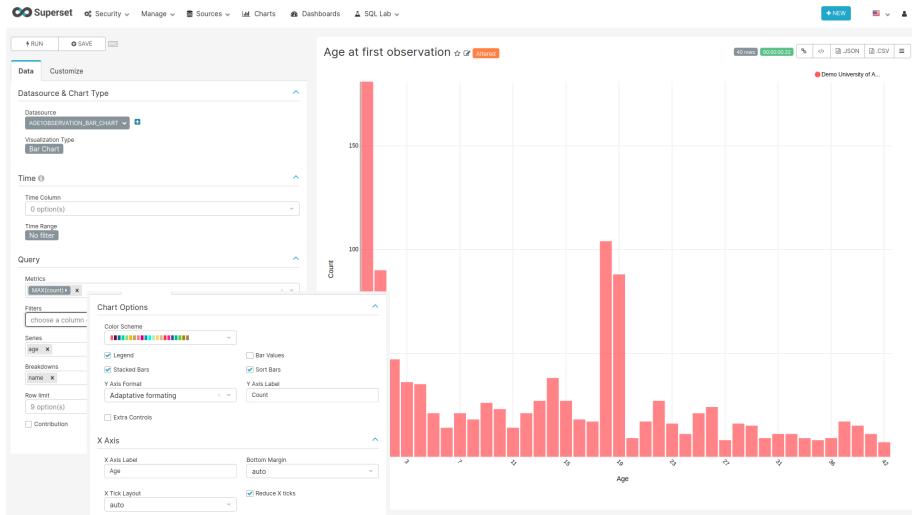


Figure 9.19: Settings for creating the Age at First Observation Bar chart

```

SELECT source.name,
       cast(stratum_1 AS int) AS Age,
       count_value AS count,
       source.acronym
  FROM public.achilles_results AS achilles
 INNER JOIN public.data_source AS source ON achilles.data_source_id=source.id
 WHERE analysis_id = 101
    
```

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Bar Chart
 - Time
 - * Time range: No filter
 - Query
 - * Metrics: MAX(count)
 - * Series: age
 - * Breakdowns: name
- Customize Tab
 - Chart Options
 - * Stacked Bars: on
 - * Sort Bars: on
 - * Y Axis Label: Count
 - X Axis

- * X Axis Label: Age
- * Reduce X ticks: on

Year of Birth {#yearOfBirth}

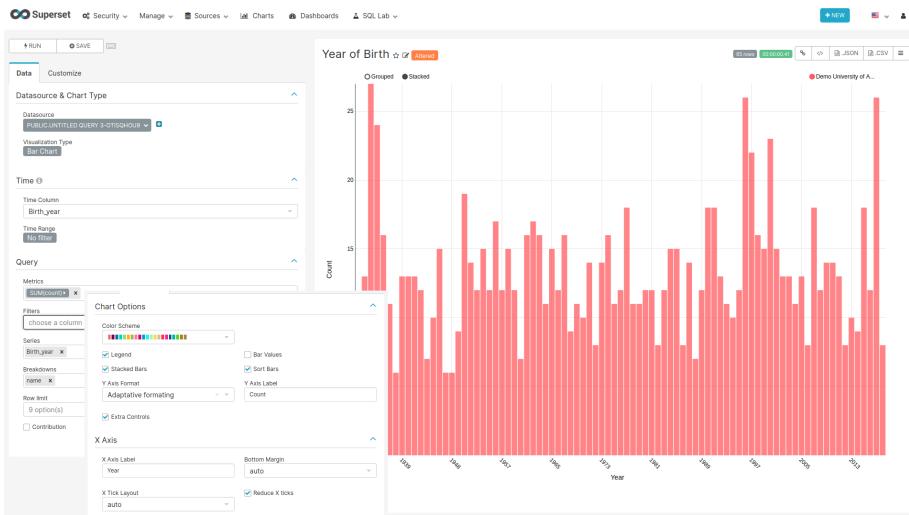


Figure 9.20: Settings for creating the Year of Birth chart

SQL query

```
SELECT source.name,
       source.acronym,
       stratum_1 AS "Birth_year",
       count_value AS count
FROM public.achilles_results AS achilles
INNER JOIN public.data_source AS source ON achilles.data_source_id=source.id
WHERE analysis_id = 3
```

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Bar Chart
 - Time
 - * Time range: No filter
 - Query
 - * Metrics: SUM(count)
 - * Series: Birth_year
 - * Breakdowns: name

- Customize Tab
 - Chart Options
 - * Stacked Bars: on
 - * Sort Bars: on
 - * Y Axis Label: Count
 - * Extra Controls: on
 - X Axis
 - * X Axis Label: Year
 - * Reduce X ticks: on

Gender

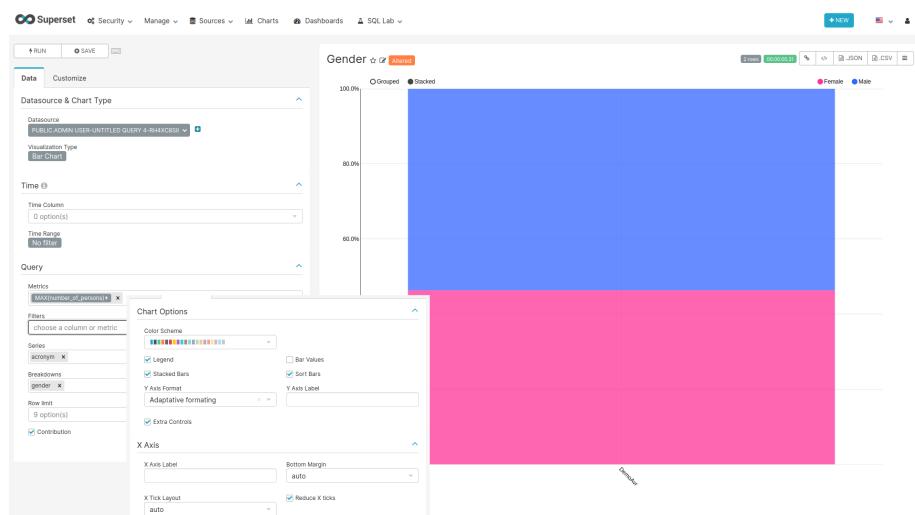


Figure 9.21: Settings for creating the Gender chart

SQL query

```

SELECT source.name,
       concept_name AS Gender,
       count_value AS Number_of_persons,
       source.acronym
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
  
```

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Bar Chart
 - Time
 - * Time range: No filter
 - Query
 - * Metrics: MAX(Number_of_persons)
 - * Series: acronym
 - * Breakdowns: gender
 - * Contribution: on
- Customize Tab
 - Chart Options
 - * Stacked Bars: on
 - * Sort Bars: on
 - * Extra Controls: on
 - X Axis
 - * Reduce X ticks: on

9.5 Observation Period [Deprecated]

CSS

To hide the dashboard header insert the following css code to the `CSS` field on the edit page:

```
.dashboard > div:not(.dashboard-content) { /* dashboard header */  
  display: none;  
}
```

With this every time you want to edit the dashboard layout you have to either comment the CSS inserted or remove it so the “Edit Dashboard” button can show again.

Data Source Filter

For the filter to work the name of the fields to filter should match in all tables used on the charts of this dashboard.

SQL query

No SQL query, use the sql table `data_source` of the `achilles` database.

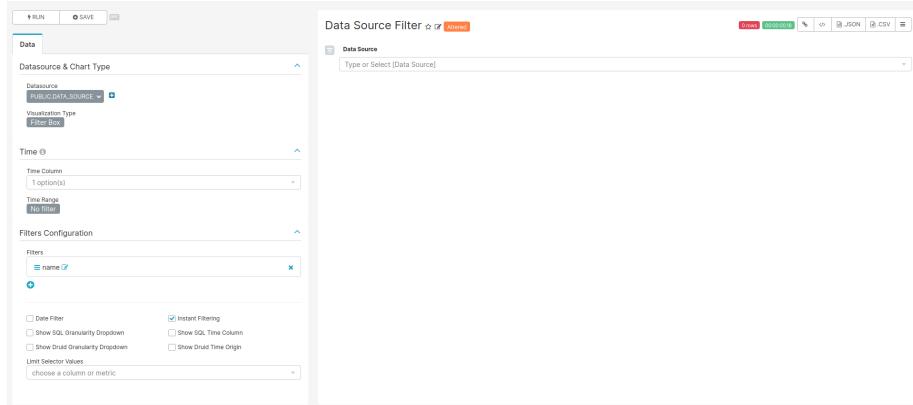


Figure 9.22: Settings for creating the Data Source filter chart

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Filter Box
 - Time
 - * Time range: No filter
 - Filters Configuration
 - * Filters:
 - name
 - * Date Filter: off
 - * Instant Filtering: on

Number of Patients in Observation Period {#numInObservationPeriod}

The Number of Patients in Observation Period plot shows the number of patients that contribute at least one day in a specific month.

SQL query

```
SELECT source.name,
       source.acronym,
       to_date(stratum_1, 'YYYYMM') as Date,
       count_value
FROM public.achilles_results AS achilles
INNER JOIN public.data_source AS source ON achilles.data_source_id=source.id
WHERE analysis_id = 110
```

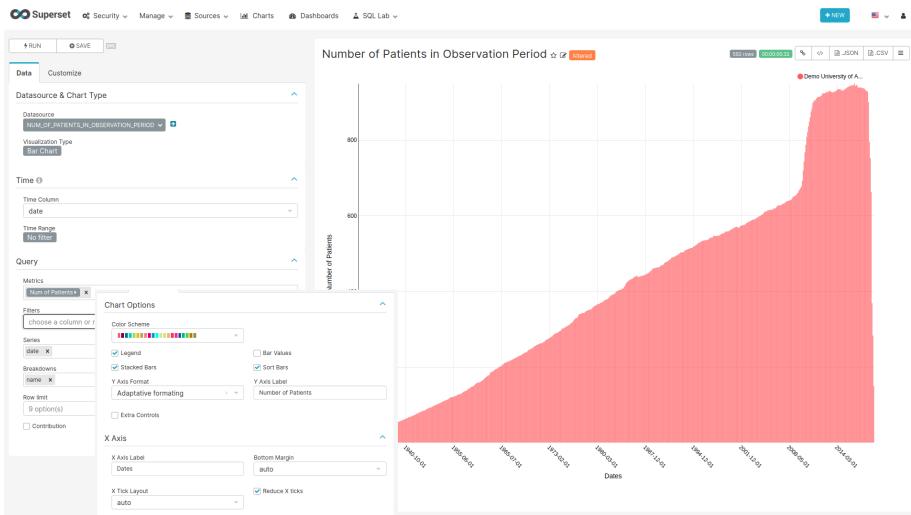


Figure 9.23: Settings for creating the Number of Patients in Observation Period chart

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Bar Chart
 - Time
 - * Time range: No filter
 - Query
 - * Metrics: `MAX(count_value)` with label “Num of Patients”
 - * Series: `date`
 - * Breakdowns: `name`
- Customize Tab
 - Chart Options
 - * Stacked Bars: on
 - * Sort Bars: on
 - * Y Axis Label: Number of Patients
 - X Axis
 - * X Axis Label: Dates
 - * Reduce X ticks: on

Observation Period Start Dates

SQL query

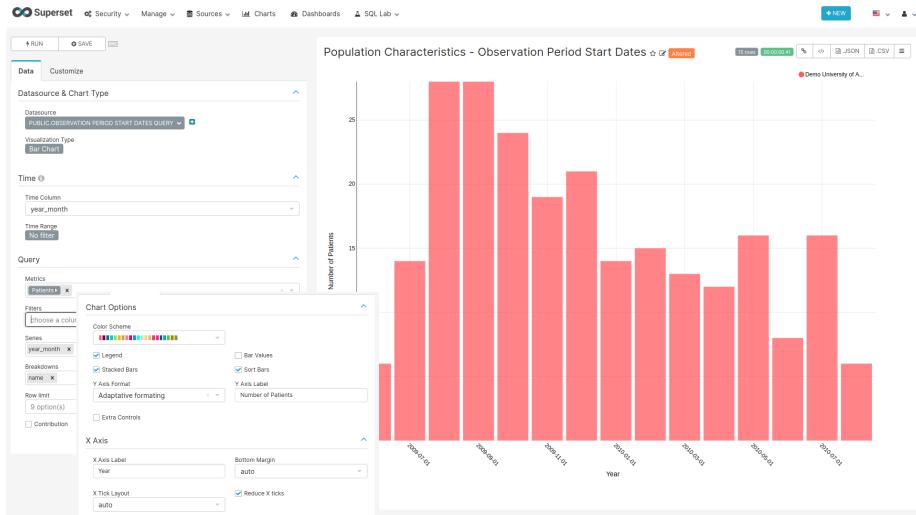


Figure 9.24: Settings for creating the Observation Period Start Dates chart

```

SELECT source.name,
       source.acronym,
       to_date(stratum_1, 'YYYYMM') AS year_month,
       count_value
FROM public.achilles_results AS achilles
INNER JOIN public.data_source AS source ON achilles.data_source_id=source.id
WHERE analysis_id = 111
    
```

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Bar Chart
 - Time
 - * Time range: No filter
 - Query
 - * Metrics: SUM(count_value) with label “Patients”
 - * Series: year_month
 - * Breakdowns: name
- Customize Tab
 - Chart Options
 - * Stacked Bars: on
 - * Sort Bars: on
 - * Y Axis Label: Number of Patients
 - X Axis

- * X Axis Label: Year
- * Reduce X ticks: on

Observation Period End Dates

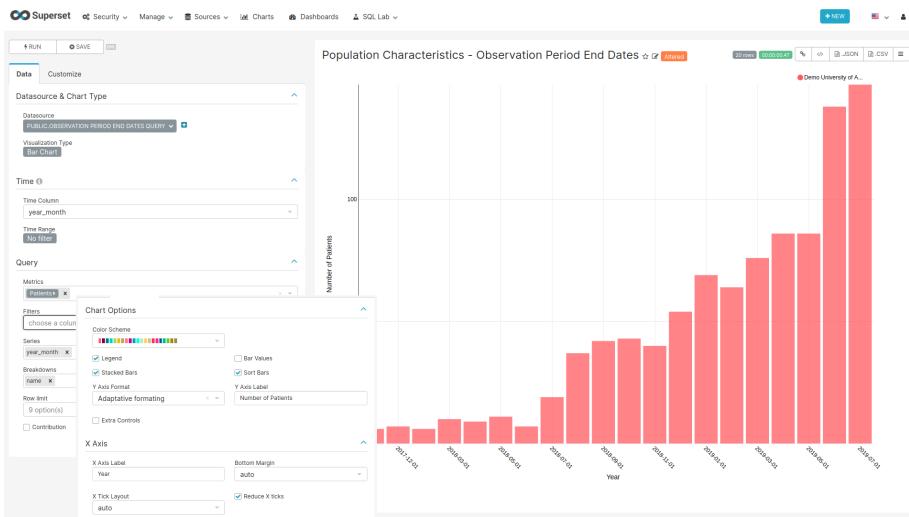


Figure 9.25: Settings for creating the Observation Period End Dates chart

SQL query

```
SELECT source.name,
       source.acronym,
       to_date(stratum_1, 'YYYYMM') AS year_month,
       count_value
FROM public.achilles_results AS achilles
INNER JOIN public.data_source AS source ON achilles.data_source_id=source.id
WHERE analysis_id = 112
```

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Bar Chart
 - Time
 - * Time range: No filter
 - Query
 - * Metrics: SUM(count_value) with label “Patients”
 - * Series: year_month
 - * Breakdowns: name

- Customize Tab
 - Chart Options
 - * Stacked Bars: on
 - * Sort Bars: on
 - * Y Axis Label: Number of Patients
 - X Axis
 - * X Axis Label: Year
 - * Reduce X ticks: on

9.6 Visit [Deprecated]

This dashboard shows the different types of visits per data source (see Visit Occurrence Table)

CSS

To hide the dashboard header insert the following css code to the CSS field on the edit page:

```
.dashboard > div:not(.dashboard-content) { /* dashboard header */
  display: none;
}
```

With this every time you want to edit the dashboard layout you have to either comment the CSS inserted or remove it so the “Edit Dashboard” button can show again.

Data Source Filter

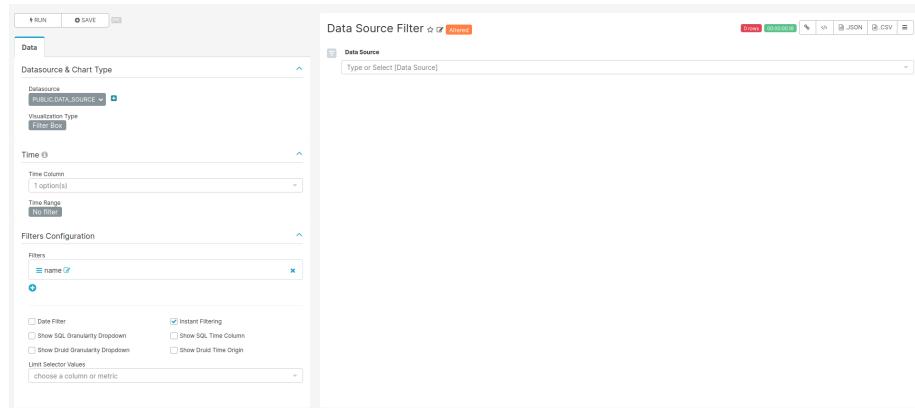


Figure 9.26: Settings for creating the Data Source filter chart

For the filter to work the name of the fields to filter should match in

all tables used on the charts of this dashboard.

SQL query

No SQL query, use the sql table `data_source` of the `achilles` database.

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Filter Box
 - Time
 - * Time range: No filter
 - Filters Configuration
 - * Filters:
 - name
 - * Date Filter: off
 - * Instant Filtering: on

Visit Type Table {#visitTypeTable}

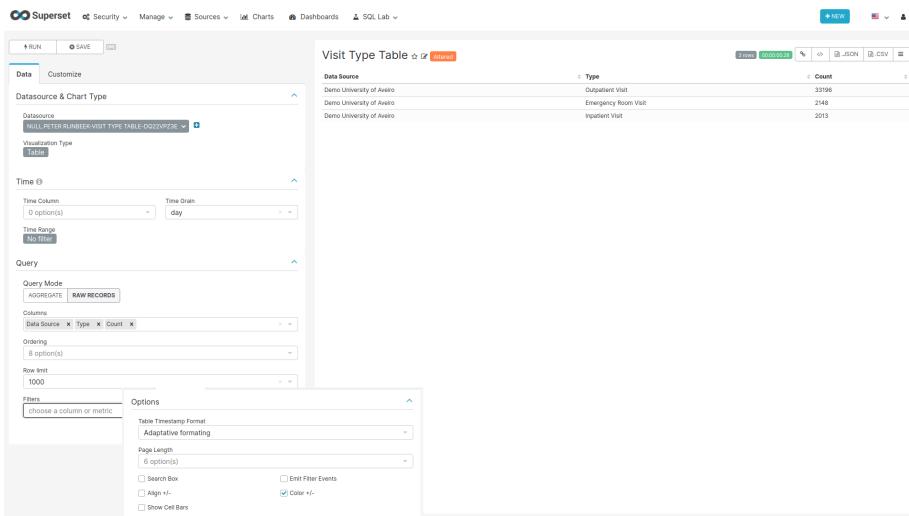


Figure 9.27: Settings for creating the Visit Type Table chart

SQL query

```
SELECT source.name,
       source.acronym,
       concept_name AS "Type",
```

```

        MAX(count_value) AS "Count"
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 CAST(stratum_1 AS BIGINT) = concept_id
WHERE analysis_id = 201
GROUP BY name, acronym, "Type"
ORDER BY "Count" DESC

```

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Table
 - Time
 - * Time range: No filter
 - Query
 - * Query Mode: Raw Records
 - * Columns: name with label “Data Source”, Type, Count

Visit Types Bars

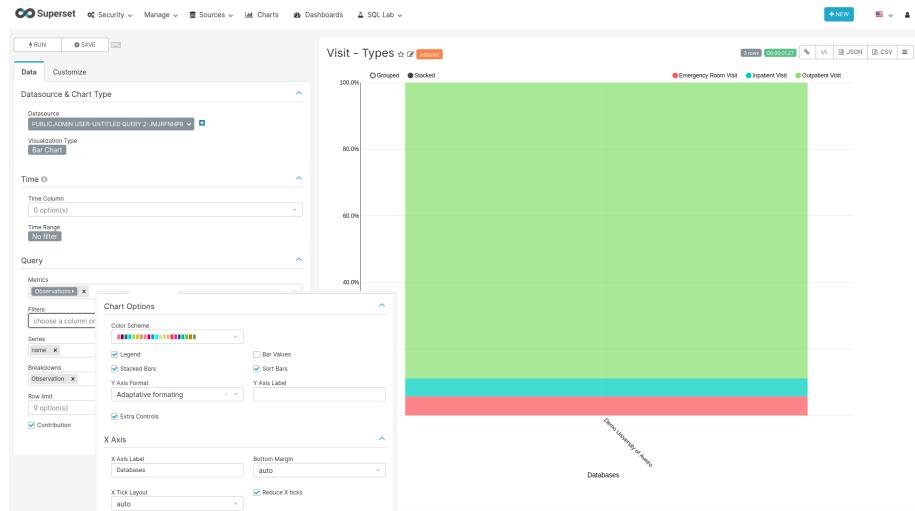


Figure 9.28: Settings for creating the Visit Types bar chart

SQL query

```

SELECT source.name,
       source.acronym,

```

```

concept_name AS "Observation",
count_value
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 CAST(stratum_1 AS BIGINT) = concept_id
WHERE analysis_id = 201

```

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Bar Chart
 - Time
 - * Time range: No filter
 - Query
 - * Metrics: MAX(count_value) with label Observations
 - * Series: name
 - * Breakdowns: Observation
- Customize Tab
 - Chart Options
 - * Stacked Bars: on
 - * Sort Bars: on
 - * Extra Controls: on
 - X Axis
 - * X Axis Label: Databases
 - * Reduce X ticks: on

9.7 Death [Deprecated]

CSS

To hide the dashboard header insert the following css code to the `CSS` field on the edit page:

```
.dashboard > div:not(.dashboard-content) { /* dashboard header */
  display: none;
}
```

With this every time you want to edit the dashboard layout you have to either comment the CSS inserted or remove it so the “Edit Dashboard” button can show again.

Data Source Filter

For the filter to work the name of the fields to filter should match in all tables used on the charts of this dashboard.

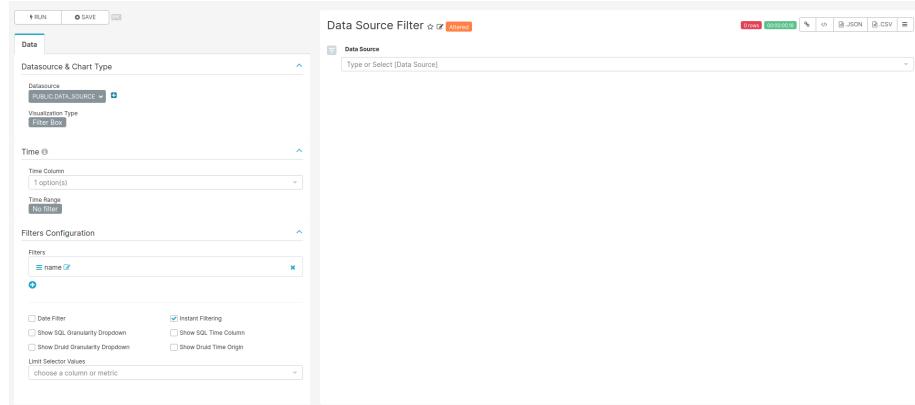


Figure 9.29: Settings for creating the Data Source filter chart

SQL query

No SQL query, use the sql table `data_source` of the `achilles` database.

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Filter Box
 - Time
 - * Time range: No filter
 - Filters Configuration
 - * Filters:
 - name
 - * Date Filter: off
 - * Instant Filtering: on

Number of Records

SQL query

```
SELECT source.name,
       count_value,
       source.acronym
FROM public.achilles_results AS achilles
INNER JOIN public.data_source AS source ON achilles.data_source_id=source.id
WHERE analysis_id = 501
```

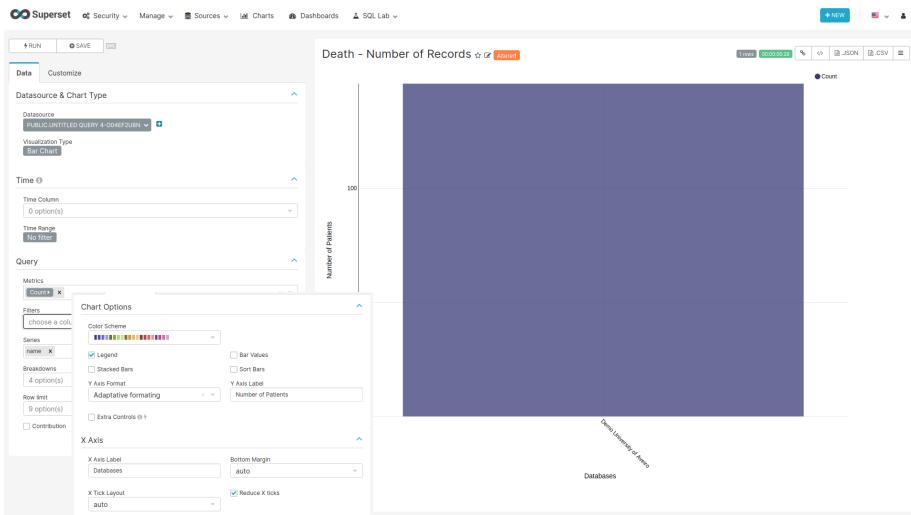


Figure 9.30: Settings for creating the Number of Records chart

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Bar Chart
 - Time
 - * Time range: No filter
 - Query
 - * Metrics: MAX(count_value) with label Count
 - * Series: name
- Customize Tab
 - Chart Options
 - * Y Axis Label: Number of Patients
 - X Axis
 - * X Axis Label: Databases
 - * Reduce X ticks: on

Death By Year per Thousand People

SQL query

```
SELECT source.name,
       source.acronym,
       EXTRACT(year FROM TO_DATE(stratum_1, 'YYYYMM')) AS Date,
       count_value
  FROM public.achilles_results AS achilles
```

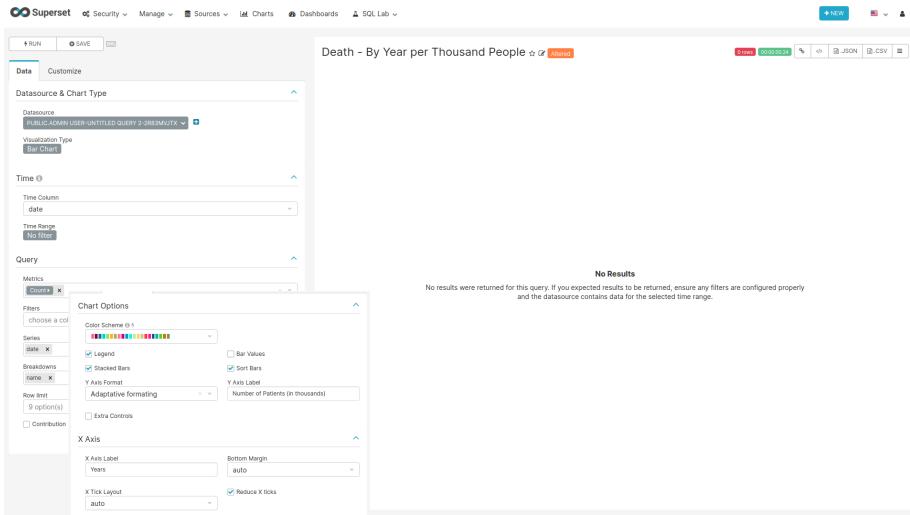


Figure 9.31: Settings for creating the Death by Year per Thousand People chart

```
INNER JOIN public.data_source AS source ON achilles.data_source_id=source.id
WHERE analysis_id = 502
```

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Bar Chart
 - Time
 - * Time range: No filter
 - Query
 - * Metrics: MAX(count_value) with label Count
 - * Series: date
 - * Breakdowns: name
- Customize Tab
 - Chart Options
 - * Stacked Bars: on
 - * Sort Bars: on
 - * Y Axis Label: Number of Patients (in thousands)
 - X Axis
 - * X Axis Label: Years
 - * Reduce X ticks: on

9.8 Concepts Browser [Deprecated]

The concepts browser allows you to search for concepts by name or concept_id in all the data sources you select. No exact number of patients or occurrences are provided but the magnitude of both.

CSS

To hide the dashboard header insert the following css code to the CSS field on the edit page:

```
.dashboard > div:not(.dashboard-content) { /* dashboard header */
  display: none;
}
```

With this every time you want to edit the dashboard layout you have to either comment the CSS inserted or remove it so the “Edit Dashboard” button can show again.

Data Source and Domain Filters

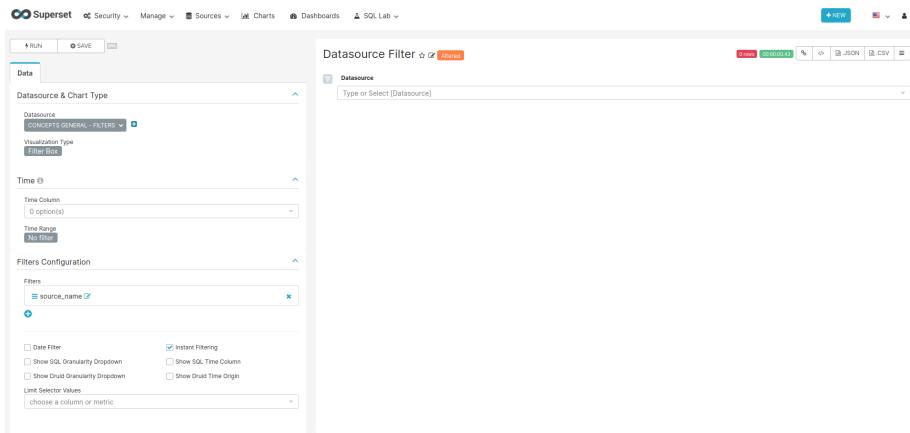


Figure 9.32: Settings for creating the Data Source and Domain filter charts

For the filters to work the name of the fields to filter should match in all tables used on the charts of this dashboard.

SQL query

```
SELECT concept_name,
       domain_id,
       source.name AS source_name,
       source.acronym
```

```
FROM achilles_results
JOIN concept ON cast(stratum_1 AS BIGINT) = concept_id
INNER JOIN public.data_source AS source ON data_source_id=source.id
WHERE analysis_id in (201, 401, 601, 701, 801, 901, 1001, 1801, 200, 400, 600, 700, 800)
```

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Filter Box
 - Time
 - * Time range: No filter
 - Filters Configuration
 - * Filters:
 - source_name or domain_id
 - * Date Filter: off
 - * Instant Filtering: on

Number of Concepts

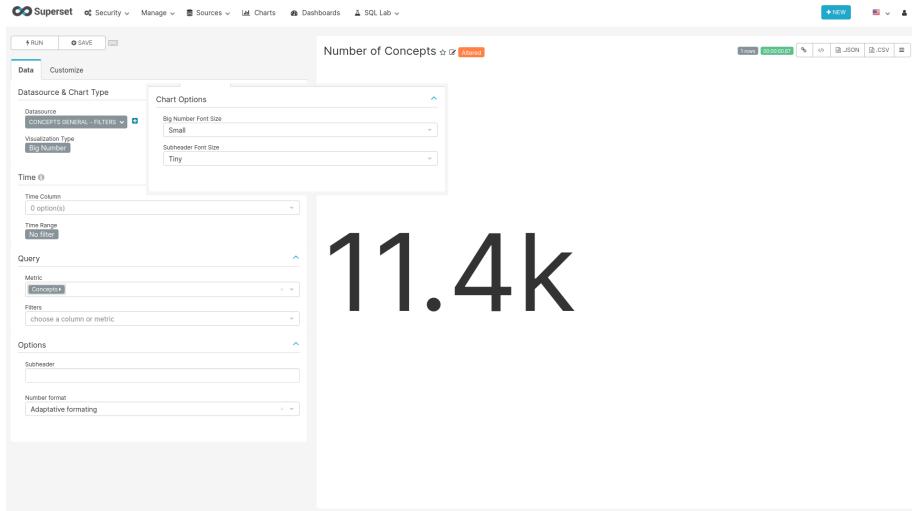


Figure 9.33: Settings for creating the Number of Concepts chart

SQL Query

Same as Data Source and Domain filters query

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Big Number
 - Time Time range: No filter
 - Query
 - * Metric: COUNT_DISTINCT(concept_name) with label Concepts
- Customize Tab
 - Big Number Font Size: Small
 - Subheader Font Size: Tiny

Concept Browser Table {#conceptBrowserTable}

| source_name | concept_id | concept_name | domain_id | magnitude_persons | magnitude_occurrences |
|---------------------------|------------|---|-----------|----------------------|-----------------------|
| Demo University of Avenio | 9202 | Outpatient Visit | | $10^{-4} \cdot 10^5$ | $10^{-4} \cdot 10^5$ |
| Demo University of Avenio | 43053141 | Pain severity - 0-10 verbal numeric rating [Score] - Reported | | $10^{-4} \cdot 10^5$ | $10^{-4} \cdot 10^5$ |
| Demo University of Avenio | 3012884 | Diastolic blood pressure | | $10^{-4} \cdot 10^5$ | $10^{-4} \cdot 10^5$ |
| Demo University of Avenio | 3004249 | Systolic blood pressure | | $10^{-4} \cdot 10^5$ | $10^{-4} \cdot 10^5$ |
| Demo University of Avenio | 3004277 | Body weight | | $10^{-4} \cdot 10^5$ | $10^{-4} \cdot 10^5$ |
| Demo University of Avenio | 3038553 | Body mass index (BMI) [Ratio] | | $10^{-4} \cdot 10^5$ | $10^{-4} \cdot 10^5$ |
| Demo University of Avenio | 3005458 | Potassium [Moles/volume] in Blood | | $10^{-3} \cdot 10^4$ | $10^{-3} \cdot 10^4$ |
| Demo University of Avenio | 3000285 | Sodium [Moles/volume] in Blood | | $10^{-3} \cdot 10^4$ | $10^{-3} \cdot 10^4$ |
| Demo University of Avenio | 3000483 | Glucose [Mass/volume] in Blood | | $10^{-3} \cdot 10^4$ | $10^{-3} \cdot 10^4$ |
| Demo University of Avenio | 3004295 | Urea nitrogen [Mass/volume] in Blood | | $10^{-3} \cdot 10^4$ | $10^{-3} \cdot 10^4$ |
| Demo University of Avenio | 3014098 | Carbon dioxide, total [Moles/volume] in Blood | | $10^{-3} \cdot 10^4$ | $10^{-3} \cdot 10^4$ |
| Demo University of Avenio | 3016572 | Chloride [Moles/volume] in Blood | | $10^{-3} \cdot 10^4$ | $10^{-3} \cdot 10^4$ |
| Demo University of Avenio | 3032504 | Calcium [Mass/volume] in Blood | | $10^{-3} \cdot 10^4$ | $10^{-3} \cdot 10^4$ |
| Demo University of Avenio | 3032505 | Creatinine [Mass/volume] in Blood | | $10^{-3} \cdot 10^4$ | $10^{-3} \cdot 10^4$ |
| Demo University of Avenio | 3032506 | Globulin, alpha-1 (C1 esterase inhibitor) [Mg predicted [Volume Rate/Area]] in Serum, Plasma or Blood by Creatinine-based formula [Mass/volume] | | $10^{-3} \cdot 10^4$ | $10^{-3} \cdot 10^4$ |
| Demo University of Avenio | 3032507 | Total protein [Mass/volume] in Serum or Plasma | | $10^{-3} \cdot 10^4$ | $10^{-3} \cdot 10^4$ |
| Demo University of Avenio | 3032508 | Cholesterol [Mass/volume] in Serum or Plasma | | $10^{-3} \cdot 10^4$ | $10^{-3} \cdot 10^4$ |
| Demo University of Avenio | 3032509 | Cholesterol in HDL [Mass/volume] in Serum or Plasma | | $10^{-3} \cdot 10^4$ | $10^{-3} \cdot 10^4$ |

Figure 9.34: Settings for creating the Concepts Table chart

```

SELECT
    q1.concept_id AS concept_id,
    q1.concept_name AS concept_name,
    q1.domain_id,
    source.name AS source_name,
    source.acronym,
    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'
    END
  
```

```

        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
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, acronym
ORDER BY "Person_count" desc

```

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Table
 - Time
 - * Time range: No filter

- Query
 - * Query Mode: Raw Records
 - * Columns: source_name, concept_id, concept_name, domain_id, magnitude_persons, magnitude_occurrences
- Customize Tab
 - Options
 - * Table Timestamps Format: %Y-%m-%d %H:%M:%S | 2019-01-14 01:32:10
 - * Page Length: 50
 - * Search Box: on
 - * Emit Filter Events: on

9.9 Provenance [Deprecated]

This Dashboard shows the provenance of the data in the different data domains.

CSS

To hide the dashboard header insert the following css code to the `CSS` field on the edit page:

```
.dashboard > div:not(.dashboard-content) { /* dashboard header */
  display: none;
}
```

With this every time you want to edit the dashboard layout you have to either comment the CSS inserted or remove it so the “Edit Dashboard” button can show again.

Data Source Filter

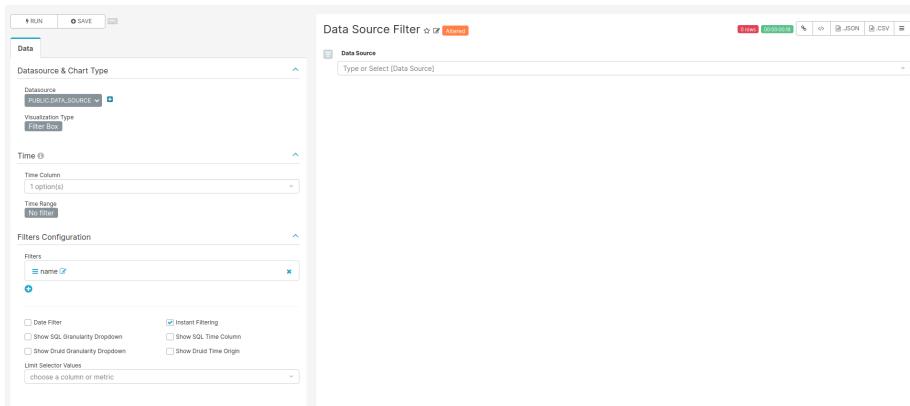


Figure 9.35: Settings for creating the Data Source filter chart

For the filter to work the name of the fields to filter should match in all tables used on the charts of this dashboard.

SQL query

No SQL query, use the sql table `data_source` of the `achilles` database.

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Filter Box
 - Time
 - * Time range: No filter
 - Filters Configuration
 - * Filters:
 - name
 - * Date Filter: off
 - * Instant Filtering: on

Condition & Drug & Procedure & Device & Measurement & Observation Types {#dataProvenanceCharts}

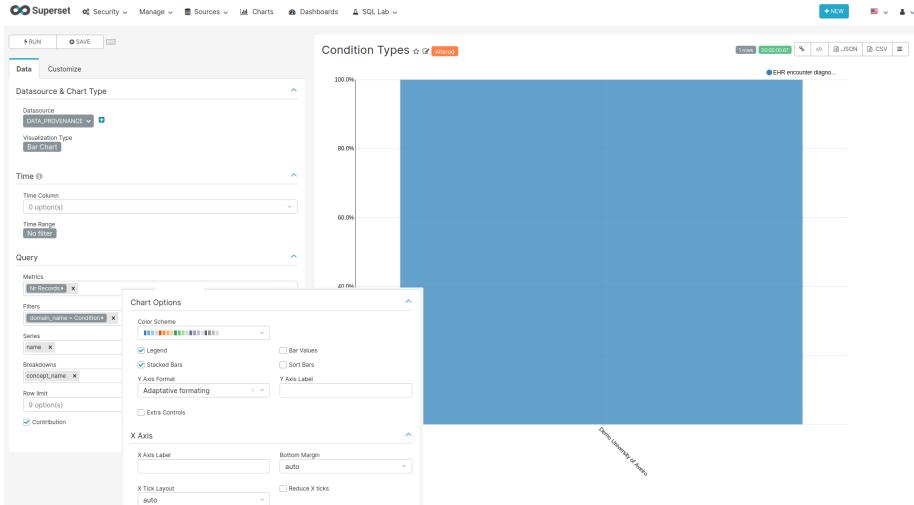


Figure 9.36: Settings for creating the Condition, Drug, Procedure, Device, Measurement and Observation charts

SQL query

All 6 charts use the same sql query.

```

SELECT source.name,
       source.acronym,
       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 CAST(stratum_2 AS BIGINT) = concept_id
 WHERE analysis_id IN (405,605,705,805,1805,2105)
 GROUP BY source.name, source.acronym, 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

```

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Bar Chart
 - Time
 - * Time range: No filter
 - Query
 - * Metrics: SUM(num_records) with label Nr Records
 - * Filters: domain_name=Condition or domain_name=Drug or domain_name=Procedure or domain_name=Device or domain_name=Measurement or domain_name=Observation
 - * Series: name
 - * Breakdowns: concept_name
 - * Contribution: on
- Customize Tab
 - Chart Options
 - * Stacked Bars: on

9.10 Data Domains [Deprecated]

CSS

To hide the dashboard header insert the following css code to the **CSS** field on the edit page:

```
.dashboard > div:not(.dashboard-content) { /* dashboard header */
  display: none;
}
```

With this every time you want to edit the dashboard layout you have to either comment the CSS inserted or remove it so the “Edit Dashboard” button can show again.

Data Source Filter

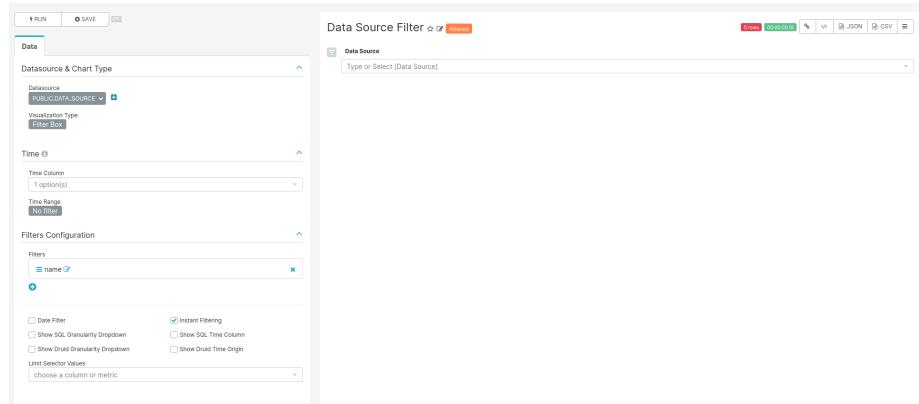


Figure 9.37: Settings for creating the Data Source filter chart

For the filter to work the name of the fields to filter should match in all tables used on the charts of this dashboard.

SQL query

No SQL query, use the sql table `data_source` of the `achilles` database.

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Filter Box
 - Time
 - * Time range: No filter

- Filters Configuration
 - * Filters:
 - name
 - * Date Filter: off
 - * Instant Filtering: on

Average Number of Records per Person {#avgRecordsPerPerson}

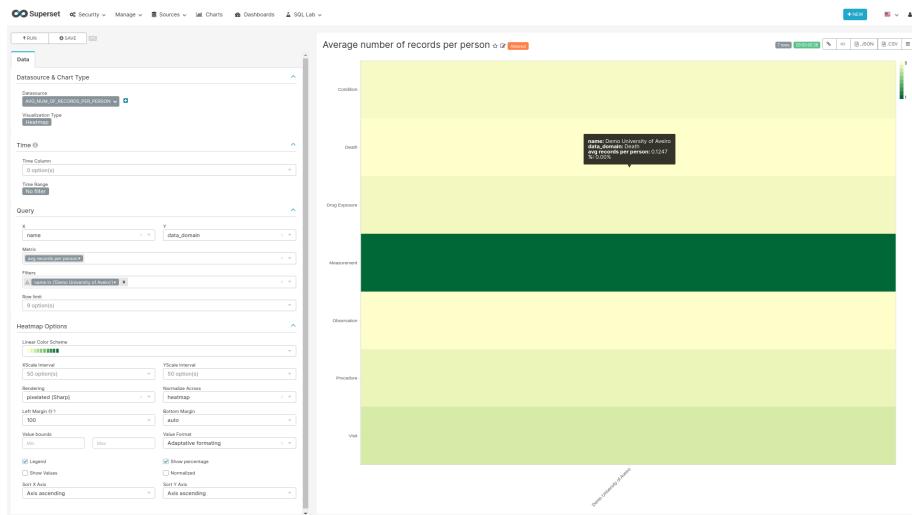


Figure 9.38: Settings for creating the Data Source filter chart

SQL query

```
SELECT
    source.name,
    source.acronym,
    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"
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.acronym
HAVING analysis_id IN (201, 401, 501, 601, 701, 801, 1801, 2101, 2201)

```

Chart settings

- Data Tab
 - Datasource & Chart Type
 - * Visualization Type: Heatmap
 - Time
 - * Time range: No filter
 - Query
 - * X: name
 - * Y: data_domain
 - * Metric: AVG(records_per_person) with a label avg records per person
 - * Row limit: None
 - Heatmap Options
 - * Left Margin: 100
 - * Show Percentage: off