

Applying the OMOP Common Data model to Dutch healthcare data

A case study

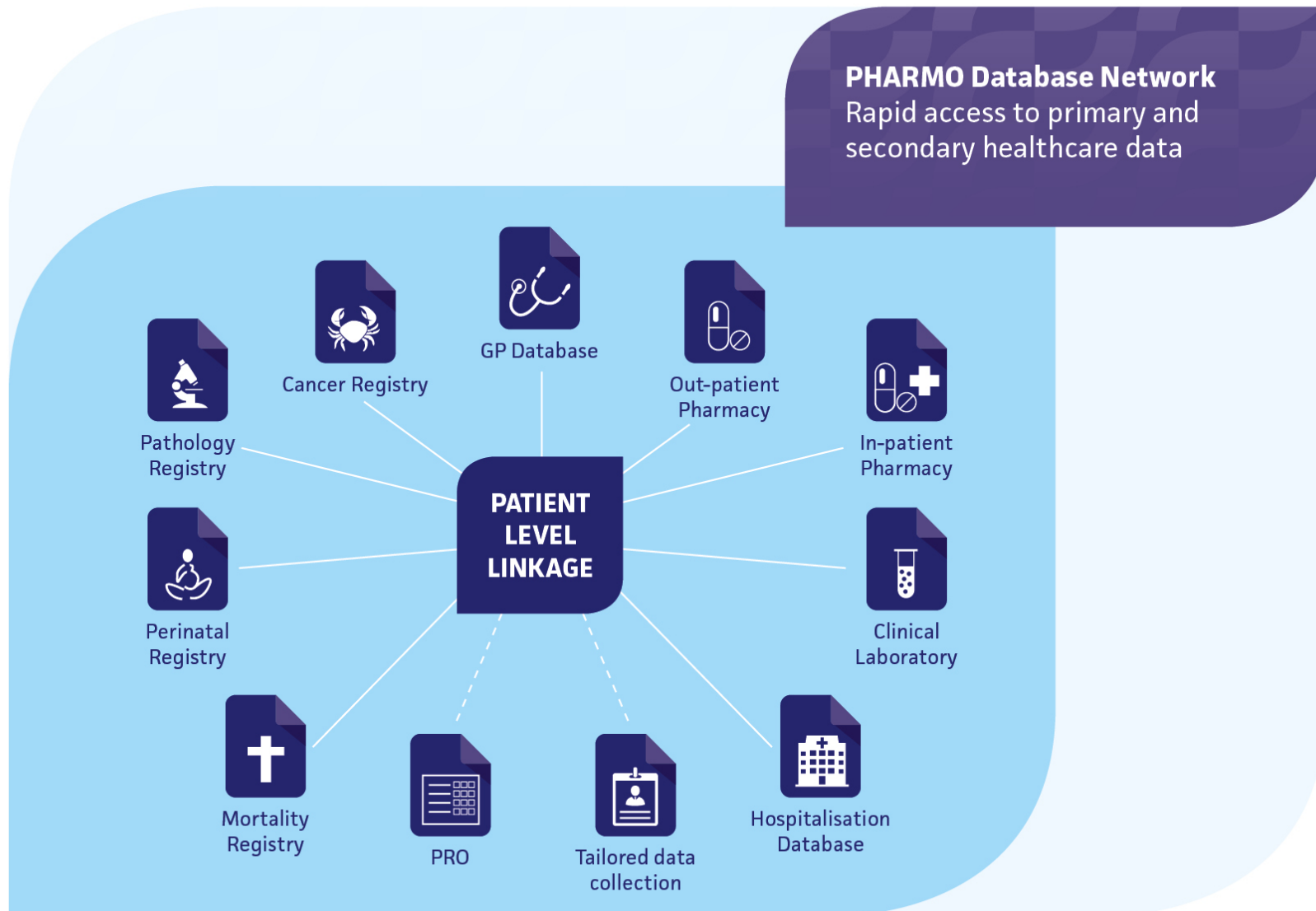


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Outline

- PHARMO Database Network
- Challenges
- OMOP Common Data Model & OHDSI
- PHARMO Diabetes Cohort
- Syntactic mapping
- Semantic mapping
- Deployment and Tools
- Conclusion and future steps

PHARMO Database Network (NL)



PHARMO in Europe

- Linked data
- GP data
- Claims data

Collaboration with partners in:

UK
Germany
France
Italy
Spain
Denmark
Norway
Sweden
Finland



Challenges

- Different Electronic Health Record (EHR) databases use different data standards
- EHR data is often coded in national coding systems
- Collaborations are often tailor made solutions
- Risk of 'reinventing the wheel'

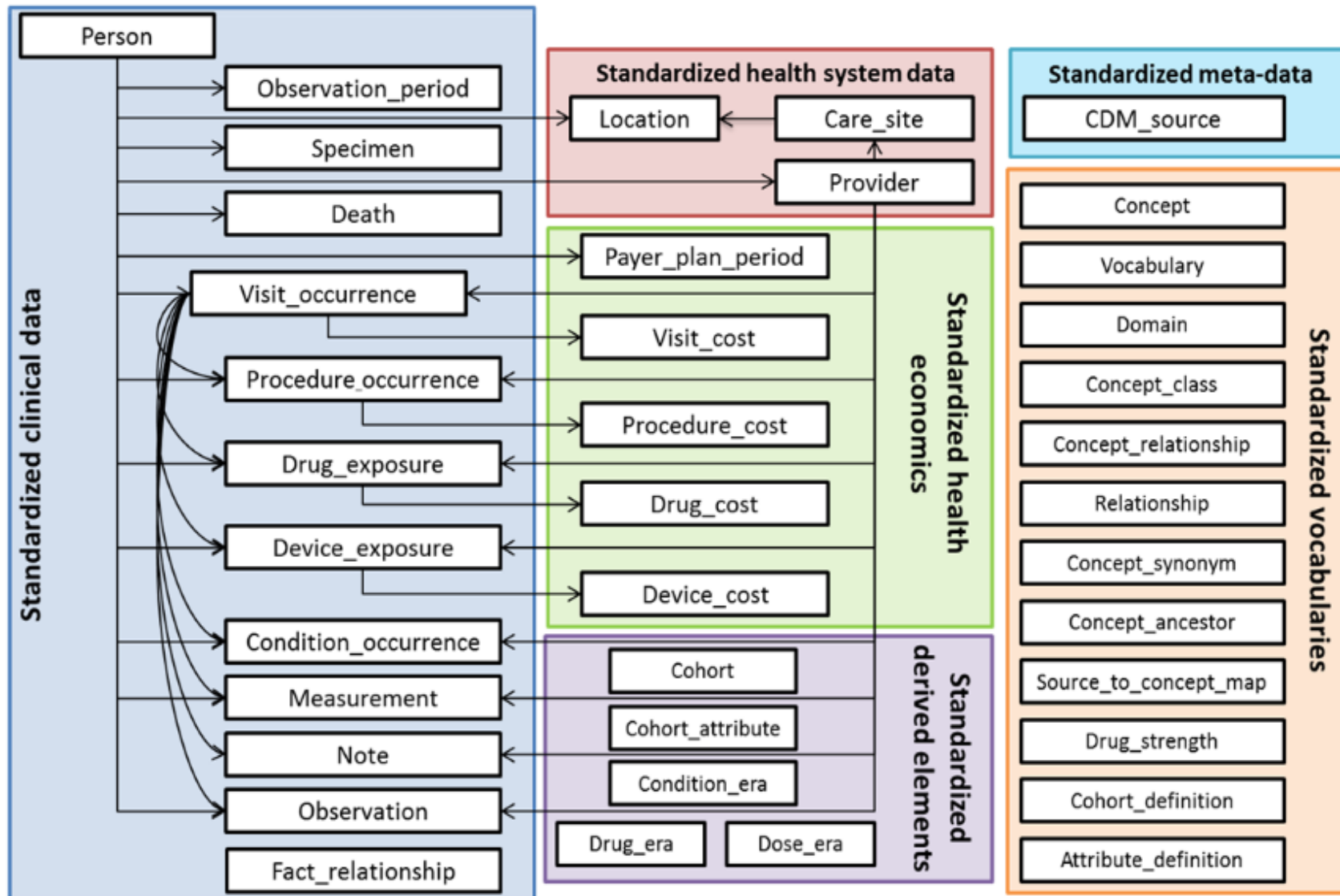
OMOP

- Observational Medical Outcomes Partnership
- public-private partnership
- aimed at the development of a common data model (CDM) and vocabulary
- specifically for observational healthcare databases
- The partnership ended in 2013

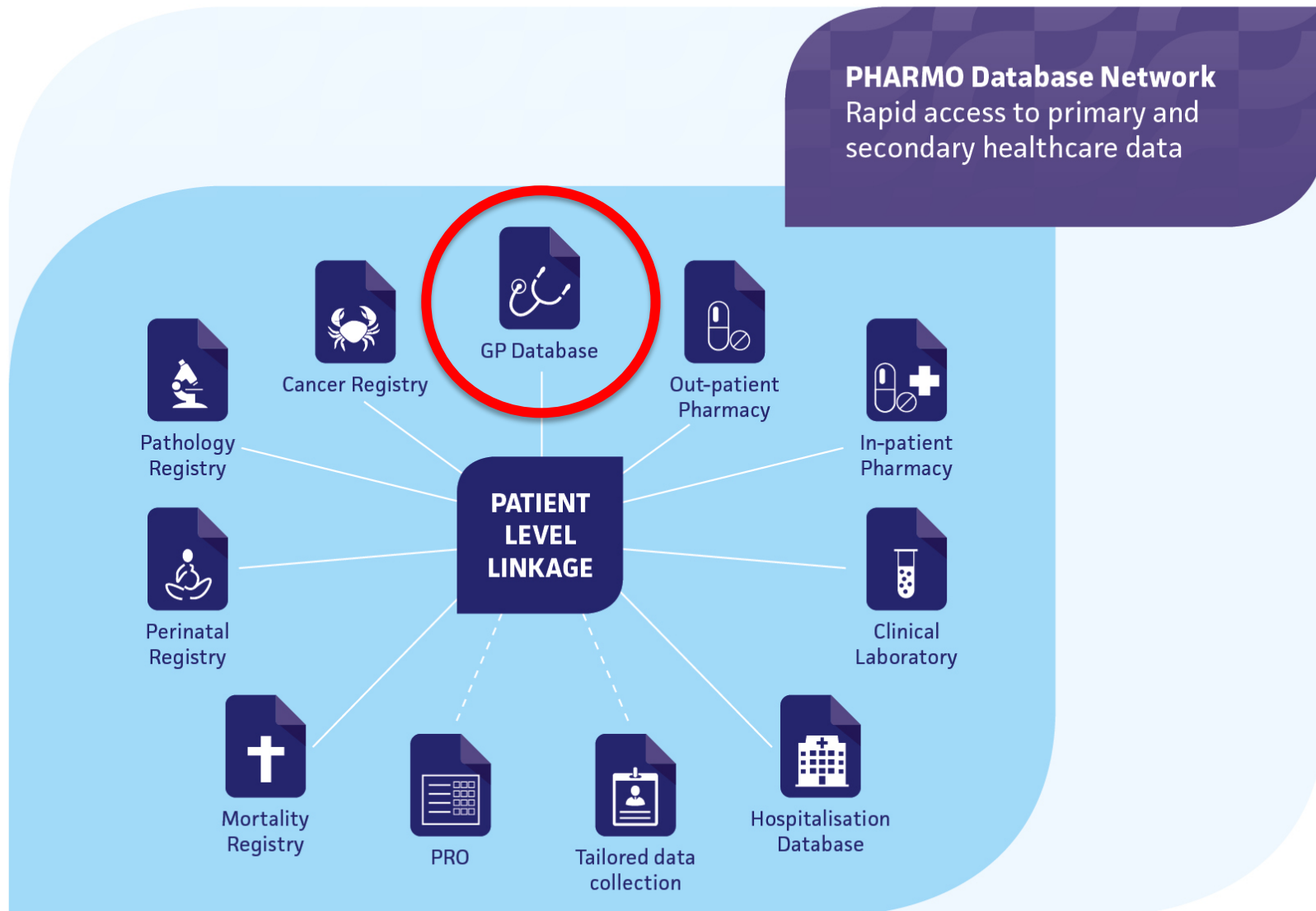
OHDSI

- Observational Health Data Sciences and Informatics collaborative
- a multi-stakeholder, interdisciplinary collaborative
- actively maintains the OMOP common data model and vocabulary
- aims at the creation of open-source solutions to leverage the value of observational health data through large-scale analytics

Common Data Model (version 5.0)



PHARMO Diabetes Cohort



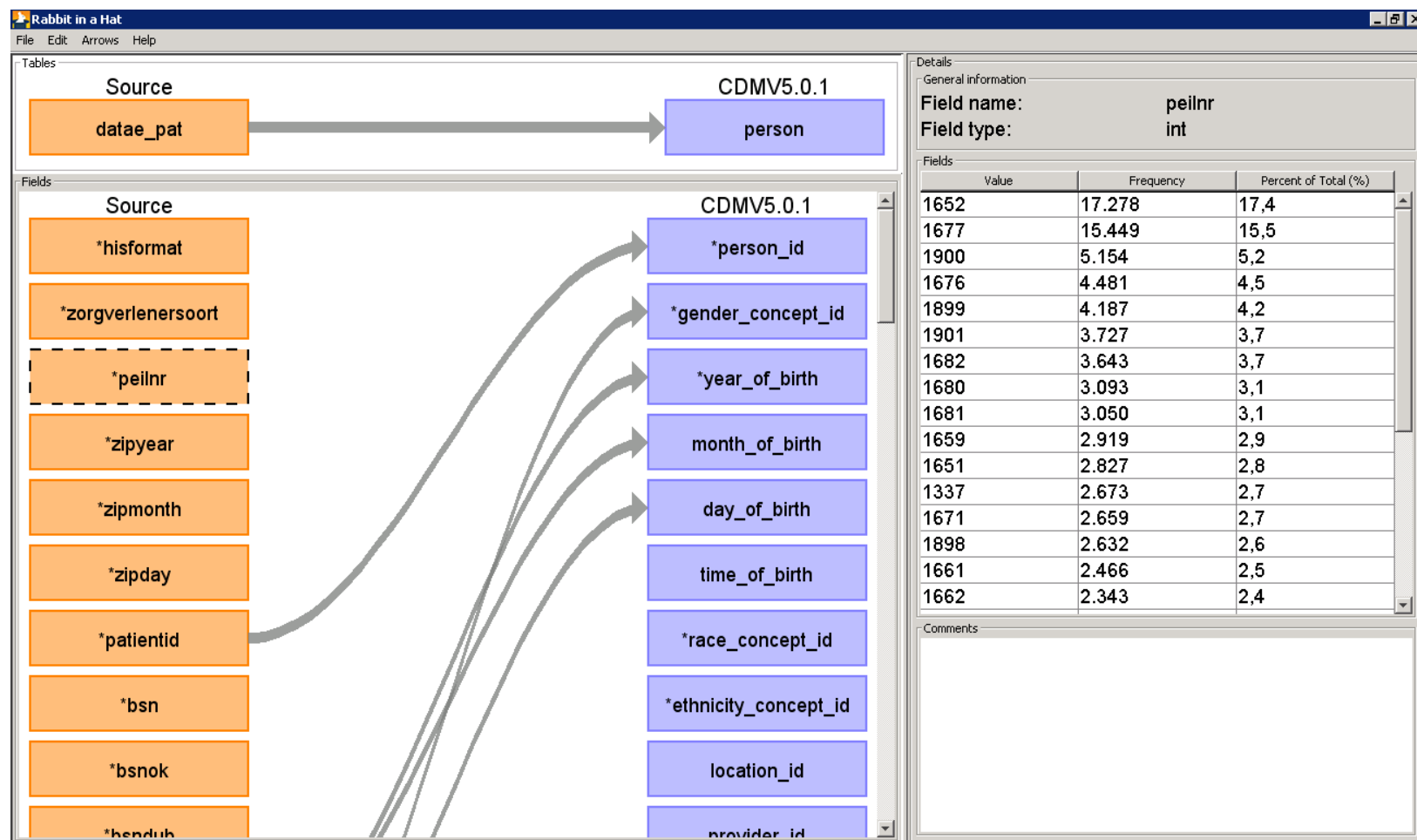
PHARMO Diabetes Cohort

- General Practitioner (GP) data from 2006-2016
- Diabetes care mainly managed in GP setting
- Sample of 73,829 patients with a Type 2 Diabetes Mellitus diagnosis.
- Average follow-up of 6.7 (± 3.7) years

Syntactic mapping

- data items available in the source data are mapped to the corresponding data items in the predefined target tables
- for example: medication prescriptions mapped to *drug exposure* table
- ‘White Rabbit’ scans and summarizes source data
- ‘Rabbit In A Hat’ GUI to create and annotate mappings

Rabbit In A Hat



Semantic mapping

- local coding systems are mapped to the coding systems as used within the OMOP common data model
- OHDSI tools are available
- based on English, not applicable to Dutch codes

Semantic mapping

Clinical concept	Local coding system	(Inter)national	Mapped to
Drug prescriptions	KNMP	National	RxNorm
Conditions	ICPC	International	SNOMED
Observations	WCIA	National	SNOMED
Measurements	WCIA	National	LOINC

- 100% mapping not feasible
- 80% mapping of cumulative count of occurrences

Deployment

- Syntactic and semantic mappings results in set of Extractions, Transform, Load (ETL) scripts
- Took 4 iterations to get the final set of ETL scripts
- We chose to handle data issues in the source tables to keep the ETL process comprehensive
- OHDSI tools installed

Achilles

- Tool for data characterization
- Summarizes data loaded in the OMOP CDM
- Creates predefined reports
- Achilles is an R package
- Results are visualized in a web application

Achilles dashboard



Data Sources ▾ Report

Pi_4th

Dashboard

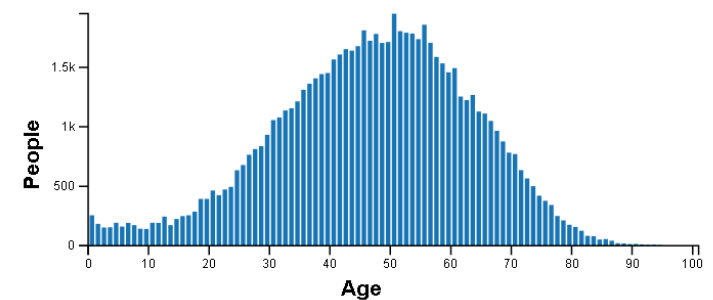
CDM Summary

Source name: 0
Number of persons: 73.83k

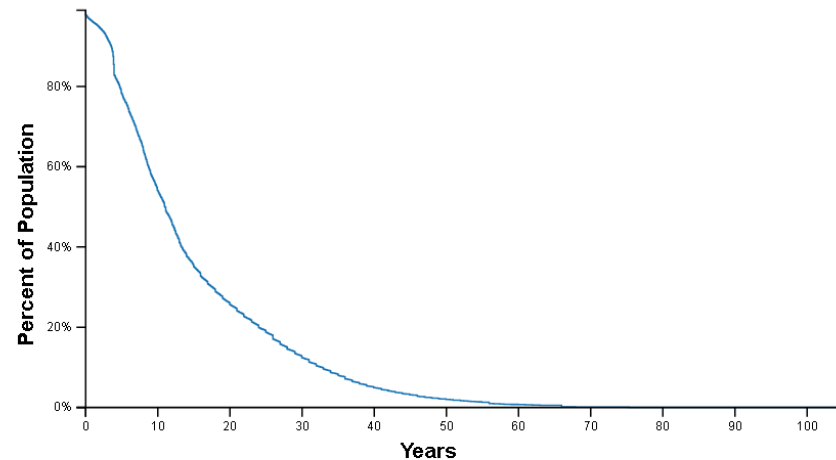
Population by Gender



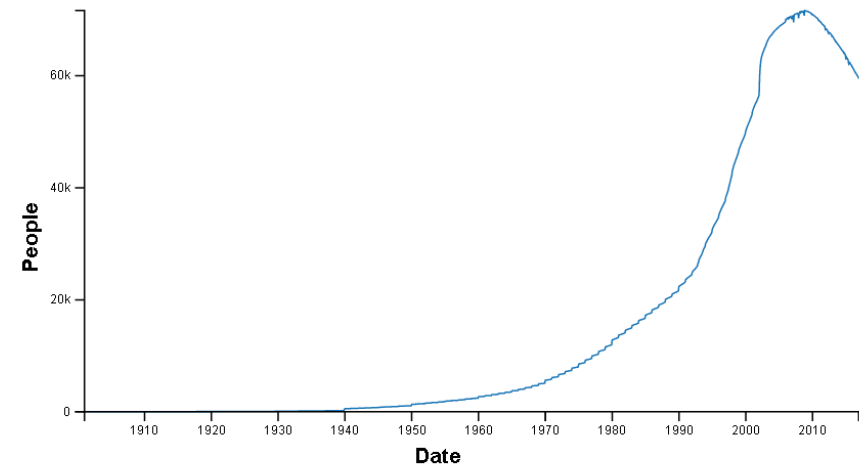
Age at First Observation



Cumulative Observation



Persons With Continuous Observation By Month



Achilles drug exposure report



Data Sources ▾ Repts

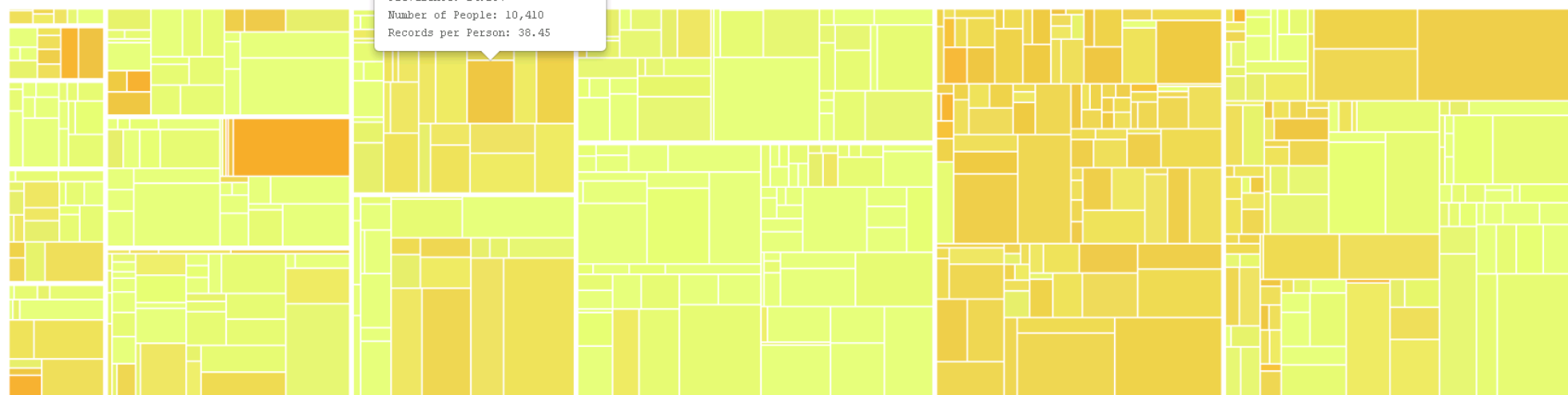
Pi_4th

Drug Exposure Report

Drug Prevalence

Treemap

Table



Box Size: Prevalence, Color: Records per Person (Blue to Orange = Low to High), Use Ctrl-Click to Zoom, Alt-Click to Reset Zoom

Atlas

- brings different individual components together in one user interface
- aid researchers to perform scientific analysis on the OMOP data
- allows users to create cohorts based on entry and exit criteria
- enables the user to browse the various vocabularies
- build on open source tools

Atlas dashboard

The screenshot displays the ATLAS dashboard. On the left is a dark blue sidebar with the 'ATLAS' logo at the top and a list of navigation items: Home, Data Sources, Vocabulary, Concept Sets, Cohorts, Incidence Rates, Profiles, Estimation, Jobs, Configuration, and Feedback. The main content area has a dark header bar with 'Home'. Below this, a welcome message states: 'Welcome to ATLAS. ATLAS is an open source application developed as a part of OHDSI intended to provide a unified interface to patient level data and analytics.' This is followed by a 'Documentation' section with a link to the user guide. A 'Getting Started' section contains two green buttons: 'Define a New Cohort' (with the description 'Begin performing research by defining the group of people you intend to study') and 'Search the Vocabulary' (with the description 'Search the different ontologies used to describe patient level data around the world'). The 'Release Notes' section lists links for 'ATLAS Version 2.1.0 Release Notes' and 'WebAPI Version 2.1.0 Release Notes', followed by a list of 9 enhancements and resolutions, each preceded by a small icon.

ATLAS	
Home	Home
Data Sources	Welcome to ATLAS. ATLAS is an open source application developed as a part of OHDSI intended to provide a unified interface to patient level data and analytics.
Vocabulary	Documentation The ATLAS user guide can be found here .
Concept Sets	Getting Started
Cohorts	Define a New Cohort Begin performing research by defining the group of people you intend to study
Incidence Rates	Search the Vocabulary Search the different ontologies used to describe patient level data around the world
Profiles	Release Notes
Estimation	ATLAS Version 2.1.0 Release Notes WebAPI Version 2.1.0 Release Notes
Jobs	This latest release contains 9 feature enhancements and issue resolutions:
Configuration	DataTables version bump and crossfilter enablement Add Impala tab showing cohort generation SQL Heracles Heel for Cohorts Autoselect for day options does not update the UI Concept set name writes right to left Error after creating new IR analysis async record count loading and add timeout controls Bug with Age at First Observation figure Concept lookup and related concepts query are multiplying between loadConcept()
Feedback	

Conclusion

- OMOP CDM may seem daunting at first
 - forces you to rethink your own data
 - software installations are tricky
- but:
- We are not alone
 - OHDSI is constantly developing and sharing new tools and packages
 - it will facilitate remote access and collaboration

Future steps

- Expand the mapping to other data sets (pharmacies, hospitalisations, etc.)
- Expand the mapping to other disease cohorts
- Finetune semantic mappings
- Run various analysis methods developed within OHDSI
- Explore the possibilities for remote access
- Collaborate in multi-database studies with OMOP

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