# – – OHDSI

Observational Health Data Sciences and Informatics (OHDSI)

2025-02-28

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| | | |
|---|---|---|
| Hamed Abedtash | Mustafa Ascha | Mark Beno |
| Clair Blacketer | David Blatt | Brian Christian |
| Gino Cloft | Frank DeFalco | Sara Dempster |
| Jon Duke | Sergio Eslava | Clark Evans |
| Thomas Falconer | George Hripcsak | Vojtech Huser |
| Mark Khayter | Greg Klebanov | Kristin Kostka |
| Bob Lanese | Wanda Lattimore | Chun Li |
| David Madigan | Sindhoosha Malay | Harry Menegay |
| Akihiko Nishimura | Ellen Palmer | Nirav Patil |
| Jose Posada | Nicole Pratt | Dani Prieto-Alhambra |
| Christian Reich | Jenna Reps | Peter Rijnbeek |
| Patrick Ryan | Craig Sachson | Izzy Saridakis |
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| Jamie Weaver | James Wiggins | Andrew Williams |
| Seng Chan You | | |

□□□□□□□□OHDSI□□□□□□□□

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| □□□□□ | □□□□□ |
|---|---|
| CaseControl | 1.6.0 |
| CaseCrossover | 1.1.0 |
| CohortMethod | 3.1.0 |
| Cyclops | 2.0.2 |
| DatabaseConnector | 2.4.1 |
| EmpiricalCalibration | 2.0.0 |
| EvidenceSynthesis | 0.0.4 |
| FeatureExtraction | 2.2.4 |
| MethodEvaluation | 1.1.0 |
| ParallelLogger | 1.1.0 |
| PatientLevelPrediction | 3.0.6 |
| SelfControlledCaseSeries | 1.4.0 |
| SelfControlledCohort | 1.5.0 |
| SqlRender | 1.6.2 |

# Part I

# OHDSI

# Chapter 1

# – – OHDSI

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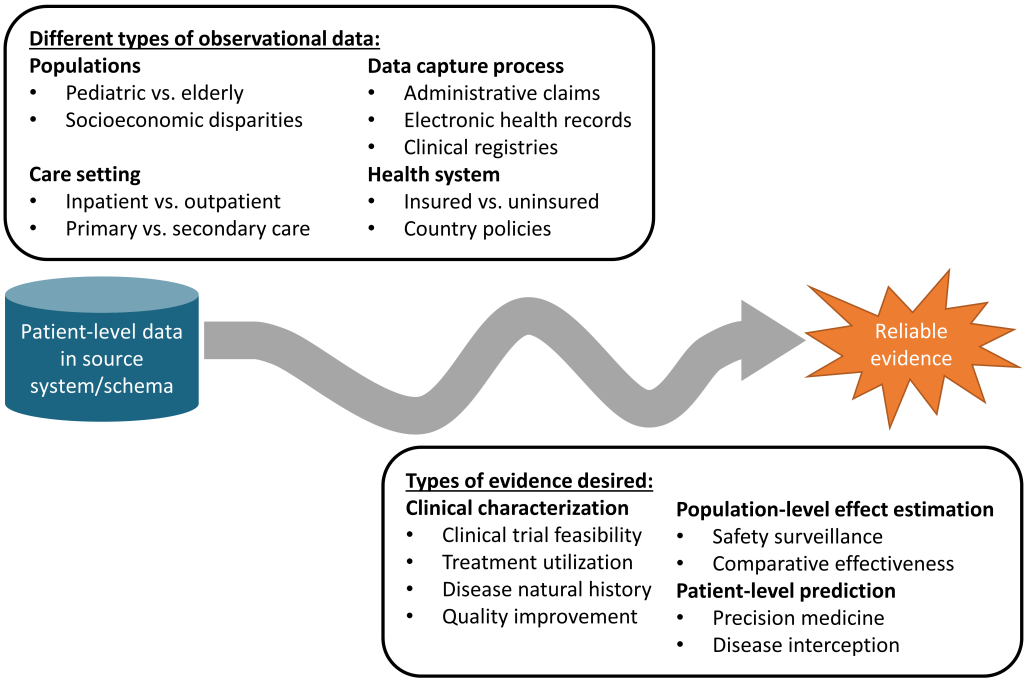


Figure 1.1: □□□□□□□□□□□□□□□

### 1.2.1

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## 1.3 OHDSI

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## 1.4 OHDSI

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# Chapter 2

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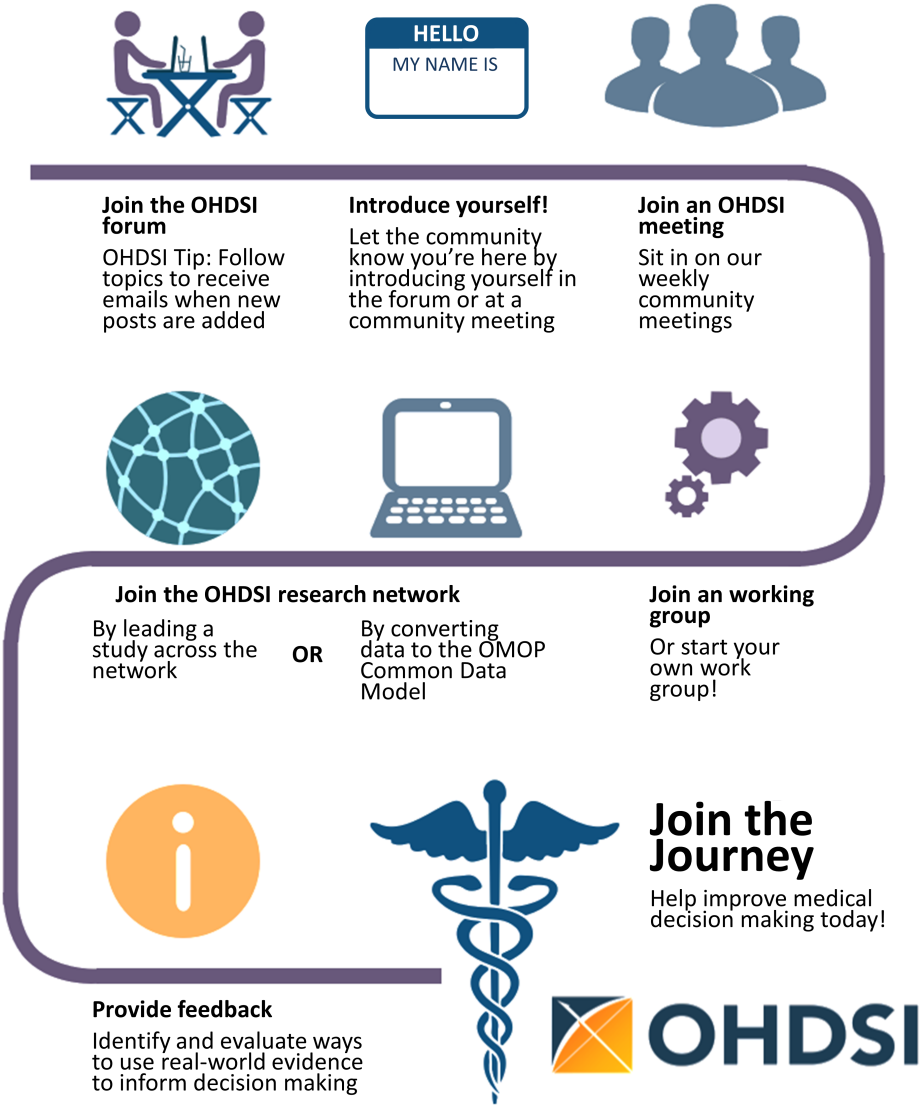


Figure 2.1: □□□□□□□□ - OHDSI□□□□□□□□□□□□□□□□

### 2.1.2 OHDSI

OHDSI□□□□□□□

| □□□□□□□□□ | □□ | □□□□□ |
|---|---|---|
| Gold Standard Phenotype Library | OHDSI□□□□□□□□

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# Chapter 3

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OHDSI□□□□□□□□□□□

## 3.3

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### 3.7.4

□□□□□□□□OMOP□□□□□□□□OHDSI□□□□□□□□□□□□□□□□

# 4 – –

# Chapter 4

□□□□: *Clair Blacketer*

□□□□

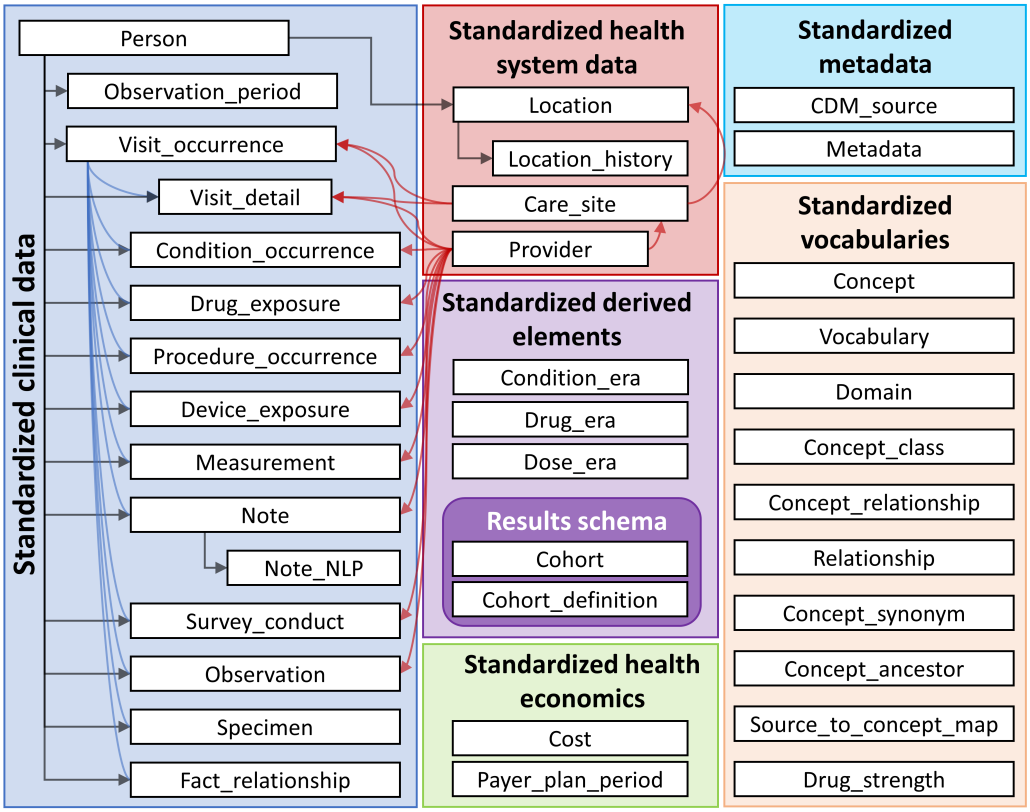


Figure 4.1: CDM□□□□□6.0□□□□□□□□

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| □□□□□□ | □□□□ID | □□□□□□ | □□□□ID |
|---|---|---|---|
| 145898 | Observation | 51 | Cost |
| 89645 | Measurement | 50 | Race |
| 33759 | Spec Anatomic Site | 13 | Plan Stop Reason |
| 17302 | Meas Value | 11 | Plan |
| 1799 | Specimen | 6 | Episode |
| 1215 | Provider Specialty | 6 | Sponsor |
| 1046 | Unit | 5 | Meas Value Operator |
| 944 | Metadata | 3 | Spec Disease Status |
| 538 | Revenue Code | 2 | Gender |
| 336 | Type Concept | 2 | Ethnicity |
| 194 | Relationship | 1 | Observation Type |

### 4.2.5

CDM□□□□□□□

- □□□□□□□□□

TERM CONNECTIONS (82)

| RELATIONSHIP | RELATES TO | CONCEPT ID | VOCABULARY |
|---|---|---|---|
| ICD-9-CM to MedDRA (MSSO) | Pulmonary tuberculosis | 36110777 | MedDRA |
| Non-standard to Standard map (OMOP) | Pulmonary tuberculosis | 253954 | SNOMED |
| Subsumes | Other specified pulmonary tuberculosis | 44830894 | ICD9CM |
| | Other specified pulmonary tuberculosis, bacteriological or histological examination not done | 44836741 | ICD9CM |
| | Other specified pulmonary tuberculosis, bacteriological or histological examination unknown (at present) | 44836742 | ICD9CM |
| | Other specified pulmonary tuberculosis, tubercle bacilli found (in sputum) by microscopy | 44821641 | ICD9CM |
| | Other specified pulmonary tuberculosis, tubercle bacilli not found (in sputum) by microscopy, but found by bacterial culture | 44833188 | ICD9CM |

Figure 4.3: □□□□SNOMED□□□

### 4.3.1 :

□□□□□□□

Table 4.3: PERSON□□□□□

| □□ | □ | □□ |
|---|---|---|
| PERSON_ID | 1 | PERSON_ID□□□□□□□□

| □□□□□□□ID | □□□ | □□□ | □□□ |
|---|---|---|---|
| 80 | 2011-01-06 | 2011-01-06 | □□□□ |
| 90 | 2012-01-06 | 2012-01-06 | □□□□ |
| 100 | 2013-01-07 | 2013-01-07 | □□□□ |
| 101 | 2013-01-14 | 2013-01-14 | □□□□ |
| 102 | 2013-01-17 | 2013-01-24 | □□□□ |

□□□□□□□□□□□□□□□□□□□□□OBSERVATION_PERIOD□□□□□□□□□□□□□□□□□□□□□□

Table 4.5: OBSERVATION_PERIOD□□□□□

| □□ | □ | □□ |
|---|---|---|
| OBSERVATION_ PERIOD_ID | 1 | □□□□□□□□□□□□□□□□□□□□

| □□ | □ | □□ |
|---|---|---|
| VISIT_TYPE_ CONCEPT_ID | 32034 | □□□□□□□□□□□□□□□□□□□□□□□□□□□□EHR□ |
| PROVIDER_ID | NULL | □□□□□□□□□□□□□□□□□□□□

| □□ | □ | □□ |
|---|---|---|
| CONDITION_START_DATE | 2010-01-06 | □□□□□□□□□□□□□□ |
| CONDITION_START_DATETIME | 2010-01-06 00:00:00 | □□□□□□□□□□□□□□

□□ **4.2.** □□□□2015□1□1□□□□□□□□□□□□□□□□□□□□□□□□□□□□2019□7□1□□□□□□□□□

□□ **4.3.** □□□□2019□5□1□□□□□□□□□□200 MG□□□□□□NDC□□□□76168009520□□30□

□□□□

□□□3□□□□□□□□□□□□□□@ref□installR□□□□□□□□□□□□□R□R-Studio□□□□Java□□□

```
install.packages(c("SqlRender", "DatabaseConnector", "remotes"))
remotes::install_github("ohdsi/Eunomia", ref = "v1.0.0")
```

Eunomia□□□□□□□□□□□□□R□□□□□□□□□□□□□CDM□□□□□□□□□□□□□□□□□□□□□□□□

```
connectionDetails <- Eunomia::getEunomiaConnectionDetails()
```

CDM□□□□□□□□□□□□□□main□□□□□□□□CONDITION_OCCURRENCE□□□□□□□□□□□□

```
library(DatabaseConnector)
connection <- connect(connectionDetails)
sql <- "SELECT *
FROM @cdm.condition_occurrence
LIMIT 1;"
result <- renderTranslateQuerySql(connection, sql, cdm = "main")
```

□□ **4.4.** SQL□R□□□□□□□□□□□□□□□□□□□□□□□ID192671□□□□□□□□□□□□□□□□□□□□□□

□□ **4.5.** SQL□R□□□□□□□□□□□□□□□□□□□

# Chapter 5

# 5 — —

□□□□: *Christian Reich & Anna Ostropolets*

OMOP□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□OHDSI□□□□□□□

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## 1660.

# A General BILL for this present Year,

Ending the 11th Day of December 1660.

According to the Report made to the King's most excellent Majesty,

By the Company of Parish Clerks of LONDON, &c.

### DISEASES and CASUALTIES.

| | | | | | |
|---|---|---|---|---|---|
| Abortive and Stillborn | 421 | Flox and Small Pox | 1523 | Palsy | 17 |
| Aged | 909 | Found dead in the Streets, Fields, &c. | 2 | Plague | 36 |
| Ague and Fever | 2303 | French Pox | 51 | Plurisy | 12 |
| Apoplexy and Suddenly | 91 | Gout | 4 | Quinsy and sore Throat | 21 |
| Blasted and Planet | 3 | Grief | 13 | Rickets | 441 |
| Bleeding and bloody Issue | 7 | Griping in the Guts | 253 | Rising of the Lights | 210 |
| Bloody Flux, Scowring, and Flux | 346 | Hanged and made away themselves | 11 | Rupture | 12 |
| Burnt and Scalded | 6 | Head-ach and Headmouldshot | 35 | Scurvy | 82 |
| Cancer, Gangrene and Fistula | 63 | Jaundies | 102 | Shot | 7 |
| Canker, sore Mouth and Thrush | 73 | Imposthume | 105 | Shingles | 1 |
| Childbed | 226 | Killed by several Accidents | 55 | Sores, Ulcers, broken and bruised Limbs | 61 |
| Chrisomes and Infants | 858 | King's Evil | 28 | Spleen | 7 |
| Cold, Cough and Hiccough | 33 | Lethargy | 6 | Spotted Fever and Purples | 368 |
| Colick and Wind | 116 | Livergrown | 8 | Starved | 7 |
| Consumption and Tissick | 2982 | Lunatick and Frenzy | 14 | Strangury | 22 |
| Convulsion | 742 | Megrims | 5 | Stopping of the Stomach | 186 |
| Cut of the Stone and Stone | 46 | Measles | 6 | Surfeit | 202 |
| Dropsy and Tympany | 646 | Mother | 1 | Swine Pox | 2 |
| Drowned | 57 | Murthered | 7 | Teeth and Worms | 839 |
| Executed | 7 | Overlaid and Starved at Nurse | 46 | Vomiting | 8 |
| Falling Sickness | 4 | | | Wen | 1 |

Figure 5.1: 1660□□□□□□□□□

### 5.1.2

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OMOP CDM□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□zip□□□□□

### 5.1.3 :

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### 5.2.3

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□□□□□□□□□□□□Pallas□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□OM

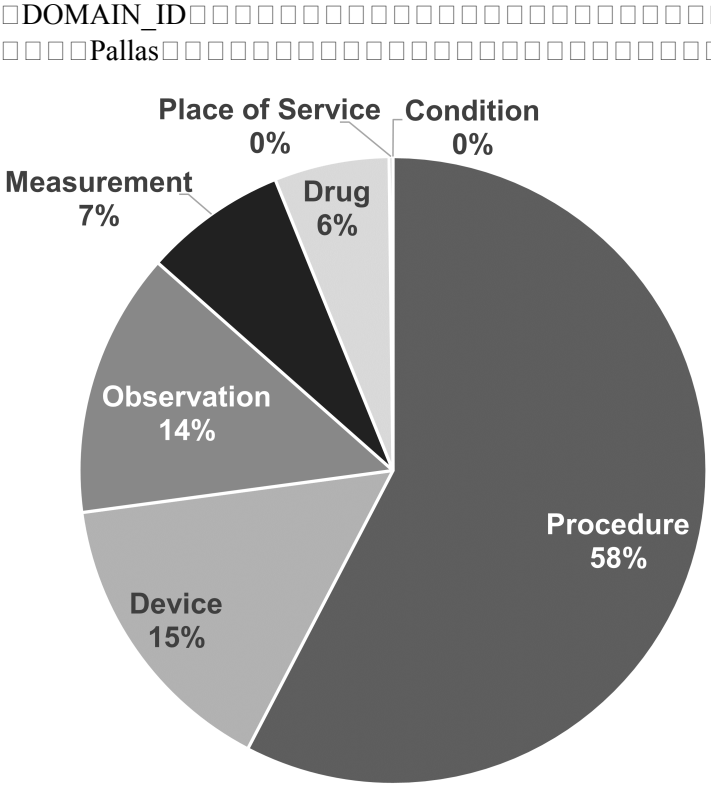


Figure 5.3: □□□□□□□□□□CPT4□□□HCPCS□□□□□□□□□□□□□□□□□□□

| □□□□□□

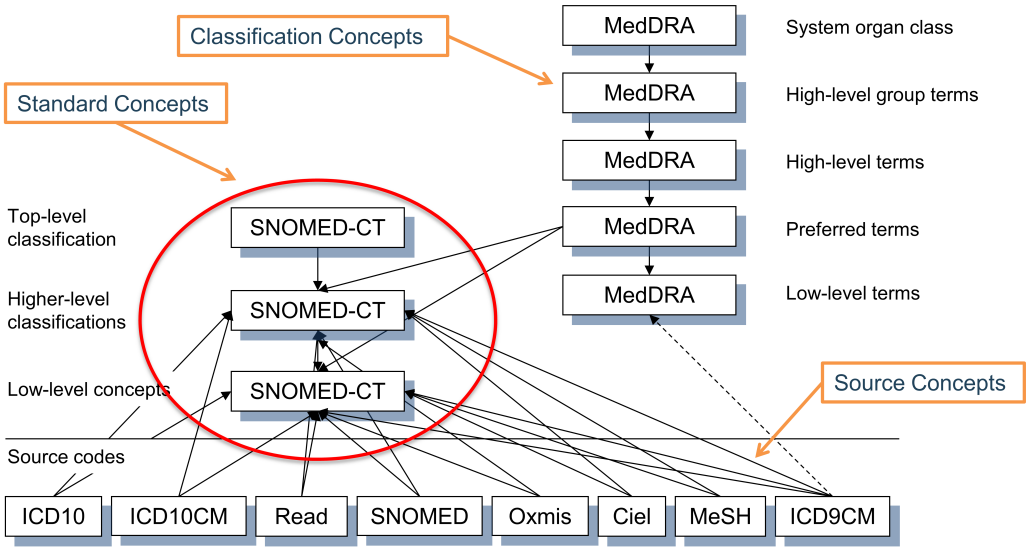
Classification Concepts
Standard Concepts
MedDRA
MedDRA
MedDRA
MedDRA
MedDRA
System organ class
High-level group terms
High-level terms
Preferred terms
Low-level terms
Top-level classification
Higher-level classifications
Low-level concepts
SNOMED-CT
SNOMED-CT
SNOMED-CT
Source Concepts
Source codes
ICD10
ICD10CM
Read
SNOMED
Oxmis
Ciel
MeSH
ICD9CM

Figure 5.4: □□□□□□□□□□

- VALID_START_DATE: □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□1
1-1□ - VALID_END_DATE: □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
- INVALID_REASON: “U” - □□□□□□□□□□□□□□□□□□□□□□□□ - □□:
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Table 5.5: □□□□Finding site of□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

| CONCEPT_ID_1 | CONCEPT_ID_2 |
|---|---|
| 4000504 “Urethra part” | 36713433 “□□□□□□□” |
| 4000504 “Urethra part” | 433583 “□□□□□□” |
| 4000504 “Urethra part” | 443533 “□□□□□□□□” |
| 4000504 “Urethra part” | 4005956 “□□□□□□□□” |

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## 5.5

DOMAIN_ID□VOCABULARY_ID□CONCEPT_CLASS_ID□□□□CONCEPT□□□□□□□□□□CON
VOCABULARY□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□VOCABULARY_REFI

## 5.6

### 5.6.1

OMOP CDM□□□□□□□□□□□□□□□□□□□

## 5.7

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# Chapter 6

# 6 — —

□□□□: *Clair Blacketer & Erica Voss*

## 6.1

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ETL□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□4□□□□□□□□□□□□□□□

1. □□□□□□□□□CDM□□□□□□□□□ETL□□□□□□□□□
2. □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
3. □□□□ETL□□□□□□
4. □□□□□□□□□□□□□□□

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## □□□□ 1: ETL□□□□□

ETL□□□□□□□□□□□□□□□□□□□

## □□□□□

White Rabbit□□□□□□□□□

□□□□□□□□□□□

White Rabbit□□□□□□□□□□□

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| 1 | Table | Field | Type | Max length | N rows | N rows checked | Fraction empty |
| 2 | dbo.allergies | start | date | 10 | 3184 | 3184 | 0 |
| 3 | dbo.allergies | stop | date | 10 | 3184 | 3184 | 0.725188442 |
| 4 | dbo.allergies | patient | varchar | 36 | 3184 | 3184 | 0 |
| 5 | dbo.allergies | encounter | varchar | 36 | 3184 | 3184 | 0 |
| 6 | dbo.allergies | code | varchar | 9 | 3184 | 3184 | 0 |
| 7 | dbo.allergies | description | varchar | 24 | 3184 | 3184 | 0 |
| 8 | | | | | | | |
| 9 | dbo.careplans | id | varchar | 36 | 30199 | 30199 | 0 |
| 10 | dbo.careplans | start | date | 10 | 30199 | 30199 | 0 |
| 11 | dbo.careplans | stop | date | 10 | 30199 | 30199 | 0.057849598 |
| 12 | dbo.careplans | patient | varchar | 36 | 30199 | 30199 | 0 |
| 13 | dbo.careplans | encounter | varchar | 36 | 30199 | 30199 | 0 |
| 14 | dbo.careplans | code | varchar | 15 | 30199 | 30199 | 0 |
| 15 | dbo.careplans | description | varchar | 62 | 30199 | 30199 | 0 |
| 16 | dbo.careplans | reasoncode | varchar | 9 | 30199 | 30199 | 0.050796384 |
| 17 | dbo.careplans | reasondescription | varchar | 56 | 30199 | 30199 | 0.050796384 |
| 18 | | | | | | | |

Overview | dbo.allergies | dbo.carepla ...

Figure 6.3: □□□□□□□□□□□□□□□□□□□□

| | A | B |
|---|---|---|
| 1 | Sex | Frequency |
| 2 | 2 | 61491 |
| 3 | 1 | 35401 |
| 4 | List truncated... | |

Figure 6.4: □□□□□□□□□□□

□□□□

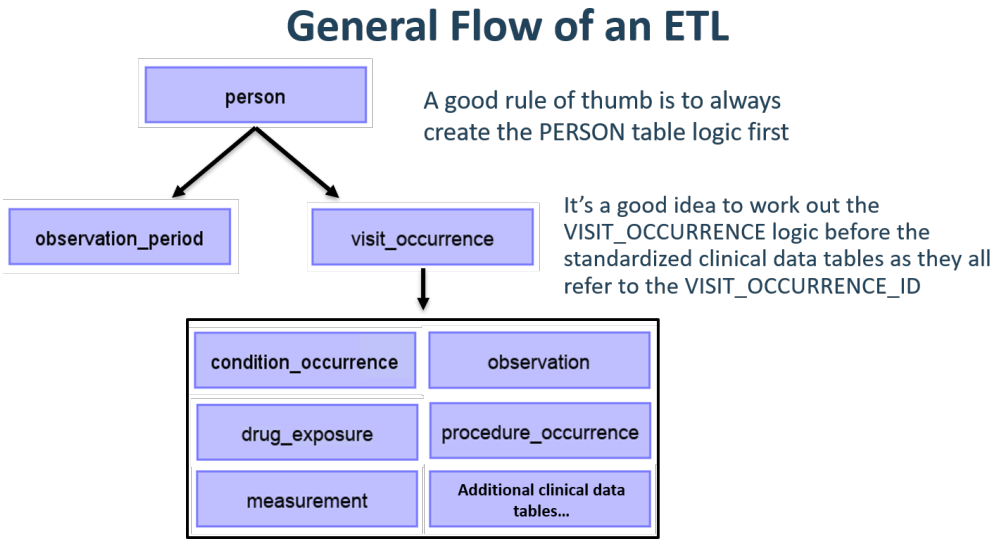


Figure 6.5: ETL□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

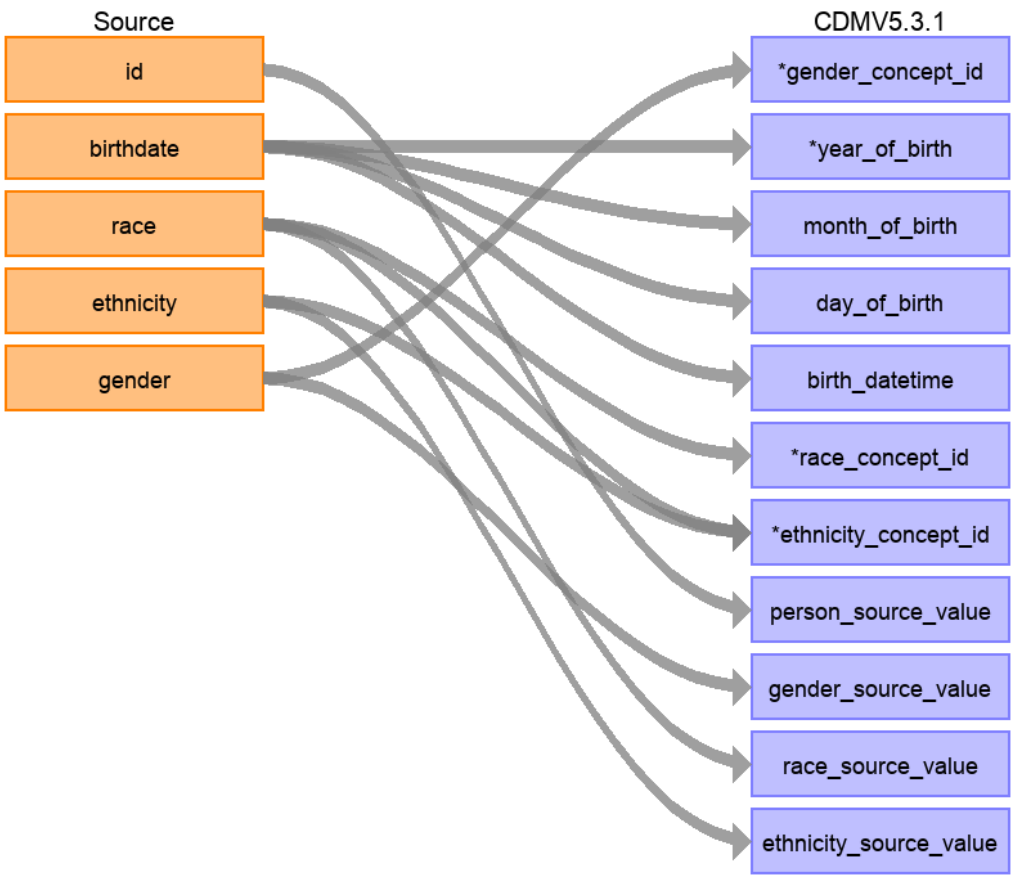


Figure 6.6: Synthea Patients□□□□□□□CDM PERSON□□□□□□□□□□□□□□

□□(□tab:syntheaEtlPerson) Synthea Patients□□□□□CDM PERSON□□□□□□□□□□□□□ETL

| □□□□□□□ | □□□□□□□□□□□□□□□□□ |
|---|---|
| PERSON_ID | □□□□□ PERSON_ID□□□□□□□□□□□□□□□□□□□□□□□id□□var □□□□id□□□□□□□□□□□□□□□□□□□□□□□□□□□□ |
| GENDER_CONCEPT_ID gender | □□□□M□□□□□GENDER_CONCEPT_ID□8507□□ |
| YEAR_OF_BIRTH birthdate | □□□□□□ |

## 6.2 2:

OMOP□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□CDM□□□□ 10CM□□□□□□□□□□□□□□□□□□SNOMED□□□□□□□□□□□□□□□□□□□□□□□□□□□relationship_id =□Maps to□□□□CONCEPT_RELATIONSHIP□□□□□□□□□□□□□□□□□□□□□□□□□□□□ICD-10CM□□□□I21□□□□□□□□□□□□□□□□□□□

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1. □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
2. Usagi□□□□□□□□□□□□□□□□□□□

## 6.3 3: ETL

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6.6 □□□□□□□□□□□□

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□□□ETL□□□□□□□□□□□□□□□□□□□□□□□□□

- ETL-Synthea - Synthea□□□□□□□□□□□□□□□□□□□□□SQL□□□□
  - https://github.com/OHDSI/etl-synthea
- ETL-CDMBuilder - □□□□□□□□□□□□□□□□□□□□□□□□□□□□.NET□□□□□□□□□
  - https://github.com/OHDSI/etl-cdmbuilder
- ETL-LambdaBuilder - AWS lambda□□□□□□□□□□□□
  - https://github.com/OHDSI/etl-lambdabuilder

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□□□□□□□□□

C) □□□□□□□□□□□□□□□□□□□□□□□□
D) □□□□□□□□□□□□□□□□

□□ **6.2.** □□□□OHDSI□□□□□□□□□□□□6.2□□□PERSON□□□□□□□□4□□□□□□□□□□

□: PERSON□□□□□

| □ | □ |
|---|---|
| PERSON_ID | A123B456 |
| GENDER_CONCEPT_ID | 8532 |
| YEAR_OF_BIRTH | NULL |
| MONTH_OF_BIRTH | NULL |
| DAY_OF_BIRTH | NULL |
| RACE_CONCEPT_ID | 0 |
| ETHNICITY_CONCEPT_ID | 8527 |
| PERSON_SOURCE_VALUE | A123B456 |
| GENDER_SOURCE_VALUE | F |
| RACE_SOURCE_VALUE | WHITE |
| ETHNICITY_SOURCE_VALUE | □□□□□□□□□ |

□□ **6.3.** VISIT_OCCURRENCE□□□□□□□□□□□□□□□□□□□□□Synthea□□□□□□□□□□□□□
PATIENT□START□END□□□□□□□□□□□□□□□□□□PERSON_ID□□□□□□□□□END□□□□□

- MIN(START)□VISIT_START_DATE□□□□□
- MAX(END)□VISIT_END_DATE□□□□□
- “IP”□PLACE_OF_SERVICE_SOURCE_VALUE□□□□□

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Data Output Explain Messages Notifications Query History

| | id character varying (1000) | start date | stop date | patient character varying (1000) | encounterclass character varying (1000) |
|---|---|---|---|---|---|
| 1 | 12 | 2004-09-26 | 2004-09-27 | 11 | inpatient |
| 2 | 13 | 2004-09-27 | 2004-09-30 | 11 | inpatient |

Figure 6.8: □□□□□□□□□

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# 7 – –

# Chapter 7

□□□□□□□□: *David Madigan*

OHDSI□□□□□□□□

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## 7.3

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### 7.4.2

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**□□ 7.2.** □□□□□□□□□□□□□□□□□□□□□□□□□GI□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

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# Chapter 8

# 8 – – OHDSI

□□□□□*Lead: Martijn Schuemie & Frank DeFalco*

OHDSI□□□□□

Library□□□□□

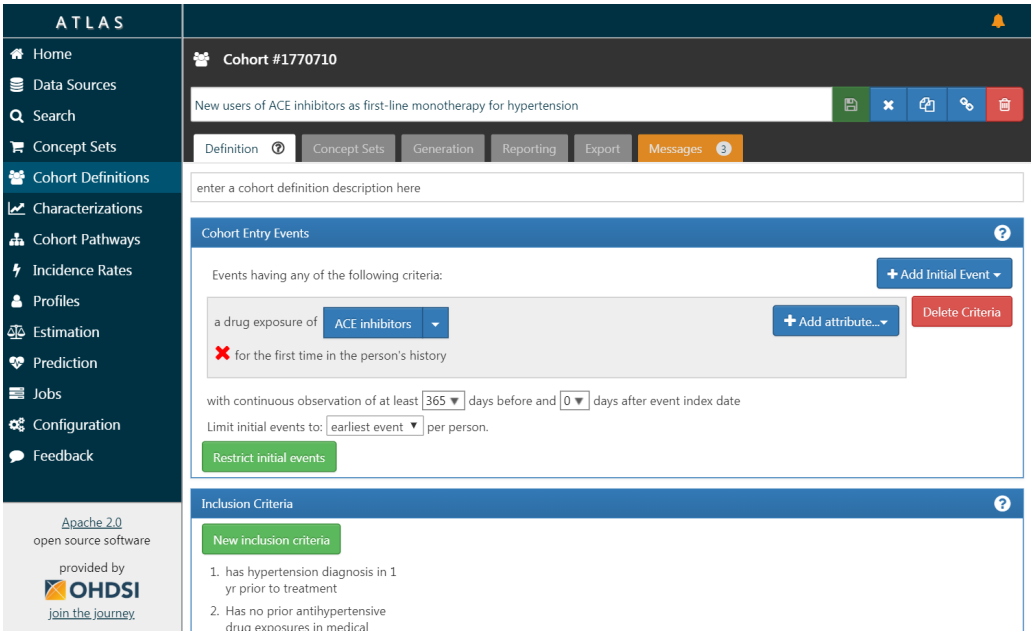


Figure 8.3: ATLAS□□□□□□□□□□□

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### 8.3.2

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Figure 8.4: OHDSI□□□□□□□□□□□□□□□□□□□□

### 8.4.3

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### 8.5.2 Amazon AWS

Amazon□□AWS□□□□

## 8.6

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- □□□□□OHDSI□□□□□□□□□□□□□□□□□□□□□□□□□□
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# Chapter 9

# 9 – – SQL R

□□□□□□□□□: *Martijn Schuemie & Peter Rijnbeek*

□□□□□□□□□□CDM□□□□□□□□□□

## 9.1 SqlRender

SqlRender □□□□□□ CRAN□Comprehensive R Archive Network□□□□□

```
sql <- "SELECT * FROM cohort {@x} ? {WHERE subject_id = 1}"
render(sql, x = FALSE)
```

```
## [1] "SELECT * FROM cohort "
```

```
render(sql, x = TRUE)
```

```
## [1] "SELECT * FROM cohort WHERE subject_id = 1"
```

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```
sql <- "SELECT * FROM cohort {@x == 1} ? {WHERE subject_id = 1};"
render(sql, x = 1)
```

```
## [1] "SELECT * FROM cohort WHERE subject_id = 1;"
```

```
render(sql, x = 2)
```

```
## [1] "SELECT * FROM cohort ;"
```

IN □□□□□□□□□□□□□□□□□

```
sql <- "SELECT * FROM cohort {@x IN (1,2,3)} ? {WHERE subject_id = 1};"
render(sql, x = 2)
```

```
## [1] "SELECT * FROM cohort WHERE subject_id = 1;"
```

### 9.1.2 SQL

SqlRender □□□□□□□□□□□□□□□□□OHDSI SQL□□□□□SQL□□□□□□□□□□□□□□□□□□

```
sql <- "SELECT TOP 10 * FROM person;"
translate(sql, targetDialect = "postgresql")
```

```
## [1] "SELECT  * FROM person LIMIT 10;"
## attr(,"sqlDialect")
## [1] "postgresql"
```

`targetDialect` □□□□□□□□□□□□□□□□□□□□□“oracle”, “postgresql”, “pdw”, “redshift”, “impala”, “netezza”, “bigquery”, “sqlite”, “sql server”□

□□□□SQL□□□□□

```sql
SELECT * FROM (SELECT * FROM table_1) tmp WHERE a = b;

-- Limiting to top rows:
SELECT TOP 10 * FROM table;

-- Selecting into a new table:
SELECT * INTO new_table FROM table;

-- Creating tables:
CREATE TABLE table (field INT);

-- Inserting verbatim values:
INSERT INTO other_table (field_1) VALUES (1);

-- Inserting from SELECT:
INSERT INTO other_table (field_1) SELECT value FROM table;

-- Simple drop commands:
DROP TABLE table;

-- Drop table if it exists:
IF OBJECT_ID('ACHILLES_analysis', 'U') IS NOT NULL
  DROP TABLE ACHILLES_analysis;

-- Drop temp table if it exists:
IF OBJECT_ID('tempdb..#cohorts', 'U') IS NOT NULL
  DROP TABLE #cohorts;

-- Common table expressions:
WITH cte AS (SELECT * FROM table) SELECT * FROM cte;

-- OVER clauses:
SELECT ROW_NUMBER() OVER (PARTITION BY a ORDER BY b)
  AS "Row Number" FROM table;

-- CASE WHEN clauses:
SELECT CASE WHEN a=1 THEN a ELSE 0 END AS value FROM table;

-- UNIONs:
SELECT * FROM a UNION SELECT * FROM b;

-- INTERSECTIONs:
SELECT * FROM a INTERSECT SELECT * FROM b;

-- EXCEPT:
SELECT * FROM a EXCEPT SELECT * FROM b;
```

### □□□□□□

□□□□□□□□SQL Server□□□□□□□□□□□□□□□□□□□□□1□□□□SQL Server□□□SELECT `first_name + ' ' + last_name AS full_name FROM table` □□□□□□□□□□□ PostgreSQL □ Oracle □□ `SELECT first_name || ' ' || last_name AS full_name FROM table` □□□□□□□□□□□□SqlRender□□□□□□□□□□□□□□□□□□□

```
## Warning: The 'oracleTempSchema' argument is deprecated. Use 'tempEmulatio
## This warning is displayed once every 8 hours.

## [1] "SELECT * FROM temp_schema.icmtp2z0children ;"
## attr(,"sqlDialect")
## [1] "oracle"
```

□□□□□ temp_schema □□□□□□□□□□□□□□□□□□□□□□□□

□□□Oracle□□□□□□□□□□□□□30□□□□□□□□□□□□□□□□□□□

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SQL Server□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□cdm_data.dbo.pe
□ cdm_data □□□□□□□□□ dbo □□□□□□□ person □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
Server□□□□□□□□□□□□□□□□1□□□□□□□□□□□□□ dbo □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
PostgreSQL□□□SQL Server□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

□□□□□□□SQL Server□□□□□□□□□□□□□□□□□□□

### 9.2.1

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```
querySql(conn, "SELECT TOP 3 * FROM person")
```

```
##   person_id gender_concept_id year_of_birth
## 1         1               8507          1975
## 2         2               8507          1976
## 3         3               8507          1977
```

```
executeSql(conn, "TRUNCATE TABLE foo; DROP TABLE foo;")
```

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```
SELECT COUNT(*) AS person_count FROM @cdm.person;
```

| PERSON_COUNT |
|---|
| 26299001 |

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```
SELECT AVG(DATEDIFF(DAY,
                    observation_period_start_date,
                    observation_period_end_date) / 365.25) AS num_years
FROM @cdm.observation_period;
```

| NUM_YEARS |
|---|
| 1.980803 |

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```
        INNER JOIN @cdm.observation_period
            ON person.person_id = observation_period.person_id
        ) age_computed
    )
SELECT MIN(age) AS min_age,
    MIN(CASE
            WHEN order_nr < .25 * n
                THEN 9999
            ELSE age
            END) AS q25_age,
    MIN(CASE
            WHEN order_nr < .50 * n
                THEN 9999
            ELSE age
            END) AS median_age,
    MIN(CASE
            WHEN order_nr < .75 * n
                THEN 9999
            ELSE age
            END) AS q75_age,
    MAX(age) AS max_age
FROM ages
CROSS JOIN (
    SELECT COUNT(*) AS n
    FROM ages
    ) population_size;
```

| MIN_AGE | Q25_AGE | MEDIAN_AGE | Q75_AGE | MAX_AGE |
|---|---|---|---|---|
| 0 | 6 | 17 | 34 | 90 |

□□□□□□□□□□SQL□□□□□□R□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□R□□□□□

```
sql <- "SELECT YEAR(observation_period_start_date) -
              year_of_birth AS age
FROM @cdm.person
INNER JOIN @cdm.observation_period
  ON person.person_id = observation_period.person_id;"
age <- renderTranslateQuerySql(conn, sql, cdm = "cdm")
quantile(age[, 1], c(0, 0.25, 0.5, 0.75, 1))
```

```
##   0%  25%  50%  75% 100%
##    0    6   17   34   90
```

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```
SELECT TOP 10 condition_source_value,
  COUNT(*) AS code_count
FROM @cdm.condition_occurrence
GROUP BY condition_source_value
ORDER BY -COUNT(*);
```

| CONDITION_SOURCE_VALUE | CODE_COUNT |
|---:|---:|
| 4019 | 49094668 |
| 25000 | 36149139 |
| 78099 | 28908399 |
| 319 | 25798284 |
| 31401 | 22547122 |
| 317 | 22453999 |
| 311 | 19626574 |
| 496 | 19570098 |
| I10 | 19453451 |
| 3180 | 18973883 |

□□□□□CONDITION_OCCURRENCE□□□□□□CONDITION_SOURCE_VALUE□□□□□□

## 9.4

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```
SELECT COUNT(*) AS subject_count,
  concept_name
FROM @cdm.person
INNER JOIN @cdm.concept
  ON person.gender_concept_id = concept.concept_id
GROUP BY concept_name;
```

| SUBJECT_COUNT | CONCEPT_NAME |
|---:|---:|
| 14927548 | FEMALE |
| 11371453 | MALE |

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```
  ON drug_concept_id = descendant_concept_id
INNER JOIN @cdm.concept ingredient
  ON ancestor_concept_id = ingredient.concept_id
WHERE LOWER(ingredient.concept_name) = 'ibuprofen'
  AND ingredient.concept_class_id = 'Ingredient'
  AND ingredient.standard_concept = 'S';
```

| PRESCRIPTION_COUNT |
|---|
| 26871214 |

## 9.5 QueryLibrary

QueryLibrary□□CDM□□□□□□SQL□□□□□□

## 9.6

### 9.6.1

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### 9.7.1

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```
sql <- "
INSERT INTO @cohort_db_schema.@cohort_table (
  cohort_definition_id,
  cohort_start_date,
  cohort_end_date,
  subject_id
)
SELECT 1 AS cohort_definition_id,
  cohort_start_date,
  cohort_end_date,
  subject_id
FROM (
  SELECT drug_era_start_date AS cohort_start_date,
    drug_era_end_date AS cohort_end_date,
    person_id AS subject_id
  FROM (
    SELECT drug_era_start_date,
      drug_era_end_date,
      person_id,
      ROW_NUMBER() OVER (
        PARTITION BY person_id
            ORDER BY drug_era_start_date
      ) order_nr
    FROM @cdm_db_schema.drug_era
    WHERE drug_concept_id = 1308216 --
  ) ordered_exposures
  WHERE order_nr = 1
) first_era
INNER JOIN @cdm_db_schema.observation_period
  ON subject_id = person_id
    AND observation_period_start_date < cohort_start_date
    AND observation_period_end_date > cohort_start_date
WHERE DATEDIFF(DAY,
               observation_period_start_date,
               cohort_start_date) >= 365;
"

renderTranslateExecuteSql(conn, sql,
                          cohort_db_schema = cohortDbSchema,
                          cohort_table = cohortTable,
                          cdm_db_schema = cdmDbSchema)
```

□□□□□CDM□□□□□□□□□□□DRUG_ERA□□□□□□□□□□□□□□□□□□□□DRUG_EXPOSURE

### 9.7.2

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```
sql <- "
INSERT INTO @cohort_db_schema.@cohort_table (
 cohort_definition_id,
 cohort_start_date,
 cohort_end_date,
subject_id
)
SELECT 2 AS cohort_definition_id,
  cohort_start_date,
  cohort_end_date,
  subject_id
FROM (
  SELECT DISTINCT person_id AS subject_id,
    condition_start_date AS cohort_start_date,
    condition_end_date AS cohort_end_date
  FROM @cdm_db_schema.condition_occurrence
  INNER JOIN @cdm_db_schema.concept_ancestor
    ON condition_concept_id = descendant_concept_id
  WHERE ancestor_concept_id = 432791 --
) distinct_occurrence
INNER JOIN @cdm_db_schema.visit_occurrence
  ON subject_id = person_id
  AND visit_start_date <= cohort_start_date
  AND visit_end_date >= cohort_start_date
WHERE visit_concept_id IN (262, 9203,
    9201) --    ER;
"

renderTranslateExecuteSql(conn, sql,
                          cohort_db_schema = cohortDbSchema,
                          cohort_table = cohortTable,
                          cdm_db_schema = cdmDbSchema)
```

□□□□□CONDITION_OCCURRENCE□□□□□CONCEPT_ANCESTOR□□□□□□□□□□□□□

### 9.7.3

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```
sql <- "
WITH tar AS (
  SELECT concept_name AS gender,
    FLOOR((YEAR(cohort_start_date) -
          year_of_birth) / 10) AS age,
```

```
    subject_id,
    cohort_start_date,
    CASE WHEN DATEADD(DAY, 7, cohort_start_date) >
      observation_period_end_date
    THEN observation_period_end_date
    ELSE DATEADD(DAY, 7, cohort_start_date)
    END AS cohort_end_date
  FROM @cohort_db_schema.@cohort_table
  INNER JOIN @cdm_db_schema.observation_period
    ON subject_id = observation_period.person_id
      AND observation_period_start_date < cohort_start_date
      AND observation_period_end_date > cohort_start_date
  INNER JOIN @cdm_db_schema.person
    ON subject_id = person.person_id
  INNER JOIN @cdm_db_schema.concept
    ON gender_concept_id = concept_id
  WHERE cohort_definition_id = 1 --
)
SELECT days.gender,
    days.age,
    days,
    CASE WHEN events IS NULL THEN 0 ELSE events END AS events
FROM (
  SELECT gender,
    age,
    SUM(DATEDIFF(DAY, cohort_start_date,
      cohort_end_date)) AS days
  FROM tar
  GROUP BY gender,
    age
) days
LEFT JOIN (
  SELECT gender,
      age,
      COUNT(*) AS events
  FROM tar
  INNER JOIN @cohort_db_schema.@cohort_table angioedema
    ON tar.subject_id = angioedema.subject_id
      AND tar.cohort_start_date <= angioedema.cohort_start_date
      AND tar.cohort_end_date >= angioedema.cohort_start_date
  WHERE cohort_definition_id = 2 --
  GROUP BY gender,
    age
) events
ON days.gender = events.gender
  AND days.age = events.age;
"

results <- renderTranslateQuerySql(conn, sql,
```

```
                                        cohort_db_schema = cohortDbSchema,
                                        cohort_table = cohortTable,
                                        cdm_db_schema = cdmDbSchema,
                                        snakeCaseToCamelCase = TRUE)
```

□□□CTE□tar□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□OBSERVATION_PERIOD_

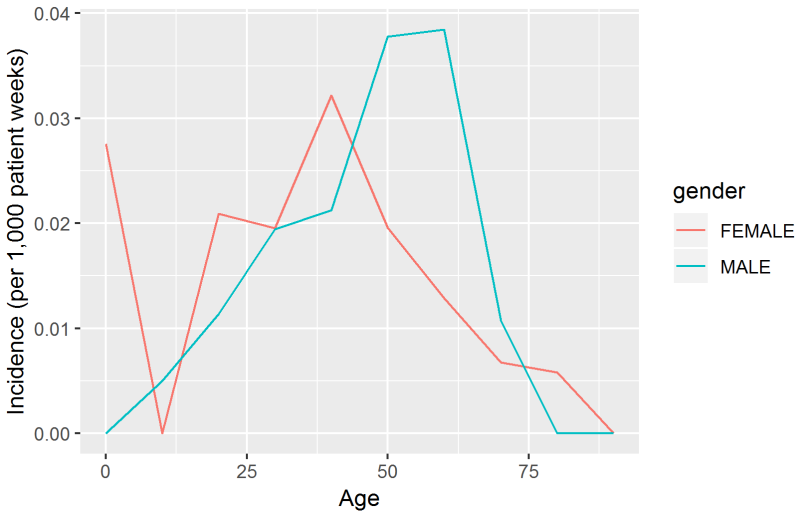
SQL□□□□□□□□□□□□□□□□□□□□□□□□□□□□SQL□□□□□□□□□□□□□□□□□□□□□R□□□□□

ggplot2□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

```
#   IR
results$ir <- 1000 * results$events / results$days / 7

#
results$age <- results$age * 10

library(ggplot2)
ggplot(results, aes(x = age, y = ir, group = gender, color = gender)) +
  geom_line() +
  xlab(" ") +
  ylab("  1,000     ")
```




### 9.7.4

□□□□□□□□□□□□□□□□□□□

```
"
renderTranslateExecuteSql(conn, sql,
                          cohort_db_schema = cohortDbSchema,
                          cohort_table = cohortTable)

disconnect(conn)
```

### 9.7.5

OHDSI SQL□DatabaseConnector□□□SqlRender□□□□□□□□□□□□□□□□□□□□□□□□□□□□□OHD

□□□□□□□□□□□□□□□□□□□□□□□□□□SQL□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ATLAS□
SQL□□□□□□SqlRender□□□DatabaseConnector□□□□□□□□□□□□□□□□

## 9.8

- **SQL**□Structured Query Language□□□□□□□□□□□□□CDM□□□□□□□□□□□□□□□□□□
- □□□□□□□□□□□□□□□□□□□□□□□□□□SQL□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
- **SqlRender**□□□**DatabaseConnector**R□□□□□□□□CDM□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
- R□SQL□□□□□□□□□□□□□□□□□□OHDSI□□□□□□□□□□□□□□□□□□□

□□ **9.2.** SQL □□□ R □□□□□□□□□□□□ 1 □□□□□□□□□□□□

# Chapter 10

# 10 – –

□□□□□: *Kristin Kostka!*

□□□□□

## 10.2

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## 10.3

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## 10.7 ATLAS

□□ATLAS□□□□□□□□ Cohort Definitions □□□□□□□□□□□□□

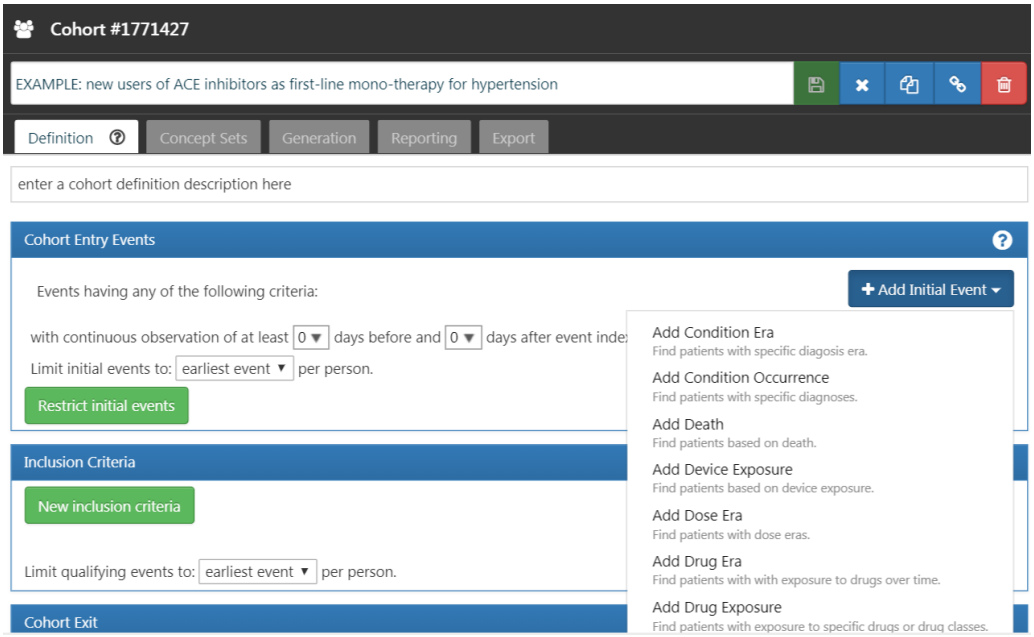


Figure 10.5: □□□□□□□□□

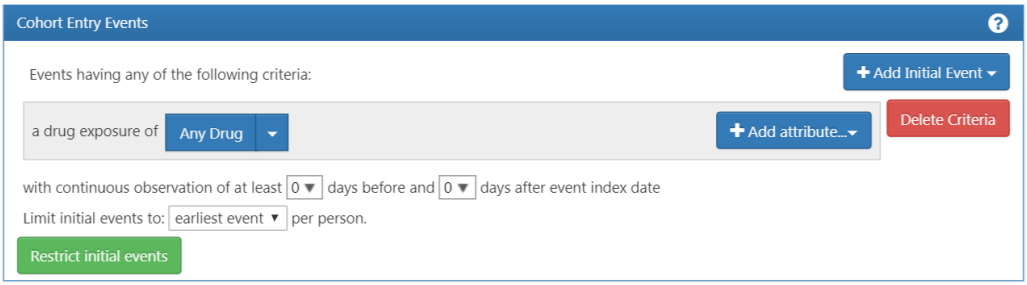


Figure 10.6: □□□□□□□

**□□□□1: □□□□□□□□□□□□□□□□□□□□**

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Concept Set Expression | Included Concepts 21536 | Included Source Codes | Export | Import

Name:

ACE Inhibitors

Show 25 entries Search:

Showing 1 to 15 of 15 entries Previous 1 Next

| Concept Id | Concept Code | Concept Name | Domain | Standard Concept Caption | Exclude | Descendants | Mapped |
|---|---|---|---|---|---|---|---|
| 1335471 | 18867 | benazepril | Drug | Standard | | ✓ | |
| 1340128 | 1998 | Captopril | Drug | Standard | | ✓ | |
| 19050216 | 21102 | Cilazapril | Drug | Standard | | ✓ | |
| 1341927 | 3827 | Enalapril | Drug | Standard | | ✓ | |
| 1342001 | 3829 | Enalaprilat | Drug | Standard | | ✓ | |
| 1363749 | 50166 | Fosinopril | Drug | Standard | | ✓ | |
| 19122327 | 60245 | imidapril | Drug | Standard | | ✓ | |
| 1308216 | 29046 | Lisinopril | Drug | Standard | | ✓ | |
| 1310756 | 30131 | moexipril | Drug | Standard | | ✓ | |
| 1373225 | 54552 | Perindopril | Drug | Standard | | ✓ | |
| 1331235 | 35208 | quinapril | Drug | Standard | | ✓ | |
| 1334456 | 35296 | Ramipril | Drug | Standard | | ✓ | |
| 19040051 | 36908 | spirapril | Drug | Standard | | ✓ | |
| 1342439 | 38454 | trandolapril | Drug | Standard | | ✓ | |
| 19102107 | 39990 | zofenopril | Drug | Standard | | ✓ | |

Classification Non-Standard Standard

Figure 10.8: ACE□□□□□□□□□□□□□□□□□□

Import Concept Set From Repository...

New Concept Set

Show 10 entries Filter Repository Concept Sets: ace inhibitors

| Id | Title | Created | Modified | Author |
|---|---|---|---|---|
| 1794480 | [OHDSI EU 2019] Excluded concepts of ACE inhibitors or Thiazide diuretics | 03/28/2019 11:04 AM | 03/28/2019 11:04 AM | anonymous |
| 963 | ACE Inhibitors | | | anonymous |
| 3268 | COPY OF: ACE Inhibitors | | | anonymous |
| 99283 | Ace Inhibitors | | | anonymous |
| 142965 | PheKB ACE-I ACE inhibitors | | | anonymous |

Showing 1 to 5 of 5 entries (filtered from 11,667 total entries) Previous 1 Next

Figure 10.9: ATLAS□□□□□□□□□□□□□□□□□□□□□□□□□□

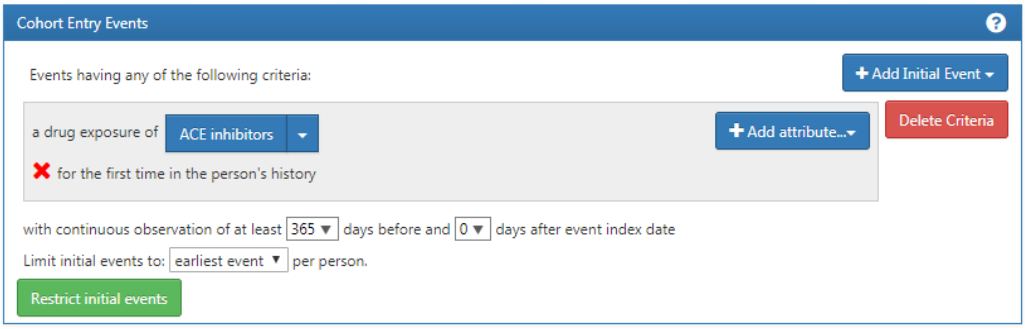
Cohort Entry Events
Events having any of the following criteria:
+ Add Initial Event
a drug exposure of
ACE inhibitors
+ Add attribute...
Delete Criteria
for the first time in the person's history
with continuous observation of at least
365
days before and
0
days after event index date
Limit initial events to:
earliest event
per person.
Restrict initial events

Figure 10.10: □□□□□□□□□□□□□□□□□□□□□□□□□□□□

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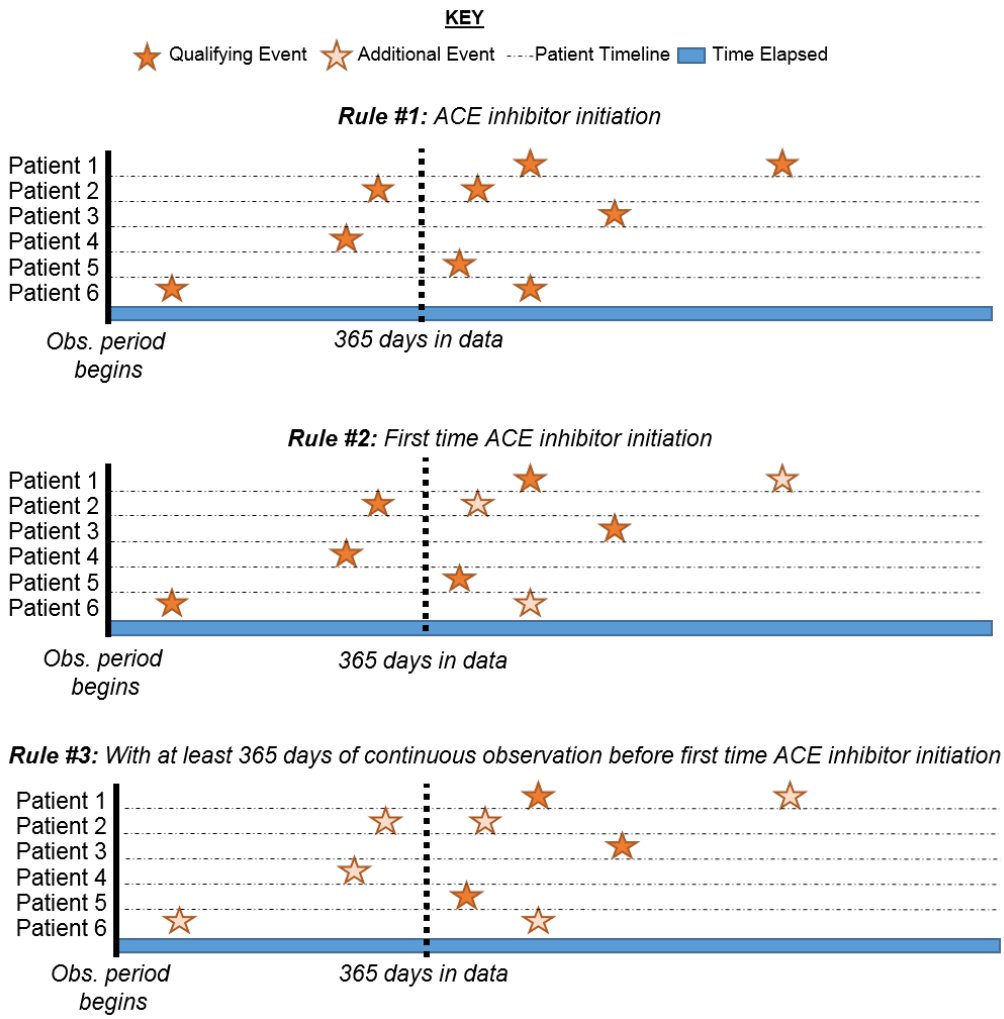
KEY
Qualifying Event
Additional Event
Patient Timeline
Time Elapsed
Rule #1: ACE inhibitor initiation
Patient 1
Patient 2
Patient 3
Patient 4
Patient 5
Patient 6
Obs. period begins
365 days in data
Rule #2: First time ACE inhibitor initiation
Patient 1
Patient 2
Patient 3
Patient 4
Patient 5
Patient 6
Obs. period begins
365 days in data
Rule #3: With at least 365 days of continuous observation before first time ACE inhibitor initiation
Patient 1
Patient 2
Patient 3
Patient 4
Patient 5
Patient 6
Obs. period begins
365 days in data

Figure 10.11: □□□□□□□□□□□□□□□□□□□□

```
                                        password = "supersecret")

cdmDbSchema <- "my_cdm_data"
cohortDbSchema <- "scratch"
cohortTable <- "my_cohorts"
```

□□□3□□□cdmDbSchema□cohortDbSchema□□□□cohortTable□□□□□□□□□□□□□

```
                          sql,
                          cdm_db_schema = cdmDbSchema,
                          ace_i = aceI)
```

DRUG_EXPOSURE□□□□□□CONCEPT_ANCESTOR□□□□□□□□□□□□□□□□ACE□□□□□□□□□□

### 10.8.4 365

□□□OBSERVATION_PERIOD□□□□□□□□□□365□□□□□□□□□□□□□□□□□□□□

```
sql <- "SELECT subject_id,
  cohort_start_date
INTO #has_prior_obs
FROM #first_use
INNER JOIN @cdm_db_schema.observation_period
  ON subject_id = person_id
    AND observation_period_start_date <= cohort_start_date
    AND observation_period_end_date >= cohort_start_date
WHERE DATEADD(DAY, 365, observation_period_start_date) < cohort_start_date;"

renderTranslateExecuteSql(conn, sql, cdm_db_schema = cdmDbSchema)
```

### 10.8.5

365□□□□□□□□□□□□□□□□□

```
sql <- "SELECT DISTINCT subject_id,
  cohort_start_date
INTO #has_ht
FROM #has_prior_obs
INNER JOIN @cdm_db_schema.condition_occurrence
  ON subject_id = person_id
    AND condition_start_date <= cohort_start_date
    AND condition_start_date >= DATEADD(DAY, -365, cohort_start_date)
INNER JOIN @cdm_db_schema.concept_ancestor
  ON descendant_concept_id = condition_concept_id
WHERE ancestor_concept_id = @hypertension;"

renderTranslateExecuteSql(conn,
                          sql,
                          cdm_db_schema = cdmDbSchema,
                          hypertension = hypertension)
```

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### 10.8.6

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```
sql <- "SELECT subject_id,
  cohort_start_date
INTO #no_prior_ht_drugs
FROM #has_ht
LEFT JOIN (
  SELECT *
  FROM @cdm_db_schema.drug_exposure
  INNER JOIN @cdm_db_schema.concept_ancestor
    ON descendant_concept_id = drug_concept_id
  WHERE ancestor_concept_id IN (@all_ht_drugs)
) ht_drugs
  ON subject_id = person_id
    AND drug_exposure_start_date < cohort_start_date
WHERE person_id IS NULL;"

renderTranslateExecuteSql(conn,
                          sql,
                          cdm_db_schema = cdmDbSchema,
                          all_ht_drugs = allHtDrugs)
```

LEFT JOIN□□□□□□□□□DRUG_EXPOSURE□□□□□□□□person_id□NULL□□□□□□□□□□□

### 10.8.7

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```
sql <- "SELECT subject_id,
  cohort_start_date
INTO #monotherapy
FROM #no_prior_ht_drugs
INNER JOIN @cdm_db_schema.drug_exposure
  ON subject_id = person_id
    AND drug_exposure_start_date >= cohort_start_date
    AND drug_exposure_start_date <= DATEADD(DAY, 7, cohort_start_date)
INNER JOIN @cdm_db_schema.concept_ancestor
  ON descendant_concept_id = drug_concept_id
WHERE ancestor_concept_id IN (@all_ht_drugs)
GROUP BY subject_id,
  cohort_start_date
HAVING COUNT(*) = 1;"

renderTranslateExecuteSql(conn,
                          sql,
                          cdm_db_schema = cdmDbSchema,
```

```
                                all_ht_drugs = allHtDrugs)
```

### 10.8.8

□□□□□□□

```
          PARTITION BY person_id ,concept_id ORDER BY event_date,
              event_type ROWS UNBOUNDED PRECEDING
          ) AS start_ordinal,
        ROW_NUMBER() OVER (
          PARTITION BY person_id, concept_id ORDER BY event_date,
            event_type
          ) AS overall_ord
      FROM (
-- select the start dates, assigning a row number to each
        SELECT person_id,
          concept_id,
          exposure_start_date AS event_date,
          0 AS event_type,
          ROW_NUMBER() OVER (
            PARTITION BY person_id, concept_id ORDER BY exposure_start_date
            ) AS start_ordinal
        FROM #exposure exposure

        UNION ALL
-- add the end dates with NULL as the row number, padding the end dates by
-- @max_gap to allow a grace period for overlapping ranges.

        SELECT person_id,
          concept_id,
          DATEADD(day, @max_gap, exposure_end_date),
          1 AS event_type,
          NULL
        FROM #exposure exposure
        ) rawdata
    ) events
  WHERE 2 * events.start_ordinal - events.overall_ord = 0
  ) events
  ON exposure.person_id = events.person_id
      AND exposure.concept_id = events.concept_id
      AND events.end_date >= exposure.exposure_end_date
  GROUP BY exposure.person_id,
      exposure.concept_id,
      exposure.exposure_start_date
  ) ends
GROUP BY ends.person_id,
  concept_id,
  ends.era_end_date;"

renderTranslateExecuteSql(conn,
                          sql,
                          cdm_db_schema = cdmDbSchema,
                          max_gap = 30)
```

□□□□□□□□□□□□□□□□□□□max_gap□□□□□□□□□□□□□□□□□□□

□□□□□□□ACE□□□□□□□

## 10.9

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- □□□□□ER□□□□□□□□□□□9201□9203□262□□□□□□□□□□□ □□□□□□□□□□□□

# Chapter 11

# 11 – –

□□□□: *Anthony Sena & Daniel Prieto-Alhambra*

□□□□

Elm et al., 2008)□

## 11.3

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$$= \frac{\#}{\quad}$$

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Prevalence

Treemap | Table

Column visibility | Copy | CSV | Show 15 entries | Filter: hypertension

Showing 1 to 15 of 47 entries
(filtered from 15,907 total entries)

Previous 1 2 3 4 Next

| Concept Id | Name | Person Count | Prevalence | Records per person |
|---|---|---|---|---|
| 320128 | Essential hypertension | 17,814,076 | 12.30% | 5.80 |
| 312648 | Benign essential hypertension | 11,014,877 | 7.61% | 4.35 |
| 317898 | Malignant essential hypertension | 1,021,441 | 0.70% | 2.22 |
| 381290 | Ocular hypertension | 521,264 | 0.36% | 2.40 |
| 441922 | Transient hypertension of pregnancy | 209,317 | 0.14% | 2.45 |
| 44782429 | Chronic kidney disease due to hypertension | 170,534 | 0.12% | 3.60 |
| 137940 | Transient hypertension of pregnancy - delivered | 153,806 | 0.11% | 1.07 |
| 321080 | Hypertension complicating pregnancy, childbirth and the puerperium | 148,728 | 0.10% | 2.15 |
| 314423 | Benign essential hypertension complicating pregnancy, childbirth and the puerperium - not delivered | 132,245 | 0.09% | 3.94 |
| 44782690 | Chronic kidney disease stage 5 due to hypertension | 119,375 | 0.08% | 5.20 |
| 44783618 | Heritable pulmonary arterial hypertension | 104,737 | 0.07% | 3.61 |
| 319826 | Secondary hypertension | 96,356 | 0.07% | 2.14 |
| 4167493 | Pregnancy-induced hypertension | 91,675 | 0.06% | 2.60 |
| 321074 | Pre-existing hypertension complicating pregnancy, childbirth and puerperium | 74,311 | 0.05% | 2.99 |
| 192680 | Portal hypertension | 71,240 | 0.05% | 3.11 |

Showing 1 to 15 of 47 entries
(filtered from 15,907 total entries)

Previous 1 2 3 4 Next

Figure 11.4: ATLAS□□□□□□: □□□□□□□□□□□□□□□□□□□□□□□□

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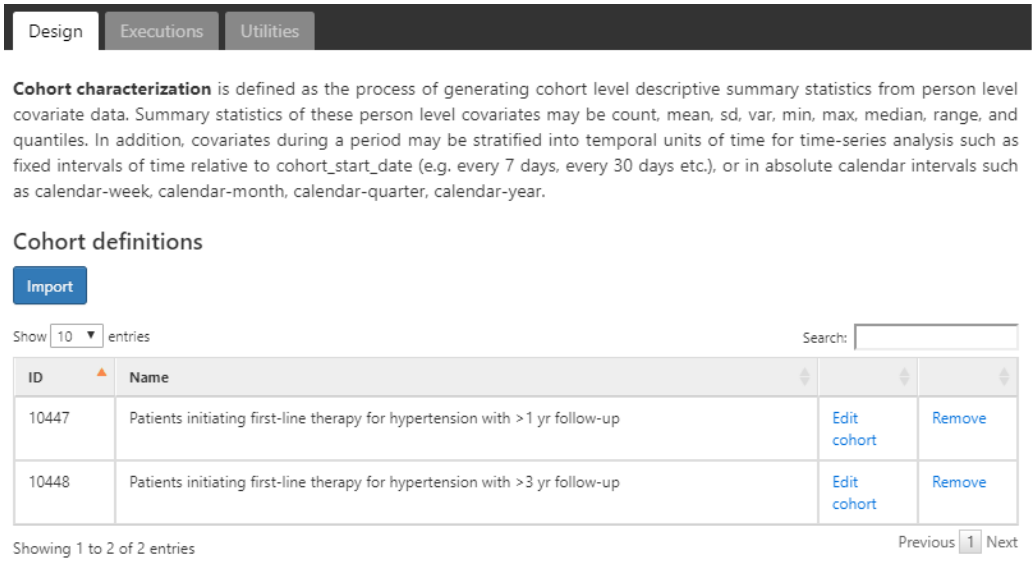



Figure 11.6: □□□□□□□ - □□□□□□□□□□□

## □□□□□□

□□□□□□□□ATLAS□□□□□□□□□□□□□□□□□□□□□Chapter 10□□□□□□ Import □□□□□□□□□□ 11.6□□□□□□□□□□□□□□□□□□□

## Feature analyses

Import

Show 25 entries Search:

| ID | Name | Description | Actions |
|---|---|---|---|
| 43 | Drug Era Short Term | One covariate per drug in the drug_era table overlapping with any part of the short window. | Remove |
| 49 | Charlson Index | The Charlson comorbidity index (Romano adaptation) using all conditions prior to the window end. | Remove |
| 67 | Condition Occurrence Long Term | One covariate per condition in the condition_occurrence table starting in the long term window. | Remove |
| 71 | Demographics Age Group | Age of the subject on the index date (in 5 year age groups) | Remove |
| 72 | Demographics Race | Race of the subject. | Remove |
| 73 | Demographics Prior Observation Time | Number of continuous days of observation time preceding the index date. | Remove |
| 74 | Demographics Gender | Gender of the subject. | Remove |
| 76 | Condition Occurrence Medium Term | One covariate per condition in the condition_occurrence table starting in the medium term window. | Remove |
| 77 | Demographics Age | Age of the subject on the index date (in years). | Remove |
| 79 | Demographics Time In Cohort | Number of days of observation time during cohort period. | Remove |
| 80 | Demographics Index Year | Year of the index date. | Remove |
| 81 | Demographics Post Observation Time | Number of continuous days of observation time following the index date. | Remove |
| 87 | Procedure Occurrence Any Time Prior | One covariate per procedure in the procedure_occurrence table any time prior to index. | Remove |
| 103 | Visit Count Long Term | The number of visits observed in the long term window. | Remove |

Figure 11.7: □□□□□□ - □□□□

## Subgroup analyses

New subgroup

Female

Calculate subgroup analyses only

Female

having all of the following criteria: Add criteria to group...

with the following event criteria:

Add attribute...

with a gender of: FEMALE Add Import

Delete Criteria

Figure 11.8: □□□□□□□□ - □□□□□□□□□□□

ATLAS□□□□□

Exploring condition_occurrence during day -365 through 0 days relative to index: Cardiac arrhythmia

Cohort: Patients initiating first-line therapy for hypertension with >1 yr follow-up

Export Show 10 entries Search:

| Relationship type | Distance | Concept name | All stratas | | Female | |
|---|---|---|---|---|---|---|
| | | | Count | Pct | Count | Pct |
| Explore Ancestor | 4 | Disorder by body site | 32 | 0.00% | 17 | 0.00% |
| Explore Ancestor | 4 | Finding of trunk structure | 991 | 0.06% | 605 | 0.08% |
| Explore Ancestor | 3 | Disorder of trunk | 23 | 0.00% | 14 | 0.00% |
| Explore Ancestor | 3 | Disorder of thorax | 241 | 0.01% | 104 | 0.01% |
| Explore Ancestor | 3 | Disorder of body system | 4,135 | 0.25% | 1,992 | 0.26% |
| Explore Ancestor | 2 | Disorder of cardiovascular system | 12,979 | 0.78% | 6,073 | 0.79% |
| Explore Ancestor | 2 | Disorder of mediastinum | 138 | 0.01% | 62 | 0.01% |
| Explore Ancestor | 2 | Disorder of body cavity | 24 | 0.00% | 10 | 0.00% |
| Explore Ancestor | 1 | Heart disease | 4,691 | 0.28% | 1,869 | 0.24% |
| Explore Selected | 0 | Cardiac arrhythmia | 30,474 | 1.83% | 13,221 | 1.72% |

Showing 1 to 10 of 62 entries Previous 1 2 3 4 5 6 7 Next

Figure 11.11: □□□□□□□□ - □□□□□□□□□□□□

CONDITION / Condition Occurrence Long Term / stratified by Female

Export Export comparison Show 10 entries Search: edema

| Covariate | Explore | Concept ID | Patients initiating first-line therapy for hypertension with >1 yr follow-up | | | | Patients initiating first-line therapy for hypertension with >3 yr follow-up | | | | Std diff |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Count | Pct | Female | | Count | Pct | Female | | |
| | | | | | Count | Pct | | | Count | Pct | |
| Edema | Explore | 433595 | 32,243 | 1.94% | 20,200 | 2.63% | 15,173 | 1.81% | 9,684 | 2.48% | -0.0066 |

Showing 1 to 1 of 1 entries (filtered from 206 total entries) Previous 1 Next

Figure 11.12: □□□□□□□□ - □□□□□□□□

□□□□explore□□□□□

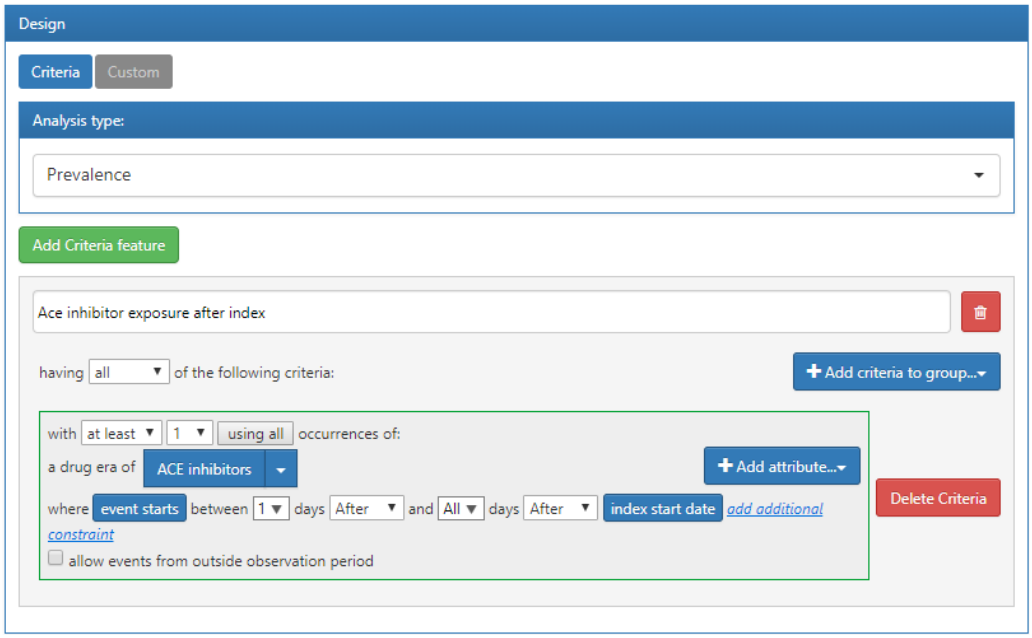
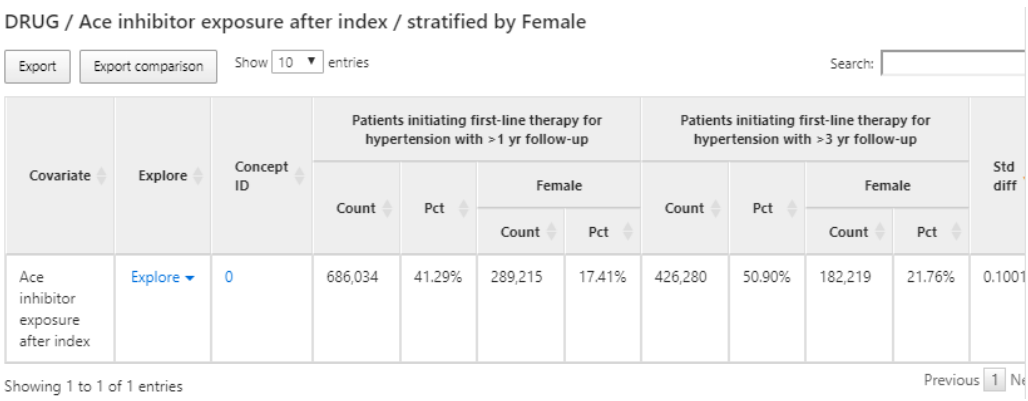



Figure 11.15: ATLAS□□□□□□□□□□□



DRUG / Ace inhibitor exposure after index / stratified by Female

Export | Export comparison | Show 10 entries | Search:

| Covariate | Explore | Concept ID | Patients initiating first-line therapy for hypertension with >1 yr follow-up | | | | Patients initiating first-line therapy for hypertension with >3 yr follow-up | | | | Std diff |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Count | Pct | Female | | Count | Pct | Female | | |
| | | | | | Count | Pct | | | Count | Pct | |
| Ace inhibitor exposure after index | Explore | 0 | 686,034 | 41.29% | 289,215 | 17.41% | 426,280 | 50.90% | 182,219 | 21.76% | 0.1001 |

Showing 1 to 1 of 1 entries | Previous 1 Ne

Figure 11.16: □□□□□□□□□□□□□□□□□

- □□□□□□□□□□□□□□□□□□
- □□□□□□□□□□□□□□□□□□□□
- □□□□□□□□□□□□□□□

FeatureExtraction□□□□□□□□□□□□□□□□□□□□□□□2□□□□□□□□□□□□□□□□□□□

□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

```
settings <- createCovariateSettings(useConditionEraLongTerm = TRUE,
                                    useConditionEraShortTerm = TRUE,
                                    useDrugEraLongTerm = TRUE,
                                    useDrugEraShortTerm = TRUE,
                                    longTermStartDays = -180,
                                    shortTermStartDays = -14,
                                    endDays = -1)
```

□□□□□□□□□□□□□□□□□□□□□□□□□□180□□□□□□□□□□□□□□□□□□□□□□□□□□□□14□□□

□□□□□□□□□□□□ID□□□□□□□□□□□□□□□□□□□□□□□□□□□□

```
settings <- createCovariateSettings(useConditionEraLongTerm = TRUE,
                                    useConditionEraShortTerm = TRUE,
                                    useDrugEraLongTerm = TRUE,
                                    useDrugEraShortTerm = TRUE,
                                    longTermStartDays = -180,
                                    shortTermStartDays = -14,
                                    endDays = -1,
                                    excludedCovariateConceptIds = 1124300,
                                    addDescendantsToExclude = TRUE,
                                    aggregated = TRUE)
```

□□□□□□□□□□□□□□□□aggregated = TRUE□□□□□□□FeatureExtraction□□□□□□□□□□□

### 11.8.4

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```
covariateSettings <- createDefaultCovariateSettings()

covariateData2 <- getDbCovariateData(
  connectionDetails = connectionDetails,
  cdmDatabaseSchema = cdmDatabaseSchema,
  cohortDatabaseSchema = resultsDatabaseSchema,
  cohortTable = "cohorts_of_interest",
  cohortId = 1,
  covariateSettings = covariateSettings,
  aggregated = TRUE)

summary(covariateData2)
```

□□□□□□□□□□□□□□□

```
## CovariateData Object Summary
##

## Number of Covariates: 41330

## Number of Non-Zero Covariate Values: 41330
```

### 11.8.5

□□□□□covariateData□□□□□

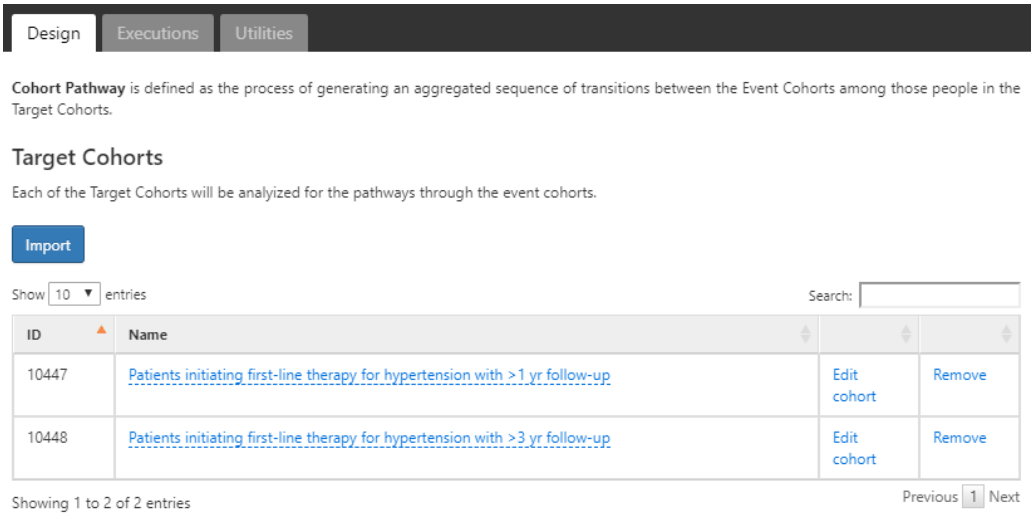
Design
Executions
Utilities
Cohort Pathway is defined as the process of generating an aggregated sequence of transitions between the Event Cohorts among those people in the Target Cohorts.
Target Cohorts
Each of the Target Cohorts will be analyized for the pathways through the event cohorts.
Import
Show 10 entries
Search:
ID
Name
10447
Patients initiating first-line therapy for hypertension with >1 yr follow-up
Edit cohort
Remove
10448
Patients initiating first-line therapy for hypertension with >3 yr follow-up
Edit cohort
Remove
Showing 1 to 2 of 2 entries
Previous 1 Next

Figure 11.18: □□□□□□□□□□□□□□□□□□□□□□□□

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## Event Cohorts

Each Event Cohort defines the step in a pathway that may occur for a person in the Target Cohort.

Import

Show 10 entries Search:

| ID | Name | | |
|---|---|---|---|
| 9174 | ACE inhibitor use | Edit cohort | Remove |
| 9175 | Angiotensin receptor blocker (ARB) use | Edit cohort | Remove |
| 9176 | Thiazide or thiazide-like diuretic use | Edit cohort | Remove |
| 9177 | dihydropyridine Calcium Channel Blocker (dCCB) use | Edit cohort | Remove |
| 9178 | non-dihydropyridine Calcium Channel Blocker (ndCCB) use | Edit cohort | Remove |
| 9179 | beta blocker use | Edit cohort | Remove |
| 9180 | Diuretic-loop use | Edit cohort | Remove |
| 9181 | Diuretic-potassium sparing use | Edit cohort | Remove |
| 9182 | alpha-1 blocker use | Edit cohort | Remove |

Showing 1 to 9 of 9 entries Previous 1 Next

Figure 11.19: □□□□□□

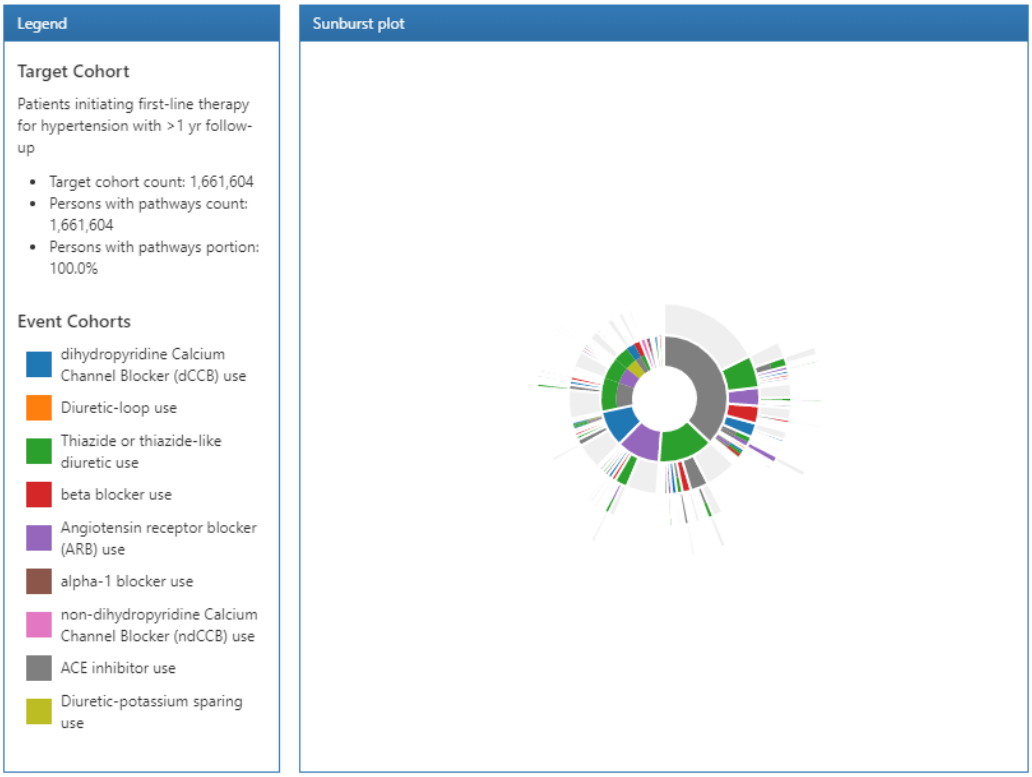
Legend
Target Cohort
Patients initiating first-line therapy for hypertension with >1 yr follow-up
Target cohort count: 1,661,604
Persons with pathways count: 1,661,604
Persons with pathways portion: 100.0%
Event Cohorts
dihydropyridine Calcium Channel Blocker (dCCB) use
Diuretic-loop use
Thiazide or thiazide-like diuretic use
beta blocker use
Angiotensin receptor blocker (ARB) use
alpha-1 blocker use
non-dihydropyridine Calcium Channel Blocker (ndCCB) use
ACE inhibitor use
Diuretic-potassium sparing use
Sunburst plot

Figure 11.20: □□□□□□□□□□

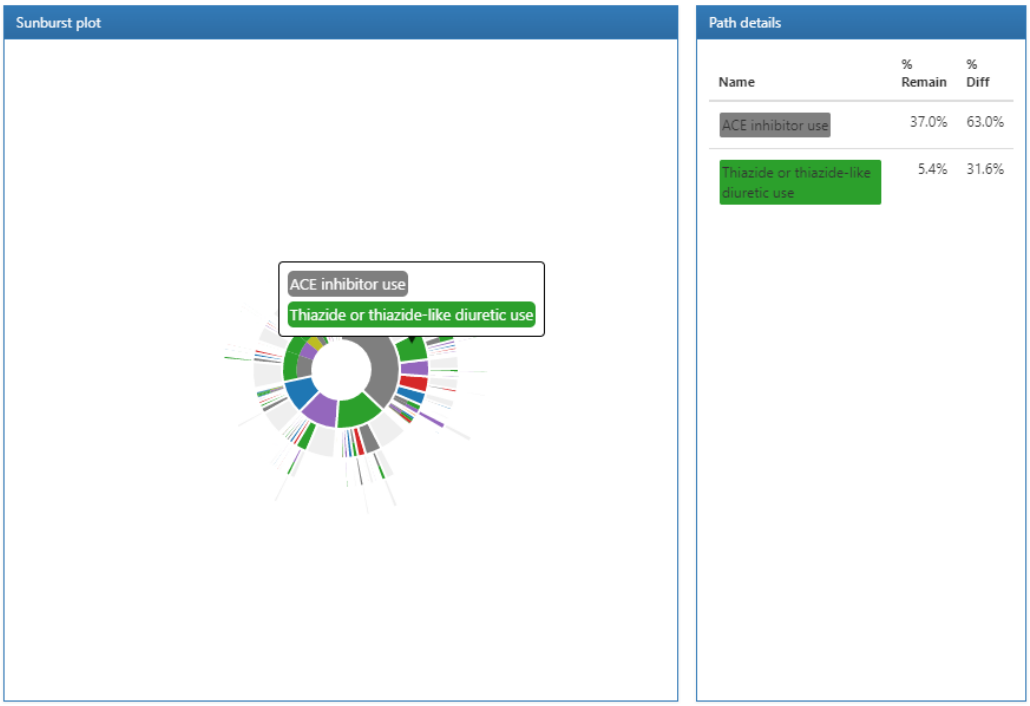


Figure 11.21: □□□□□□□□□□□□□□□□□□□□□□

(ARB) □□□□□□□□□□□□□□□□ARB □□□□□□□□□□□□□□□□□□□□

*acute myocardial infarction events □ angioedema events □□□□ Angiotensin receptor blocker (ARB) use* □□□□□□□□□□

Figure 11.25: □□□□□□□□

| | Persons | Cases | Proportion [+\|-] per 1k persons | Time At Risk (years) | Rate [+\|-] per 1k years |
|---|---|---|---|---|---|
| Summary Statistics: | 816,867 | 1,703 | 2.08 | 623,402 | 2.73 |

| | Stratify Rule | N | Cases | Proportion [+\|-] per 1k persons | Time At Risk (years) | Rate [+\|-] per 1k years |
|---|---|---|---|---|---|---|
| 1. | Gender = Female | 313,518 | 416 | 1.33 | 230,157 | 1.81 |

Figure 11.26: □□□□□□□□ - AMI □□□□□□□□□□□□ ACEi □□□□

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□□ **11.1.** □□□□□□

# Chapter 12

# 12 – –

□□□□□□□□: *Martijn Schuemie, David Madigan, Marc Suchard & Patrick Ryan*

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Table 12.2: □□□□□□□□□□□□□□□□□□□□□□□□

| Choice | Description |
|---|---|
| Target cohort | □□□□□□□□□□ |
| Outcome cohort | □□□□□□□□□□□□□□□□□□ |
| Time-at-risk | □□□□□□□□□□□□□□□□□□□□

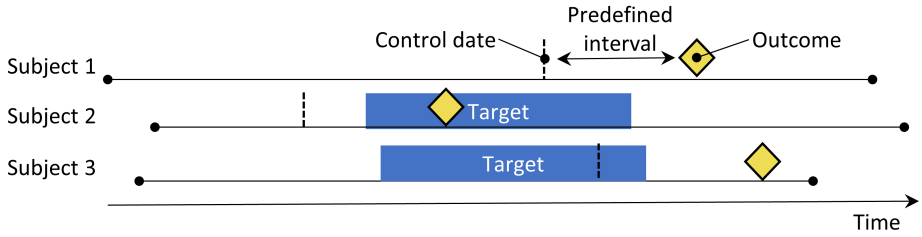
Predefined
interval
Control date
Outcome
Subject 1
Subject 2
Target
Subject 3
Target
Time

Figure 12.4: □□□□□□□□□□□□

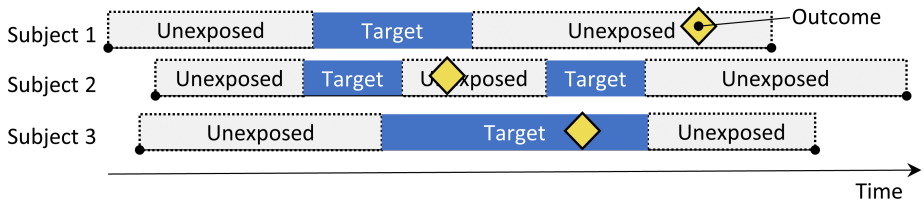
Subject 1
Unexposed
Target
Unexposed
Outcome
Subject 2
Unexposed
Target
Target
Unexposed
Subject 3
Unexposed
Target
Unexposed
Time

Figure 12.5: □□□□□□□□□

### 12.6.7

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12.7□□□□□□□□

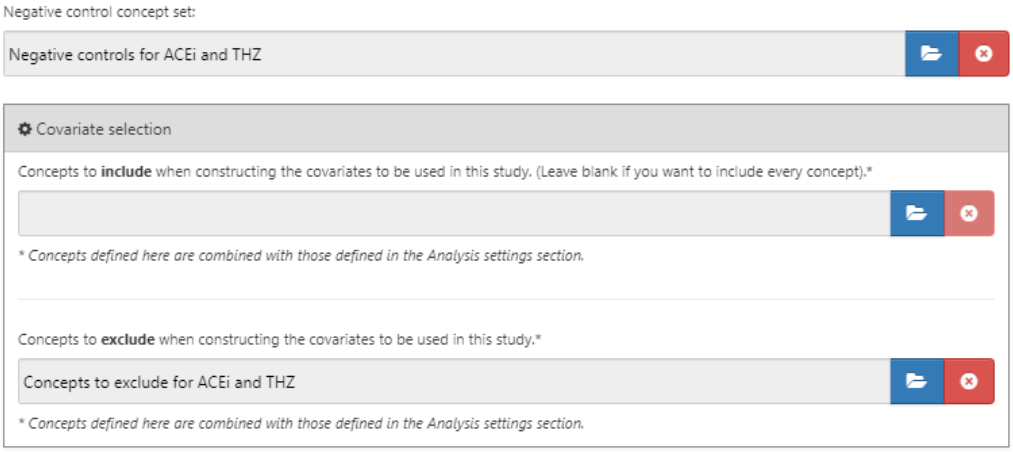
Negative control concept set:
Negative controls for ACEi and THZ
Covariate selection
Concepts to **include** when constructing the covariates to be used in this study. (Leave blank if you want to include every concept).*
* Concepts defined here are combined with those defined in the Analysis settings section.
Concepts to **exclude** when constructing the covariates to be used in this study.*
Concepts to exclude for ACEi and THZ
* Concepts defined here are combined with those defined in the Analysis settings section.

Figure 12.9: □□□□□□□□□□□□

```
library(CohortMethod)
connDetails <- createConnectionDetails(dbms = "postgresql",
                                       server = "localhost/ohdsi",
                                       user = "joe",
                                       password = "supersecret")

cdmDbSchema <- "my_cdm_data"
cohortDbSchema <- "scratch"
cohortTable <- "my_cohorts"
cdmVersion <- "5"
```

□□□4□□cdmDbSchema□cohortDbSchema□□□□cohortTable□□□□CDM□□□□□□□□□□□□□
SQL Server□□□□□□□□□□□□□

```
## CohortMethodData
##
##     ID 1
##       ID 2
##      ID(s) 3
```

□□□□□□□□□□□□□□□□□□□□□CohortMethod□□□□□□□□□□□□□□□□□□createDefault
(12.1)□□□□□□□□□□□□□□□□□□□

□□□□□1□□□□□□□□□□□□□□□□CohortMethod□□□□□□□□□□□□□□□□

### 12.8.5

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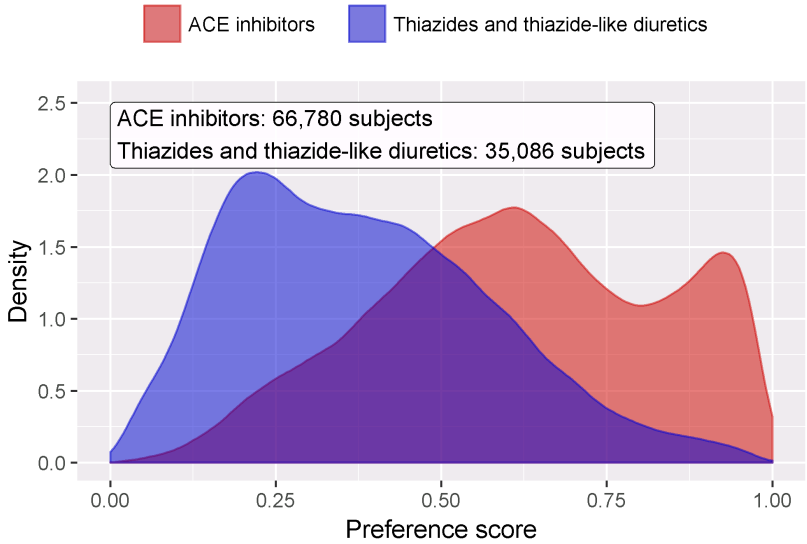


Figure 12.10: □□□□□□□□

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| -1.42 | □□□□□-30□□□0□□□□□□□□□□□□: □□ |
| -1.11 | □□□□□0□□□0□□□□□□□□□□□□: □□□□□□ |
| 0.68 | □□□□□□: 05-09 |
| 0.64 | □□□□□-365□□□0□□□□□□□□□□: □□□ |
| 0.63 | □□□□□-30□□□0□□□□□□□□□□□□: □□□ |
| 0.57 | □□□□□-30□□□0□□□□□□□□□□□□: □□□□□ |
| 0.55 | □□□□□-365□□□0□□□□□□□□□□□□: □□□□□□□□□□□ |
| -0.54 | □□: □□□□□□□□□□□□□□□□ |
| 0.52 | (□□) |
| 0.50 | □□: □□ |

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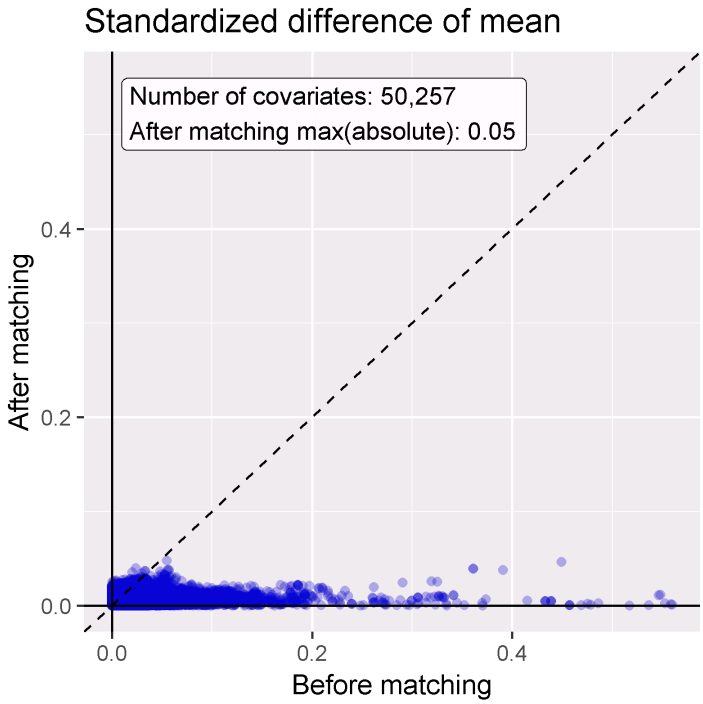
Standardized difference of mean
Number of covariates: 50,257
After matching max(absolute): 0.05
After matching
0.0
0.2
0.4
Before matching
0.0
0.2
0.4

Figure 12.11: □□□□□□□□□□□□□□□□□ □□□□□□□□□□□□□□□□□

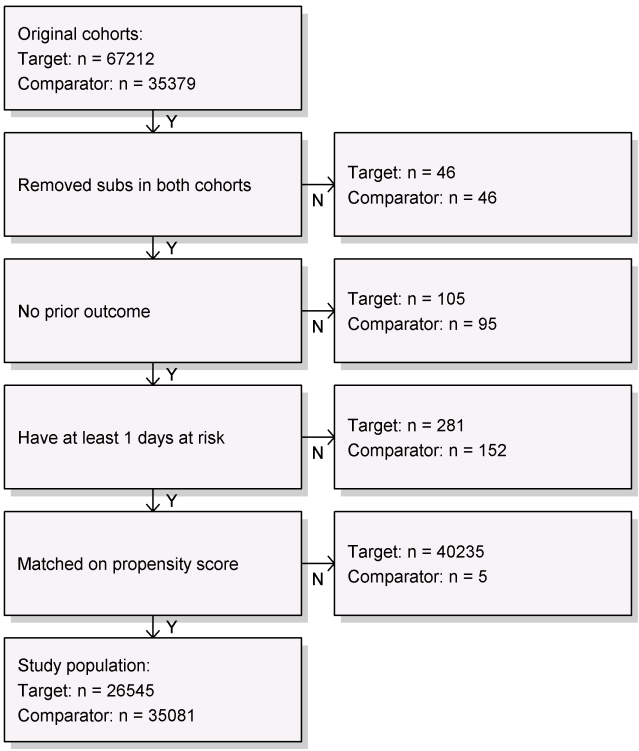
Original cohorts:
Target: n = 67212
Comparator: n = 35379
Y
Removed subs in both cohorts
N
Target: n = 46
Comparator: n = 46
Y
No prior outcome
N
Target: n = 105
Comparator: n = 95
Y
Have at least 1 days at risk
N
Target: n = 281
Comparator: n = 152
Y
Matched on propensity score
N
Target: n = 40235
Comparator: n = 5
Y
Study population:
Target: n = 26545
Comparator: n = 35081

Figure 12.12: □□□□□□□□□

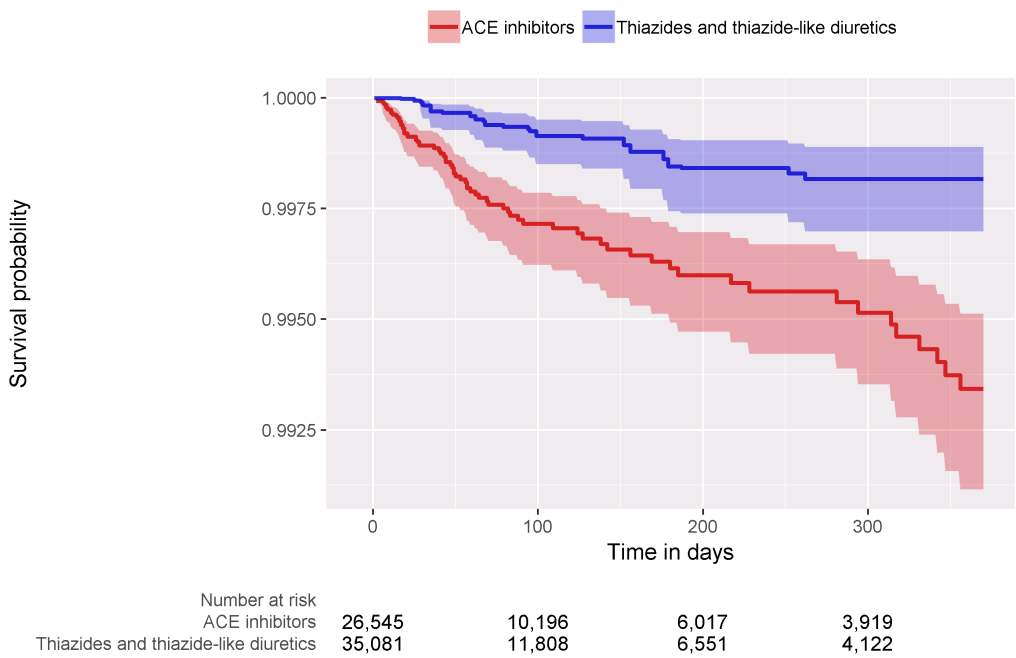


Figure 12.14: □□□□−□□□□□□□□□□

```
remotes::install_github("ohdsi/CohortMethod")
```

Eunomia□□□□□□□□□□□□□R□□□□□□□□□□□□□CDM□□□□□□□□□□□□□

□□ **12.3.** □□□□□□□□□

# Chapter 13

# 13 – –

□*Lead: Peter Rijnbeek & Jenna Reps*

□□□

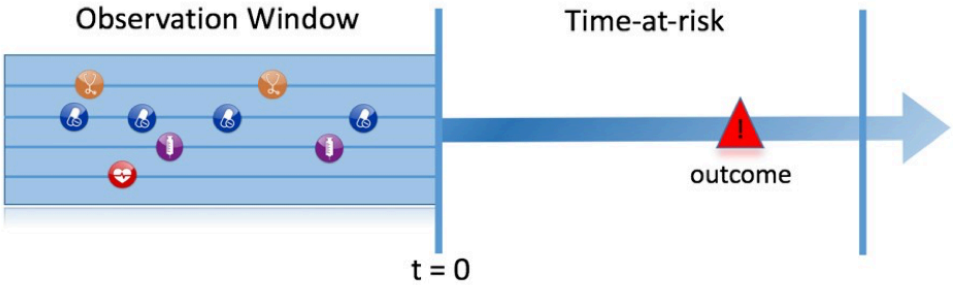


Figure 13.1: □□□□□

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|---|---|
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### 13.2.1

□ 13.2.1 □□2□□□□□□□□□□□□COHORT□□□□□□□□□□□□□□□□□□□□□□□□ID□1□□□□□

□□ □□□□COHORT□□□□□□□□□□□□COHORT_END_DATE□□□□□□□□□□

| COHORT_DEFINITION_ID | SUBJECT_ID | COHORT_START_DATE |
|---|---|---|
| 1 | 1 | 2000-06-01 |
| 1 | 2 | 2001-06-01 |
| 2 | 2 | 2001-07-01 |

□ 13.2.1 □□□□□□CONDITION_OCCURRENCE□□□□□□□□□□□□□□Concept ID 320128 □□□□□□□□□□□□□□□□□

□□ □□□□CONDITION_OCCURRENCE□□□□□□□□□□□□3□□□□□□□□□□□□□□□

| PERSON_ID | CONDITION_CONCEPT_ID | CONDITION_START_DATE |
|---|---|---|
| 1 | 320128 | 2000-10-01 |
| 2 | 320128 | 2001-05-01 |

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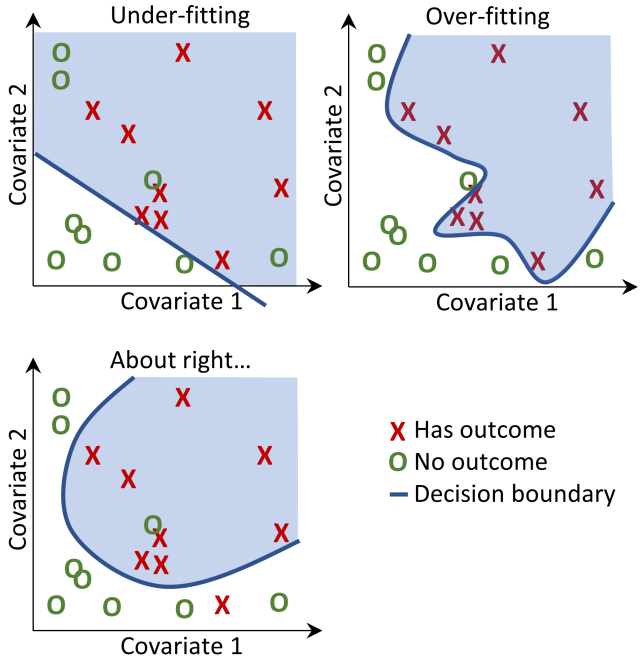


Figure 13.2: Decision boundary.

### 13.3.1

LASSO□□□□□□□

| □□□□□ | □□ | □□□□□ |
|---|---|---|
| learningRate | □□□□□□□□□□□□ | 0.005,0.01,0.1 |
| maxDepth | □□□□□□ | 4,6,17 |
| minRows | □□□□□□□□□□□□□□□□ | 2 |
| ntrees | □□□ | 100,1000 |

### 13.3.3

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| □□□□□ | □□ | □□□□□ |
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### 13.3.7

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- □□: $TP/(TP+FN)$
- □□□: $TN/(TN+FP)$
- □□□□□: $TP/(TP+FP)$

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## 13.5

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### 13.5.5

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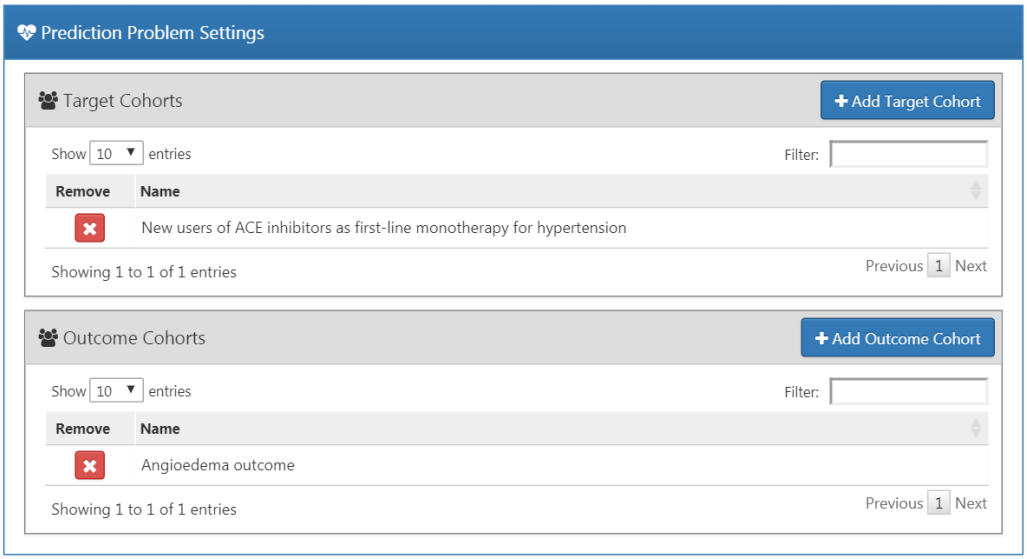


Figure 13.4: □□□□□□.

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CDM□□□□□□□□

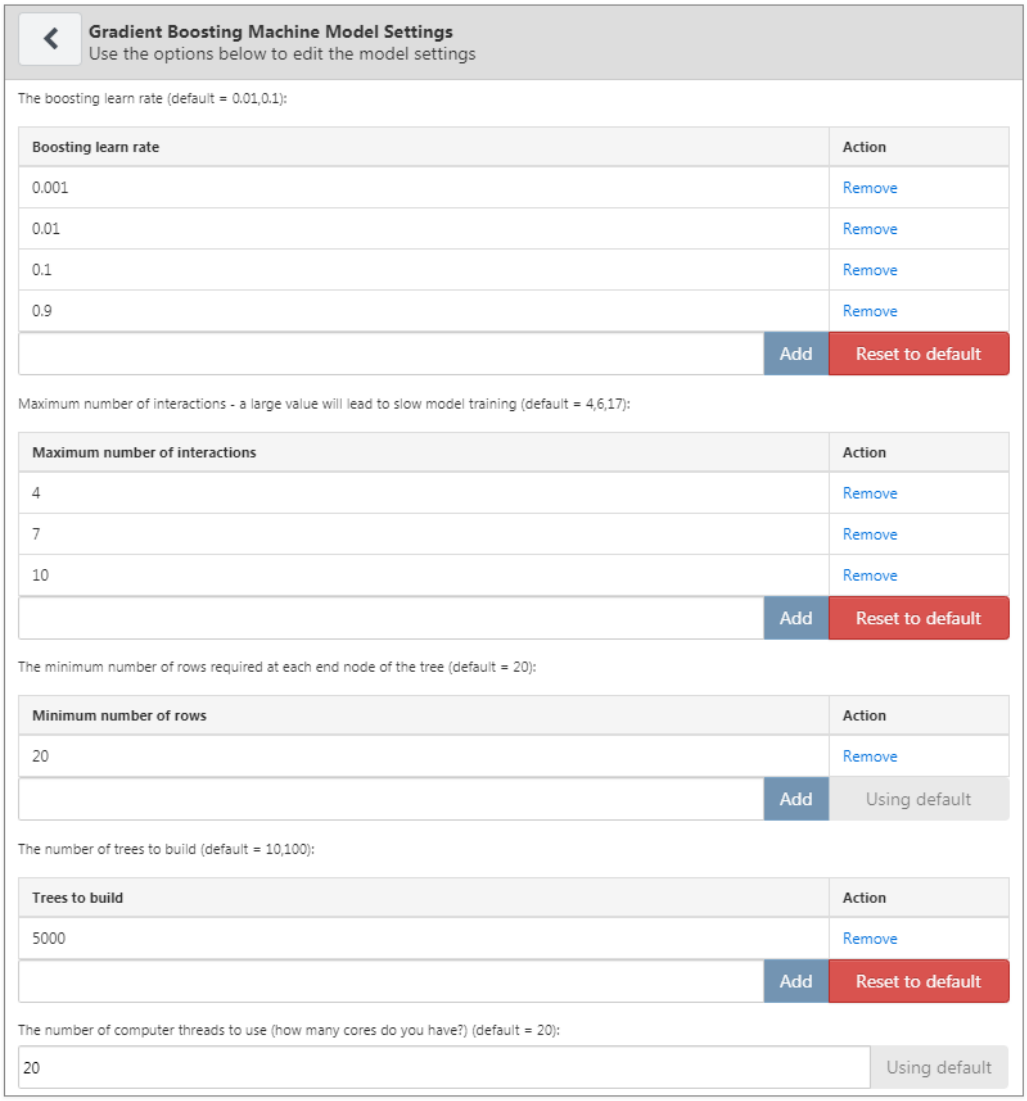
Gradient Boosting Machine Model Settings
Use the options below to edit the model settings
The boosting learn rate (default = 0.01,0.1):
Boosting learn rate
Action
0.001
Remove
0.01
Remove
0.1
Remove
0.9
Remove
Add
Reset to default
Maximum number of interactions - a large value will lead to slow model training (default = 4,6,17):
Maximum number of interactions
Action
4
Remove
7
Remove
10
Remove
Add
Reset to default
The minimum number of rows required at each end node of the tree (default = 20):
Minimum number of rows
Action
20
Remove
Add
Using default
The number of trees to build (default = 10,100):
Trees to build
Action
5000
Remove
Add
Reset to default
The number of computer threads to use (how many cores do you have?) (default = 20):
20
Using default

Figure 13.5: □□□□□□□□□□□□□□□□

What concepts do you want to include in baseline covariates in the propensity score model? (Leave blank if you want to include everything)

Should descendant concepts be added to the list of included concepts?

No

What concepts do you want to exclude in baseline covariates in the propensity score model? (Leave blank if you want to include everything)

Should descendant concepts be added to the list of included concepts?

No

A comma delimited list of covariate IDs that should be restricted to:

Figure 13.6: □□□□□□□□□□□□.

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Select Covariates

| | Gender | Age | Age Groups | Race | Ethnicity | Index Year | Index Month | Prior Observation Time | Post Observation Time | Time In Cohort | Index Year & Month |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Demographics | ☑ | ☐ | ☑ | ☑ | ☑ | ☐ | ☑ | ☐ | ☐ | ☐ | ☐ |

Figure 13.7: □□□□□□.

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- □□ [□□□□□□-365□□□□□□□□□□□□□]
- □□ [□□□□□□-180□□□□□□□□□□□□□]
- □□ [□□□□□□-30□□□□□□□□□□□□□]

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Time bound covariates

Set the time windows for the time bound covariates in days relative to the cohort index

| | Any Time Prior | Long Term | Medium Term | Short Term | End Days |
|---|---|---|---|---|---|
| Time Windows | All Time | -365 | -180 | -30 | 0 |

Figure 13.8: □□□□□□□□□□□.

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- Condition: □□□□□□□□□□□□□□□□□□□□□□□□□□ID□□□□□□□□□□□□□□□□□□□

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```
cohortsDbTable <- "my_cohorts"
cdmVersion <- "5"
```

□□□4□□cdmDbSchema□cohortsDbSchema□cohortsDbTable□□□□□□□CDM□□□□□□□
SQL Server□□□□□□□

```
                    sampleSize = 10000
)
```

getPlpData□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□PatientLevelPrediction□□□□□□□□□□

plpData□□□□□□□□□□□□□□□□□□□

runPlP□□□□□□□plpData□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□75
25%□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□testSplit□□/□□□□□□□testFractio

```
gbmResults <- runPlp(population = population,
                     plpData = plpData,
                     modelSettings = gbmModel,
                     testSplit = 'person',
                     testFraction = 0.25,
                     nfold = 2,
                     splitSeed = 1234)
```

□□□□□□□□□□□□□R□xgboost□□□□□□□□□□□□75%□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

runPlp□□□□□□plpData□plpResults□plpPlots□evaluation□□□□□□□□□□□□□□□□□□□□□

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```
savePlpModel(gbmResults$model, dirPath = "model")
```

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```
plpModel <- loadPlpModel("model")
```

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```
savePlpResult(gbmResults, location = "gbmResults")
```

□□□□□□□□□□□□□□□□□□□□□□□

```
gbmResults <- loadPlpResult("gbmResults")
```

### 13.7.5

□□□□□□□□□□□runPlp□□□□□□□□□□□□□□□□□□□□□□/□□□□□□□□□□□□□□□□□□□

### 13.7.6

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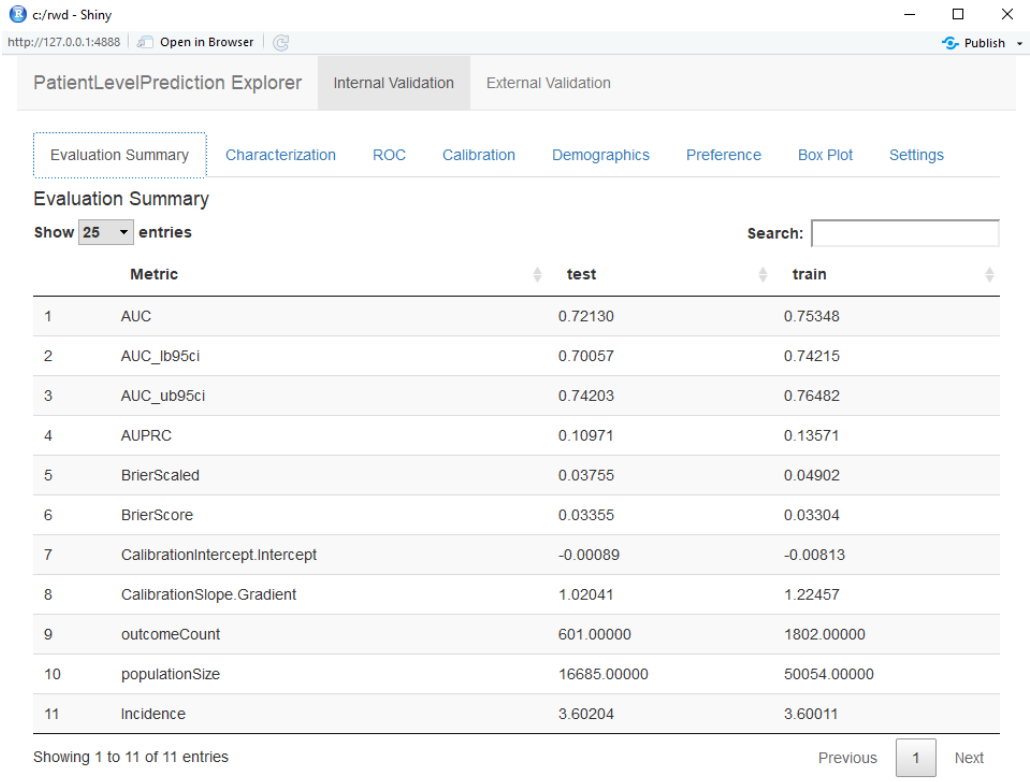


Figure 13.10: Shiny□□□□□□

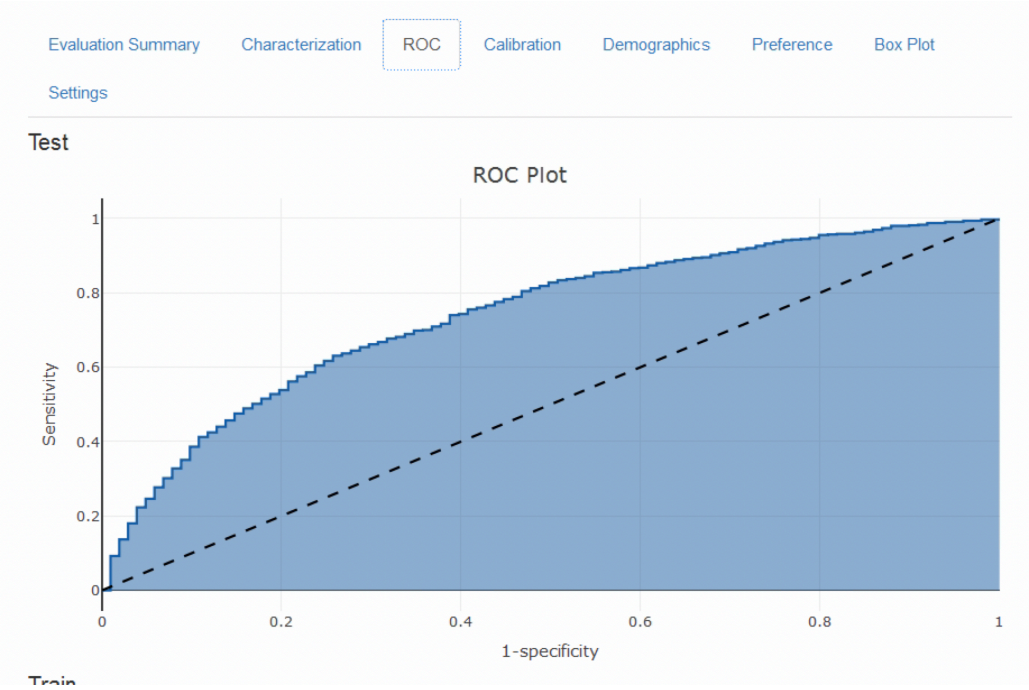


Figure 13.11: ROC□□□□□

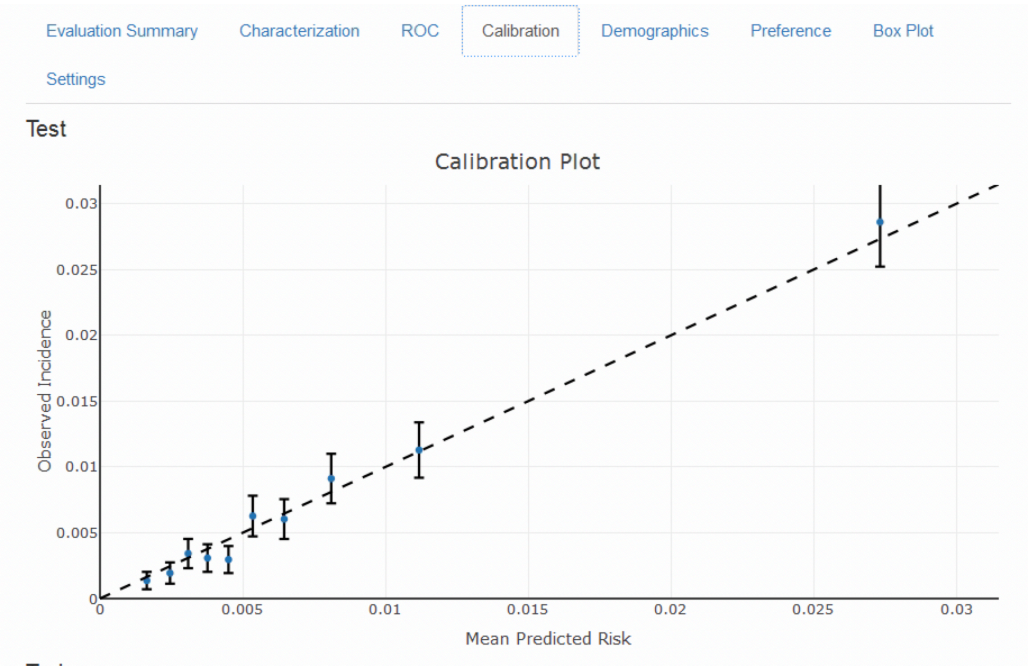


Figure 13.12: □□□□□□□□□□□□□□

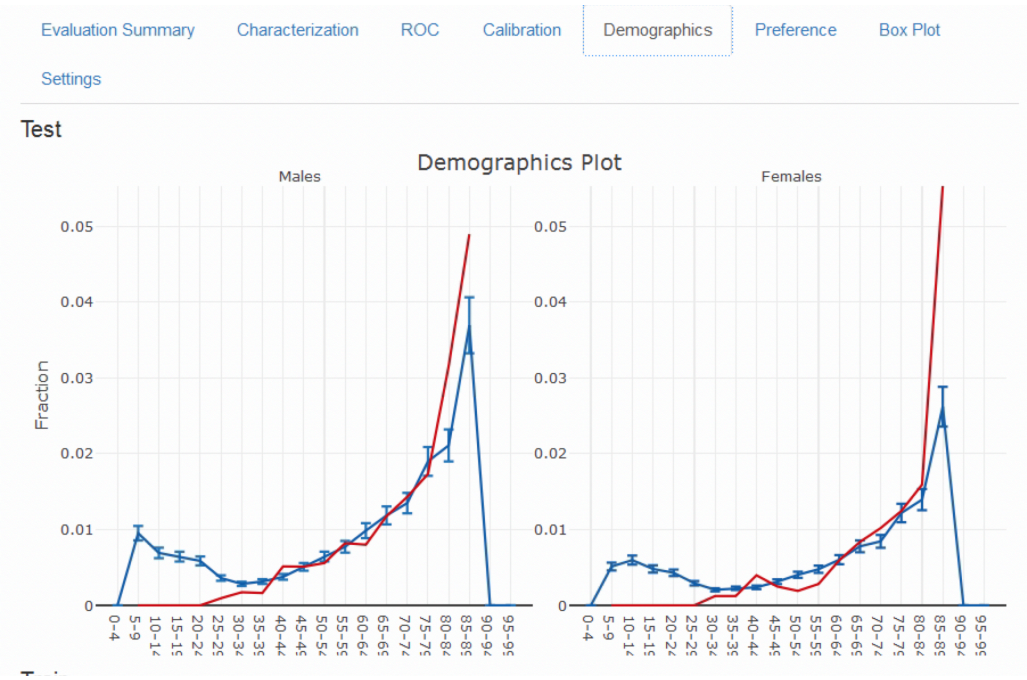


Figure 13.13: □□□□□□□□□□□□□□□□□□□□□□

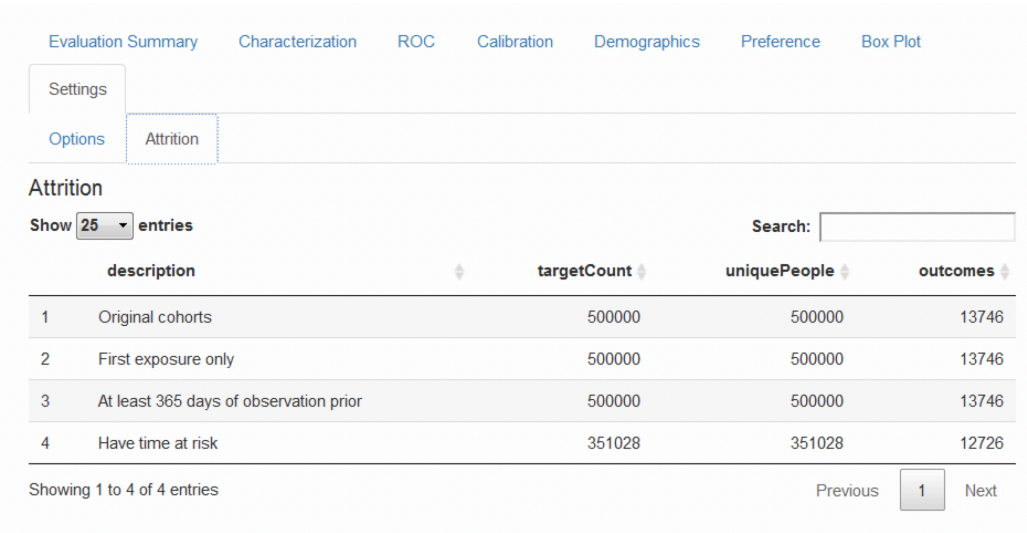


Figure 13.14: □□□□□□□□attrition□□□□

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□□□□□□□□□□Shiny□□□□□□ 13.15□□□□□□□□□□□□□□□□□□

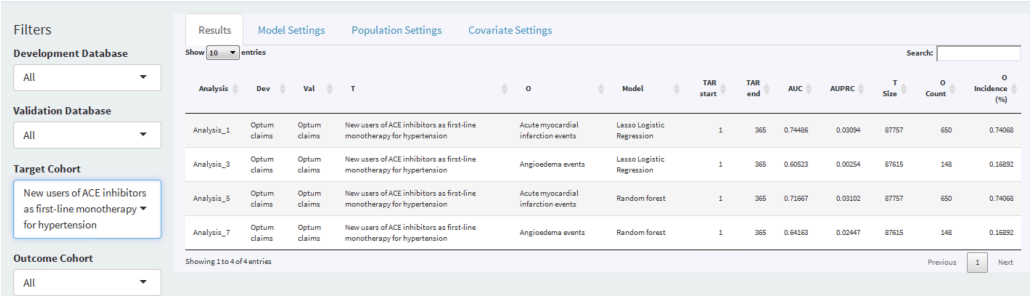


Figure 13.15: □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□Shiny□□□□□□

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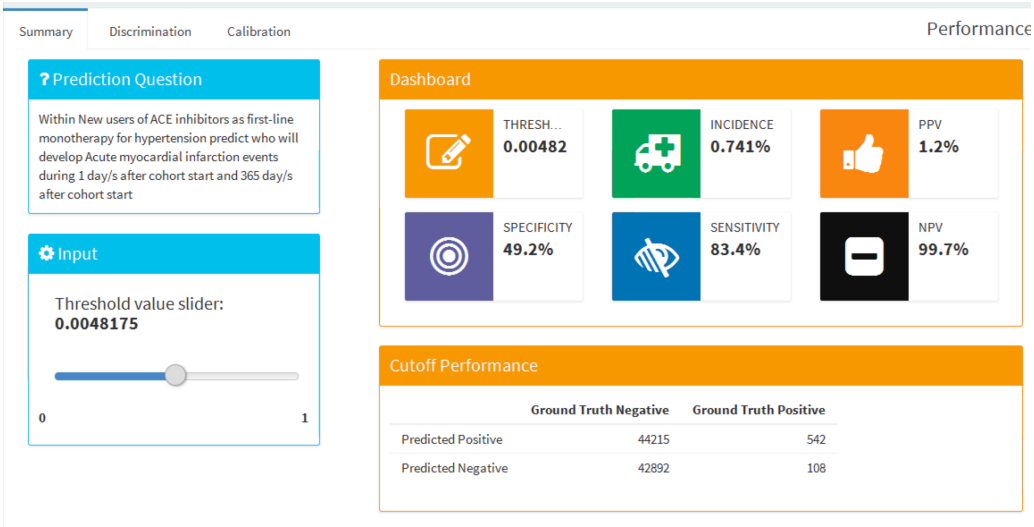
Summary
Discrimination
Calibration
Performance
Prediction Question
Within New users of ACE inhibitors as first-line monotherapy for hypertension predict who will develop Acute myocardial infarction events during 1 day/s after cohort start and 365 day/s after cohort start
Input
Threshold value slider:
0.0048175
0
1
Dashboard
THRESH...
0.00482
INCIDENCE
0.741%
PPV
1.2%
SPECIFICITY
49.2%
SENSITIVITY
83.4%
NPV
99.7%
Cutoff Performance
Ground Truth Negative
Ground Truth Positive
Predicted Positive 44215 542
Predicted Negative 42892 108

Figure 13.17: □□□□□□□□□□□□□□□□□□□□□□□□□□□□

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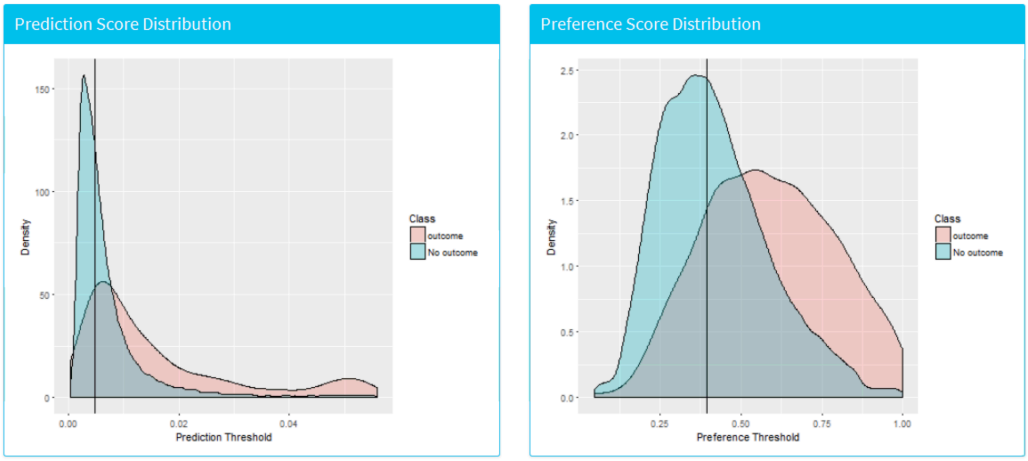


Figure 13.19: □□□□□□□□□□□outing□□□□□□□□□□

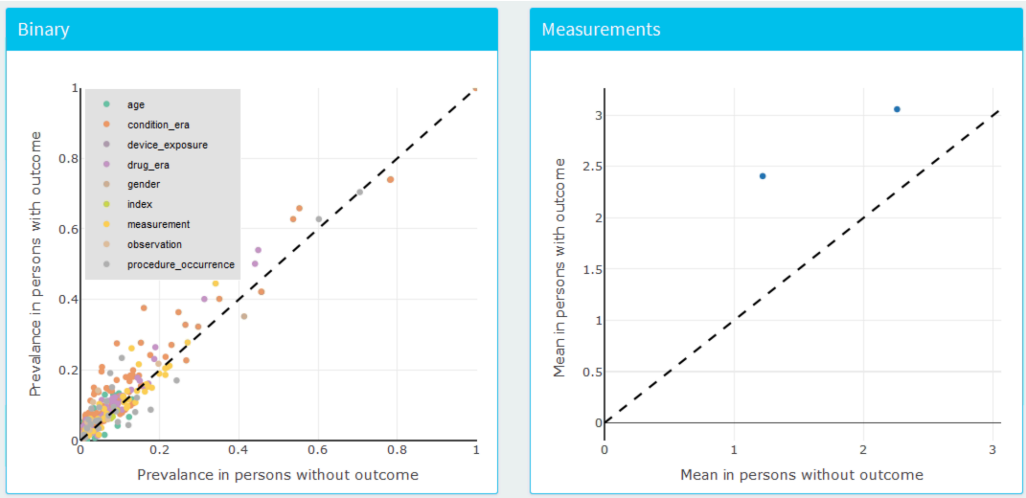
Binary
age
condition_era
device_exposure
drug_era
gender
index
measurement
observation
procedure_occurrence
Prevalance in persons with outcome
Prevalance in persons without outcome
Measurements
Mean in persons with outcome
Mean in persons without outcome

Figure 13.21: □□□□□□□

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```
install.packages(c("SqlRender", "DatabaseConnector", "remotes"))
remotes::install_github("ohdsi/Eunomia", ref = "v1.0.0")
remotes::install_github("ohdsi/PatientLevelPrediction")
```

Eunomia□□□□□□□□CDM□□□□□□□□

# Part II

# Chapter 14

□□□□□□□□: *Patrick Ryan & Jon Duke*

## 14.1

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## 14.2

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# Chapter 15

# — —

□□□□□: *Martijn Schuemie, Vojtech Huser & Clair Blacketer*

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16□Chapter 17□Chapter 18 □□□□□□□□□□□□□ ## □□□□□□□□□□

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(2016) □□□□□□□□□□□□□□□□□□□□DQ□□□□3□□□□□□□□□□□□□□□□□□□□□□

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| □□□□□□ | □□□□□□□□ | □□ | □□ |
|---|---|---|---|
| 0.99 | MEASUREMENT □□□□□ measurement_source_value □□□□□□□□□□□□□□□□□□□□□□□□□□□□ 0 □□□□□□□□□□□□□ | 0.30 | FAIL |
| 0.09 | DRUG_ERA □□□□□ drug_concept_id □□□□□□□□□□□□□□□□□□□□

□□□□□□Rabbit-in-a-Hat □□□□□□□

## 15.2

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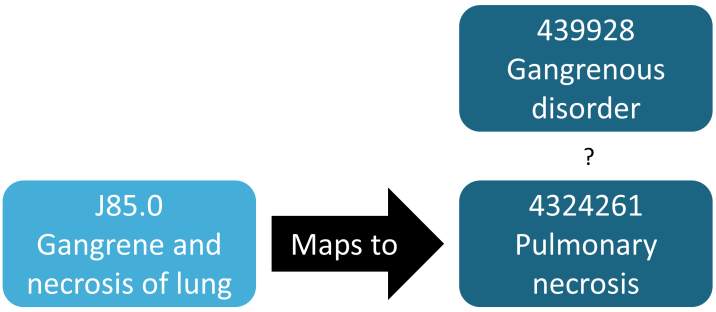


Figure 15.3: □□□□□□□□□□□□□□□□□□

## 15.3 ACHILLES

□□□□□CDM□□□□□□□□□□□□□□□ACHILLES□□□□□□□□□□□□□□□

□□□R□□□□□□□□□□□□□□□□□□□□□□□□□□□ACHILLES□ DatabaseConnector □□□□□□□□□□□□□□□□□□□□□ `createConnectionDetails` □□□□□□□□□□□□□□□□□□□□□□□□□□

```
library(Achilles)
connDetails <- createConnectionDetails(dbms = "postgresql",
                                       server = "localhost/ohdsi",
                                       user = "joe",
                                       password = "supersecret")

cdmDbSchema <- "my_cdm_data"
cdmVersion <- "5.3.0"
```

□□□2□□ `cdmDbSchema` □□□CDM□□□□□□□□□□□□□□□□□□□□□□□CDM□□□□□□□□□□□□□□□□□□□

```
DataQualityDashboard::executeDqChecks(connectionDetails = connectionDetails,
                                      cdmDatabaseSchema = cdmDbSchema,
                                      resultsDatabaseSchema = cdmDbSchema,
                                      cdmSourceName = "My database",
                                      outputFolder = "My output")
```

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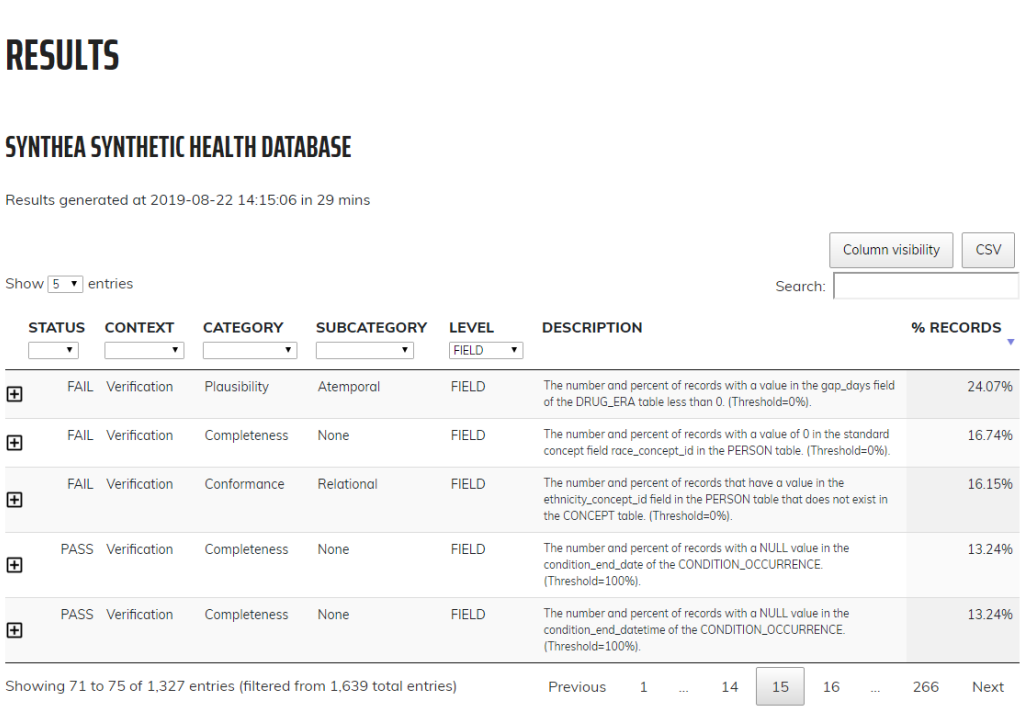


Figure 15.5: Data Quality Dashboard□□□□□□□□□□□□□□□□□□□

```
                    cdmDatabaseSchema = cdmDbSchema,
                    cohortJson = json,
                    cohortSql = sql,
                    outputFile = "output.html")
```

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9□□□□□□□□ICD-10□□□□□□□□□□□□□□□□□□□

| □□□ | □□ | □□ID | □□□□□□□ |
|---|---|---|---|
| 148774 | Angioneurotic Edema of Larynx | CIEL | 0 |
| 402383003 | Idiopathic urticaria and/or angioedema | SNOMED | 0 |
| 232437009 | Angioneurotic edema of larynx | SNOMED | 0 |
| 10002472 | Angioneurotic edema, not elsewhere classified | MedDRA | 0 |

□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□”Angioneurotic edema, sequela”□□□□□□□□□□□□□□□□□□□

| ‰ per month | Max monthly ‰ | Person count | Description |
|---|---|---|---|
| | 60.60 | 24,189,656 | **Inpatient or ER visit** |
| | 39.50 | 15,003,249 | **Emergency Room Visit** 9203 |
| | 39.50 | 15,003,249 | ER (None) No matching concept |
| | 23.90 | 9,186,407 | **Inpatient Visit** 9201 |
| | 23.90 | 9,186,407 | IP (None) No matching concept |
| | 0.27 | 76,711 | **Angioedema** |
| | 0.27 | 76,711 | **Angioedema** 432791 |
| | 0.26 | 64,726 | 9951 (ICD9CM) Angioneurotic edema, not elsewhere classified |
| | 0.20 | 8,822 | T783XXA (ICD10CM) Angioneurotic edema, initial encounter |
| | 0.09 | 3,163 | T783XXD (ICD10CM) Angioneurotic edema, subsequent encounter |

Figure 15.6: □□□□□□

# Chapter 16

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□□□□□□□□: *Joel Swerdel, Seng Chan You, Ray Chen & Patrick Ryan*

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| | | Gold Standard | |
|---|---|---|---|
| | | True | False |
| **Cohort Definition** | True | True Positive | False Positive |
| | False | False Negative | True Negative |

Figure 16.1: □□□□□□□□□□□□□□□

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### 16.1.2

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□□□□ **1: xSpec** □□□□□□□□

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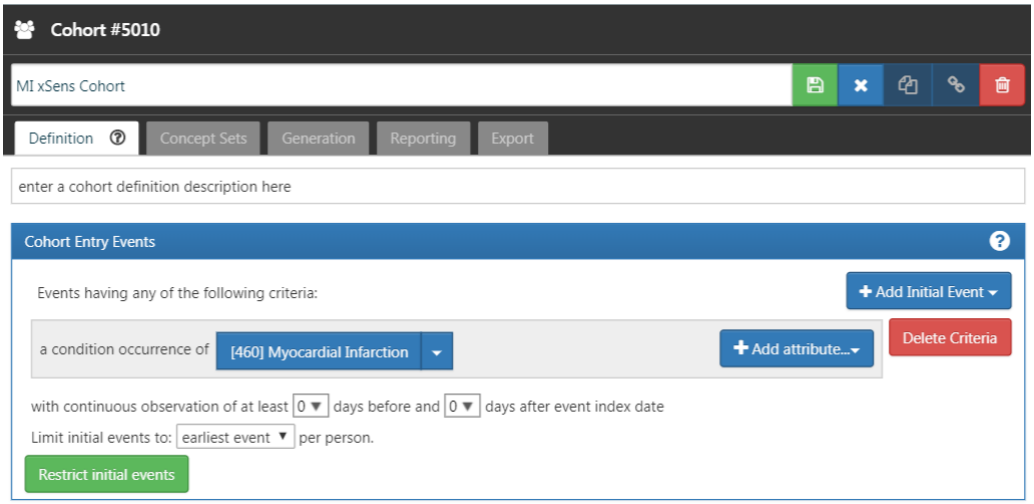


Figure 16.3: □□□□□□□□□□□□□□□□□□□□□□□□xSens□□

xSpec□□□□□□□□□□□□□□□□□□□

```
  upperAgeLimit = 90,
  gender = c(8507, 8532),
  startDate = "20100101",
  endDate = "20171231")
```

□□□□□□“my_results”□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□cohortDatabase
- “my_results.cohort”□□□□□□□□□□□□□□□□□□□□□□□□□□□□cdmDatabaseSchema
- “my_cdm_data”□□□□□□□□□□□□□□□□□□□□□□□□□□□□2010□1□1□□□□2017□12□31□□□□□CDM
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# Chapter 17

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□□□□□□□□: *Martijn Schuemie*

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### 17.1.6

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## 17.3

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# Chapter 18

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□□□□□: *Martijn Schuemie*

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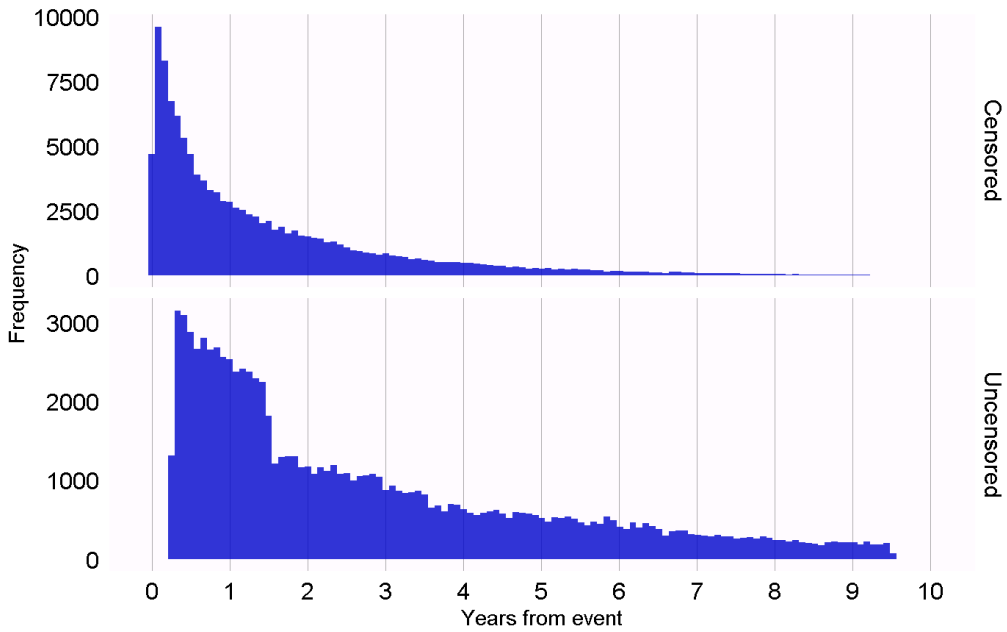


Figure 18.1: □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

### 18.2.1

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$$\beta_i \sim N(\mu, \sigma^2) \text{ □□□ } \hat{\theta}_i \sim N(\theta_i + \beta_i, \tau_i^2)$$

□□□ $N(a, b)$ □□□□ $a$ □□□ $b$ □□□□□□□□□□□□□□□□:

$$L(\mu, \sigma|\theta, \tau) \propto \prod_{i=1}^{n} \int p(\hat{\theta}_i|\beta_i, \theta_i, \hat{\tau}_i) p(\beta_i|\mu, \sigma) \mathrm{d}\beta_i$$

□□□□□□□□□□□ $\hat{\mu}$ □ $\hat{\sigma}$ □□□□□□□□□□□□□□□□□□□p□□□□□□□□□□□□□□□□□□

Evidence for all conditions for ACEi and THZ combined

Save New Concept Set From Selection Below | View database record counts (RC) and descendant record counts (DRC) for: SYNPUF 5%

Column visibility | Copy | CSV | Show 15 entries | Filter:

Showing 1 to 15 of 13,787 entries | Previous 1 2 3 4 5 ... 920 Next

Suggested Negative Control
No (12777)
Yes (1010)

Found in Publications
No (12398)
Yes (Parent) (1160)
Yes (Exact) (229)

Found on Product Label
No (12667)
Yes (Parent) (878)
Yes (Exact) (242)

Found in Product Label Or Publications
Yes (10576)
No (3211)

Signal in FAERS
No (10951)
Yes (Parent) (1949)

| Name | Suggested Negative Control | Sort Order | Publication Count (Descendant Concept Match) | Publication Count (Exact Concept Match) | Publication Count (Parent Concept Match) | Product Label Count (Descendant Concept Match) | Product Label (Exact Concept Match) | Product Label (Parent Concept Match) |
|---|---|---|---|---|---|---|---|---|
| Rift valley fever | Y | 13,781 | 0 | 0 | 0 | 0 | 0 | 0 |
| Obstruction due to foreign body accidentally left in operative wound AND/OR body cavity during a procedure | Y | 13,780 | 0 | 0 | 0 | 0 | 0 | 0 |
| Infection by Shigella | Y | 13,766 | 0 | 0 | 0 | 0 | 0 | 0 |

Figure 18.4: □□□□□□□□□

```
  removePeopleWithPriorOutcomes = TRUE,
  washoutPeriod = 365,
  riskWindowStart = 1,
  riskWindowEnd = 0,
  endAnchor = "cohort end",
  exposureOutcomePairs = eoPairs,
  effectSizes = c(1.5, 2, 4),
  cdmVersion = cdmVersion,
  workFolder = file.path(outputFolder, "pcSynthesis"))
```

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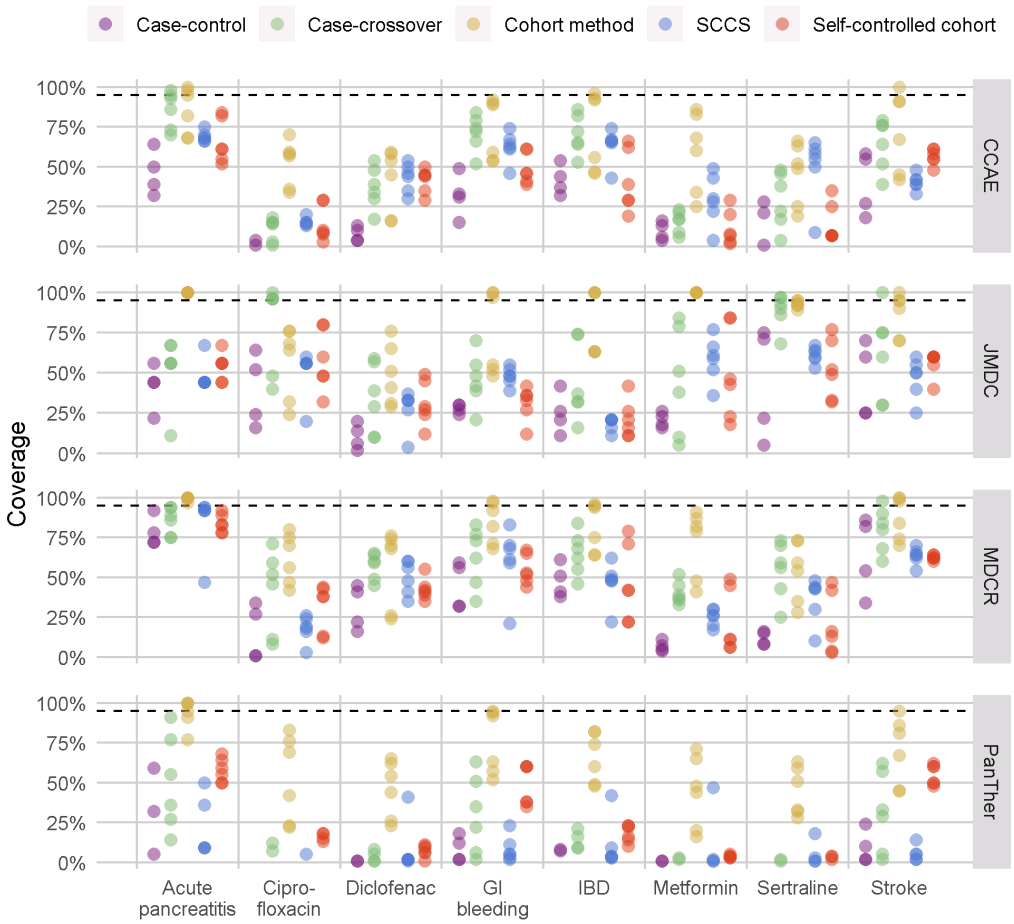


Figure 18.6: □□□□□□□□□□□□□□□□□□□□□95%□□□□□□□□□□□□□□□□□□□

# Part III

# OHDSI

# Chapter 19

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□□□□□□□□: *Sara Dempster & Martijn Schuemie*

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# Chapter 20

# – – OHDSI

□□□□: *Kristin Kostka, Greg Klebanov & Sara Dempster*

OHDSI□□□□

### 20.2.2 OHDSI

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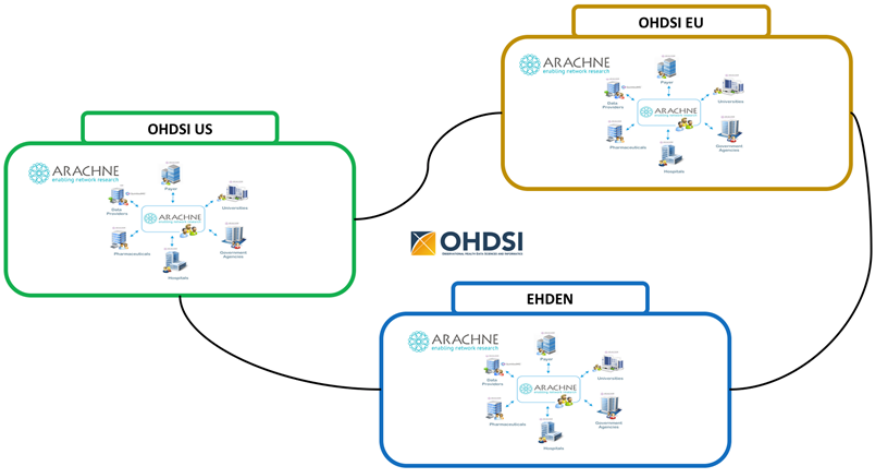


Figure 20.2: ARACHNE□□□□□□□□□□□□□□□□□□□

## 20.4

- OHDSI□□□□□□□□□□□□□□CDM□□□□□□□□OHDSI□□□□□□□□□□□□□□□□□□□
- OHDSI□□□□□□□□□□□□□□□□□□□

# Chapter A

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**ACHILLES** □□□□

□□□□**Measurement**□ □□□□□□

# Chapter B

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Table B.1: ACE□□□

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| 1310756 | □□□□□□□ | □□□ | □□ | □□□ |
| 1331235 | □□□□□ | □□□ | □□ | □□□ |
| 1334456 | □□□□□ | □□□ | □□ | □□□ |
| 1335471 | □□□□□□ | □□□ | □□ | □□□ |
| 1340128 | □□□□□□ | □□□ | □□ | □□□ |
| 1341927 | □□□□□□ | □□□ | □□ | □□□ |
| 1342439 | □□□□□□□□ | □□□ | □□ | □□□ |
| 1363749 | □□□□□□□ | □□□ | □□ | □□□ |
| 1373225 | □□□□□□□ | □□□ | □□ | □□□ |

## B.2 ACE

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| 974166 | □□□□□□□□□□ | □□□ | □□ | □□□ |
| 978555 | □□□□□□ | □□□ | □□ | □□□ |
| 991382 | □□□□□ | □□□ | □□ | □□□ |
| 1305447 | □□□□□ | □□□ | □□ | □□□ |
| 1307046 | □□□□□□□ | □□□ | □□ | □□□ |
| 1307863 | □□□□□ | □□□ | □□ | □□□ |
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| 1309068 | □□□□□□ | □□□ | □□ | □□□ |
| 1309799 | □□□□□□ | □□□ | □□ | □□□ |
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| 1313200 | □□□□□ | □□□ | □□ | □□□ |
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| 1318853 | □□□□□□ | □□□ | □□ | □□□ |
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| 1363053 | □□□□□□ | □□□ | □□ | □□□ |

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| 1395058 | □□□□□□□□ | □□□ | □□ | □□□ |
| 1398937 | □□□□□□ | □□□ | □□ | □□□ |
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## B.3 AMI

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Table B.9: □□□□□□□□□□□□□□□□□□□□□□

| □□□□□ID | □□□□□□ | □□ | □□□ | □□□□□□ |
|---|---|---|---|---|
| 907013 | □□□□□ | □□□ | □□ | □□□ |
| 974166 | □□□□□□□□□□ | □□□ | □□ | □□□ |
| 978555 | □□□□□□ | □□□ | □□ | □□□ |
| 1395058 | □□□□□□□ | □□□ | □□ | □□□ |

Table B.10: □□□□□□

| □□□□□ID | □□□□□□□ | □□ | □□□ | □□□□□□□ |
|---|---|---|---|---|
| 316866 | □□□□□□□ | □□□ | □□ | □□□ |

Table B.11: □□□□□□

| □□□□□ID | □□□□□□ | □□ | □□□ | □□□□□□ |
|---|---|---|---|---|
| 904542 | □□□□□□□ | □□□ | □□ | □□□ |
| 907013 | □□□□□ | □□□ | □□ | □□□ |
| 932745 | □□□□□ | □□□ | □□ | □□□ |
| 942350 | □□□□□ | □□□ | □□ | □□□ |
| 956874 | □□□□□ | □□□ | □□ | □□□ |
| 970250 | □□□□□□□□ | □□□ | □□ | □□□ |
| 974166 | □□□□□□□□□□ | □□□ | □□ | □□□ |
| 978555 | □□□□□□ | □□□ | □□ | □□□ |
| 991382 | □□□□□□ | □□□ | □□ | □□□ |
| 1305447 | □□□□□ | □□□ | □□ | □□□ |
| 1307046 | □□□□□□□ | □□□ | □□ | □□□ |
| 1307863 | □□□□□ | □□□ | □□ | □□□ |
| 1308216 | □□□□□□ | □□□ | □□ | □□□ |
| 1308842 | □□□□□□ | □□□ | □□ | □□□ |
| 1309068 | □□□□□□ | □□□ | □□ | □□□ |
| 1309799 | □□□□□□ | □□□ | □□ | □□□ |
| 1310756 | □□□□□□□ | □□□ | □□ | □□□ |
| 1313200 | □□□□□ | □□□ | □□ | □□□ |
| 1314002 | □□□□□□ | □□□ | □□ | □□□ |
| 1314577 | □□□□□□ | □□□ | □□ | □□□ |
| 1317640 | □□□□□□□ | □□□ | □□ | □□□ |
| 1317967 | □□□□□□ | □□□ | □□ | □□□ |
| 1318137 | □□□□□□□ | □□□ | □□ | □□□ |
| 1318853 | □□□□□□ | □□□ | □□ | □□□ |
| 1319880 | □□□□□□ | □□□ | □□ | □□□ |
| 1319998 | □□□□□□□ | □□□ | □□ | □□□ |

| □□□□□ID | □□□□□□□ | □□ | □□□ | □□□□□□□ |
|---|---|---|---|---|
| 1322081 | □□□□□□□ | □□□ | □□ | □□□ |
| 1326012 | □□□□□□□ | □□□ | □□ | □□□ |
| 1327978 | □□□□□□□□ | □□□ | □□ | □□□ |
| 1328165 | □□□□□□□ | □□□ | □□ | □□□ |
| 1331235 | □□□□□□ | □□□ | □□ | □□□ |
| 1332418 | □□□□□□□ | □□□ | □□ | □□□ |
| 1334456 | □□□□□□ | □□□ | □□ | □□□ |
| 1335471 | □□□□□□□ | □□□ | □□ | □□□ |
| 1338005 | □□□□□□□□ | □□□ | □□ | □□□ |
| 1340128 | □□□□□□□ | □□□ | □□ | □□□ |
| 1341238 | □□□□□□ | □□□ | □□ | □□□ |
| 1341927 | □□□□□□□ | □□□ | □□ | □□□ |
| 1342439 | □□□□□□□□□ | □□□ | □□ | □□□ |
| 1344965 | □□□□□□□□ | □□□ | □□ | □□□ |
| 1345858 | □□□□□□□ | □□□ | □□ | □□□ |
| 1346686 | □□□□□□□□ | □□□ | □□ | □□□ |
| 1346823 | □□□□□□□□ | □□□ | □□ | □□□ |
| 1347384 | □□□□□□□□ | □□□ | □□ | □□□ |
| 1350489 | □□□□□□ | □□□ | □□ | □□□ |
| 1351557 | □□□□□□□□ | □□□ | □□ | □□□ |
| 1353766 | □□□□□□□□□ | □□□ | □□ | □□□ |
| 1353776 | □□□□□□□ | □□□ | □□ | □□□ |
| 1363053 | □□□□□□□ | □□□ | □□ | □□□ |
| 1363749 | □□□□□□□□ | □□□ | □□ | □□□ |
| 1367500 | □□□□□□ | □□□ | □□ | □□□ |
| 1373225 | □□□□□□□□ | □□□ | □□ | □□□ |
| 1373928 | □□□□□□□ | □□□ | □□ | □□□ |
| 1386957 | □□□□□□□ | □□□ | □□ | □□□ |
| 1395058 | □□□□□□□□ | □□□ | □□ | □□□ |
| 1398937 | □□□□□□ | □□□ | □□ | □□□ |
| 40226742 | □□□□□□□□ | □□□ | □□ | □□□ |
| 40235485 | □□□□□□□□ | □□□ | □□ | □□□ |

## B.6

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| □□□□□ID | □□□□□□ | □□ | □□□ | □□□□□□ |
|---|---|---|---|---|
| 1353776 | □□□□□□ | NO | YES | NO |
| 1363749 | □□□□□□ | NO | YES | NO |
| 1367500 | □□□□□ | NO | YES | NO |
| 1373225 | □□□□□□□ | NO | YES | NO |
| 1395058 | □□□□□□□ | NO | YES | NO |
| 40226742 | □□□□□□□ | NO | YES | NO |
| 40235485 | □□□□□□□ | NO | YES | NO |

Table B.13: □□□□

| □□□□□ID | □□□□□□ | □□ | □□□ | □□□□□□ |
|---|---|---|---|---|
| 904542 | □□□□□□□ | NO | YES | NO |
| 907013 | □□□□□ | NO | YES | NO |
| 932745 | □□□□□ | NO | YES | NO |
| 942350 | □□□□□ | NO | YES | NO |
| 956874 | □□□□□ | NO | YES | NO |
| 970250 | □□□□□□□□ | NO | YES | NO |
| 974166 | □□□□□□□□□□ | NO | YES | NO |
| 978555 | □□□□□□ | NO | YES | NO |
| 991382 | □□□□□ | NO | YES | NO |
| 1305447 | □□□□□ | NO | YES | NO |
| 1307046 | □□□□□□□ | NO | YES | NO |
| 1307863 | □□□□□ | NO | YES | NO |
| 1308216 | □□□□□□ | NO | YES | NO |
| 1308842 | □□□□□□ | NO | YES | NO |
| 1309068 | □□□□□□ | NO | YES | NO |
| 1309799 | □□□□□□ | NO | YES | NO |
| 1310756 | □□□□□□□ | NO | YES | NO |
| 1313200 | □□□□□ | NO | YES | NO |
| 1314002 | □□□□□□ | NO | YES | NO |
| 1314577 | □□□□□□ | NO | YES | NO |
| 1317640 | □□□□□□□ | NO | YES | NO |
| 1317967 | □□□□□□ | NO | YES | NO |
| 1318137 | □□□□□□ | NO | YES | NO |
| 1318853 | □□□□□□ | NO | YES | NO |
| 1319880 | □□□□□□ | NO | YES | NO |
| 1319998 | □□□□□□□ | NO | YES | NO |
| 1322081 | □□□□□□□ | NO | YES | NO |
| 1326012 | □□□□□□ | NO | YES | NO |
| 1327978 | □□□□□□□ | NO | YES | NO |
| 1328165 | □□□□□□ | NO | YES | NO |
| 1331235 | □□□□□ | NO | YES | NO |

| □□□□□ID | □□□□□□ | □□ | □□□ | □□□□□□ |
|---|---|---|---|---|
| 1332418 | □□□□□□ | NO | YES | NO |
| 1334456 | □□□□□ | NO | YES | NO |
| 1335471 | □□□□□□ | NO | YES | NO |
| 1338005 | □□□□□□□ | NO | YES | NO |
| 1340128 | □□□□□□ | NO | YES | NO |
| 1341238 | □□□□□ | NO | YES | NO |
| 1341927 | □□□□□□ | NO | YES | NO |
| 1342439 | □□□□□□□□ | NO | YES | NO |
| 1344965 | □□□□□□□ | NO | YES | NO |
| 1345858 | □□□□□□ | NO | YES | NO |
| 1346686 | □□□□□□□ | NO | YES | NO |
| 1346823 | □□□□□□□ | NO | YES | NO |
| 1347384 | □□□□□□□ | NO | YES | NO |
| 1350489 | □□□□□ | NO | YES | NO |
| 1351557 | □□□□□□□ | NO | YES | NO |
| 1353766 | □□□□□□□□ | NO | YES | NO |
| 1353776 | □□□□□□ | NO | YES | NO |
| 1363053 | □□□□□□ | NO | YES | NO |
| 1363749 | □□□□□□ | NO | YES | NO |
| 1367500 | □□□□□ | NO | YES | NO |
| 1373225 | □□□□□□□ | NO | YES | NO |
| 1373928 | □□□□□□ | NO | YES | NO |
| 1386957 | □□□□□□ | NO | YES | NO |
| 1395058 | □□□□□□□ | NO | YES | NO |
| 1398937 | □□□□□ | NO | YES | NO |
| 40226742 | □□□□□□□ | NO | YES | NO |
| 40235485 | □□□□□□□ | NO | YES | NO |

Table B.14: □□□□□□

| □□□□□ID | □□□□□□ | □□ | □□□ | □□□□□□ |
|---|---|---|---|---|
| 316866 | □□□□□□ | NO | YES | NO |

## B.7 3

□□□□□□ *B.6* □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□365□□□□**1095**□□□□□□□□□□□□

## B.8 ACE

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- *ACE*□□□□□ B.15□□□□□□□

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Table B.16: □□□□□□□□□□□□□□□□ARB□

| □□□□□ID | □□□□□□ | □□ | □□□ | □□□□□□ |
|---|---|---|---|---|
| 1308842 | □□□□□□ | NO | YES | NO |
| 1317640 | □□□□□□□ | NO | YES | NO |
| 1346686 | □□□□□□□ | NO | YES | NO |
| 1347384 | □□□□□□□ | NO | YES | NO |
| 1351557 | □□□□□□□ | NO | YES | NO |
| 1367500 | □□□□□ | NO | YES | NO |
| 40226742 | □□□□□□□ | NO | YES | NO |
| 40235485 | □□□□□□□ | NO | YES | NO |

## B.10

□□□□□□ *B.8* □□□□□□□□□□□□□□□□□□□□

| □□□□□ID | □□□□□□ | □□ | □□□ | □□□□□□ |
|---|---|---|---|---|
| 1332418 | □□□□□□ | NO | YES | NO |
| 1353776 | □□□□□□ | NO | YES | NO |

## B.12 NDCCB

□□□□□□ *B.8* □□□□□□□

## B.14

*ACE*□□□□□ *B.8* □□□□□□□□□□□□□ (□ B.21) □ *ACE*□□□ (□ B.15) □□□□□□□□□□

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Table B.21: □□□□□□

| □□□□□ID | □□□□□□□ | □□ | □□□ | □□□□□□□ |
|---|---|---|---|---|
| 932745 | □□□□□ | NO | YES | NO |
| 942350 | □□□□□ | NO | YES | NO |
| 956874 | □□□□□ | NO | YES | NO |

## B.15

*ACE*□□□□□ *B.8* □□□□□□□□□□□□□□□□□ (□ B.22) □ *ACE*□□□ (□ B.15) □□□□□□□□□□

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Table B.22: □□□□□□□□□□□

| □□□□□ID | □□□□□□□ | □□ | □□□ | □□□□□□□ |
|---|---|---|---|---|
| 904542 | □□□□□□□□ | NO | YES | NO |
| 991382 | □□□□□□□ | NO | YES | NO |

## B.16 1

*ACE*□□□□□ *B.8* □□□□□*α1*□□□ (□ B.23) □ *ACE*□□□ (□ B.15)□□□□□□□□□□

□□□□□□□□□□□□

Table B.23: α1□□□

| □□□□□ID | □□□□□□□ | □□ | □□□ | □□□□□□□ |
|---|---|---|---|---|
| 1341238 | □□□□□ | NO | YES | NO |
| 1350489 | □□□□□ | NO | YES | NO |
| 1363053 | □□□□□□ | NO | YES | NO |

# Chapter C

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| □□□□□ID | □□□□□□□□□ |
| --- | --- |
| 134438 | □□□□□□ |
| 78619 | □□□□□ |
| 201606 | □□□□□ |
| 76786 | □□□□ |
| 4115402 | □□□□ |
| 45757370 | □□□□□□□□□ |
| 433111 | □□□□□ |
| 433527 | □□□□□ |
| 4170770 | □□□□ |
| 4092896 | □□□□□□□□ |
| 259995 | □□□□□□□ |
| 40481632 | □□□□□□□□ |
| 4166231 | □□□□□ |
| 433577 | □□□□□□ |
| 4231770 | □□□□□□ |
| 440329 | □□□□□□□□□□ |
| 4012570 | □□□□□□□□ |
| 4012934 | □□□□□□□□ |
| 441788 | □□□□□□□□□□□□□□ |
| 4201717 | □□□□□□ |
| 374375 | □□□□ |
| 4344500 | □□□□□□□□□□□□□□□□□□ |
| 139099 | □□□ |
| 444132 | □□□□ |
| 196168 | □□□□□□ |
| 432593 | □□□□□□□ |
| 434203 | □□□□□□ |
| 438329 | □□□□□□□□□ |
| 195873 | □□□□ |
| 4083487 | □□□ |
| 4103703 | □□□□□□□□ |
| 4209423 | □□□□□□□ |
| 377572 | □□□□□□□□□□□ |
| 40480893 | □□□□□□□□□□□□□□□ |
| 136368 | □□□□□□□□□□□ |
| 140648 | □□□□□□□□□□□ |
| 438130 | □□□□□□□ |
| 4091513 | □□ |
| 4202045 | □□□□□□□□□□□□ |
| 373478 | □□ |
| 46286594 | □□□□□□□□□□□□□□□ |
| 439790 | □□□□ |
| 81634 | □□□□ |

| □□□□□ID | □□□□□□□□ |
| --- | --- |
| 380706 | □□□□□□ |
| 141932 | □□□□□□ |
| 36713918 | □□□□□□□□□ |
| 443172 | □□□□□□□□□□□□ |
| 81151 | □□□□□ |
| 72748 | □□□□□□□□□□□□□□□□□□ |
| 378427 | □□□□ |
| 437264 | □□□□□□ |
| 194083 | □□□□□□□□□ |
| 140641 | □□□□□ |
| 440193 | □□□□ |
| 4115367 | □□□□ |

# Chapter D

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# Chapter E

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## E.1

### □□ 4.1

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Table E.1: PERSON□□□□□

| □□□□ | □ | □□ |
|---|---|---|
| PERSON_ID | 2 | □□□□□□ |
| GENDER_CONCEPT_ID | 8507 | □□□□□□□□ ID □ 8507□ |
| YEAR_OF_BIRTH | 1974 | |
| MONTH_OF_BIRTH | 8 | |
| DAY_OF_BIRTH | 4 | |
| BIRTH_DATETIME | 1974-08-04 00:00:00 | □□□□□□□□□□□□□00:00:00□□□□□ |
| DEATH_DATETIME | NULL | |
| RACE_CONCEPT_ID | 8516 | □□□□□□□□□□□□□□□□ ID □ 8516□ |
| ETHNICITY_ CONCEPT_ID | 38003564 | 38003564 □□□□□□□□□□□□□□□□□□□□ |
| LOCATION_ID | | □□□□□□ |
| PROVIDER_ID | | □□□□□□□ |
| CARE_SITE | | □□□□□□□□□ |
| PERSON_SOURCE_ VALUE | NULL | □□□□□□□□□ |
| GENDER_SOURCE_ VALUE | Man | □□□□□□□□□□□□□ |

| □□□□ | □ | □□ |
|---|---|---|
| GENDER_SOURCE_CONCEPT_ID | 0 | |
| RACE_SOURCE_VALUE | African American | □□□□□□□□□□□□□□ |
| RACE_SOURCE_CONCEPT_ID | 0 | |
| ETHNICITY_SOURCE_VALUE | NULL | |
| ETHNICITY_SOURCE_CONCEPT_ID | 0 | |

### □□ 4.2

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Table E.2: OBSERVATION_PERIOD□□□□□

| □□□□ | □ | □□ |
|---|---|---|
| OBSERVATION_PERIOD_ID | 2 | □□□□□□ |
| PERSON_ID | 2 | □□□PERSON□□□□□□□□□□□□□□□□□□□□□□□□ |
| OBSERVATION_PERIOD_START_DATE | 2015-01-01 | □□□□□□□ |
| OBSERVATION_PERIOD_END_DATE | 2019-07-01 | □□□□□□□□□□□□□□□□□□□□□ |
| PERIOD_TYPE_CONCEPT_ID | 44814722 | 44814724 □□□□□□□□□□□□□□ |

### □□ 4.3

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Table E.3: DRUG_EXPOSURE□□□□□

| □□□□ | □ | □□ |
|---|---|---|
| DRUG_EXPOSURE_ID | 1001 | □□□□□□ |
| PERSON_ID | 2 | □□□PERSON□□□□□□□□□□□□□□□□□□□□□□□□ |
| DRUG_CONCEPT_ID | 19078461 | □□□□□NDC□□□□□□□□□□□□ 19078461 □□□□□□□□□□□ |
| DRUG_EXPOSURE_START_DATE | 2019-05-01 | □□□□□□□□□□ |

| □□□□ | □ | □□ |
|---|---|---|
| DRUG_EXPOSURE_START_DATETIME | 2019-05-01 00:00:00 | □□□□□□□□□□□□□□□□ |
| DRUG_EXPOSURE_END_DATE | 2019-05-31 | □□□ + □□□□□□□□□□ |
| DRUG_EXPOSURE_END_DATETIME | 2019-05-31 00:00:00 | □□□□□□□□□□□□□□□□ |
| VERBATIM_END_DATE | NULL | □□□□□□□□□□ |
| DRUG_TYPE_CONCEPT_ID | 38000177 | 38000177 □□□□□□□□□□□□□□□□□□ |
| STOP_REASON | NULL | |
| REFILLS | NULL | |
| QUANTITY | NULL | □□□□□□□□□□ |
| DAYS_SUPPLY | 30 | □□□□□□□□□□□□□□ |
| SIG | NULL | □□□□□□□□□□ |
| ROUTE_CONCEPT_ID | 4132161 | 4132161 □□□□□□□□□□ |
| LOT_NUMBER | NULL | □□□□□□□□□□ |
| PROVIDER_ID | NULL | □□□□□□□□□□ |
| VISIT_OCCURRENCE_ID | NULL | □□□□□□□□□□□□□□□□□□□□ |
| VISIT_DETAIL_ID | NULL | |
| DRUG_SOURCE_VALUE | 76168009520 | □□□□□NDC□□□□□ |
| DRUG_SOURCE_CONCEPT_ID | 583945 | 583945 □□□□□□□□□□ (NDC□□□□76168009520□)□ |
| ROUTE_SOURCE_VALUE | NULL | |

### □□ 4.4

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```
library(DatabaseConnector)
connection <- connect(connectionDetails)
sql <- "SELECT *
FROM @cdm.condition_occurrence
WHERE condition_concept_id = 192671;"

result <- renderTranslateQuerySql(connection, sql, cdm = "main")
head(result)
```

```
##   CONDITION_OCCURRENCE_ID PERSON_ID CONDITION_CONCEPT_ID ...
## 1                    4657       273               192671 ...
## 2                    1021        61               192671 ...
```

```
## 3                    5978       351                192671 ...
## 4                    9798       579                192671 ...
## 5                    9301       549                192671 ...
## 6                    1997       116                192671 ...
```

### □□ 4.5

□□□□□□□□□□□□□□□□CONDITION_OCCURRENCE□□□□□□CONDITION_SOURCE_VALUE

```
sql <- "SELECT *
FROM @cdm.condition_occurrence
WHERE condition_source_value = 'K92.2';"

result <- renderTranslateQuerySql(connection, sql, cdm = "main")
head(result)
```

```
##   CONDITION_OCCURRENCE_ID PERSON_ID CONDITION_CONCEPT_ID ...
## 1                    4657       273                192671 ...
## 2                    1021        61                192671 ...
## 3                    5978       351                192671 ...
## 4                    9798       579                192671 ...
## 5                    9301       549                192671 ...
## 6                    1997       116                192671 ...
```

### □□ 4.6

□□□□□OBSERVATION_PERIOD□□□□□□□□□□□□□□□

```
library(DatabaseConnector)
connection <- connect(connectionDetails)
sql <- "SELECT *
FROM @cdm.observation_period
WHERE person_id = 61;"

renderTranslateQuerySql(connection, sql, cdm = "main")
```

```
##   OBSERVATION_PERIOD_ID PERSON_ID OBSERVATION_PERIOD_START_DATE ...
## 1                    61        61                     1968-01-21 ...
```

## E.2

### □□ 5.1

□□□□□ ID 192671 (“□□□□”)

### □□ 5.2

ICD-10CM□□□□

- K29.91 “□□□□□□□□□□□□□□□□□□□□”
- K92.2 “□□□□□□□□□□□□□”

ICD-9CM□□□□

- 578 “□□□□”
- 578.9 “□□□□□□□□□□□□□”

### □□ 5.3

MedDRA□□□□□

- “□□□□” (□□□□□ID 35707864)
- “□□□” (□□□□□ID 35707858)

## E.3

### □□ 6.1

A) □□□□□□□□CDM□□□□□□□□□ETL□□□□□□
B) □□□□□□□□□□□□□□□□□□□□□□□□
C) □□□□ETL□□□□□
D) □□□□□□□□□□□□□

### □□ 6.2

| □□□ | □ | □□ |
|---|---|---|
| PERSON_ID | A123B456 | □□□□□□□□□□□□□□□□□□□□□□□□□□□□□ |
| GENDER_CONCEPT_ID | 8532 | |
| YEAR_OF_BIRTH | NULL | □□□□□□□□□□□□□□□□□□□□□□□□□□□□□ |
| MONTH_OF_BIRTH | NULL | |
| DAY_OF_BIRTH | NULL | |
| RACE_CONCEPT_ID | 0 | □□□WHITE□□□□□□□□8527□□□□□□□□□ |
| ETHNICITY_CONCEPT_ID | 8527 | □□□□□□□□□□□□□□□□□□□□□0□□□□□□□ |
| PERSON_SOURCE_VALUE | A123B456 | |
| GENDER_SOURCE_VALUE | F | |
| RACE_SOURCE_VALUE | WHITE | |
| ETHNICITY_SOURCE_VALUE | NONE PROVIDED | |

□□ **6.3**

| □□□ | □ |
|---|---|
| VISIT_OCCURRENCE_ID | 1 |
| PERSON_ID | 11 |
| VISIT_START_DATE | 2004-09-26 |
| VISIT_END_DATE | 2004-09-30 |
| VISIT_CONCEPT_ID | 9201 |
| VISIT_SOURCE_VALUE | inpatient |

## E.4

□□ **7.1**

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3. □□□□□□□□

□□ **7.2**

□□□□□□□

```
library(DatabaseConnector)
connection <- connect(connectionDetails)
sql <- "SELECT COUNT(DISTINCT(person_id)) AS person_count
FROM @cdm.drug_exposure
INNER JOIN @cdm.concept_ancestor
  ON drug_concept_id = descendant_concept_id
INNER JOIN @cdm.concept ingredient
  ON ancestor_concept_id = ingredient.concept_id
WHERE LOWER(ingredient.concept_name) = 'celecoxib'
  AND ingredient.concept_class_id = 'Ingredient'
  AND ingredient.standard_concept = 'S';"

renderTranslateQuerySql(connection, sql, cdm = "main")
```

```
##   PERSON_COUNT
## 1         1844
```

COUNT(DISTINCT(person_id))□□□

```
INNER JOIN @cdm.condition_occurrence
  ON condition_start_date >= drug_era_start_date
    AND condition_start_date <= drug_era_end_date
INNER JOIN @cdm.concept_ancestor
  ON condition_concept_id =descendant_concept_id
WHERE LOWER(ingredient.concept_name) = 'celecoxib'
  AND ingredient.concept_class_id = 'Ingredient'
  AND ingredient.standard_concept = 'S'
  AND ancestor_concept_id = 192671;"

renderTranslateQuerySql(connection, sql, cdm = "main")
```

```
##   DIAGNOSE_COUNT
## 1             41
```

□□□□□DRUG_EXPOSURE□□□□□□□□□DRUG_ERA□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

## E.6

### □□ 10.1

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- 16□□□
- □□□□□□□□□□365□□□□□□□□□□□□□□

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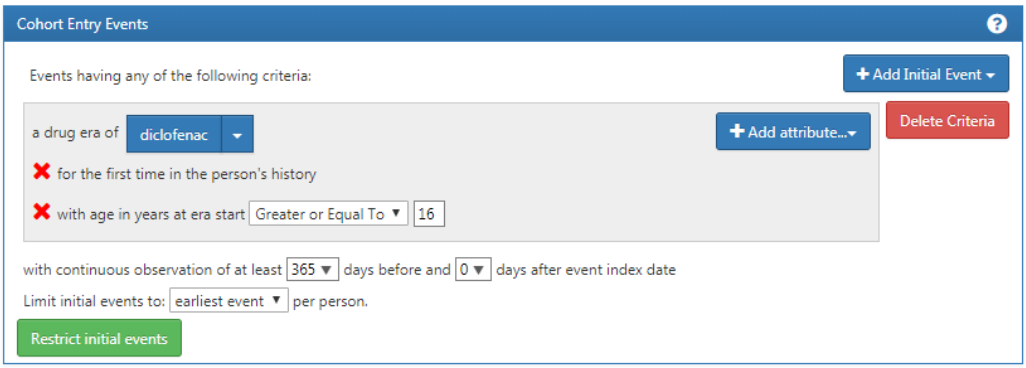


Figure E.1: □□□□□□□□□□□□□□□□□□□□

Concept Set Expression | Included Concepts 11473 | Included Source Codes | Export | Import

Name:

diclofenac

Show 25 entries Search:

Showing 1 to 1 of 1 entries Previous 1 Next

| Concept Id | Concept Code | Concept Name | Domain | Standard Concept Caption | Exclude | Descendants | Mapped |
|---|---|---|---|---|---|---|---|
| 1124300 | 3355 | Diclofenac | Drug | Standard | ☐ | ☑ | ☐ |

Classification Non-Standard Standard

Figure E.2: □□□□□□□□□□□□□□□□□□□□□

Inclusion Criteria

New inclusion criteria

1. Without prior exposure to any NSAID
*Excluding subjects with prior exposure to any NSAID*

Without prior exposure to any NSAID | Copy | Delete

Excluding subjects with prior exposure to any NSAID

having all of the following criteria: + Add criteria to group...

with exactly 0 using all occurrences of:
a drug exposure of NSAIDs + Add attribute...
where event starts between All days Before and 1 days Before
index start date *add additional constraint*
☐ restrict to the same visit occurrence
☐ allow events from outside observation period

Delete Criteria

Limit qualifying events to: earliest event per person.

Figure E.3: NSAID□□□□□□□□□□□□□

Concept Set Expression | Included Concepts 23112 | Included Source Codes | Export | Import

Name:

NSAIDs

Show 25 entries Search:

Showing 1 to 1 of 1 entries Previous 1 Next

| Concept Id | Concept Code | Concept Name | Domain | Standard Concept Caption | Exclude | Descendants | Mapped |
|---|---|---|---|---|---|---|---|
| 21603933 | M01A | ANTIINFLAMMATORY AND ANTIRHEUMATIC PRODUCTS, NON-STEROIDS | Drug | Classification | ☐ | ☑ | ☐ |

Classification Non-Standard Standard

Figure E.4: NSAIDs□□□□□□□□□□□□

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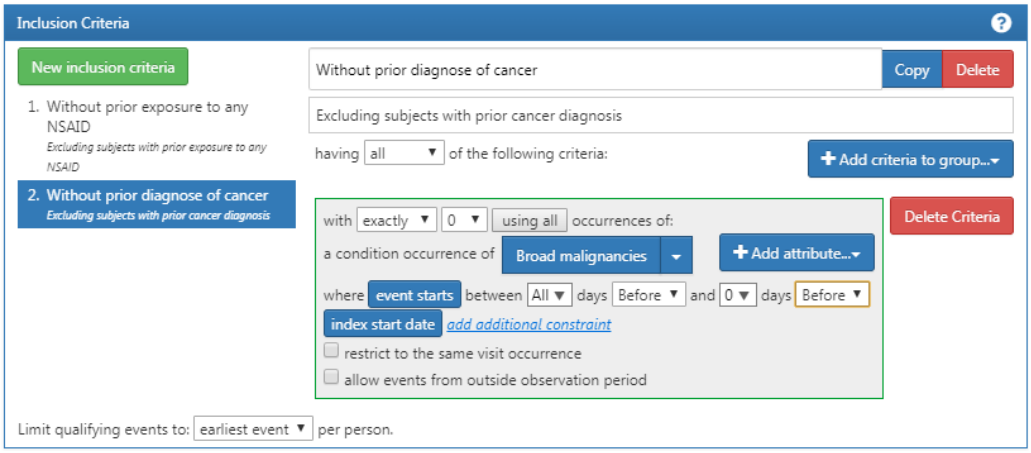



Figure E.5: □□□□□□□□□□□□□□□□□□□

□□□□□□□□□□□□□□□□□□□□□□□□□E.6□□□□□□□□□□□□□□□□□□□

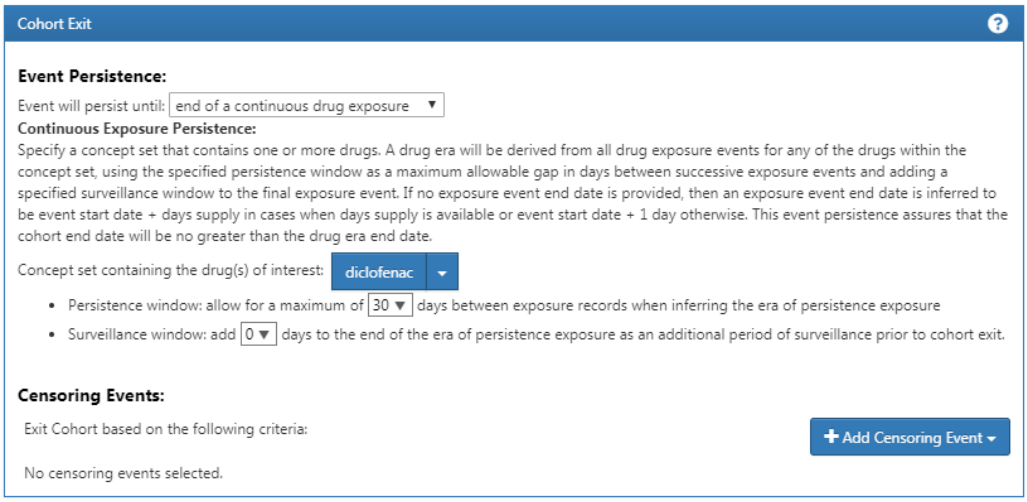



Figure E.7: □□□□□□□□□□□□

```
    WHERE ancestor_concept_id = 4329847 --
)
  AND condition_concept_id NOT IN (
    SELECT descendant_concept_id
    FROM @cdm.concept_ancestor
    WHERE ancestor_concept_id = 314666 --
);"

renderTranslateExecuteSql(connection, sql, cdm = "main")
```

□□□□□□□□□ER□□□□□□□□□□□□□□□□□□□□□□□□□□□COHORT_DEFINITION_ID□□□□

```
sql <- "INSERT INTO @cdm.cohort (
  subject_id,
  cohort_start_date,
  cohort_definition_id
  )
SELECT subject_id,
  cohort_start_date,
  CAST (1 AS INT) AS cohort_definition_id
FROM #diagnoses
INNER JOIN @cdm.visit_occurrence
  ON subject_id = person_id
    AND cohort_start_date >= visit_start_date
    AND cohort_start_date <= visit_end_date
WHERE visit_concept_id IN (9201, 9203, 262); --    ER;"

renderTranslateExecuteSql(connection, sql, cdm = "main")
```

□□□□□□VISIT_OCCURRENCE_ID□□□□□□

## □□ 11.2

Cohort Definitions □□□□□

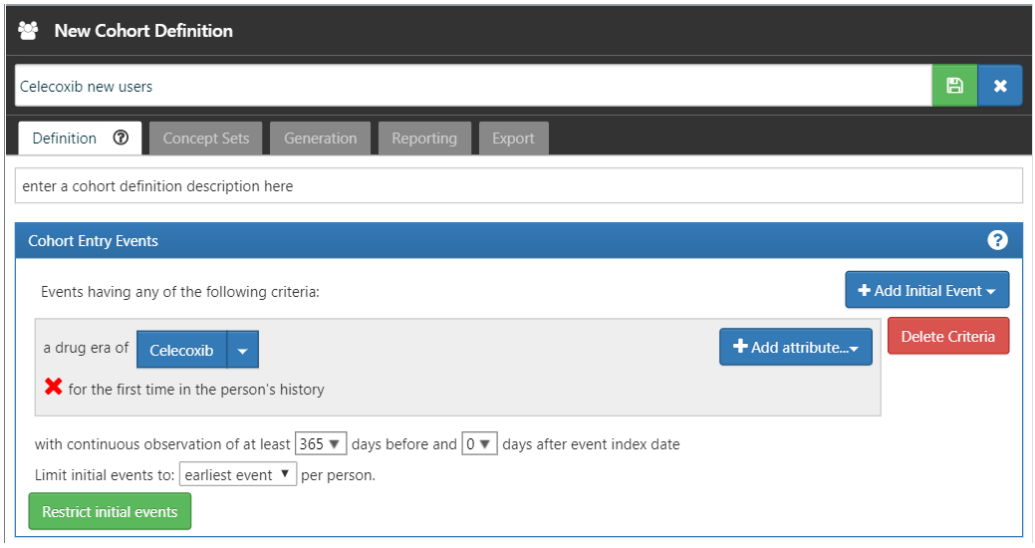



Figure E.10: □□□□□□□□□□□□□□□□□□□□□□□□

□E.13 □□□□□□□□□□□□□□□□□□□□

New Characterization

Celecoxib new users characterization

Design | Executions | Utilities

**Cohort characterization** is defined as the process of generating cohort level descriptive summary statistics from person level covariate data. Summary statistics of these person level covariates may be count, mean, sd, var, min, max, median, range, and quantiles. In addition, covariates during a period may be stratified into temporal units of time for time-series analysis such as fixed intervals of time relative to cohort_start_date (e.g. every 7 days, every 30 days etc.), or in absolute calendar intervals such as calendar-week, calendar-month, calendar-quarter, calendar-year.

## Cohort definitions

Import

Show 10 entries Search:

| ID | Name | | |
|---|---|---|---|
| 1771701 | Celecoxib new users | Edit cohort | Remove |

Showing 1 to 1 of 1 entries Previous 1 Next

## Feature analyses

Import

Show 10 entries Search:

| ID | Name | Description | Actions |
|---|---|---|---|
| 15 | Drug Group Era Any Time Prior | One covariate per drug rolled up to ATC groups in the drug_era table overlapping with any time prior to index. | Remove |
| 27 | Condition Group Era Any Time Prior | One covariate per condition era rolled up to groups in the condition_era table overlapping with any time prior to index. | Remove |

Showing 1 to 2 of 2 entries Previous 1 Next

Figure E.11: □□□□□□□

Characterization #69

Celecoxib new users characterization

Design | Executions | Utilities

Executions › Reports for SYNPUF 5%

Date: 08/23/2019 12:53 PM Design: -1840810470 Results: 2 reports

Filter panel

Cohorts: Celecoxib new users

Analyses: Condition Group Era Any Time P

Domains: Condition, Drug

CONDITION / Condition Group Era Any Time Prior

Export Show 10 entries Search:

| Covariate | Explore | Concept ID | Count | Pct |
|---|---|---|---|---|
| Pain | Explore | 4329041 | 1,140 | 78.62% |
| Pain finding at anatomical site | Explore | 4132926 | 1,135 | 78.28% |
| Inflammation of specific body systems | Explore | 4178818 | 1,135 | 78.28% |
| Arthropathy | Explore | 73553 | 1,122 | 77.38% |

Figure E.12: □□□□□□□

GI bleed › GI bleed

Search

Search | Import

Gastrointestinal hemorrhage

Advanced Options

Column visibility Copy CSV Show 15 entries Filter:

Showing 1 to 15 of 25 entries Previous 1 2 Next

Vocabulary
SNOMED (17)
ICD10CM (2)
ICD9CM (2)
DRG (2)
NDFRT (1)

Class
Clinical Finding (17)

| Id | Code | Name | Class | RC | DRC | Domain | Vocabulary |
|---|---|---|---|---|---|---|---|
| 192671 | 74474003 | Gastrointestinal hemorrhage | Clinical Finding | 919 | 37,144 | Condition | SNOMED |
| 4338544 | 87763006 | Lower gastrointestinal hemorrhage | Clinical Finding | 0 | 15,617 | Condition | SNOMED |
| 4100660 | 27719009 | Acute gastrointestinal hemorrhage | Clinical Finding | 0 | 9,852 | Condition | SNOMED |

Figure E.13: □□□□□□□□□□□□□□□□□□□□□□□

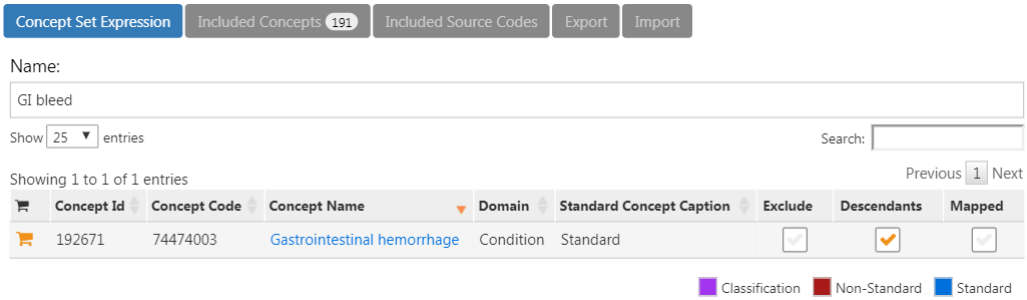



Figure E.14: □□□□□□□□□□□□□□□□□□□□

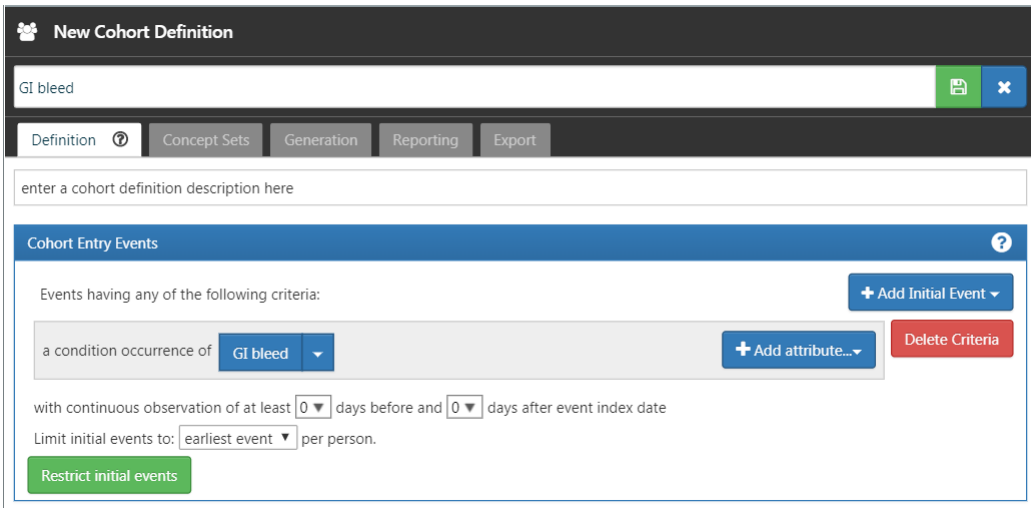



Figure E.15: □□□□□□□□□□□□□□□□□

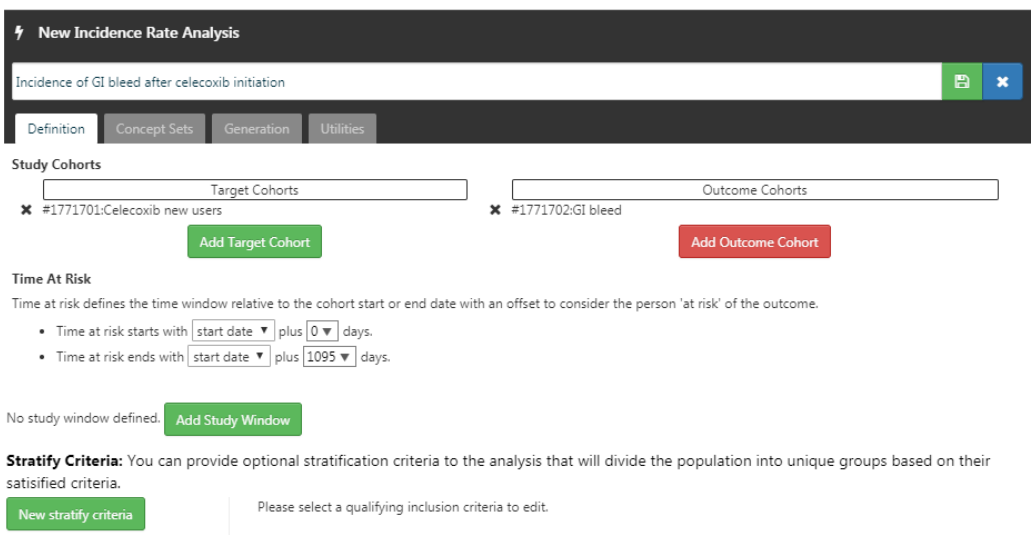



Figure E.16: □□□□□□

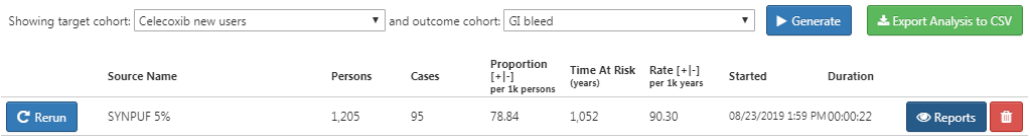



Figure E.17: □□□□□

```
  cdmDatabaseSchema = "main",
  targetId = 1,
  comparatorId = 2,
  outcomeIds = 3,
  exposureDatabaseSchema = "main",
  exposureTable = "cohort",
  outcomeDatabaseSchema = "main",
  outcomeTable = "cohort",
  covariateSettings = covSettings)
summary(cmData)
```

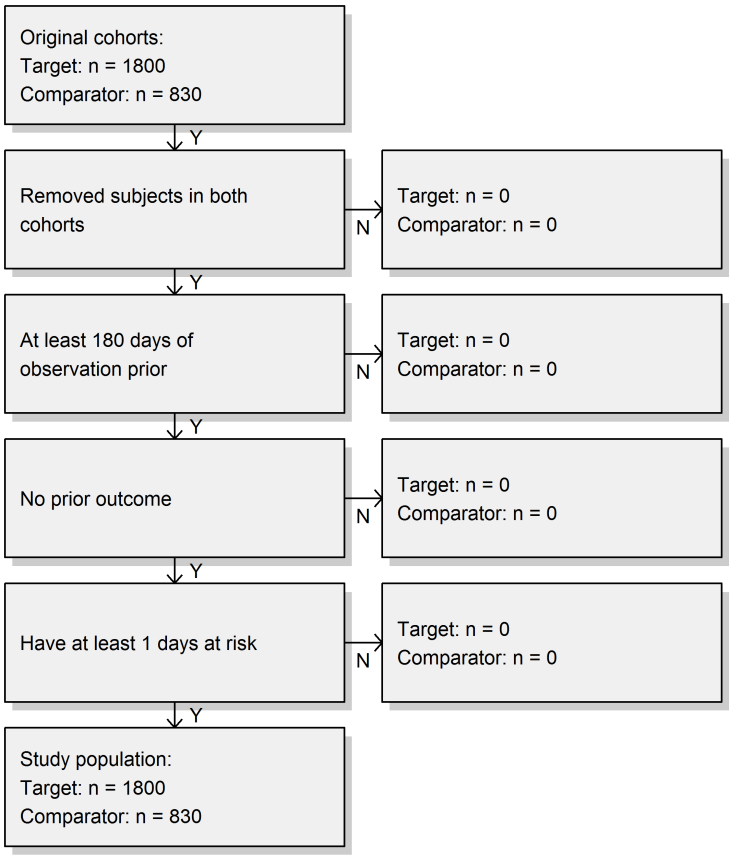
```
## CohortMethodData
##
##      ID 1
##      ID 2
##      ID 3
##
##       1800
##      830
##
##
##
## 3            479         479
##
##
##     389
##        26923
```

### □□ 12.2

□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

```
studyPop <- createStudyPopulation(
  cohortMethodData = cmData,
  outcomeId = 3,
  washoutPeriod = 180,
  removeDuplicateSubjects = "remove all",
  removeSubjectsWithPriorOutcome = TRUE,
```

```
  riskWindowStart = 0,
  startAnchor = "cohort start",
  riskWindowEnd = 99999)
drawAttritionDiagram(studyPop)
```

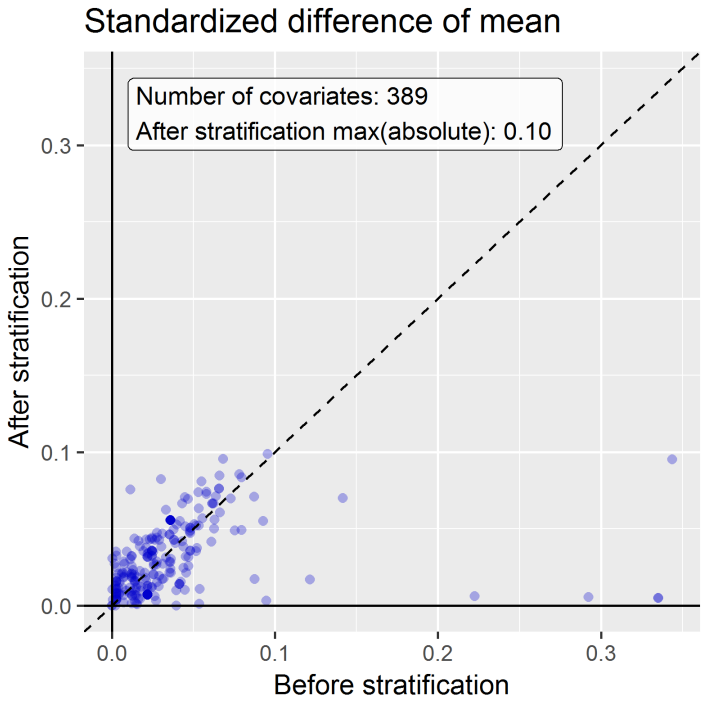



□□□□□□□□

```
##     FALSE
##          FALSE
##    OK
##
##                .95    .95
##         1.34612    1.10065    1.65741 0.29723    0.1044
```

□□□□□

```
                                showMaxLabel = TRUE,
                                beforeLabel = "  ",
                                afterLabel = "  ")
```




□□□□□□□□□□□□□□□□□□□□□□□□x□□□□□□□□>0.3□□□□□□□□□□□□□□□□□□□

□□□□□□□□□□□□□□□□□□□□□□□□□95□□□□□□□1□□□□□□□□□□□□□□□□□□□□□□□□□2□□

## E.9

### □□ 13.1

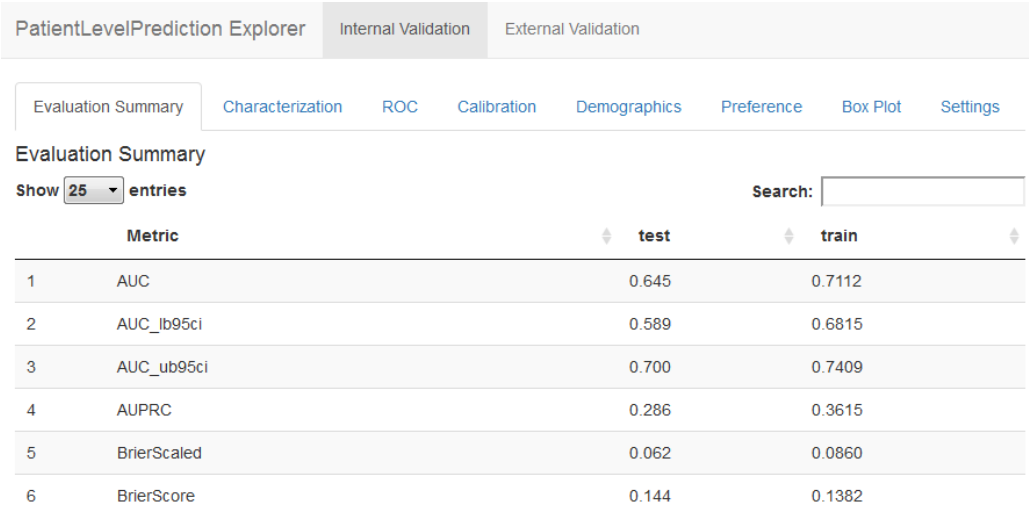
□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□getPlpData□□□□□□□□□□

```
library(PatientLevelPrediction)
covSettings <- createCovariateSettings(
  useDemographicsGender = TRUE,
  useDemographicsAge = TRUE,
  useConditionGroupEraLongTerm = TRUE,
  useConditionGroupEraAnyTimePrior = TRUE,
  useDrugGroupEraLongTerm = TRUE,
  useDrugGroupEraAnyTimePrior = TRUE,
  useVisitConceptCountLongTerm = TRUE,
  longTermStartDays = -365,
  endDays = -1)

plpData <- getPlpData(connectionDetails = connectionDetails,
                      cdmDatabaseSchema = "main",
                      cohortDatabaseSchema = "main",
                      cohortTable = "cohort",
                      cohortId = 4,
                      covariateSettings = covSettings,
                      outcomeDatabaseSchema = "main",
                      outcomeTable = "cohort",
                      outcomeIds = 3)

summary(plpData)
```

```
## plpData
##
##          ID -1
##     ID 3
##
##   2630
##
##
##
## 3           479        479
##
##
##     245
##       54079
```

### □□ 13.2

□□□□□□□□




| | Metric | test | train |
|---|---|---|---|
| 1 | AUC | 0.645 | 0.7112 |
| 2 | AUC_lb95ci | 0.589 | 0.6815 |
| 3 | AUC_ub95ci | 0.700 | 0.7409 |
| 4 | AUPRC | 0.286 | 0.3615 |
| 5 | BrierScaled | 0.062 | 0.0860 |
| 6 | BrierScore | 0.144 | 0.1382 |

Figure E.18: □□□□□□□Shiny□□□□

## E.10

### □□ 15.1

ACHILLES□□□□□□□:

```
library(ACHILLES)
result <- achilles(connectionDetails,
                   cdmDatabaseSchema = "main",
                   resultsDatabaseSchema = "main",
                   sourceName = "Eunomia",
                   cdmVersion = "5.3.0")
```

### □□ 15.2

□□□□□□□□□□□□□□□□□□□□:

```
DataQualityDashboard::executeDqChecks(
  connectionDetails,
  cdmDatabaseSchema = "main",
  resultsDatabaseSchema = "main",
  cdmSourceName = "Eunomia",
  outputFolder = "C:/dataQualityExample")
```

### □□ 15.3

□□□□□□□□□□□□□□□□□□□:

```
DataQualityDashboard::viewDqDashboard(
  "C:/dataQualityExample/Eunomia/results_Eunomia.json")
```

## E.11

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